International Mediterranean Natural Sciences, Health Sciences and Engineering Congress (MENSEC)

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International Mediterranean Natural Sciences, Health Sciences and Engineering Congress (MENSEC)

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THIRD INTERNATIONAL MEDITERRANEAN CONGRESS ON NATURAL SCIENCES, HEALTH SCIENCES AND ENGINEERING (MENSEC III)

THEME: The Future of Organic Agriculture in Mediterranean Basin

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FOREWORD

Third International Mediterranean Natural Sciences, Health Sciences and Engineering Congress (MENSEC III) with the main theme of "The Future of Organic Agriculture in Mediterranean Basin" was jointly organized by the University of Donja Gorica and Bandirma Onyedi Eylul University and also supported by the following universities: Istanbul Sabahattin Zaim University, International University of Sarajevo and Sivas Cumhuriyet University. The congress was held in June 18-20, 2019 in Podgorica, Montenegro. In the congress, over 55 oral/poster presentations were made by scholars from 27 universities from 8 countries (Montenegro, Bosnia and Herzegovina, Croatia, Slovenia, North Macedonia, Italy, Northern Cyprus Turkish Republic and Turkey).

The congress aimed to bring together international scholars and researchers in the areas of natural sciences, healt sciences, sport sciences and engineering in order to provide a forum for dialogue and exchange of recent research findings and ideas related to the challenges that Balkan and Mediterranean countries. The Scientific and Organizing Committees are founded by different universities in the region. We received large number of applications that gave us the opportunity to choose the most excellent of them in order to reach higher scientific level.

I would like to thank all the participants for their enthusiasm to contribute to this project and their willingness both to keep to tight deadlines and to accept editorial recommendations; to all the Scientific and Organizing Committee members, for their patience, support and tolerance. Special thanks for the rectors of our partner universities for their valuable support. We hope to see you all in our next congress.

Sincerely Yours,

Prof. Dr. Veselin Vukotic, Rector
University of Donja Gorica

Third International Mediterranean Natural Sciences, Health Sciences and Engineering Congress

MENSEC III

The Future of Organic Agriculture in Mediterranean Basin

CONGRESS PROCEEDINGS

University of Donja Gorica

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Anti-Icing Methods for Highways and Airfield's Pavements

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ABSTRACT

With the increase of the human population, the need for travel has also increased and safe, uninterrupted and fast transportation has become increasingly important in every climate condition. In winter, snow, ice storm, icing, etc. cause significant problems in road transport, and can lead to traffic congestion and flight cancellations at airports such as bridges, tunnels and vertical curves, leading to cost and spiritual losses. Therefore, the removal of snow or icing on the road surface and airfield in a timely manner and the safe opening of asphalt pavements is one of the most important issues since early times. The anti-icing methods can be divided under two parts as passive and active. In this paper, the anti-icing methods and the advantages and disadvantages of the methods are mentioned. The application details of the active anti-icing methods, which are being applied more and more nowadays, are mentioned.

Keywords: Anti-Icing Methods, Highways, Airfields, Passive Anti-Icing Methods, Active Anti-Icing Methods.

INTRODUCTION

The most important 3 basic concepts in Highway Engineering are safety, economy and comfort. Road users demand safe, uninterrupted and fast transportation in every climate condition. Especially in winter snow and icing problems are serious risky for the traffic safety, so the concept of "safety" requires more attention than in other seasons. Accidents and pileup can occur resulting in many deaths and injuries. In addition, the negative impact of icing on the "economy" can be explained by the flight delays and cancellations at airports. The last principle "comfort" is about reduced frictional resistance between the road and the vehicle wheel. The roughness of the pavement is the most important factor affecting driving comfort and safety. For vehicles using airport pavement, the pavement must not only smooth, but also rough enough to provide the necessary friction resistance (Seferoğlu *et al.*, 2015). Since the reasons, the prevention of icing has become a major problem in highway engineering for long periods of time.

Many critical road sections are very dangerous in terms of icing and it is very significant to prevent icing in these sections. These sections are bridges, tunnel's entrances and exits, road's vertical and horizontal curve segments, sidewalks, parking lots, hospital emergencie's roads, driveways, shopping centres, subways, loading docks, airfields and bus stops.

There are generally two methods to prevent icing and frost propagation on roads. These are "anti-icing" and "de-icing" methods. Anti-icing method, also known as the modern method, is application of chemicals that not only de-ice, but also remain on a surface and continue to delay the reformation of ice for a certain period of time, or prevent adhesion of ice to make mechanical removal easier (Gürer C., Düşmez C. & Demirci B.). The application of chemicals that reduce the freezing point to the road surface immediately after the precipitation has started and even before the precipitation has started prevents snow or ice from forming a bond among the surface. Subsequently, periodic and partial repetitions and the application of the chemical substance while the precipitation is continuing ensures this effect. These preventive processes are the most important points to prevent icing. Anti-icing is more suitable for high priority roads requiring quick and frequent intervention. In order to prevent icing, the snow or loose ice must be cleared from the road before applying the chemical to the road surface. This aims to ensure that the chemical is more effective by preventing become too dilute (Ağar & Kutluhan, 2005). De-icing method, also known as the traditional method, is defined as removal of snow, ice or frost (Gürer C., Düşmez C. & Demirci B.). In the traditional snow and ice control methods, it should be waited until the snow has become 2.5 cm of thickness or more on the surface, then should be removed the snow and chemicals and anti-skid materials should applied to the surface. This method generally results in the formation of a layer of snow that is firmly adhered to the surface. Removal of this layer requires a large amount of chemical treatment. Because these chemicals must be able to reach to the surface between snow and road and destroy or weaken the bond between them. Since this is a later reaction, it results in less safety and higher costs than icing prevention. However, this reactive method can be used in less priority ways. These chemicals are the same as those used in the anti-icing approach (Agar & Kutluhan, 2005).

Active and passive methods are used to prevent snow and ice. Mechanical and chemical methods are known as passive methods. However, both of these methods may have some damages on airfield pavements and bridge slabs. The de-icing salts used in winter also affect a significant part of the structures such as bridges or viaducts in our country.

CONTROL METHODS FOR SNOW AND ICING

Passive Methods

Physical Methods

Different machines and equipment are used to remove the snow from the road surface. All of the machines and equipment will be used is decided according to the thickness of the snow and the place to be deposited. When the snow thickness exceeds 5 cm, snow can be removed from the road with trucks fitted with a flat snow blade at a speed of approximately 50 km / h. These machines are effective up to 20 cm snow thickness. In places with snow thickness between 20 cm and 50 cm, closed places are opened with V blades and final cleaning is done with flat blades. Where snow thicknesses reach 1 m, snow is split with V blades fitted to more powerful trucks. When the snow thickness exceeds 50 cm, it is more useful to open the road with rotators, except in emergencies.

Chemical Methods

The application of various chemicals to the road surface is one of the most widely used methods in our country and all over the world in order to ensure the formation of snow and ice thawing. These substances; There are two types as solid and liquid. The most important feature of these chemicals is the melting of ice and frozen snow on the road surface by reducing the freezing point of water. These substances, which are in solid (granular, powder, etc.) and liquid (solutions of a certain concentration, etc.), can be applied either alone or by mixing with each other and other substances to improve their performance. The researchers found that the rigidity modulus of concrete asphalt pavements exposed to 2.5% saline solution decreased by 35% and fatigue strength decreased by 41%.

Active Methods

Automatic Solution Spraying Systems

These systems are anti-icing solution spray systems fixed on the pavement. Such icing prevention methods comprise a solution tank, an electric pumping system and a control room with a computer-based control system. The control rooms of these systems are scalable and capable of combating icing in multiple lanes by spraying systems.

The basic principle of this method is to spray the anti-icing chemicals to the coating with the system placed at the application site, thereby preventing the adhesion of ice to the pavement by forming a chemical layer between the ice and the pavement surface.

Hydronic Systems

Hydronic heating systems is a circulating a heated liquid through a pipe network located below the pavement to melt snow and ice that accumulate in the pavement (ASHRAE, 2003). In such systems, geothermal water extracted from the ground by using a geothermal heat pump is supplied by a heat exchanger to a propylene glycol mixture and is intended to prevent icing on the surface by circulating the pipes placed under the pavement. The reason for using propylene glycol is to reduce the freezing point of water. Hydronic fluid circulates in polyethylene pipes placed under the pavement. The diameter of these pipes is 18 mm and they are laid under the pavement at a distance of 300 mm from each other. Coiled pipes are placed 75 mm below the road surface. Pavement thickness should be 200 mm.

Electrically Conductive Concrete/Asphalt Concrete

Conductive asphalt concrete, which is part of asphalt pavement heating systems, is a new technology in snow melting and defrosting. In this system, the superstructure is divided into heating modules of appropriate scale. The conductivity level varies according to the size of the split modules and the desired heat requirement. In general, module sizes with conductivity not exceeding 100 ohms are preferred. The application of conductive asphalt concrete was developed by Minsk in 1968 as a new snow melting / icing system (Minsk and Hanover, 1971).

It consists of a conductive asphalt de-icing system, a conductive coating mix power supply, conductive cables carrying power, sensors measuring the weather conditions, and a control-monitoring system. The traditional asphalt mixture is a mixture of bitumen, aggregate and mineral fillers, all of which are insulating. According to the basic conductive composite polymer theory, conductive asphalt concrete with a low resistance value is activated by the addition of conductive, dust, fiber and particles in various forms into the asphalt concrete. Since the power supply cables and control systems for this ice-fighting system are similar and common, it is important to obtain a conductive asphalt mixture which has both excellent conductivity and acceptable mechanical properties. Graphite, carbon powder, carbon fiber, steel fiber, steelmaking slags are used for conducting materials for asphalt concrete to have low resistivity (Düşmez, 2019).

Cable Heating Systems

Such systems are based on heating cables placed under the pavement and keeping the surface temperature of the pavement above the degree of continuous freezing according to the road air opposition. These systems require higher power and longer run time than other systems. Generally, heating cables are made along the sections where the wheel marks are concentrated on the pavements. The surface temperature change of the pavement is continuously monitored by the surface mounted temperature sensors. A similar system of this type has been applied on the road connecting Esenboga Airport to Ankara, which is also called as protocol road in our country.

Comparison of Active and Passive Methods

In passive methods, which are the most commonly used methods in snow and ice fighting, plowing, salting, sand and chemicals are applied. However, these methods require more substances to be able to dissolve the bond between the coating and ice after they have been applied after snow or ice. Human health and the environment are also affected negatively, as it causes bottlenecks on road and decreases in operating speed (Ağar & Kutluhan, 2005; Akbulut *et al.*, 2018). In active methods; systems based on the determination that there is no ice formation due to the system established before icing occurs. For this reason, active methods are more advantageous than passive methods.

Advantages of Active Methods

- These methods are very effective and environmentally friendly method.
- Long term costs is lower than passive methods.
- The methods are can be controlled by computer.
- Emergency action plans for cold weather conditions can be applied successfully by Road Authority of the Countries.

Disadvantages of Passive Methods

- It requires significant number of labors, machinery, fuel, consumables (solutions, salts, abrasive material etc.),
- Deicing chemicals and salts have destructive effects on the soil ecological environment,
- Anti-icing salts and solutions cause to corrosion deteriorations in concrete and vehicles,
- Anti-icing salts and solutions have detrimental effects on plants,
- Because of the salts, asphalt pavements could be rapidly deteriorating and need to rehabilitate.

CONCLUSION

Anti-icing in winter is a major problem for cold climate regions. One of the most important of these problems is the traffic accidents that happen in a row. After the traffic accidents, both material and spiritual losses are occurred and therefore alternative methods of ice struggle are needed to eliminate the negative effects. Active methods are used instead of passive methods in the prevention of icing so that they can be prevented before icing occurs and losses such as time and cost, labor, etc. in passive methods can be removed (Akbulut *et al.*, 2018). The Anti-Icing Methods for Highways and Airfield's Pavements are one of the most important issues today as before.

Passive methods based on human employment and machine park have been replaced by active methods, also known as modern methods. In this way, both the protection of the

environment by reducing the use of chemicals and the anti-icing have become the primary targets. With increasing traffic density and travel demand, electricaly conductive pavements among the active anti-icing methods will become more and more important and will be increasingly used in critical road sections such as airports and public buildings etc. under heavy winter conditions.

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Artificial Intelligence in Work Process Automation

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ABSTRACT

Artificial Intelligence (AI) nowadays has become a part of nearly every working process. The evolvement of the AI in processes automation is progressing fast and is becoming a substitute by creating more effective and precise work, thus generating more sustainability on the industries worldwide.

> *"AI is usually defined as the science and engineering of imitating, extending and augmenting human intelligence through artificial means and techniques to make intelligent machines"*
> *Zhongzhi SHI*

The emphasizes of the displacement with AI in effect of work automation is creating machines and AI replacing works in specific tasks that manpower have used it to perform. This displacement effect inclines the reduction of the demand for working force, yet in the other-hand it has counteracted productivity effect resulting increased incomes by process automation as well as demanded increase of workforce for non-automated tasks generated via automation processes. The more powerful countervailing force against automation is the creation of new labor-intensive tasks, which reinstates labor in new activities and tends to in-crease the labor share to counterbalance the impact of automation. The more dominant countervailing energy against automation is the formation of new work concentrated assignments, which reestablishes work as new activities and has in affected in the counterbalance process automations. The paper will present the counterbalance and the positive effects that AI has brought to the industries over the past decades.

Keywords: AI, Automation, Demand, Work-Force, Displacement, Technology, Productivity.

INTRODUCTION

At our context is the idea that automation and thus AI, technology and robotics supersede employee jobs in tasks that they previously performed via this channel, create a powerful displacement effect. Highlighting several countervailing forces, which push against the displacement effect and may imply that automation, AI, technology and robotics could increase labor demand.

> *Artificial intelligence is an apparently self-evident phrase which has come into common usage without having a well-defined and generally accepted meaning.* (Samuel, 1962)

Recent surveys find high levels of concern about automation and other technological trends, stressing the widespread concerns about their effects (Smith & Anderson, 2019). The expectations and concerns notwithstanding are far from a satisfactory understanding of how automation in general, AI, technology and robotics in particular, impact the labor market and productivity. Even worse, much of the debate in both the popular press and academia centers around commenced over the years have attributed to an inconsistency. On the one side are the pessimistic arguments that the oncoming advances in AI, technology and robotics will spell the end of work by humans, while many economists on the other side claim that because of the technological breakthroughs in the past we have eventually increased the demand for manual labor, there is no reason to be concerned that this time will be any different.

The productivity effect could manifest itself as an increase in the demand for labor in the same sectors undergoing automation or as an increase in the demand for labor in non-automating sectors.

A more critical factor is a potential mismatch between technology and skills, between the requirements for the new technologies, jobs and the skills of the manpower. The paper will show that such a mismatch slows down the adjustment for labor demand, contributes to inequality, and also reduces the productivity advances from both automation and the introduction of new job lines.

JOBS, DISPLACEMENT AND AI

Some jobs have to be produced by manual labor, while some other can be produced either by manual labor or by technology, thus AI. Also, labor and technology have comparative advantages in different jobs, meaning that the relative productivity of labor varies across jobs and specific tasks.

The displacement effect could cause a decline in the demand for labor and the equilibrium wage rate (Joseph, 1998). The possibility that technological improvements that increases productivity can actually reduce the remuneration of all workers, is an important point to highlight it because it is often downplayed or ignored.

An elastic labor supply as a reduction in the demand for manual labor leads to lower employment (Tuzel Selale, 2019). In contrast to the standard approach based on factor augmenting technological changes, a job-based approach immediately opens the way to productivity (Graetz & Michaels, 2015) enhancing technological developments that simultaneously reduce remunerations and employment.

UNDERBALANCED EFFECTS

The presence of the displacement effect (Sirkin, Zinser, & Rose, 2015) does not mean that automation will always reduce manual labor demand. In fact, throughout history, there are several periods where automation was accompanied by an expansion of manual labor demand and even raised the renumeration doe to specificities required to meet the need in combination with new trends and AI involvements. There is a number of reasons why automation will also create a positive impact on labor demand, such as:

Expanding of automation: The displacement effect is created by automation at the extensive margin. This normally does not create additional displacement, because manual labor was already replaced by the planned investments. The productivity effects (Manuelli & Seshadri, 2014) then raises manual labor demand, referring to this aspect of advances in automation technology as the expansion of automation.

The productivity effect: By reducing the cost of producing a subset of any task within a manual laboring process, automation raises the demand for labor in non-automated tasks.

Capital accumulation: As the paper clarifies, automation corresponds to an increase in the capital intensity of production. By default, the investments on capital accumulation raises the need for more manual labor.

DISTRIBUTED ARTIFICIAL INTELLIGENCE

With the continuous development of computer and networking, computer communication and concurrent programming technologies since the 1980's, Distributed Artificial Intelligence (DAI) has become the new research focus in the field of AI. The term DAI was coined by American researchers, and the first International Workshop on Distributed Artificial Intelligence was held at MIT in Boston in 1980.

With the increase in scale, scope and complexity of new computer based information systems, decision support systems and knowledge based systems, as well as the requirement to encode more complex knowledge in these systems, applications and development of DAI technologies is becoming increasingly important to these systems.

As Lady Ada Lovelace remarked nearly two centuries a go in describing Charles Babbage's Analytic Engine:

> *"nothing comes out of the computer which has not been put into it, bearing, of course, an infrequent case of malfunctioning, and the computer can only do what we know how to instruct to do"*

AI will continue to advance as well as the demands for manual labor. The technologies will always replace the labor that has been done manually on a repeated section, non the less manual labor will be present as it was previously.

TASKS

Periods of intensive automation have often coincided with the emergence of new jobs, activities, industries and tasks. In early 20th century America and other countries, the mechanization of agriculture coincided with a large increase in employment in new industry and factory jobs (Kuznets, 1966), among others in the flourishing industries of farm equipment (Olmstead & Rhode, 2001) and cotton milling (Rasmussen, 1982). This is not just a historical phenomenon. In 19th century Great Britain, for example, there was a rapid expansion of various new industries and jobs ranging from engineers, machinists, repairmen, conductors, back-office workers and managers involved with the introduction and operation of new technologies (Landes, 1988).

Throughout the paper are highlighted that the creation of new, labor-intensive jobs-tasks may be the most powerful force balancing the growth process in the face of rapid automation.

In the same way that automation has a displacement effect, should be thinking of the creation of new jobs as engendering a reinstatement effect. In this way, the creation of new jobs would have the opposite effect on automation in regard to non-automated task.

GAP BETWEEN SKILLS AND TECHNOLOGIES

The adjustment to the large supply of manual labor freed from agriculture in the early 20th century USA may have been greatly aided by the high school movement which increased the human capital of the new generation of American workers (Goldin & Katz, 2010).

Is not only the speed of adjustment that is at stake nowadays, it is also the potential to gain from new technologies. The mismatch between skills and technologies not only slows down the adjustment of employment, it holds back potential productivity gains and new development for either new AI or manual laboring job.

The fact that while there is heightened concerns about job losses from automation, many employers are unable to find workers with the right skills for their jobs underscores the importance of these considerations (Deloitte et. al, 2011).

EXCESSIVE AUTOMATION

The issues raised in the previously are important, not just because a deep puzzle in any discussion of the impact of new technologies is missing productivity growth - the fact that while so many sophisticated technologies are being adopted, productivity growth has been slow.

One line of attack argues that there is plenty of productivity growth, but it is being mis measured (Zeira, 1998). But, as pointed out by (Syverson, 2017), the pervasive nature of this slow down, and the fact that it is even more severe in industries that have made greater investments in information technology (Acemoglu, Autor, Dorn, Hanson, & Price, 2014) make the productivity mismeasurement hypothesis unlikely to account for all of the slowdown.

There are two broad reasons for excessive automation, both of which are considered to be important. There are natural reasons why too much weight on automation may come at the cost of investments in other technologies, including the creation of new jobs. For instance, in a setting where technologies are developed endogenously (Syverson, 2017) using a common set of resources (e.g., biological researchers), there is a natural trade-off between faster automation and investments in other types of technologies (Acemoglu & Restrepo, Robots and Jobs: Evidence, 2017).

TECHNOLOGICAL CHANGE

Here we incorporate four different types of technological advances. All advances increase productivity, but it will be seen with a different effect on the demand for manual labor and remunerations.

Creation of new tasks: As highlighted in (Acemoglu & Restrepo, Robots and Jobs: Evidence, 2017), another important aspect of technological change is the creation of new tasks and activities in which labor has a comparative advantage. In our model this can be captured in the simplest possible way by an increase in N.

Automation: Is considered automation to be an expansion of the set of tasks that are technologically automated as represented by the parameter I.

Deepening of automation: Another dimension of advances in AI and robotics technology will tend to increase the productivity of machines in tasks that are already automated, for example, by replacing existing machines with newer, more productive vintages. In terms the model here shown, this corresponds to an increase in the $\gamma M(x)$ function for tasks $x < I$.

Labor-augmenting technological advances: Standard approaches in macroeconomics and labor economics typically focus on labor-augmenting technological advances. Such technological changes correspond to increases in the function $\gamma L(x)$. The analysis show that they are in fact quite special, and the implications of automation and AI are generally very different from those of labor-augmenting advances.

THE DISPLACEMENT EFFECT

The result shows that automation at the extensive margin indeed creates a displacement effect (Brynjolfsson & McAfee, 2016), reducing manual labor demand, but also that it is counteracted by a productivity effect, pushing towards greater manual labor demand.

As Lady Ada Lovelace remarked:

"*...the computer can only do what we know how to instruct it to do*".

$$\frac{d \ln W}{dl} = \underbrace{\frac{d\,ln(N-1)}{dl}}_{\substack{\text{Displacement} \\ \text{effect} <0}} + \underbrace{\frac{d\,ln(Y\,/\,N)}{dl}}_{\substack{\text{Productivity} \\ \text{effect} >0}}$$

(Daron & Pascual, 2018)

The result shows that automation at the extensive margin indeed creates a displacement effect, reducing labor demand, but also that it is responded by a productivity effect, pushing towards greater labor demand. Presenting based on the aggregate output as given by a Cobb-Douglas aggregate of the capital stock and employment. Where Y denotes aggregate output; N refers to a new job-task and W is the equilibrium of wage.

Exclusive of the productivity effect, automation would always reduce manual labor demand, because it is directly replacing labor in tasks that were previously performed by workers. Indeed, if the productivity effect is limited, automation will reduce manual labor demand and have direct impact into compensations.

APPOINTMENTS – CREATING OF NEW JOBS

Periods of intensive automation have often co incited with the emergence of new jobs, activities, and industries. As documented in (Groover, Weiss, Nagel, & Odrey, 1986), from 1980 to 2010, the introduction and expansion of new jobs and job titles explains about half of employment growth. Throughout this paper are highlighted that the creation of new, labor-intensive tasks may be the most powerful force balancing the growth process in the face of rapid automation. The same way that automation of work labor force has a displacement effect, it is known that the creation of new jobs as engendering a reinstatement effect. This way the creation of the new jobs will have opposite effect to automation. Throughout the e paper as well as based on many researches of the same field there have been stressed into two key ideas.

Automation does create a potential negative impact on manual labor through the displacement effect and also by reducing the share of manual labor in a national income. Automation can be counterbalanced with the creation of new jobs.

The representation we have dyed does underplay some of the challenges of adjustment. However, the economic adjustment following rapid automation can be more painful than the process we have outlined for a number of reasons.

Most straightforwardly, automation changes the nature of existing jobs, and the reallocation of workers from existing jobs and tasks to new ones is a complex and often slow process. The change management is a painful and hard process to go through. These effects are visible in recent studies that have focused on the adjustment especially if we look the US labor markets to negative demand shocks, such as (Dorn & Hanson, 2015), who study the slow and highly incomplete adjustment of local labor markets in response to the surge in Chinese exports,

(Sufi & Sufi, 2014), who investigate the implications of the collapse in housing prices on consumption and local employment, and perhaps more closely related to our focus, (Levy & Murnane, 2013), who find employment and wage declines in areas most exposed to one specific type of automation, the introduction of industrial robots in manufacturing. There should thus be no presumption that adjustment to the changed labor market brought about by rapid automation will be a seamless, costless and rapid process.

DISCREPANCY BETWEEN SKILLS AND TECHNOLOGIES

At stake here is not only the speed of adjustment, but potential gains from new technologies. If certain skills are complementary to new technologies, their absence will imply that the productivity of these new technologies will be lower than otherwise. Thus, the gap between skills and technologies not only slows down the adjustment of employment and remunerations, but holds back potential productivity gains.

This is particularly true for the creation of new jobs. The fact that while there are heightened concerns about job losses from automation, many employers are unable to find workers with the right skills for their jobs underscores the importance of these considerations (Deloitte et. al, 2011).

NEW JOBS AND THE COMPARATIVE ADVANTAGE OF LABOR

Much more powerful than the countervailing effects of capital accumulation and the deepening of automation is the creation of new jobs in which manual labor has a comparative advantage. These jobs include both new, more complex versions of existing jobs and the creation of new activities, which are made possible by advances in technology.

> *Take for e.g. the Personnel Administration, there have been dramatic changes to the process over the last fifty years, not to mention that not only the job has changed - from staff administration to human resources management – but also the way the process follows. Nowadays the Human Resources Management if in most of the industries fully automated and at most is followed be precision of the request for the needed skills and followed education.*

In contrast to capital accumulation and the deepening of automation, which increase the demand for labor but do not affect the labor share, implies that new tasks increase the labor share, i.e.,

$$\frac{d\dot{s}_L}{dN} = 1$$

Automation is not a recent phenomenon. As we already discussed earlier, the history of technology of the last two centuries is full of examples of automation, ranging from weaving and spinning machines (Nilsson, 2009) to the mechanization of agriculture etc., if there were no other counteracting force, we would see the share of labor in national income declining steadily.

CONCLUSION

This paper condensed a conceptual framework that can help understand the implications of automation and bridge the opposite sides of this false separation. At the center of our framework is a task-based approach, where automation is conceptualized as replacing labor in tasks that it used to perform. This type of replacement causes a direct displacement effect, reducing labor demand. If this displacement effect is not counterbalanced by other economic forces, it will reduce labor demand, wages and employment. But our framework also stresses that there are several countervailing forces. These include the fact that automation will reduce the costs of production and thus create a productivity effect, the induced capital accumulation, and the deepening of automation - technological advances that increase the productivity of machines in tasks that have already been automated.

The paper also underlines that these first-order countervailing forces are generally insufficient to totally balance out the implications of automation. In particular, even if these forces are strong, the displacement effect of automation tends to cause a decline in the share of manual labor. But we know from the history of technology and industrial development that despite several waves of rapid automation, the growth process has been more or less balanced, with no secular downward trend in the share of labor and in national income. It argued that this is because another powerful force that is balancing the implications of automation: the creation of new tasks in which labor has a comparative advantage, which fosters a countervailing reinstatement effect for labor. These tasks increase the demand for labor and tend to raise the labor share. When they go hand-in-hand with automation, the growth process is balanced, and it need not to imply a murky scenario for labor.

As a conclusion is the pointing out of a number of additional issues that may be important in understanding the full impact of AI and other automation technologies on future prospects of labor.

The role of the productivity effect in partially counterbalancing the displacement effect created by automation. However, this countervailing effect works by increasing the demand for products. As we have also seen, automation tends to increase inequality.

The analysis highlighted the negative consequences of a shortage of skills for realizing the productivity gains from automation and for inequality. In practice, the problem may be workers acquiring the wrong types of skills rather than a general lack of skills – here also the education redirection to change has its strong role.

To the extent that some uses of AI may complement labor more or generate opportunities for more rapid creation of new tasks, an understanding of the impact of various policies, including support for academic and applied researches, and social factors on the path of development of AI is critical.

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Behavior of Solutions of the Singular Shrödinger Equation

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ABSTRACT

Recently, rapid developments in the natural sciences, especially in Quantum theory, have been important for learning different characteristics of singular Sturm-Liouville operators. For example, the energy levels of hydrogen atoms and atoms with similar atomic structure, the problems of finding wave functions corresponding to these levels, are reduced to the problem of learning the behaviour of eigenvalues of the Shrödinger operator with the potential of Columb and the corresponding eigenfunctions corresponding to these eigenvalues. Therefore, some features of the Shrödinger operator with special type singular potential will be examined in the presented study. Let us consider $\sigma(x) \equiv \int_0^x q(t)dt \in BV[0,1]$, the boundary value problem that is generated by the

$$\ell(y) \equiv -y'' + q(x)y = \lambda y$$

differential equation in the $[0,1]$ interval and the

$$y(0) = 0, y(1) = 0$$

boundary conditions. In this study, it is proved that Gronwall's theorem is valid for discrete integral equations given in the space of bounded variation functions. Then the proof of the existence and uniqueness of the solution of the given problem will be given.

Keywords: Singular Shrödinger Equation, Bounded Variation Functions, İntegral Equation.

INTRODUCTION

One of the important problems of the theory of linear differential equations with continuous or summable coefficients is to prove the existence of the solution of the differential equation given with the help of appropriate integral equations in the class of wider functions. This method can be applied to singular differential equations as well as for regular differential equations. The application of integral equations methods to the solution of such problems, which have recently been solved in the practical sciences, is reduced to the various problems placed for singular differential equations. In the present study, the behaviors of different variables for the solutions singular Shrödinger differential equation will be learned on the finite interval. In the classical theory of Sturm-Liouville operators generated by the $\ell(y) \equiv -y'' + q(x)y$ differential expression on $(a, b) \in \mathbb{R}$, it is generally assumed that the condition $q(x) \in L_{1,\ell oc}(a, b)$, ie the function q(x), can be summable in each compact sub-range of on (a, b). Singular Sturm-Liouville operators are characterized by the assumption that in the classical theory of these operators $q(x)$ function is not summable on [a, b] or on (a, b) is infinite.

The spectral theory of differential operators has an important place in applied sciences and is widely used in various fields of mathematics, physics and mechanics. Especially in quantum theory, the singular Shrödinger operator has many applications. For example, the energy levels of structures with hydrogen atoms and similar atoms, the presence of wave functions corresponding to these energy levels, are reduced to the problem of learning the problems of the Coulumb and similar potential singular Shrödinger operator and the behavior of the eigenvalues corresponding to these eigenfunctions. Therefore, in our study, the characteristics of the singular Shrödinger operator with special type potential will be examined.

Let us show with $\sigma'(x) = q(x)$, $\sigma(x) \in BV[0,1]$, the operator $L(q)$ produced by the

$$\ell(y) \equiv -y'' + q(x)y = \lambda y, \ \lambda = k^2 \tag{1}$$

differential equation and the $y(0) = 0$, $y(1) = 0$ boundary conditions on [0,1]. As it is known, q(x) function has real value on [0,1] and the spectra of this operatör is learned if can be integrated in Lebesque sense, and inverse problems are investigated according to different data. In this study, the important features of singular Shrödinger operator, which is a subspace of the class of distribution functions belonging to Sobolev space with q(x) function negative index order, ie, $\ell(y) \equiv -y'' + q(x)y$ differential expression in the functions class [0,1], which provides $\sigma'(x) = q(x)$, $\sigma(x) \in BV_c[0,1]$ condition, will be examined. Here, a set of functions with bounded variation and from the right continuous the $BV_c[0,1]$ to on [0,1] is shown.

BASIC RESULTS

Let's the

$$y(x) = c_1 + c_2 x - \int_0^x (x - t)y(t)d(k^2 t + \sigma(t)) \tag{2}$$

integral equation. The $\varphi(x, \lambda)$ and $\psi(x, \lambda)$ functions of the equation (1) are respectively $\varphi(0, \lambda) = 0$, $\varphi'(0, \lambda) = 1$ and $\psi(0, \lambda) = 1$, $\psi'(0, \lambda) = 0$ get linear independent solutions that provide initial conditions.

Theorem 2.1 There is at least one number of $k_0 > 0$, so that the

$$\psi(x, \lambda) = O\left(e^{|Imk|x}\right), \quad \varphi(x, \lambda) = O\left(\frac{e^{|Imk|x}}{k}\right), \tag{3}$$

$$\psi(x, \lambda) = \cos kx + O\left(|k|^{-1}e^{|Imk|x}\right),$$

$$\varphi(x, \lambda) = \frac{\sin kx}{k} + O\left(|k|^{-2}e^{|Imk|x}\right) \tag{4}$$

behaviors for $|k| > k_0$ are provided properly on $[0,1]$ according to the x variable.

Proof: Let's the

$$y(x, k) = y(0, k)\cos kx + y'(0, k)\frac{\sin kx}{k} - \int_0^x \frac{\sin k(x-t)}{k} y(t, k)d\sigma(t) \tag{5}$$

integral equation for this.

In the study of [Atkinson, F.V.,(1964)], we can easily show by using the proven Theorem 11.4.1 that the

$$y(x) = c_1 + c_2 x - \int_0^x (x - t)y(t)d(k^2 t + \sigma(t)) \tag{6}$$

integral equation is equivalent to the (5) integral equation.

If the function $\sigma(x)$ is a differentiable function, it is known from the general theory that the integral equation (5) is equivalent to the differential equation (1). In addition, since the integral equation of (6) is equivalent to the differential equation (1), the integral equation (5) for the function σ (x) which provides the conditions of the theorem is equivalent to the differential equation (1). After the necessary operations for the

$$z(x, \lambda) = e^{ikx}y(x, \lambda) \tag{7}$$

the integral equation function (5) is written as

$$z(x, k) = \frac{1}{2}y(0, k)\left(e^{2ikx} + 1\right) + y'(0, k)\frac{e^{2ikx} - 1}{2ik}$$
$$- \int_0^x \frac{e^{2ik(x-t)} - 1}{2ik} z(t, k)d\sigma(t) \tag{8}$$

create

$$p(x, k) = e^{-ikx}(y' + iky), \quad q(x, k) = e^{ikx}(y' - iky) \tag{9}$$

functions

$$y(x,k) = \frac{pe^{ikx} - qe^{-ikx}}{2ki}, \qquad y'(x,k) = \frac{pe^{ikx} + qe^{-ikx}}{2} \tag{10}$$

becomes for $k \neq 0$. Here, for the $p(x,k)$ and $q(x,k)$ functions, $0 \leq a < x$,

$$p(x,k) - p(0,k) = -\int_0^x e^{-ikt} z(t,k) d\sigma(t) = -\frac{1}{2ik} \int_0^x [p(t,k) - q(t,k)e^{-2ikt}] d\sigma(t) \tag{11}$$

$$q(x,k) - q(0,k) = -\int_0^x e^{ikt} z(t,k) d\sigma(t) = -\frac{1}{2ik} \int_0^x [p(t,k)e^{2ikt} - q(t,k)] d\sigma(t) \tag{12}$$

integral equations are obtained. Equation

$$e^{2ikx} p(x,k) - q(x,k) = e^{2ikx} p(0,k) - q(0,k) - \int_0^x [e^{2ik(x-t)} - 1] z(t,k) d\sigma(t)$$

is obtained from the equations (11) and (12). Considering that both sides of the last equation are divided by $2ik$ and

$$z(x,k) = \frac{p(x,k)e^{2ikx} - q(x,k)}{2ki}, \quad p(0,k) = y'(0,k) + iky(0,k), \quad q(0,k) = y'(0,k) - iky(0,k)$$

is taken into account, (8) the integral equation is obtained. Since $k = \xi + i\eta$, $\eta \geq 0$, $k \neq 0$ and $x \geq 0$ are $|e^{2ikx}| \leq 1$, the equation (8) is

$$|z(x,k)| \leq |y(0,k)| + \frac{|y'(0,k)|}{|k|} + \frac{1}{|k|} \int_0^x |z(t,k)||d\sigma(t)| \tag{13}$$

According to the Gronwall theorem, from the last inequality,

$$|z(x,k)| \leq \left\{ |y(0,k)| + \frac{1}{|k|} |y'(0,k)| \right\} exp \left\{ \frac{1}{|k|} \int_0^x |d\sigma(t)| \right\} \tag{14}$$

inequality is obtained. From here,

$$|e^{ikx} y(x,k)| \leq \left\{ |y(0,k)| + \frac{1}{|k|} |y'(0,k)| \right\} exp \left\{ \frac{1}{|k|} \int_0^x |d\sigma(t)| \right\} \tag{15}$$

becomes. On the other hand, taking the expression (12),

$$q(x,k) = q(0,k) - \int_0^x z(t,k) d\sigma(t)$$

is obtained, here $c = \left\{ |y(0,k)| + \frac{1}{|k|} |y'(0,k)| \right\} exp \left\{ \frac{1}{|k|} \int_0^x |d\sigma(t)| \right\}$ is.

Due to

$$|q(x,k)| \leq |q(0,k)| + sup_{0 \leq t \leq 1} |z(t,k)| \int_0^x |d\sigma(t)|$$

or

$$|q(x,k)| \leq |q(0,k)| + c. \int_0^x |d\sigma(t)|$$

inequality, $q(x,k)$ function is bounded variation. Similarly, it is obtained that by using

$$p(x,k) = p(0,k) - \int_0^x e^{-2ikt} z(t,k) d\sigma(t)$$

equality, $\mathrm{Im}k > 0$, $p(x,k)$ function is bounded variation due to the inequality of
$$|p(x,k)| \leq |p(0,k)| + sup_{0 \leq t \leq 1} |z(t,k)| \int_0^x |d\sigma(t)|.$$

(10)equality

$$\varphi(x,k) = \frac{sinkx}{k} + O\left(|k|^{-2} e^{|Imk|x}\right) \tag{16}$$

$$\psi(x,k) = \cos kx + O(|k|^{-1} e^{|Imk|x}) \tag{17}$$

behavior is obtained..

Theorem 2.2. $\sigma(x)$ is for each real k on $[0,1]$ from the right in continuous and bounded variation

$$-y'' + q(x)y = \lambda y, \quad \lambda = k^2 \tag{18}$$

there is a $\omega(k,x)$ solution, $x \to 0$, for the

$$\omega(x,k) = x(1 + o(1)), \quad \omega'_x(x,k) = 1 + o(1) \tag{19}$$

conditions of the differential equation.

This solution is the entaire function of k and provides the inequality
$$\left|(\omega(x,k) - sinkx)e^{ikx}\right| \leq \left[\left|\int_0^x t|d\sigma(t)| - \int_{|k|^{-1}}^x t|d\sigma(t)|\right|\right] e^{\int_0^x t|d\sigma(t)|}$$

for k≥0

Proof. Get $v(x) = \int_0^x |d\sigma(t)|$. Theorem2.2 showed that, if $x \to 0$ $\omega(x,k)$ function is the solution of the

$$\omega(x,k) = \frac{sinkx}{k} + \int_0^x \frac{sink(x-t)}{k} \omega(t,k) d\sigma(t) \tag{20}$$

integral equation that provides the $\omega(x,k) = o(x)$ condition is the solution of the equation (18). Let's call $\omega(x,k) = xe^{-i\lambda x} z(x,k)$ in the solution of (20) integral equation for $\mathrm{Im}k \geq 0$.

In this case, $z(x,\lambda)$ function is obtained for

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$$z(x,k) = \frac{\sin kx}{kx}e^{ikx} + \int_0^x \frac{\sin k(x-t)}{kt}e^{ik(t-x)}tz(t,k)\,d\sigma(t) \qquad (21).$$

$$z_0(x,k) = \frac{\sin kx}{kx}e^{ikx}$$

$$z_i(x,k) = \int_0^x \frac{\sin k(x-t)}{kt}e^{ik(t-x)}tz_{i-1}(t,k)\,d\sigma(t), \quad i = 1,2,\cdots$$

(20) the solution of the integral equation with the help of consecutive approaches

$$z(x,k) = \sum_{i=0}^{\infty} z_i(x,k) \qquad (22)$$

format search.

In this case, if $v(x) = \int_0^x t|d\sigma(t)|$ is continuous,

$$0 \le \xi_k(x) = \int_0^x t\xi_{k-1}(t)|d\sigma(t)| = \frac{1}{(k-1)!}\int_0^x t\left\{\int_0^t \tau|d\sigma(\tau)|\right\}^{k-1}|d\sigma(t)|$$

$$= \frac{1}{(k-1)!}\int_0^x \left\{\int_0^t \tau|d\sigma(\tau)|\right\}^{k-1}d\left(\int_0^t \tau|d\sigma(\tau)|\right) = \frac{1}{k!}\left(\int_0^x t|d\sigma(t)|\right)^k$$

becomes.

In the general case, the $\xi_{k-1}(t)$ and $t|d\sigma(t)|$ functions have same discontinuity points, while the above operations are not valid. In this case, if we take the $0 = x_0 < x_1 < \cdots < x_n = x$ part of the range $(0,x)$ to obtain similar result,

$$\sum_{i=0}^{n-1}\xi_{k-1}(t_i)t_i|\sigma(t_{i+1}) - \sigma(t_i)| \le \sum_{i=0}^{n-1}\frac{1}{(k-1)!}\left(\int_0^{t_i}\tau|d\sigma(\tau)|\right)^{k-1}t_i|\sigma(t_{i+1}) - \sigma(t_i)| =$$

$$= \sum_{i=0}^{n-1}\frac{1}{(k-1)!}\left(\int_0^{t_i}\tau|d\sigma(\tau)|\right)^{k-1}t_i\left(\int_{t_i}^{t_{i+1}}d\sigma(\tau)\right) \le$$

$$\le \sum_{i=0}^{n-1}\frac{1}{(k-1)!}\left(\int_0^{t_i}\tau|d\sigma(\tau)|\right)^{k-1}t_i\int_{t_i}^{t_{i+1}}|d\sigma(\tau)| \le$$

$$\le \sum_{i=0}^{n-1}\frac{1}{(k-1)!}\left(\int_0^{t_i}\tau|d\sigma(\tau)|\right)^{k-1}\int_{t_i}^{t_{i+1}}\tau|d\sigma(\tau)| =$$

$$= \sum_{i=0}^{n-1} \frac{1}{(k-1)!} \left(\int_0^{t_i} \tau \, |d\sigma(\tau)| \right)^{k-1} \left(\int_0^{t_{i+1}} \tau|d\sigma(\tau)| - \int_0^{t_i} \tau|d\sigma(\tau)| \right) =$$

$$= \lim_{\lambda \to 0} \frac{1}{(k-1)!} \int_0^x \left(\int_0^t \tau \, |d\sigma(\tau)| \right)^{k-1} d \left(\int_0^t \tau|d\sigma(\tau)| \right) = \frac{1}{k!} \left(\int_0^x t \, |d\sigma(t)| \right)^k$$

is obtained by evaluating its integral sum instead of $\int_0^x t\xi_{k-1}(t)|d\sigma(t)|$ integral. Here is $\lambda = \max_i(t_{i+1} - t_i)$. The series is uniformly convergent in each $[0, a]$ $(a < \infty)$ finite sub-range of the $[0, \infty)$ range. The $z(x, k)$ function, which is the sum of this series, provides

$$|z(x, k)| \leq \exp\{\int_0^x t \, |d\sigma(t)|\} \tag{23}$$

inequality $(\text{Im}k \geq 0)$. While $\text{Im}k > 0$ is the analytical function of k, we get that $\text{Im}k \geq 0$ is continuous in the closed half-plane. Here, we obtain that $\omega(x, k) = xz(k, x)e^{-ikx}$ function (20) provides integral equation and

$$\left| \omega(x, k)e^{ikx} \right| \leq x\exp\{\int_0^x t \, |d\sigma(t)|\} \tag{24}$$

inequality. In addition, when $\omega(x, k)$ function is $\text{Im}k > 0$, we obtain that k is the analytic function and is continuous in the $\text{Im}k \geq 0$ closed half plane. Similarly, when $\text{Im}k \leq 0$, (20) the existence of the solution of the integral equation can be proved that the solution $\omega(x, k)$ is regular in the $\text{Im}k < 0$ half-plane according to the k, and continuous while $\text{Im}k \leq 0$ is continuous. Therefore, the function $\omega(x, k)$ is the solution that provides the $\omega(0, k) = 0$ condition of (18) differential equation and k is the complete function.

$$\left| \omega(x, k) - \frac{\sin kx}{k} \right| \leq x \int_0^x t \, |d\sigma(t)| \exp \left\{ |\text{Im}kx| + \int_0^x t \, |d\sigma(t)| \right\}$$

and

$$|\omega'(x, k) - \cos kx| \leq x \int_0^x t \, |d\sigma(t)| \exp \left\{ |\text{Im}kx| + \int_0^x t \, |d\sigma(t)| \right\}$$

inequalities are obtained by using similar operations. Therefore $\omega(x, k)$ function provides the conditions (19). Using the (20) integral equation and the inequality (24),

$$\left| (k\omega(x, k) - \sin kx)e^{ikx} \right| \leq \int_0^x \sin k(x - t) \, e^{ik(x-t)} z(t, k)|d\sigma(t)| \leq$$

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$$\leq \int_0^x t\,|d\sigma(t)|\exp\left\{\int_0^t \xi\,|d\sigma(\xi)|\right\} = \exp\left\{\int_0^x t\,|d\sigma(t)|\right\} - 1$$

are obtained as $\text{Im}\,k \geq 0$, and in this case,

$$\left|(k\omega(x,k) - \sin kx)e^{ikx}\right| \leq \int_0^x t\,|d\sigma(t)|\exp\{\int_0^x t|d\sigma(t)|\} \tag{25}$$

and

$$|k\omega(x,k)| \leq \exp\{\int_0^x t|d\sigma(t)|\} \tag{26}$$

inequalities are obtained.

Suppose $\text{Im}\,k \geq 0$ and $|k|^{-1} < x$. We then assume that (20), (24) and (26) are

$$\left|(k\omega(x,k) - \sin kx)e^{ikx}\right| \leq \int_0^x \sin k(x-t)\,e^{ik(x-t)}\omega(t,k)|d\sigma(t)| \leq$$

$$\leq \left\{\int_0^{|k|^{-1}} t\,|d\sigma(t)| + |k|^{-1}\int_{|k|^{-1}}^x |d\sigma(t)|\right\}\exp\left\{\int_0^x t\,|d\sigma(t)|\right\} =$$

$$= \left\{-|k|^{-1}\int_{|k|^{-1}}^x |d\sigma(t)| + \int_{|k|^{-1}}^x t|d\sigma(t)|\right.$$

$$\left. + |k|^{-1}\left[\int_{|k|^{-1}}^x |d\sigma(t)| - \int_x^x |d\sigma(t)|\right]\right\}\exp\left\{\int_0^x t\,|d\sigma(t)|\right\} \leq$$

$$\leq \left[\int_0^1 t|d\sigma(t)| - \int_{|k|^{-1}}^1 t|d\sigma(t)|\right]\exp\{\int_0^x t\,|d\sigma(t)|\}.$$

Similarly, in case of $|k|^{-1} \geq x$, the above inequality is valid. Thus the theorem will be proved.

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Behaviors of Eigenvalues and Eigenfunctions of The Singular Shrödinger Operator

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ABSTRACT

Let us show the boundary value problem $L(q)$ with the
$-y'' + q(x)y = \lambda y$
differential equation in the $[0,1]$ range, and the
$y(0) = 0, y(1) = 0$
boundary conditions in $\sigma(x) \equiv \int_0^x q(t)dt$.

It is important to examine this operator as the solution to many problems of quantum physics is closely linked to the learning of the spectral properties of the operator $L(q)$. Singular Shrödinger operators are characterized by the assumption that, in classical theory, the function $q(x)$ is not summable in the range $[a, b]$ for example it has singularity that cannot be integrated in at least one of the end points of the range or at one of its internal points, or that the range (a, b) is infinite range. In the present study, firstly, the operator of $L(q)$ will be proved to be well-defined in the class of distribution functions with first-order singularity, which is the larger class of functions. In the following step, the concepts of eigenvalue and eigenfunctions are defined for the well-defined $L(q)$ operator and the representations for their behaviour are obtained.

Keywords: Singular Shrödinger Operator, Eigenvalue, Eigenfunction.

INTRODUCTION

In the classical Sturm-Liouville operators theory produced by the differential expression $\ell(y) \equiv -y'' + q(x)y$ on $(a,b) \in \mathbb{R}$ it is generally assumed that the condition $q(x) \in L_{1,\ell oc}(a,b)$, that is, on (a,b) of the $q(x)$ function, is summable in each compact subrange. Singular Sturm-Liouville operators are characterized by the assumption that q(x) is not summable on $[a,b]$ or that on (a,b) is infinite.

Spectral theory of differential operators has an important place in applied sciences and is widely used in various fields of mathematics, physics and mechanics. Particularly in quantum theory, the singular Shrödinger operator has many applications. For example, the energy levels of structures having hydrogen atoms and similar atoms are reduced to the problem of finding wave functions corresponding to these levels to learn the eigenvalues of the singular Shrödinger operator with the potential of Coulomb and the like and the behavior of the eigenfunctions corresponding to these eigenvalues. Therefore, in this study, we will learn the properties of singular Shrödinger operator with special type potential.

Let us show with $\sigma'(x) = q(x), \sigma(x) \in BV[0,1]$ the operator $L(q)$ produced by the

$$\ell(y) \equiv -y'' + q(x)y = \lambda y, \ \lambda = k^2 \tag{1}$$

differential equation and the $y(0) = 0, y(1) = 0$ boundary conditions on [0,1]. As it is known, q(x) function has real value on [0,1] and the spectra of this operatör is learned it can be integrated in Lebesque sense, and inverse problems are investigated according to different data.

Similar problems have been addressed in [Savchuk,A.M., Shkalikov,A.A.(1999)] and [Amirov,R.Kh., Guseinov,I.M.(2002)]. The $q \in W_2^{-1}(0,1)$-type potential of the differential expression produced by the differential expression of the operators $\ell(y) = -y'' + q(x)y$, $|x|^{-\alpha} = q(x), (0 < \alpha < \frac{3}{2})$ case in the [Savchuk,A.M., Shkalikov,A.A.(1999)] study, in the case of $\alpha \in (1,2)$ is obtained in the [Amirov, R. Kh., Guseinov, I. M. (2002)] study. In addition, [Amirov,R.Kh., Guseinov,I.M.(2002)] and [Amirov,R.Kh.,(2006)] provide important information about the location of boundary value problems for singular differential equations. In particular in the work ([Amirov, R. Kh., Guseinov, I. M. (2002)], $(0 < \alpha < 2)$), the problem of regularization was investigated for singular differential equations of type (1) and the problem of how to give boundary value conditions was examined.

PROPERTY OF THE SPECTRUM

Let $L = L(u(x), h, H)$ boundary value problem produced by

$$\ell(y) := -y'' + u'(x)y = \lambda y, \ 0 < x < \pi, \ \lambda = k^2 \tag{2.1}$$

differential equation and

$$U(y) := (\Gamma y)(0) - hy(0) = 0, \ V(y) := (\Gamma y)(\pi) + Hy(\pi) = 0 \tag{2.2}$$

boundary conditions.

Here, h, H real numbers $u(x) \in BV[0, \pi]$ real value and continuous function in the points $x = 0, x = \pi$, λ spectral parameter, $(\Gamma y)(x) = y'(x) - u(x)y$ is.

Let's define the functions $y_1(x) = y(x)$, $y_2(x) = (\Gamma y)(x) = y'(x) - u(x)y$ and if we write the expression

$$\ell(y) := -\big((\Gamma y)(x)\big)' + u(x)(\Gamma y)(x) - u^2(x)y(x) \qquad (2.3)$$

on the left side of equation (2.1), we can write (2.1) the differential equation

$$\begin{cases} y_1' - u(x)y_1 = y_2 \\ y_2' + u(x)y_2 + u^2(x)y_1 = -k^2 y_1 \end{cases} \qquad (2.4)$$

as a system of differential equations.

Similarly (2.2) boundary conditions are

$$y_2(0) - hy_1(0) = 0, \ y_2(\pi) + Hy_1(\pi) = 0 \qquad (2.5)$$

Definition1.

(2.4) system of differential equations $y_1(\xi) = \alpha_1, y_2(\xi) = \alpha_2, \ \xi \in [0, \pi], \ \alpha_1, \alpha_2 \in \mathbb{C}$, providing the initial conditions $y(x) = (y_1, y_2)^t$ solution $y_1(x)$ component (2.1) is called the solution of the equation.

Definition2.

The number of λ that realizes the existence of the solution of the non-zero $y(x)$ equation of $Ly = \lambda y$ is called the eigenvalues of the L problem, and the $y(x)$ function is called the eigenfunction corresponding to these eigenvalues.

In the $[\text{Amirov, R. Kh. , Guseinov, I. M. (2002)}]$ study, it is shown that the spectrum of the L problem is discrete in case of $u(x) \in BV[0,1]$ $[0,1]$.

Let us show the solutions of the equation (2.1) with $C(x, \lambda), S(x, \lambda), \varphi(x, \lambda)$ and $\psi(x, \lambda)$, which implement the initial conditions

$$C(0, \lambda) = (\Gamma S)(0, \lambda) = 1, \qquad S(0, \lambda) = (\Gamma C)(0, \lambda) = 0$$

$$\varphi(0, \lambda) = 1, \ (\Gamma \varphi)(0, \lambda) = h, \ \psi(\pi, \lambda) = 1, \ (\Gamma \psi)(\pi, \lambda) = -H.$$

In this case, it is clear that $C(x, \lambda), S(x, \lambda), \varphi(x, \lambda)$ and $\psi(x, \lambda)$ are entaire functions for each fixed x relative to λ and

$$U(\varphi) = 0, \ V(\psi) = 0 \qquad (2.6)$$

conditions holds.

Let

$$\langle y(x), z(x) \rangle := y(x)(\Gamma z)(x) - (\Gamma y)(x)z(x)$$

define

$$\Delta(\lambda) = \langle \psi(x, \lambda), \varphi(x, \lambda) \rangle \qquad (2.7)$$

function.

It is clear that the expression $\langle \psi(x, \lambda), \varphi(x, \lambda) \rangle$ does not depend on the variable x by the Liouville formula.

The function $\Delta(\lambda)$ is called the characteristic function of the boundary value problem $L = L(u(x), h, H)$.

If we write $x = 0$ and $x = \pi$ in the expression (2.7),

$$\Delta(\lambda) = V(\varphi) = -U(\psi) = (\Gamma\varphi)(\pi, \lambda) + H\varphi(\pi, \lambda) = -(\Gamma\psi)(0, \lambda) + h\psi(0, \lambda) \qquad (2.8)$$

is obtained. On the other hand, since $\Delta(\lambda)$ is a complete function of λ, it has a countable number of zero, so the L problem has a countable number of eigenvalues.

Lemma1. The sequence $\{\lambda_n\}_{n \geq 1}$, which is the zeros of the characteristic function $\Delta(\lambda)$, is ordered and is the eigenvalues of the L problem. The functions $\varphi(x, \lambda_n)$ and $\psi(x, \lambda_n)$ are suitable eigenfunctions. There are $(\beta_n)_{n \geq 1}$ sequences so that

$$\psi(x, \lambda_n) = \beta_n \varphi(x, \lambda_n), \beta_n \neq 0 \qquad (2.9)$$

equality is achieved.

Proof. Let λ_0 be a zero of the function $\Delta(\lambda)$. In this case, we take the existence of $\beta_0 \neq 0$ such that $\varphi(x, \lambda_0) = \beta_0 \psi(x, \lambda_0)$ from the equations (2.6) and (2.8). On the other hand, the functions $\varphi(x, \lambda_0)$ and $\psi(x, \lambda_0)$ provide boundary conditions (2.2). Here, it is obtained that λ_0 has eigenvalue, eigenfunctions corresponding to $\varphi(x, \lambda_0)$ and $\psi(x, \lambda_0)$ functions.

Conversely, let λ_0 be the eigenvalues of the L problem, and $y_0(x)$ is the corresponding eigenfunction. In this case, $U(y_0) = V(y_0) = 0$ is. Also, since $y_0(x) \neq 0$ is $y_0(0) = 1$, $(\Gamma y_0)(0) = h$, so $y_0(x) \equiv \varphi(x, \lambda_0)$ is obtained. Here, (2.8) is used, $\Delta(\lambda_0) = V(\varphi(x, \lambda_0)) = V(y_0(x)) = 0$ is obtained

Definition3. The sequence of $(\alpha_n)_{n \geq 1}$ defined as

$$\alpha_n := \int_0^\pi \varphi^2(x, \lambda_n)dx \qquad (2.10)$$

is called normalizing numbers of L problem, and $\{\lambda_n, \alpha_n\}$ is called spectral data.

Lemma2.

$$\beta_n \alpha_n = -\dot{\Delta}(\lambda_n) \quad (n = 1,2, \dots) \tag{2.11}$$

are correct. Here, $\dot{\Delta}(\lambda) = \frac{d}{d\lambda} \Delta(\lambda)$ is.

Proof.

Since $\frac{d}{dx}\langle \psi(x,\lambda), \varphi(x,\lambda_n)\rangle = (\lambda - \lambda_n)\psi(x,\lambda)\varphi(x,\lambda_n)$, (2.8) using the equation,

$$(\lambda - \lambda_n)\int_0^\pi \psi(x,\lambda)\varphi(x,\lambda_n)\,dx = (\Gamma\varphi)(\pi, \lambda_n) + H\varphi(\pi, \lambda) + (\Gamma\psi)(0, \lambda) - h\psi(0, \lambda) =$$

$$= \Delta(\lambda_n) - \Delta(\lambda)$$

is obtained. From here, while $\lambda \to \lambda_n$

$$\int_0^\pi \psi(x,\lambda_n)\varphi(x,\lambda_n)\,dx = -\dot{\Delta}(\lambda_n)$$

is. If we use (2.9) and (2.10), we get (2.11).

Lemma3. The eigenvalues λ_n $(n = 1,2, \dots)$ of the L problem are real and simple.

The proof of the lemma is similar to the proof of Lemma4 in $[Amirov, R. Kh., (2006)]$.

Theorem1. While $|\rho| \to \infty$, for the solution of $\varphi(x,\lambda) = \left(\varphi_1(x,\lambda), \varphi_2(x,\lambda)\right)^t$ and $\psi(x,\lambda) = \left(\psi_1(x,\lambda), \psi_2(x,\lambda)\right)^t$ equation (2.1) on $[0, \pi]$ with respect to x uniformly

$$\varphi_1(x,\lambda) = \cos\rho x + O\left(\frac{1}{|\rho|}exp(|\tau|x)\right) = O\left(exp(|\tau|x)\right) \tag{2.12}$$

$$(\Gamma\varphi_1)(x,\lambda) = \varphi_2(x,\lambda) = -\rho\sin\rho x + O\left(exp(|\tau|x)\right) = O\left(exp(|\tau|x)\right) \tag{2.13}$$

$$\psi_1(x,\lambda) = \cos\rho(\pi - x) + O\left(exp(|\tau|(\pi - x))\right) = O\left(exp(|\tau|(\pi - x))\right) \tag{2.14}$$

$$(\Gamma\psi_1)(x,\lambda) = \rho\sin\rho(\pi - x) + O\left(exp(|\tau|(\pi - x))\right) = O\left(|\rho|exp(|\tau|(\pi - x))\right) \tag{2.15}$$

behavior is valid. Here is $\lambda = \rho^2$, $\tau = Im\lambda$.

Proof. Since the function $u(x)$ has a boundadly variation on $[0, \pi]$, it is summable in this interval.

Therefore, if we use the appropriate theorem in the $[Naimark, M.A., (1969)]$ study, (2.4) the system of differential equations has a one solution $(\varphi_1(x,\lambda), \varphi_2(x,\lambda))^t$ which realizes the initial conditions $\varphi_1(0,\lambda) = 1, \varphi_2(0,\lambda) = h$. In this case, the system of

$$\varphi_1(x,\lambda) = \cos\rho x + \frac{h}{\rho}\sin\rho x +$$

$$+ \int_0^x \left\{ u(t)\varphi_1(t,\lambda)\cos\rho(x-t) - [u^2(t)\varphi_1(t,\lambda) + u(t)\varphi_2(t,\lambda)]\frac{\sin\rho(x-t)}{\rho} \right\} dt$$

$$\varphi_2(x,\lambda) = -\rho\sin\rho x + h\cos\rho x +$$

$$+ \int_0^x \{-\rho u(t)\varphi_1(t,\lambda)\sin\rho(x-t) - [u^2(t)\varphi_1(t,\lambda) + u(t)\varphi_2(t,\lambda)]\cos\rho(x-t)\} dt \quad (2.16)$$

integral equations has only one solution.

Let's define

$$\varphi_1^*(x,\lambda) = |\varphi_1(x,\lambda)|exp(-|\tau|x), \quad \varphi_2^*(x,\lambda) = |\varphi_2(x,\lambda)|exp(-|\tau|x)$$

functions. Considering that

$$|\sin\rho x| \leq exp(|\tau|x), \quad |\cos\rho x| \leq exp(|\tau x|), \quad u(x), u^2(x) \in L_1[0,\pi],$$

and Gronwal's theorem given in the study [Amirov, R. Kh., Guseinov, I. M. (2002)],

$$\varphi_1^*(x,\lambda) \leq K\left(1 + \frac{|h|}{|\rho|}\right)exp\left(\frac{1}{|\rho|}\int_0^x |u(t)|^2 dt\right)$$

$$\frac{1}{|\rho|}\varphi_2^*(x,\lambda) \leq K\left(1 + \frac{|h|}{|\rho|}\right)exp\left(\frac{1}{|\rho|}\int_0^x |u(t)|^2 dt\right)$$

inequality for each $x \in [0,\pi]$ is obtained. Here is $K = exp\left(2\int_0^\pi |u(t)|dt\right)$. From here, the behavior of $|\rho|$ for sufficiently large values (2.12) and (2.13) is obtained. Similarly (2.14) and (2.15) behavior is shown to be valid.

Remark. Similarly, while $|\rho| \to \infty$,

$$\varphi_1(x,\lambda) = \cos\rho x + u(x)\frac{\sin\rho x}{2\rho} - \frac{1}{2\rho}\int_0^x \sin\rho(x-2t)du(t) +$$

$$+O\left(\frac{1}{|\rho|}\exp(|\tau|x)\right)$$

$$(\Gamma\varphi_1)(x,\lambda) = \varphi_2(x,\lambda) = -\rho\sin\rho x - u(x)\cos\rho x + \frac{1}{2}\int_0^x \cos\rho(x-2t)du(t) +$$

$$+O\big(\exp(|\tau|x)\big)$$

asymptotic behaviors are valid for each $x \in [0,\pi]$.

Theorem2. The $\{\lambda_n\}_{n\geq 0}$ set of eigenvalues of the problem L can be counted and

$$\rho_n = \sqrt{\lambda_n} = n + \frac{\omega}{\pi n} + \frac{K_n}{n}, \qquad \{K_n\} \in \ell_2 \tag{2.17}$$

$$\varphi_1(x,\lambda_n) = \cos nx + \frac{\xi_{1,n}(x)}{\pi}\int_0^\pi u(t)\sin 2nt\, dt + \frac{\xi_{2,n}(x)}{n}, \quad \big|\xi_{1,n}(x)\big|, \big|\xi_{2,n}(x)\big| \leq c \tag{2.18}$$

asymptotic behavior is valid when $n \to \infty$. Here is

$$\omega = H + h - \frac{1}{2}u(\pi) - \frac{1}{2}\int_0^\pi u^2(t)dt.$$

Proof. $\varphi_1(x,\lambda)$ and $\varphi_2(x,\lambda)$ functions (2.12) and (2.13) by taking advantage of the behavior given (2.16) can write the equation as

$$\varphi_1(x,\lambda) = \cos\rho x + \int_0^x u(t)\cos\rho\,(x-2t)dt - h\int_0^x u(t)\frac{\sin\rho(x-2t)}{\rho}dt -$$

$$-\int_0^x u^2(t)\frac{\sin\rho(x-2t)}{2\rho} + \left(h - \frac{1}{2}\int_0^x u^2(t)dt\right)\frac{\sin\rho x}{\rho} + O\left(\frac{e^{|\tau|x}}{|\rho|}\right) \tag{2.19}$$

$$(\Gamma\varphi_1)(x,\lambda) = \varphi_2(x,\lambda) = -\rho\sin\rho x - \rho\int_0^x u(t)\sin\rho\,(x-2t)dt -$$

$$-h\int_0^x u(t)\cos\rho(x-2t)\,dt - \frac{1}{2}\int_0^x u^2\,(t)\cos\rho(x-2t)\,dt +$$

$$+\left(h - \frac{1}{2}\int_0^x u^2\,(t)dt\right)\cos\rho x + O\left(e^{|\tau|x}\right). \tag{2.20}$$

Since $u(x), u^2(x) \in BV[0,\pi]$,

$$\Delta(\lambda) = -\rho\sin\rho\pi + \omega\cos\rho\pi + K(\rho) \tag{2.21}$$

for the $\Delta(\lambda) = (\Gamma\varphi_1)(\pi,\lambda) + H\varphi_1(\pi,\lambda)$ characteristic function is used if

$$\left|\int_0^x u(t)\sin\rho(x-2t)\right| = O\left(\frac{1}{|\rho|}\right), \qquad \left|\int_0^x u(t)\cos\rho(x-2t)dt\right| = O\left(\frac{1}{|\rho|}\right)$$

$$\left|\int_0^x u^2(t)\sin\rho(x-2t)dt\right| = O\left(\frac{1}{|\rho|}\right), \qquad \left|\int_0^x u^2(t)\cos\rho(x-2t)\,dt\right| = O\left(\frac{1}{|\rho|}\right)$$

evaluations are used due to the property of the Stiltijes integral is obtained. Here, let's get

$$\omega = H + h - \frac{1}{2}u(\pi) - \frac{1}{2}\int_0^\pi u^2\,(t)dt,$$

$$K(\rho) = -\frac{1}{2}\int_0^\pi \cos\rho\,(x-2t)du(t) + O\left(\frac{1}{|\rho|}\right)$$

$$G_\delta = \{\rho\colon |\rho - K| \geq \delta\,, \delta > 0\,, K = 0, \pm1, \pm2, \ldots\,\}.$$

In this case, if we use Lemma3.2 in $[Shkalikov, A.A., (1983)]$, we obtain the existence of the number $\rho^* > 0$ such that

$$|\Delta(\lambda)| \geq c_\delta|\rho|exp(|\tau|\pi),\ \rho \in G_\delta, |\rho| \geq \rho^* \tag{2.22}$$

is.

Let $\Gamma_n = \left\{ \lambda : |\lambda| = \left(n + \frac{1}{2}\right)^2 \right\}$. So if we apply the Rouche theorem, take that Γ_n has exactly $(n + 1)$ zeroes in the function $\Delta(\lambda)$, and each circle $\gamma_n(\delta) = \{\rho : |\rho - n| \leq \delta\}$ has a single zero in the sufficiently large values of n. Since $\delta > 0$ is arbitrary, we take the equation

$$\rho_n = n + \varepsilon_n, \ \ \varepsilon_n = o(1), \ \ n \to \infty \tag{2.23}$$

If (2.23) is substituted in the (2.21) function,

$$0 = \Delta(\rho_n^2) = -(n + \varepsilon_n) \sin(n + \varepsilon_n)\pi + \omega \cos(n + \varepsilon_n)\pi + K_n \tag{2.24}$$

is. From here,

$$\varepsilon_n = \left(H + h - \frac{1}{2} u(\pi) - \frac{1}{2} \int_0^\pi u^2(t)dt \right) \frac{1}{\pi n} - \frac{1}{2} \int_0^\pi \cos n(x - 2t) du(t) \frac{1}{\pi n} + O\left(\frac{1}{n^2}\right)$$

is obtained. Therefore, $\rho_n = n + \frac{\omega}{\pi n} + \frac{K_n}{n}$ asymptotic expression is obtained. Here, $K_n = -\frac{1}{2} \int_0^\pi \cos n(x - 2t) du(t) + O\left(\frac{1}{n}\right)$ and $\sum K_n \cos nx = K(x) \in BV[0, \pi]$ are.

If the expression of ρ_n is written in its place (2.19),

$$\varphi_1(x, \rho_n) = \cos nx + \frac{\sin nx}{n}[h + h_0(x)] - \varepsilon_n x. \sin nx + \frac{1}{n} \int_0^x u(t) \sin n(x - 2t)dt$$

$$+ O\left(\frac{1}{n^2}\right) \tag{2.25}$$

asymptotic behavior is obtained for the eigenfunctions of the given problem.

(2.25) by squaring the equation is integrated on $[0, \pi]$ of the given problem $(\alpha_n)_{n \geq 0}$ for the normalizer numbers,

$$\alpha_n = \int_0^\pi \varphi_1^2(x, \rho_n)dx = \frac{\pi}{2} + a_n$$

asymptotic expression is obtained. Here the sequence $(a_n)_{n \geq 0}$ satisfies the condition

$$\sum_n a_n \cos nx = a(x) \in BV[0, \pi].$$

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A Research on the Monumental Trees of Alanya-Manavgat (Antalya)

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ABSTRACT

This study, between 2012 to 2014, aims that 105 trees', including 5 of them has been already registered monumental tree, locational detection with GPS (Global Positioning System) and current condition and age, determination of length and diameter which are located in boundaries of Alanya(Antalya). Each of the trees inventory has been recorded seperately. According to study results, in these cities,there are 105 trees, including 5 of them which are oriental plane (*Platanus orientalis*), had been registered monumental tree by governmental agency, has been evaluated and they are considerable as a monumental tree and worthy of preservation. At the same time, as a result of study, there are 22 different tree species have been detected and the most common species is Oriental Plane (*Platanus orientalis*) that are counted 51 in Alanya.

Keywords: Monumental Trees, Alanya.

INTRODUCTION AND LITERATURE REVIEW

Technology age people who have to live with multidimensional environmental pollution have probably never destroyed the nature so fast since the first time it was seen on Earth. It is not known whether today's terrible outcome has been predicted long ago, Hz. Abraham (SA) declared Mecca a forbidden zone thousands of years ago. The Last Prophet Muhammad (SA) "As Prophet Abraham made Mecca haram, I made Medina haram. The area from that mountain to that mountain is the forbidden zone; can not be hunted, tree can not be cut, grass can not be plucked" commanded. Likewise, a similar practice, again in the time of the Prophet Muhammad, Made for the city of Taif. As we continue to look at the historical documents, we see that The first Western immigrants to America were so impressed by the extraordinary beauty of nature that the natural landscape could be preserved and passed on to future generations. They separated the Yosemite Valley and the Yellowstone water basin on the Rocky Mountains in 1864 as a park national park. Yellowstone is the world's first known national park in a modern sense (Genç ve Güner, 2003).

Prof. Dr. Musa GENÇ and Prof Dr. Ünal ASAN With their studies on Memorial Trees, these and similar concepts have made significant contributions to the scientific basis. In particular, Musa GENÇ has spent considerable time and effort on the most discussed criteria and has put it under discipline. Apart from these, it is seen that not only scientists, but also everyone interested in Monumental Trees published various photos with a photograph by measuring the diameter of the trees, which they consider monumental.

Especially since the beginning of the 1900s, industrialization has been carried out at the expense of natural balance; caused environmental damage and increased environmental problems. In the same period; as a condition for increasing the love of nature and environmental awareness, especially living witnesses of natural history, which has deeply affected society and human psychology, Studies on the detection and protection of trees, which serve as an important bridge between the past and the future, have increased. (Asan, 1998 ve Genç ve ark., 1998).

Protecting the forest and leaving it to the next generations means protecting all kinds of natural and artificial heritage in the forest ecosystem. In this heritage, besides the trees which are the real assets of the forest; mountains and hills, caves, cliffs, canyons, lime and lava deposits, hot springs, water springs, waterfalls and cascades formed under natural conditions; In general description, together with natural monuments, there are historical monuments which have a special and important place in our riches, that is, cultural monuments. (Genç, 2003).

In our country which is the cradle of many cultures and civilizations, There are many trees that can be described as monumental trees that have been reached from the past to the present with the advantage it provides in different ecological conditions and there are even stands of these. (Gümüş ve ark.,1999).

According to the records of the Ministry of Forestry, the number of monumental trees determined in our country is 100; According to the records of the Ministry of Culture is stated

that around 2000. However, many of these unique natural wonders have been destroyed by people from all walks of our society. (Genç ve Güner 2003).

The oldest cedar in our country is the Ambar Tar which is estimated to be over 2000 years old and continues to live within the forest boundaries of Antalya Regional Directorate of Forestry (Kantarcı, 1984). The tallest Cedar (Cedrus libani) was recorded which is 46 meters tall in Kahramanmaraş Hartlap-Kalekaya Village Cemetery. (Boydak, 1988) .

Age, diameter and height in terms of reaching the size of the species far beyond the usual size, local history, culture and folklore has a special place; trees with natural lifes that can provide communication between past and present, present and future are called monumental trees. (Asan,1991 ve Asan,1998).

The monumental trees and stands that are shown in the World Heritage in international agreements are our natural monuments with their historical, mystical, folkloric and phytological features. (Genç, 2003). Trees have been accompanying their lives since the formation of mankind and they have been an indispensable part of their lives. If there were no trees, it would be more difficult for humanity to exist. So much so that trees are the most important nutrient sources beyond every moment of our lives. Therefore, for humanity, trees are not only important as a biological object, but also socially and psychologically. In this context, beyond the ordinary trees, some trees become more important in human life as both their size, age and sociological phenomenon. Such trees are generally referred to as the Memorial Tree or the Monumental Tree.

Turkey is a very rich country in terms of diversity of plant species (YALTIRIK ve Efe 1989), has brought the species richness in the presence of monumental trees. (Cedrus libani A.Rich.), (Pinus nigra Arnold), (Juniperus excelsa M. Bieb.), (Taxus baccata L.), (Quercus robur L. and Quercus petraea (Mattuschka) Liebl.), (Platanus orientalis L) .), (Castanea sativa Mill.), The monumental trees of many species constitute an important part of our country's natural wealth. (Asan 1987, Başlar ve ark. 1998).

Historical monument trees has a special place in the presence of Turkey's monumental trees. One of the most important monumental trees in relation to Ottoman history is the 870-year-old Larch in Domur village of Domaniç, Kütahya. Sadly, this tree has dried up in 1977; Overthrown by a storm in 1988 after 11 years of standing dry (Aras- Tayhan 1999) and because of its historical importance, it was taken under special protection by the Ministry of Culture. The historical importance of this pine, known as "Mızık Çamı", is based on its relationship with Osman Bey, the founder of the Ottoman Empire (Asan 1999, Aras-Tayhan 1999, Genç ve Güner 2003).

The fact that trees or forests, especially monumental trees or stands, are regarded as natural artifacts respected for their inhabitants and affect the economic and cultural life of societies throughout history, to be regarded as an indicator of glory, honor, wealth and greatness by ancient societies, being subject to mythology and epics, the presence of tree and leaf motifs in the flags of some states and their use as symbols in treaties between states and their

contribution to tourism in terms of their characteristics, makes them more important than other species (Asan,1987).

In this context, this research project which we think will contribute to Ecotourism in Alanya and Manavgat districts of Antalya, which is one of the most important tourism centers of our country, has been designed. In this way, monumental or monumental trees within the boundaries of Antalya will be handled within a certain scientific framework. On the other hand, some tree values whose existence is not socially known until today can be brought up.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

Research material in the central part of the Mediterranean Region, In Antalya Province (Figure 1) Manavgat (36 ° 787 'north latitude-31 ° 443' east longitude) and Alanya (36 ° 787 'north latitude-31 ° 443' east longitude) district memorial trees and candidate memorial trees. The monumental trees and candidate monumental trees, which are the subject of the research, were determined and inventory measurements were taken and photographs were taken. The official documents related to the monumental trees were benefited from the results of the research studies carried out in the official institutions and organizations.

Figure 1: Working area
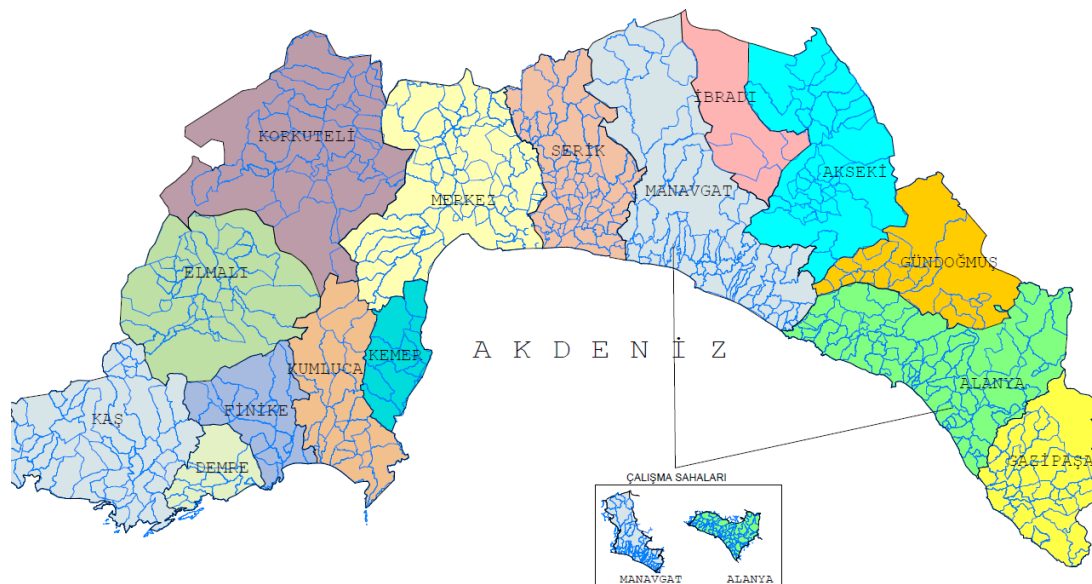
The coordinates of the monumental trees and candidate monumental trees and their heights above sea level were measured and recorded by GPS. Trunk circumference of trees 1,30 cm. Diameter values measured from height were obtained by dividing by π. The height of the trees was measured with the help of a height meter. In addition, a full-length photo of each tree was imaged with a wide-angle camera. Memorial tree and candidate monumental tree ages annual age rings located in the wood zone at a height of 1.30 cm from the ground, taken by

means of incremental auger and counted one by one. In some, age estimates were made based on the information obtained from local people. In order to record the information of the monument and candidate monument trees examined in the field studies, a field inventory report was prepared and used in the field measurements as follows: (Figure 2). It is shown on a 1/250000 scale map indicating the locations of the trees selected as study material during field studies. (Figure 4). A photo of each tree was added to the study (Figure 3).

Figure 2: Table of the replenished specifications and GPS point for each individual

Adı	Türkçe		Latince	
	Çınar		*Platanus orientalis*	
Tescil Durumu	Tescilli			
Anıtsal değeri	Boyutsal – Tarihi			
Boy (m)	24			
Yaş (yıl)	800			
Çap (cm)(ort.130 cm)	770/pi			
Gövde Özellikleri	0 da güneyde 150 cm genişliğinde 95 cm yüksekliğinde, kuzey doğuda 75 cm genişliğinde 270cm yüksekliğinde ve kuzeyde 50 cm genişliğinde 60 cm yüksekliğinde olmak üzere 3 tane kovuk olduğu görülmüştür.			
Sağlık Durumu	Sağlıksız			
Açıklamalar	Mutlaka bakım yapılmalıdır			
Tepe İzdüşümü (cm)	Kuzey	Güney	Doğu	Batı
	1170	680	1030	1230
Bulunduğu Yer	Kestel Mahallesi Çam Yolu Mevkii			
Rakım (m)	12			
Koordinatlar	418114.00 d D		4040534.00 m K	
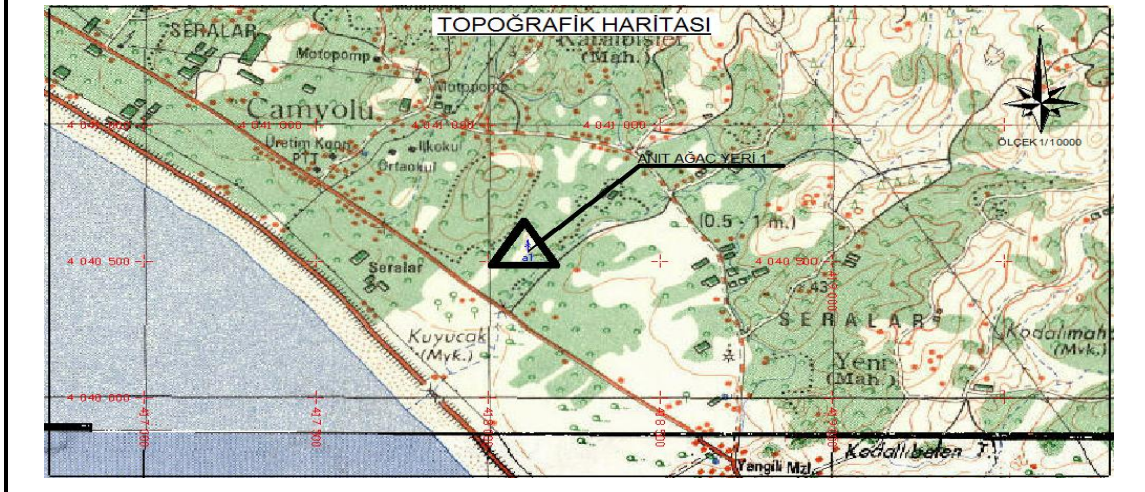
Figure 3: Each individual is photographed
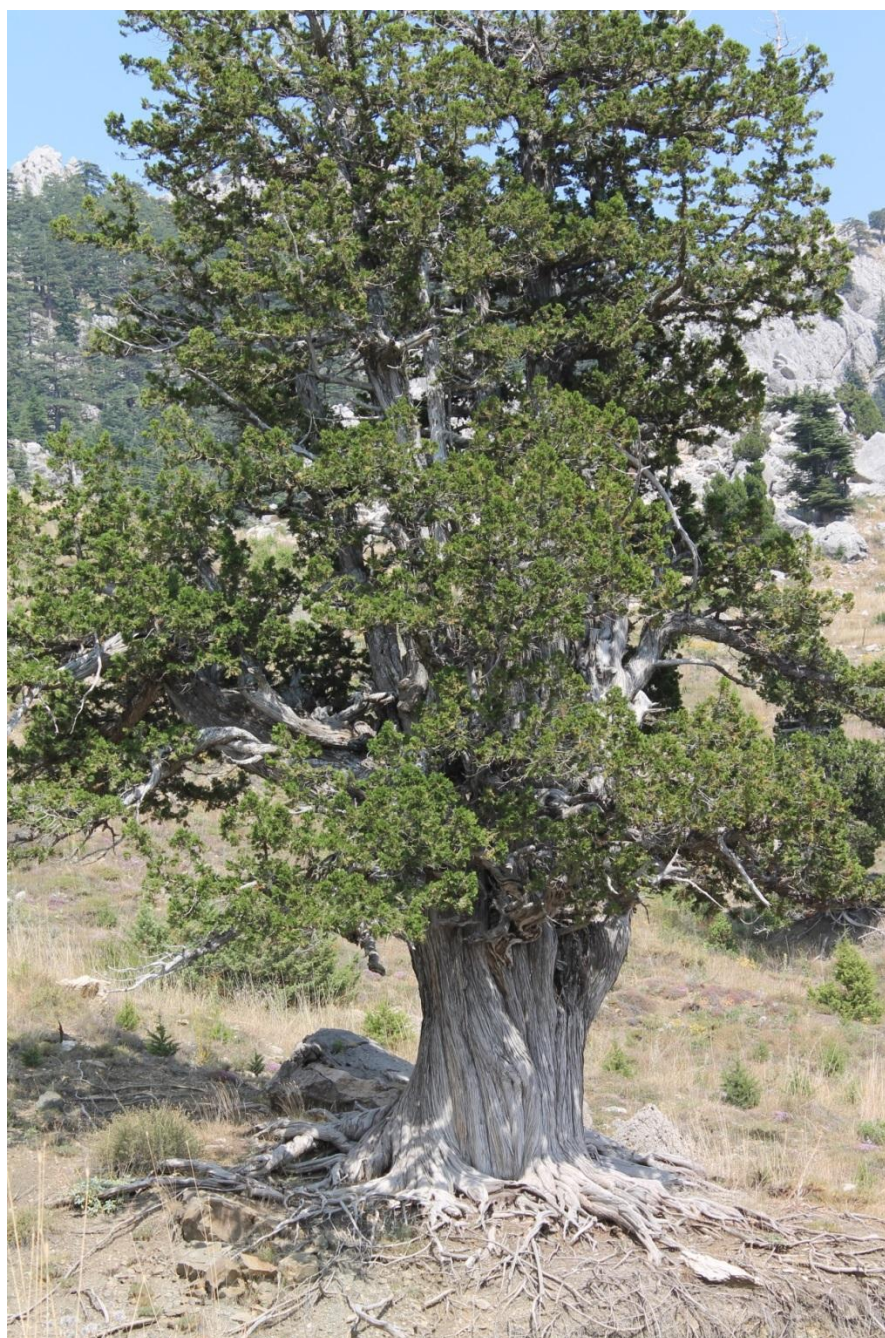
Results

In the research area, 105 monumental trees were identified and photographed and their properties are shown in Table 2. The locations of these trees are given in coordinates and tree locations are shown with separate map of two 1/250000 scaled working areas for easier access. (Figure 1). 19 different taxonomy were determined in relation to the monumental tree works (Table 2).

Figure 4: Points of trees on the map
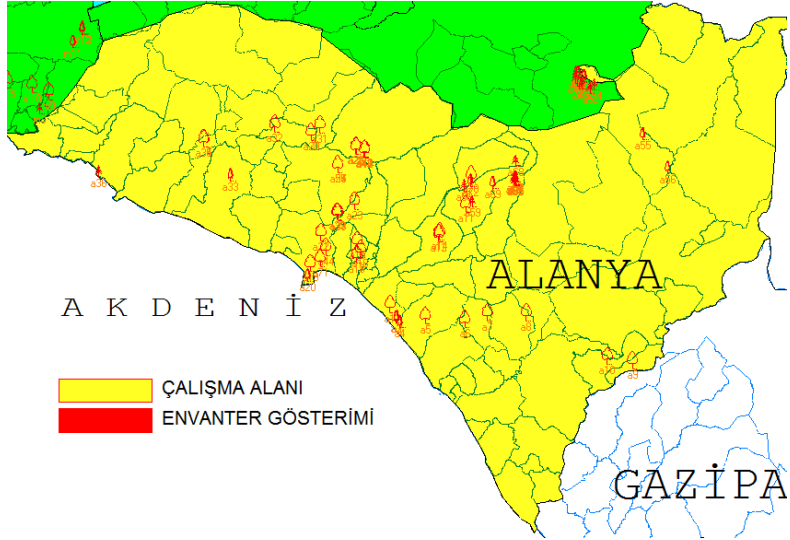
CONCLUDING REMARKS

In this study, the identification and registration of these trees, one of our natural beauties reflecting our history and culture as a monument, is carried out by official institutions and protected and transferred to future generations.. 1., 17., 18., 40., ve 44. *Platanus orientali*s L. registered monument trees.

In this study, 105 trees were measured and evaluated in Alanya and Manavgat districts of Antalya Province. 5 of these trees are registered monumental trees. 100 candidate monumental trees that need to be protected for monumental quality have been evaluated. Most monumental tree 51 pieces Platanus orientalis. Larch follows with 11 pieces (Table 1). The trees determined by the research are given in Table 2.

Table 1: Species and number of individuals in research

	Scientific name	piece
1.	*Abies cilicica* (Ant. et Kotschy) Carr.	1
2.	*Alnus glutinosa* L.	2
3.	*Castanea sativa* Mill.	2
4.	*Cedrus libani* A. Rich.	9
5.	*Celtis australis* L.	1
6.	*Cupressus sp.* L.	4
7.	*Juglans regia* L.	2
8.	*Juniperus drupacea* Labill.	4
9.	*Juniperus excelsa* M.Bieb.	3
10.	*Juniperus foetidissima* Willd.	1
11.	*Morus alba* L.	1
12.	*Morus nigra* L.	2
13.	*Morus rubra* L.	1
14.	*Olea europaea* L.	2
15.	*Pinus brutia* Ten.	2
16.	*Pinus nigra* subsp. *pallasiana* Arn.	11
17.	*Platanus orientalis* L.	51
18.	*Quercus aucheri* Jaub. & Spach	1
19.	*Quercus cerris* L.	5

Table 2: Finded trees as a result of research

	Scientific name	Coordinates		Age	Size(m)
1.	***Platanus orientalis** L.*	**418114.00**	**4040534.00**	**800**	**24**
2.	*Olea europaea* L.	418788.00	4039503.00	450	18
3.	*Quercus cerris* L.	418745.00	4039483.00	400	23
4.	*Morus alba* L.	419096.00	4038986.00	450	9
5.	*Platanus orientalis* L.	421668.00	4039361.00	500	18
6.	*Platanus orientalis* L.	425641.00	4039004.00	300	31
7.	*Platanus orientalis* L.	427923.00	4039685.00	750	34
8.	*Platanus orientalis* L.	431826.00	4039713.00	500	21
9.	*Platanus orientalis* L.	442514.00	4034885.00	900	33
10.	*Platanus orientalis* L.	439984.00	4035275.00	450	28
11.	*Platanus orientalis* L.	425746.00	4050574.00	1000	37
12.	*Platanus orientalis* L.	423002.00	4047640.00	350	33
13.	*Platanus orientalis* L.	423030.00	4047648.00	400	17
14.	*Platanus orientalis* L.	423105.00	4047807.00	750	36
15.	*Platanus orientalis* L.	414807.00	4046937.00	600	25
16.	*Platanus orientalis* L.	415137.00	4046088.00	450	28
17.	***Platanus orientalis** L.*	**414763.00**	**4045520.00**	**500**	**24**
18.	***Platanus orientalis** L.*	**414762.00**	**4045512.00**	**550**	**18**
19.	*Platanus orientalis* L.	410085.00	4044628.00	350	15
20.	*Juniperus drupacea* Labill.	409833.00	4043671.00	200	23
21.	*Platanus orientalis* L.	411154.00	4047777.00	1000	26
22.	*Platanus orientalis* L.	411143.00	4047773.00	1000	21
23.	*Platanus orientalis* L.	414560.00	4050915.00	700	29
24.	*Platanus orientalis* L.	412852.00	4054572.00	600	28
25.	*Platanus orientalis* L.	412853.00	4054568.00	400	20
26.	*Platanus orientalis* L.	414711.00	4056411.00	750	14
27.	*Platanus orientalis* L.	414692.00	4056426.00	900	22
28.	*Platanus orientalis* L.	414676.50	4056433.23	1000	27
29.	*Quercus cerris* L.	410152.00	4057858.00	350	28
30.	*Platanus orientalis* L.	410160.00	4057851.00	600	27
31.	*Platanus orientalis* L.	411049.00	4058616.00	450	27
32.	*Platanus orientalis* L.	406500.00	4058666.00	600	25
33.	*Quercus cerris* L.	402049.00	4053768.00	350	23
34.	*Platanus orientalis* L.	399365.00	4057152.00	300	32
35.	*Platanus orientalis* L.	399352.00	4057173.00	600	18
36.	*Pinus brutia* Ten.	388822.00	4054159.00	150	24
37.	*Platanus orientalis* L.	412870.00	4049801.00	600	17
38.	*Platanus orientalis* L.	412848.00	4049805.00	450	13
39.	*Platanus orientalis* L.	412777.00	4049828.00	400	18/15
40.	***Platanus orientalis** L.*	**415528.00**	**4056133.00**	**1000**	**25**
41.	*Platanus orientalis* L.	415547.00	4056137.00	950	25
42.	*Platanus orientalis* L.	415558.00	4056123.00	600	33
43.	*Platanus orientalis* L.	415524.00	4056110.00	500	28
44.	***Platanus orientalis** L.*	**411645.57**	**4046282.77**	**1200**	**21**
45.	*Cedrus libani* A. Rich.	437416.02	4063012.37	600	24
46.	*Juniperus foetidissama* Willd.	437417.93	4063043.76	800	16
47.	*Abies cilicica* (Ant. Et Kotschy) Carr.	437200.97	4063028.13	500	28
48.	*Pinus nigra subsp. pallasiana* Arn.	436766.10	4063614.01	500	19
49.	*Juglans regia* L.	437652.56	4063766.45	850	11
50.	*Pinus nigra subsp. pallasiana* Arn.	436866.49	4064244.15	500	24
51.	*Alnus glutinosa subsp. antitaurica* L.	437047.03	4064101.71	500	14
52.	*Cedrus libani* A. Rich	438246.78	4062524.65	750	24

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53.	*Morus nigra* L.	437640.76	4063688.89	800	12
54.	*Pinus nigra subsp. pallasiana* Arn.	438696.24	4062922.02	400	9
55.	*Juniperus excelsa* M.Bieb.	443544.88	4057886.42	600	14
56.	*Quercus cerris* L.	446052.84	4054512.43	450	22
57.	*Cupressus sempervirens* var.*pyramidalis*	412836.84	4054568.53	750	29
58.	*Pinus nigra* subsp. *pallasiana* Arn.	425606.96	4052763.94	400	25
59.	*Pinus nigra* subsp. *pallasiana* Arn.	426390.45	4051126.16	500	29
60.	*Pinus nigra* subsp. *pallasiana* Arn.	430715.42	4053658.54	400	29
61.	*Cedrus libani A. Rich.*	430779.24	4053669.95	750	18
62.	*Cedrus libani A. Rich.*	430800.62	4053642.58	500	23
63.	*Pinus nigra* subsp. *pallasiana* Arn.	430620.77	4053514.09	500	22
64.	*Cedrus libani A. Rich.*	430705.10	4053311.85	600	15
65.	*Cedrus libani A. Rich.*	430764.90	4053418.30	500	11
66.	*Cedrus libani A. Rich.*	430758.54	4053260.71	500	17
67.	*Pinus nigra* subsp. *pallasiana* Arn.	430721.57	4053426.76	500	23
68.	*Cedrus libani A. Rich.*	430761.27	4055219.99	600	27
69.	*Juniperus excelsa* M.Bieb.	428450.34	4053000.38	800	11
70.	*Platanus orientalis* L.	426278.21	4053549.53	800	26
71.	*Platanus orienalis* L.	411078.98	4045159.20	800	12
72.	*Juglans regia* L.	426199.59	4053205.90	100	9
73.	*Castanea sativa* Mill.	335467.04	4120858.21	700	26
74.	*Castanea sativa* Mill.	335439.74	4120808.51	600	11
75.	*Cupressus goveniana* L.	334225.82	4121684.25	500	27
76.	*Quercus cerris* L.	334219.73	4121376.05	350	33
77.	*Cedrus libani* A. Rich	333451.04	4123642.04	450	38
78.	*Quercus aucheri* Jaub. & Spach	333452.26	4123703.68	300	22
79.	*Cupressus goveniana* L.	333427.62	4123704.17	450	37
80.	*Pinus brutia* Ten.	382879.18	4060482.51	350	26
81.	*Platanus orientalis* L.	383752.00	4061956.35	800	22
82.	*Platanus orientalis* L.	382074.41	4062645.51	450	24
83.	*Juniperus drupacea* Labill.	386190.80	4067198.63	500	19
84.	*Juniperus drupacea* Labill.	387151.00	4068640.00	650	38
85.	*Juniperus drupacea* Labill.	387108.57	4068532.39	800	14
86.	*Platanus orientalis* L.	378460.64	4067325.66	700	16
87.	*Platanus orientalis* L.	379536.07	4063106.63	550	19
88.	*Juniperus excelsa* M.Bieb.	383633.20	4076333.47	750	12
89.	*Olea europaea* L.	383748.47	4076316.97	800	11
90.	*Platanus orientalis* L.	382632.17	4080451.60	600	26
91.	*Platanus orientalis* L.	382642.40	4080465.21	500	26
92.	*Alnus glutinosa* L.	384410.23	4080021.87	700	11
93.	*Platanus orientalis* L.	382526.80	4081274.93	1000	24
94.	*Celtis australis* L.	370970.60	4071427.48	400	20
95.	*Platanus orientalis* L.	364712.67	4073214.62	800	18
96.	*Cupressus sp.* L.	362125.70	4075210.06	300	21
97.	*Platanus orientalis* L.	362176.84	4075270.48	800	18
98.	*Pinus nigra* subsp. *pallasiana* Arn.	365040.65	4100396.61	500	31
99.	*Pinus nigra* subsp. *pallasiana* Arn.	365037.11	4100384.44	550	29
100.	*Pinus nigra* subsp. *pallasiana* Arn.	368983.45	4097640.80	700	35
101.	*Morus rubra* L.	363491.38	4098153.05	650	22
102.	*Morus nigra* L.	363421.89	4098159.99	600	12
103.	*Platanus orientalis* L.	363503.86	4098164.98	700	24
104.	*Platanus orientalis* L.	369105.32	4071281.34	600	24
105.	*Platanus orientalis* L.	369432.39	4069689.95	400	26

*proprietary monument tree

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A Research on the Monumental Trees of "Yıldız" Park (Istanbul)

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ABSTRACT

This study was conducted in Yıldız Park in Istanbul in 2014. The aim of this study was to determine monumental or worth preserving trees. As a result of this study, 192 trees were detected. 20 of the determined trees are monumental trees and other 172 trees are worth preserving trees. There are 9 species as monumental tree in the study area. The most monumental trees are Pistacia atlantica (7 trees). All the monumental trees are healty.

Keywords: Monumental tree, Istanbul, "Yıldız" Park.

INTRODUCTION AND LITERATURE REVIEW

With the rapid population growth in our world, the pollution resulting from the unconscious and uncontrolled use of developing technologies completely covers the living spaces of people and threatens natural areas. In order to stop the collapse caused by these negativities in nature, the idea of protecting nature and natural resources has been spreading rapidly all over the World (Palabaş ve ark.,2005).

Protecting the forest and leaving it to the next generations means protecting all kinds of natural and artificial heritage in the forest ecosystem. In this heritage, along with the trees that are the main assets of the forest individually or in groups, hundreds of thousands of years ago, mountains and hills, caves, rocks, canyons, lime and lava deposits, hot springs, water springs, waterfalls and cascades formed under natural conditions; In general description, together with natural monuments, there are historical monuments which have a special and important place in our riches, that is, cultural monuments. (Genç, Güner, 2003).

The first laws that came into force for the protection of nature in our country are the laws numbered 3116 and 3167 issued in 1937. Article 25 of this law states that the General Directorate of Forestry may allocate the places it deems appropriate due to its location and characteristics as national parks, natural monuments, nature protection areas and forest recreation areas (Çolak, 2001).

Having dimensions above the usual dimensions of its kind in terms of age, diameter and length; it evokes some symbols in the memory of the audience due to its interesting root, stem and branch form; Trees that have a special place in local folklore, culture and history and have a natural life long enough to provide communication between past and present, present and future fall into the status of 'monumental trees' (Asan, 1992).

However, no matter how glorious a tree is, trees with a short natural life (alder, poplar, willow, etc.) are not considered as monumental trees. However, since they are extremely dimensional and rare for their species, they should be considered as Tree Worth preserving. Although they are not very large in size, the trees and shrubs that evoke the same thoughts in the minds due to the interesting formations observed in the roots, stems and branches are also included in the monument and tree class worth preserving (Asan, 1986).

The first condition for us to call a tree or forest piece a memorial tree, a piece of wood or forest has a feature that can deeply affect human and social psychology. This feature is related to the tree and forest, Magnificent appearance at diameter and height, having a positive and negative reputation in local culture and folklore, it has to be the scene of some important events in the historical process and finally it must be in mystical holy places.

Huge sized old trees have attracted the attention of societies throughout the entire history of humanity. Primitive clans have adopted such trees directly as totems. This approach was also accepted by the Lebanese and the flag of the country was adorned with an old Cedar tree. This approach is the product of the same idea to distribute redwood seeds to the delegation

of member states at the United Nations meeting in San Francisco in 1945 to express international friendships and a long-lasting desire for world peace.

The contribution of monumental wood and forest fragments to natural sciences and environmental protection is important. Monumental forests on steep terrain and upper forest zones prevent soil avalanches. Delays snowmelt and regulates water economy. Helps wildlife thrive and diversify, as they are under special protection. It serves as a gene pool for the related tree species with individuals who have reached the upper limit of their natural lifespan, and also gives the planner an idea of the physical management periods required during the planning of forest resources. Provides natural material for climatological research, shedding light on retrospective climate forecasts. With the mystical effect of magnificent and long-lasting individuals on human psychology it helps both to awaken and develop feelings of homeland love and soy attachment in young minds and to raise awareness of respect for nature and the environment.

The monumental tree and forest fragments are of great importance in terms of national culture, local history and folklore. The popularity of monumental wood and forest fragments is increasing day by day in parallel with the adoption of environmental problems by the broad public. This living heritage, which adds privilege to its location, is also an important resource value for the Eco-Tourism phenomenon, whose trend has risen significantly, in which the passion for green conservation has reached the level of worship and environmental protection activities have come to the forefront. Monumental trees located in national parks in different countries, especially in California's Redwoods, are among the indispensable places to visit for thousands of nature-loving tourists every year. Ağlayan Çınar, located in Bursa, attracts thousands of tourists every year.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

In this study, trees in Yıldız Park (İstanbul) were investigated and 192 qualified trees were identified after the studies were started. The history of the Yıldız Grove, which is one of the most valuable places in Istanbul, both natural and historical, dates back to ancient times. The greens mentioned as Daphne in the first Byzantine sources are the ridges of Beşiktaş where the present Yıldız Grove is located. The grove, which was built during the Ottoman period, was preserved for many years with its natural structure. It is known that the grove slopes were covered with Cypress, Almond, Acacia and Maple during these periods. The bottom of the trees was full of flower beds, especially tulips. During the reign of Abdulhamid II, the grove was arranged by foreign garden architects in the western sense. The grove, which took the name of Mabeyn Garden during the reign of Abdulaziz, was extended to Ortakoy during this period. II Abdulhamid's palace has turned into humayun. Yıldız's first pavilion was built by Selim III. After that, Mahmut II had build the first mansion known as Yıldız. Mahmut II, who came to this mansion in summer, supervised the drills of his new soldiers in Yıldız gardens. The land of Yıldız garden was enlarged during the reign of Abdülmecit. His mother built Kasrı Dilküşa here. Later, Abdülaziz also built new buildings in Yıldız garden. (Anonim, 2012).

After the Republic, the areas of the Yıldız Palace were divided into three. The buildings on the hill are devoted to the War Academy, later transferred to the Ministry of Culture. Şale Mansion was given to the Presidency of the National Assembly. The slopes towards the sea are left to Istanbul Municipality together with the Tents and Maltese Pavilions. (Anonim, 2012). The area used as the Yıldız Park today is these slopes. The green heritage from the history is preserved and offered to the public. Especially at the beginning of 1979 the park's restoration and maintenance of the municipal undertaking by agreement with Turkey Turing Automobile Association's work, the park has gained great values. After the restoration and opening of the Maltese Pavilion and Tent Pavilion to the public, the Pink Greenhouse has been built with various facilities, buffets, country coffees, and the recreation environment which is of great importance for the citizens has been created in the park. (Anonim, 2012).

In the research belong to each tree;

- ✓ Turkish and Latin names of each tree subject to measurement
- ✓ Chest diameter, peak diameter is half of the sum of the radii measured in 4 directions - and the estimated age
- ✓ Visual Impact and Habitus
- ✓ Health status and threat factors, (insect and fungal damages and air pollution)
- ✓ Technical procedures such as pruning, rehabilitation, complete cutting and renewal to be applied to the related tree considering the measurement, observation and health status
- ✓ Acoustic tomography.

Acoustic tomography is the process of detecting cavities and rot in the trunk based on the difference in the rate of propagation of sound waves in the intact and decayed parts of the trunk without cutting a planted tree. The sound propagation speed moves faster between the two ends of the trunk diameter in the solid parts of the wood, slower in the rotten and cavity. The aim of this study is to convert the spreading velocities measured between the double points formed at different places on the body circumference to a computer environment and then convert them into 2D graphics for each section and then 3D graphics with different sections. As it can be seen from the scale graphs, it shows whether a tree that looks intact from the outside has rot in the trunk and the thickness of the solid part of the tree after removal is present on scale. The type, top shape and size of the tree with tomography removed and the maximum wind speed the tree is exposed to in the position is entered into the program it becomes possible to learn about whether the trunk can carry the existing crown and the risk of tipping.

A template was created and recorded for each species as shown in Figure 1.

Figure 1: Template created for each tree

İSTANBUL BEŞİKTAŞ İLÇESİ YILDIZ KORUSU ANIT VE KORUNMAYA DEĞER AĞAÇ TESPİT FİŞİ			**ENVANTER NO: 11**		
KORDİNAT BİLGİLERİ			TAPU BİLGİLERİ		
X	Y	Z	PAFTA	ADA	PARSEL
4546122,500	417123,406	48,72	63-64-65	232	8

KİMLİK BİLGİLERİ	
TÜR ADI (TÜRKÇE)	AKDENİZ SERVİSİ
TÜR ADI (LATİNCE)	*Cupressus sempervirens* var. *pyramidalis*
YAŞ	254
ÇAP (cm)	94
BOY (cm)	2300
ÇEVRE (cm)	324-297

GENEL GÖRÜNÜM	
TEPE ÇAPI (m)	7.05
TEPE İZDÜŞÜMÜ (M²)	39.02
HABİTÜS	NORMAL
ÇATALLANMA	–
TEPE DURUMU	NORMAL
EĞİKLİK	–

ANITSAL ÖZELLİKLERİ			
BOYUTSAL		KÜLTÜREL	
YAŞ	X	TARİHİ	X
BOY	X	FOLKLORİK	
GÖVDE ÇAPI		MİSTİK	
TEPE ÇAPI		İMGESEL	

BULUNDUĞU YER	
ORMAN	
SİT ALANI	
KENTSEL TEK	
KENTSEL GRUP	X
KIRSAL TEK	
KIRSAL GRUP	
MÜLKİYET	KAMU TÜZEL KİŞİLİK

ARAZİ BİLGİLERİ	
BAKI	DOĞU
EĞİM %	30-40
TABAN	-
YAMAÇ	ORTA
SIRT	-
DÜZLÜK	-

SAĞLIK BİLGİLERİ				AKUSTİK TOMOGRAFİ	
SAĞLIKLI	√	KOVUK SAYISI	–		
MANTAR	–	KOVUK ORANI %	–	SARARMA RENK KAYBI	–
DAL KURUMA	–	KOVUK YERİ	–	MÜDAHALE GEREKSİNİMİ	
SIVI AKINTISI	–	UR SAYISI	3	KÖK ÇEVRE BAKIMI	–
TEPE GÖÇMESİ	–	UR ORANI %	1	REHABİLİTASYON	–
İBRE YAPRAK KAYBI	–	UR YERİ	1-2,5 M	BUDAMA	–

TESCİL DURUMU VE ANITSAL DEĞERİ
KORUNMAYA DEĞER AĞAÇ

NOT: İSTANBUL BÜYÜKŞEHİR BELEDİYESİ AVRUPA YAKASI PARK VE BAHÇELER MÜDÜRLÜĞÜ ARŞİVİNDEN FAYDALANILMIŞTIR.

FOTOĞRAF
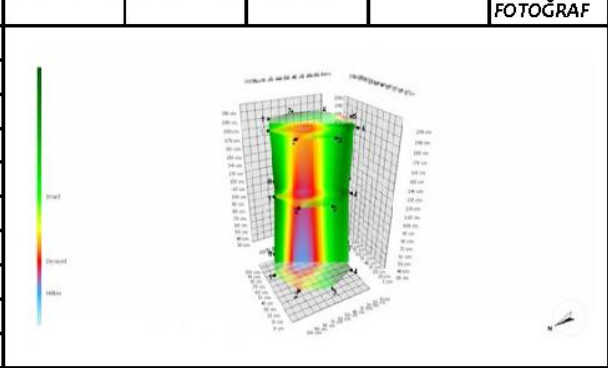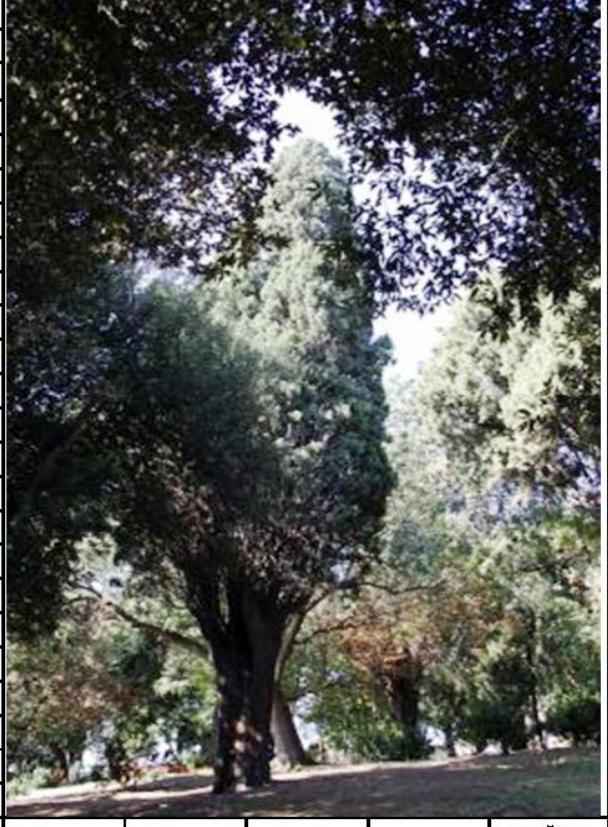
Results

In this study, 192 trees were measured and evaluated in Yıldız Park. 20 of these are monumental trees (Table 1,2). The remaining 172 trees are monumental and worth preserving (Table 3). Trees and spots are marked in Figure 2.

Figure 2: Map of Monumental and Trees Worth Protecting in Yıldız Grove
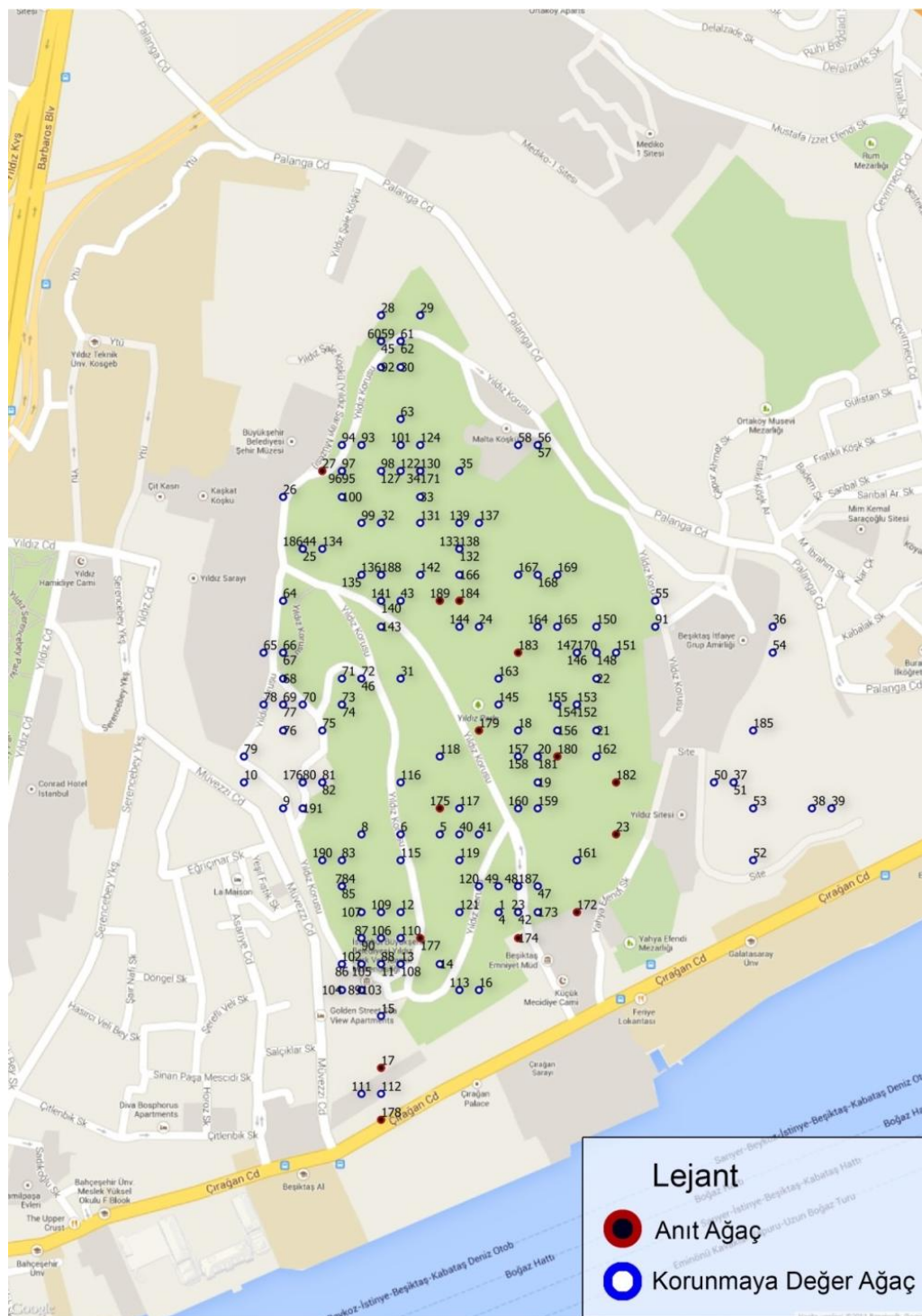
Table 1: Monumental Trees in Yıldız Park

Anıt Ağaç	Ağaç No (Table 3)
Fraxinus excelsior L.	176-186
Pinus brutia Ten.	27-67
Pistacia atlantica Desf.	172-175-177-180-181-182-183
Platanus × acerifolia L.	189
Platanus orientalis L.	174-178-187
Quercus infectoria Olivier	56
Quercus petraea (Mattuschka) Liebl.	184
Quercus robur L.	179
Tilia argentea Moench	17-42

Table 2: Tree species and their numbers in Yıldız Park

Sıra No	Türü	Sayısı
1.	*Aesculus hippocantanum* L.	6
2.	*Cedrus deodora* G.Don	3
3.	*Cedrus libani* A.Rich	10
4.	*Celtis australis* L.	2
5.	*Cupressus sempervirens* var. *horizontalis*	3
6.	*Cupressus sempervirens* var. *pyramidalis*	7
7.	*Fraxinus angustifolia* Vahl	9
8.	*Fraxinus excelsior* L.	4
9.	*Pinus brutia* Ten.	17
10.	*Pinus halepensis* Miller	11
11.	*Pinus nigra* Arnold	2
12.	*Pinus pinea* L.	4
13.	*Pistacia atlantica* Desf.	47
14.	*Platanus × acerifolia* L.	11
15.	*Platanus orientalis* L.	21
16.	*Quercus coccifera* L.	1
17.	*Quercus frainetto* Ten.	1
18.	*Quercus ilex* L.	3
19.	*Quercus infectoria* Olivier	1
20.	*Quercus petraea* (Mattuschka) Liebl.	2
21.	*Quercus robur* L.	19
22.	*Tilia argentea* Moench	7
23.	*Ulmus glabra* Huds.	1

Table 3: Monuments and Monumental Trees in Yıldız Park

Trees Nummer	Scientific name	Age	Size(m)
106.	*Platanus orientalis* L.	155	26
107.	*Platanus orientalis* L.	141	28
108.	*Platanus orientalis* L.	400	23
109.	*Platanus orientalis* L.	120	31
110.	*Pistacia atlantica* Desf.	200	24
111.	*Pistacia atlantica* Desf.	187	11
112.	*Pistacia atlantica* Desf.	126	14
113.	*Pinus pinea* L.	238	17
114.	*Pinus pinea* L.	240	17
115.	*Ulmus glabra* Huds.	138	22
116.	*Cupressus sempervirens* var. *horizontalis*	254	23
117.	*Quercus frainetto* Ten	182	17
118.	*Pistacia atlantica* Desf.	150	16
119.	*Pistacia atlantica* Desf.	138	17
120.	*Pinus brutia* Ten.	230	15
121.	*Fraxinus excelsior* L.	110	22
122.	***Tilia argentea* Moench.**	**207**	**27**
123.	*Pistacia atlantica* Desf.	141	19
124.	*Pistacia atlantica* Desf.	147	14
125.	*Cedrus libani A. Rich*	203	18
126.	*Pistacia atlantica* Desf.	154	14
127.	*Pinus brutia* Ten.	225	2
128.	*Quercus coccifera* L.	134	19
129.	*Pistacia atlantica* Desf.	182	13
130.	*Plantanus x acerifolia* L.	148	24
131.	*Pinus brutia* Ten.	222	16
132.	***Pinus brutia* Ten.**	**300**	**17**
133.	*Aesculus hippocastanum* L.	109	23,1
134.	*Quercus robur* L.	118	22,1

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135.	*Platanus orientalis* L.	108	16
136.	*Pistacia atlantica* Desf.	189	11,2
137.	*Fraxinus excelsior* L.	98	18
138.	*Platanus orientalis* L.	165	19
139.	*Platanus orientalis* L.	92	18
140.	*Cedrus libani* A. Rich	192	16
141.	*Pinus pinea* L.	218	15
142.	*Pistacia atlantica* Desf.	131	12
143.	*Celtis australis* L.	141	17
144.	*Quercus robur* L.	157	11
145.	*Fraxinus angustifolia*Vahl	103	24
146.	*Aeculus hippocastanum* L.	100	24
147.	***Tilia argentea* Moench**	**160**	**32**
148.	*Celtis australis* L.	142	23,7
149.	*Platanus x acerifolia* L.	107	24,2
150.	*Platanus x acerifolia* L.	94	22,1
151.	*Pistacia atlantica* Desf.	157	17
152.	*Aesculus hippocastanum* L.	107	32
153.	*Tilia argentea Moench*	146	34
154.	*Platanus orientalis* L.	110	32
155.	*Pistacia atlantica* Desf.	131	13
156.	*Pistacia atlantica* Desf.	112	15
157.	*Pistacia atlantica* Desf.	138	16
158.	*Pistacia atlantica* Desf.	101	13
159.	*Pistacia atlantica* Desf.	131	14
160.	*Pinus brutia* Ten.	180	15
161.	***Quercus infectoria* Oliver**	**130**	**16**
162.	*Cedrus libani* A. Rich	173	19
163.	*Fraxinus angustifolia* Vahl	90	16
164.	*Platanus x acerifolia* L.	100	26
165.	*Platanus x acerifolia* L.	80	24
166.	*Platanus x acerifolia* L.	96	26
167.	*Platanus orientalis* L.	79	24

168.	*Cedrus libani* A. Rich.	197	29
169.	*Pistacia atlantica* Desf.	134	18
170.	*Pinus pinea* L.	180	17
171.	*Cupressus sempervirens* var. *horizontalis*	167	20
172.	**Pinus brutia Ten.**	**305**	**16**
173.	*Pinus brutia* Ten.	153	18
174.	*Pinus nigra* Arn.	184	16
175.	*Quercus robur* L.	122	20
176.	*Pinus brutia* Ten.	215	18
177.	*Pistacia atlantica* Desf.	109	15
178.	*Pistacia atlantica* Desf.	109	18
179.	*Quercus ilex* L.	106	17
180.	*Pistacia atlantica* Desf.	155	15
181.	*Cedrus libani* A. Rich	181	20
182.	*Pistacia atlantica* Desf.	112	15
183.	*Pinus halepensis* Miller	178	19
184.	*Quercus robur* L.	126	15
185.	*Platanus orientalis* L.	97	16
186.	*Cedrus deodora* G. Don	224	17
187.	*Pinus halepensis* Miller	221	16
188.	*Quercus robur* L.	112	14
189.	*Pistacia atlantica* Desf.	99	15
190.	*Pistacia atlantica* Desf.	106	15
191.	*Pistacia atlantica* Desf.	106	16
192.	*Cupressus sempervirens* var. *pyramidalis*	186	14
193.	*Pistacia atlantica* Desf.	125	14
194.	*Pistacia atlantica* Desf.	180	16
195.	*Cupressus sempervirens* var. *pyramidalis*	208	18
196.	*Quercus robur* L.	99	15
197.	*Quercus robur* L.	120	17
198.	*Quercus robur* L.	114	16
199.	*Pistacia atlantica* Desf.	99	17
200.	*Pinus halepensis* Miller	219	13

201.	*Pinus halepensis* Miller	192	14
202.	*Pinus halepensis* Miller	194	15
203.	*Aesculus hippocastanum* L.	90	18
204.	*Fraxinus angustifolia* Vahl	88	16
205.	*Pinus halepensis* Miller	194	16
206.	*Cedrus deodora* G. Don	162	16
207.	*Cupressus sempervirens* var. *horizontalis*	197	17
208.	*Pinus halepensis* Miller	203	16
209.	*Pistacia atlantica* Desf.	126	16
210.	*Pistacia atlantica* Desf.	120	16
211.	*Pistacia atlantica* Desf.	120	15
212.	*Pistacia atlantica* Desf.	114	14
213.	*Pistacia atlantica* Desf.	99	15
214.	*Pistacia atlantica* Desf.	110	15
215.	*Pistacia atlantica* Desf.	110	13
216.	*Tilia argentea* Moench	149	15
217.	*Platanusx acerifolia* L.	84	14
218.	*Pistacia atlantica* Desf.	104	13
219.	*Fraxinus angustifulia* Vahl	73	14
220.	*Pistacia atlantica* Desf.	136	13
221.	*Quercus robur* L.	123	17
222.	*Pistacia atlantica* Desf.	125	17
223.	*Quercus robur* L.	125	16
224.	*Tilia argentea* Moench	109	21
225.	*Quercus ilex* L.	109	19
226.	*Cupressus sempervirens* var. *pyramidalis*	211	16
227.	*Platanus orientalis* L.	89	21
228.	*Aesculus hippocastanum*	73	19
229.	*Platanus orientalis* L.	84	20
230.	*Aesculus hippocastanum* L.	77	17
231.	*Platanus orientalis* L.	98	19
232.	*Platanus orientalis* L.	90	18
233.	*Platanus orientalis* L.	79	20

234.	*Platanus orientalis* L.	82	19
235.	*Platanus orientalis* L.	77	20
236.	*Fraxinus angustifolia* Vahl	104	20
237.	*Pinus halepensis* Miller	224	15
238.	*Cedrus libani* A. Rich	173	12
239.	*Fraxinus angustifolia* Vahl	92	12
240.	*Fraxinus angustifolia* Vahl	91	21
241.	*Platanus x acerifolia* L.	89	20
242.	*Pinus halepensis* Miller	211	16
243.	*Pinus halepensis*Miller	189	15
244.	*Cedrus libani* A. Rich	203	15
245.	*Quercus robur* L.	130	17
246.	*Tilia argentea* Moench	96	16
247.	*Quercus robur* L.	187	20
248.	*Pinus halepensis* Miller	167	15
249.	*Quercus robur* L.	130	15
250.	*Quercus robur* L.	136	17
251.	*Pinus brutia* Ten.	155	15
252.	*Pinus brutia* Ten.	153	17
253.	*Pinus brutia* Ten.	170	19
254.	*Pinus brutia* Ten.	170	18
255.	*Pinus brutia* Ten.	160	18
256.	*Pinus brutia* Ten.	175	18
257.	*Pistacia atlantica* Desf.	138	17
258.	*Pinus brutia* Ten.	165	17
259.	*Pinus brutia* Ten.	155	18
260.	*Quercus robur* L.	112	16
261.	*Cedrus libani* A. Rich	170	18
262.	*Cupressus sempervirens* var. *pyramidalis*	173	20
263.	*Cupressus sempervirens* var. *pyramidalis*	173	17
264.	*Cedrus deodora* G.Don	181	18
265.	*Fraxinus angustifulia* Vahl	89	17
266.	*Fraxinus angustifulia* Vahl	94	16

267.	*Tilia argentea* Moench	110	20
268.	*Cedrus libani* A. Rich	176	19,9
269.	*Cupressus sempervirens* var. *pyramidalis*	154	22
270.	*Cupressus sempervirens* var. *pyramidalis*	157	19
271.	*Pistacia atlantica* Desf	99	17
272.	*Quercus robur* L.	102	13
273.	*Quercus robur* L.	9	12
274.	*Quercus robur* L.	102	17
275.	*Pinus brutia* Ten.	200	18
276.	*Platanus x acerifolia* L.	77	19
277.	***Pistacia atlantica* Desf.**	**256**	**19**
278.	*Platanus orientalis* L.	169	27
279.	***Platanus orientalis* L.**	**199**	**24**
280.	***Pistacia atlantica* Desf.**	**215**	**20**
281.	***Fraxinus excelsior* L.**	**167**	**18**
282.	***Pistacia atlantica* Desf.**	**210**	**17**
283.	***Platanus orientalis* L.**	**245**	**17**
284.	***Quercus robur* L.**	**263**	**16**
285.	***Pistacia atlantica* Desf.**	**243**	**16**
286.	***Pistacia atlantica* Desf.**	**228**	**18**
287.	***Pistacia atlantica* Desf.**	**254**	**18**
288.	***Pistacia atlantica* Desf.**	**243**	**11**
289.	***Quercus petraea* (Mattuschka) Liebl**	**210**	**17**
290.	*Cedrus libani* A. Rich	211	21
291.	**2** ***Fraxinus excelsior*L.**	**175**	**23**
292.	***Platanus orientalis* L.**	**204**	**31**
293.	*Platanus x acerifolia* L.	189	21,8
294.	***Platanus x acerifolia* L.**	**196**	**19**
295.	*Quercus petraea* (Mattuschka) Liebl	125	16
296.	*Pinus nigra* Arn.	129	9
297.	*Quercus ilex* L.	126	13

CONCLUDING REMARKS

This study was conducted at Yıldız Park in Beşiktaş, Istanbul. According to the results of the study, 192 monumental or conservative trees were used in the park. Of these, 20 are monumental trees and 172 are worth preserving. The memorial trees are made up of 9 species and the maximum memorial tree is *Pistacia atlantica* Desf with 7 trees. The oldest of the monumental trees is 305-year-old *Pinus brutia* Ten. *Platanus orientalis* L. has a thickest diameter of 153 cm. The tallest is Tilia argentea Moench with a height of 32 meters. Information about monumental trees is given in Table 3. All monumental trees are healthy. On the other hand, 23 different types of trees were identified in Yıldız Park. The maximum number of individuals is Pistacia atlantica Desf. with 47 trees. *Platanus orientalis* L. is followed by 21 trees and Quercus robur L. is followed by 19 trees. Other species and their numbers are also given in Table 2.

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A Researches on Some Morphological Properties of Stone Pine (*Pinus pinea* L.) Milas (Mugla) Province

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ABSTRACT

This research Milas (Muğla) province, 350-650 m. in height, which occur naturally in the forests of Stone Pine has been realized. Research in the field and at each elevation in total three different heights so that a total of 30 trees in the trees 10 height, diameter at breast height, age were measured. Study statistically significant sample cone length from trees, pine cones weight, seed size, seed weight were measured. Accordingly, the average size of the trees measured 12.96 m. average diameter at breast height 43.19 cm. the mean age was measured as 57.62. Cones average height 12.28 cm. average grain size 7.4 mm. average 12.7 cm. cone weight, average seed weight was measured as 31.5 cm.

Keywords: Stone Pine, *Pinus pinea* L., Morphology, Milas.

INTRODUCTION AND LITERATURE REVIEW

Stone Pine (Pinus pinea L.) has always been an important tree species throughout history due to its valuable seed. Today, this feature continues to increase (Orman ve Av-2008). Stone Pine, Although it is a tree of Mediterranean Climate Type, it shows natural distribution in a very narrow area compared to red pine which is the tree of the same climate and geography. Calabrian Pine forest area is 5.420.524.6 hectares, while our Stone Pine forest is 42.618.2 hectares. Again in the Peanut Pine Action Plan covering the years 2006-2010 prepared by the General Directorate of Forestry natural peanut forest area is stated as 33.742.0 hectares (OGM-Orman Varlığımız-2006). Compared with the Calabrian Pine, it is seen that Stone Pine has a special growing environment. Fıstıkçamı is distributed in all natural distribution areas in Anatolia where medium-coarse, permeable, deep soils are found on the main rocks such as granite, gneiss, micaschist, volcanic tuff and these areas are classified as moist forests with annual average rainfall values. Stone Pine is a tree that requires better ecological conditions than Calabrian Pine and its natural spread is therefore limited. (Consequently, the places where artificial cultivation is limited). Moreover, as it will be explained later, it is under the pressure and threat of Calabrian Pine in its natural distribution areas. (Kılcı. M., Sayman M., Akbin., G.).

Bergama-Kozak Region always comes to mind when Stone Pine is mentioned. However the largest natural range of the Stone pine in Turkey It is located within the borders of Aydın and Muğla provinces, also called Mazon region in literature. It is important that this special habitat is handled within the scope of a project and the existing problems in terms of forestry techniques are eliminated and protected and made efficient. (Orman ve Av-2008).

According to the management plan data Within the borders of Muğla Regional Directorate of Forestry, there are 36,722,0 hectares of Stone Pine forest mixed with Calabrian Pine. Of this, 21,888,0 hectares are normal and 14,834,0 hectares are defective. It is not very suitable to evaluate efficiency only according to closure. A stand that is considered to be defective by closure can be fruitful in fruit yield (O.G.M. 2012). A large part of this peanut forest (34.977.0 hectares) is the largest natural distribution area in Anatolia and also known as Mazon Region in the literature, and lies on the east-west mountain range. Here, the bedrock is gneiss, and soil and other ecological conditions are the most important and widespread natural distribution of stone pine in Anatolia. However, as of the current situation, peanut forest is less than ideal. Potential area of peanut forest is more. As a result of the interventions made by the people around the villages because of the ownership of stone pine, pure peanut stands are concentrated, away from villages and in steep areas mixed with calabrian pine. The peanut forests in the region are generally old, neglected, under the pressure of the main stand, hills are underdeveloped, shrubs and growth energy is lost. The number of individuals in the unit area is insufficient in most places. For various reasons gaps formed by stone pine leaving the area are occupied by calabrian pine. In peanut pine trees, which are generally abundant seed years in 3 years, the repetition of abundant seed years in the Mazon region occurs every 7-8 years. (Saatçioğlu F., 1975).

If this process and perspective persists, this natural habitat which is very special and valuable in terms of stone pine cultivation is invaded by calabrian pine and rapidly transforms into pure calabrian pine forest. Because the cones of stone pine are completely collected by humans, there is no seed left to sustain their generation. Calabrian pine gives enough seeds to cover the area slowly every year. Since the seeds of stone pine are heavy, there is almost no chance of moving to other places. Red pine seeds fly into the field and germinate. Peanut is more selective in terms of growing environment. Red pine is more contented. Stone pine growing environment is more luxurious for calabrian pine and therefore more powerful. It is difficult for peanut pine to compete with red pine in its natural habitat. Both tree species are forest trees with high light demand. Stone Pine is not able to continue its generation in places where calabrian pine invades the soil. Fire risk is much higher in calabrian pine-stone pine forests than in pure stone pine forests. This situation threatens stone pine. After a forest fire, the area is often covered with calabrian pine youth. Plans and silvicultural practices made according to the forest structure and establishment of the forest without being able to realize where the forest is going, seeing, evaluating and understanding are going to be completely in favor of calabrian pine. This situation jeopardizes the future of stone pine pine which is already disadvantageous against calabrian pine.

Stone pine has an umbrella-like hill of 20-25 m in length which can be easily distinguished from other pine species. Male and female flowers are on the same tree and tree of light. Pollination occurs by wind. The body is first pulsed, brown-red, then reddish gray and its thick shell is deeply cracked. Resin-free buds 7-20 mm in size, egg-shaped and pointed. The ends of the bud scales are curled backwards. Young shoots were dark green at first, then yellowish brown. The root system is usually strong and develops deep root pile system starting in early years on favorable soils. The seed of this species is also very thin, can be broken between the fingers (Pinus pinea cv. "Fragilis" Du Hamel) is also available (Kayacık, 1980. Anşin ve Özkan, 1993; Yaltırık, 1988). According to national forest inventories prepared by various countries; There are approximately 620.000 ha pure or mixed stone pine forests in the Mediterranean Basin. (Garcia ve Baciller, 2000).

Male flowers of calabrian pine are long and cylindrical. Terminal state female flowers are one at a time, sometimes 2-3 together. Cone 8-12 (15) cm. in length, 5-11 (12) cm. wide, very short-handled and twig almost like seated. Cones complete ripening in three years. Cones are green in walnut size at the end of the first vegetation season, and bright redish at the end of the ripening process. Cones open the year they ripen or the next year. The cones are oval and symmetrical, and the scales are bright brown. Cone weight varies between 100-400 g (Anşin ve Özkan, 1993; Yaltırık, 1988). Cones and seeds ripen in January. Seed collection time is between January and June according to rainfall. Studies have shown that weather conditions in the last year of cone ripening have a significant impact on the quality of cones (Calama et al., 2011). Bir kozalaktan 65-75 g. kabuklu ve 13-20 g. kadarda iç fıstık elde edilmektedir (Bilgin, 2001).

Seed 1.5-2 cm in size, large, very thin wings remained, the upper side is covered with a purplish-brown powder. Seed thousand grain weight is 750 grams (Anşin ve Özkan, 1993;

Yaltırık, 1988). Rich seed years are repeated every 3-4 years. Depending on the age of the trees and habitat conditions in Turkey began to give seed in 13-16 years, 40-45 years of cones yield to the highest level and continues seed yield up to 80-100 years (Atay, 1982). The seeds maintain germination ability for at least two years at room temperature and in dry conditions. Shelled seeds can be stored up to 10 years in +4 degrees and 6-8% humidity. Seeds germinate in 28 days (Saatçioğlu, 1971).

Natural stone pine stands are spread on flysch, alluvial base material and sand depots with various bedrock such as granite, gneiss, micaschist, volcanic tuff, quartzite. The common feature of all these materials is that they give medium-coarse soils. When the granularity (structure) of the soils in natural distribution areas is examined, the best development is made in areas with sand ratios between 60-96% clay rates 3-10% and dust ratios between 1-28%. Reactions of soils in natural distribution areas generally vary between mild acid and neutral. Only in Antalya / Belek and Çanakkale / Radar are between moderate and severe alkaline. All natural field soils are salt-free. The lime content of natural land soils is low except for Antalya / Belek and Çanakkale / Radar (Ege Ormancılık Araştırma Enst.).

Although the sites are under the influence of Mediterranean climate type, the places where stone pine stands are located receive more rainfall locally. The stands in Kozak, Katrancı and Küner are good examples. These areas are classified as moist forests with average annual rainfall values.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

The research area is located within the borders of Milas District of Muğla Province between 37 ° 23 'north latitude and 27 ° 55' east longitude. Muğla Regional Directorate of Forestry, Milas Forest Management Directorate, Sarıçay Forest Management Chief was planned and made within the boundaries. The research area starts from 490 m to 690 m altitude. The forested area of Sarıçay Operation Directorate is 16.119.5 hectares, of which 10.629.0 ha is productive and 5.490.5 hectares are inefficient degraded forest area. (T.C. Orman Genel Müdürlüğü, 2013).

In the research area, although the soil characteristics differ from place to place according to the land shape and bedrock type, sandy-clay loam soil structure exists throughout the area. For the climate data of the research area, data belonging to Milas Meteorological Station of the General Directorate of State Meteorological Affairs was used to represent the area. Milas Meteorological Station is located in Milas District Center. The station is 52 meters above sea level, This station was used to measure the average of measurements made in the 31-year period between 1975-2005. The hottest months are June (41.3 ° C), July (45.7 ° C) and August (43.6 ° C). Total annual precipitation is 702.8 mm and annual average temperature is 17.9 ° C. Annual Average Relative Humidity is 61.8%, the lowest average temperature during the year is February with -6.0 ° C and the highest average temperature during the year is 45.7 ° C with July.

According to the Thornthwaite method, Milas region has a humid climate with a sea effect and water deficit in summer. The fact that summers are scarce in terms of the amount of water affects the spring-summer wood thickness.

The study has been carried out at an altitude of 650 m, which is the highest altitude at which the stone pine can rise in the Türbe region. 10 trees were identified that could represent an area every 200 meters. Measurements were made to determine some morphological values on these sample trees. Diameter, height and age values for each tree were measured and recorded in area. Each tree was enumerated and recorded, and cone samples were taken from each tree and packaged in accordance with the technique for laboratory measurements. The sample was collected from each of the trees in a number of 25 cones suitable for statistical evaluation. Weight and height measurements of cone samples were made. Number, height and weight measurements of seed samples in cones were made. Since a sample tree was taken every 100 meters between 300-650 m altitude and 10 trees were selected in each sample area, 30 sample trees were measured from 3 points (altitude: 200-400,400-600,600-650 meters) in total.

Sample trees were chosen from healthy trees which exhibit stand characteristics that normally represent the stand best. Trees that have been damaged by pests such as disease, insect damage, fungal damage, etc. are not selected from the roadside, through forest openings or from very congested trees, from very young or very old individuals. All trees were measured from the same point of view and slope while the selected trees were measured. The aim of selecting Milas-Türbe region is to reach the highest altitude where peanut pine can start from 300 altitude without changing climate and some criteria in the shortest distance. Thus, it was aimed to reach the results in the determination of some morphological features. Diameter measurement is based on chest height (1.30 m). The test materials were brought to the laboratory and measured. Haglöf brand increment auger (600 mm) was used to determine the age of the trees. Cone weights and seed weights were measured by digital scale. Length measurement was determined with the help of Silva Clinomaster. Cone and seed length measurements were measured with the help of Max Extra digital caliper. Altitude detection is provided by the Garmin Oregon 550 GPS. The trial area was prepared in ArcGIS environment. Trial of the largest natural range in Turkey, Aydin and is located in Mugla province borders of Muğla Regional Directorate of Forestry Milas Forest Management Directorate Sarıçay Forest Management located in Conducting border is the region also named as of Mazon in the literature.

Results

The physical characteristics of the trees studied in the trial areas are given in Table 1 as average values. Accordingly, the average altitude in the research area is 504.6 meters, the average length of trees is 1393 centimeters, the average age is 62.6 years, the average chest diameter (1.30 cm) 44.5 centimeters. The views are generally south and east. In general, the diameter of the trees varies between 34 and 60 centimeters. In this sense, the average diameter was found to be 44.5 centimeters. It is understood that the average annual ring width in the research area is 42 millimeters, which indicates that Stone Pine grows very fast.

Table 1: Properties of Sample Areas and Trees

Trial Area	Altitude (m)	Length (cm)	Age (yıl)	Land View	1.30 diameter range (cm)	The average diameter of 1.30 (cm)
1	637,0	1560	67,3	G	42-60	49,2
2	480,0	1430	64,0	D	40-56	46,8
3	397,0	1190	57,0	GD	34-42	37,6
Average	504,6	1393	52,6		34-60	44,5

Cones are given in Table 2 as the average of 25 cones randomly selected from each trial area. Accordingly, the average weight of cones is 213.3 grams and length is 10.19 centimeters. Seeds obtained from cones measured were evaluated for measurement. Accordingly, each cone has an average of 61.3 seeds. Each seed has an average length of 155 millimeters and an average weight of 0.68 grams. Seed characteristics on the basis of trial areas are also given in Table 2.

Table 2: Cones and Seed Properties

Trial Area	Cones Weight (gr)	Cones Length (mm)	Seed Piece	Seed Weight (gr)	Seed Length (mm)
1	216,1	10,41	61,8	0,68	158
2	217,8	9,93	62,2	0,68	155
3	206,1	10,25	59,9	0,67	153
Average	213,3	10,19	61,3	0,68	155

In addition, some species have been identified with red pine in the research area. These include Arbutus unedo L., Carob (Ceratonia siliqua L.), Laden (Cistus salviifolius L.), Funda (Erica L.), Euphorbia cyparissias L., Tar Juniper (Juniperus oxicedrus L.), Laurel (Laurus sp. L.), Mersin (Mytus communis L.), Oleander (Nerium oleander L.), Wild Olive (Olea sp.L.), Gum Tree (Pistacia) lentiscus L., Melengiç (Pistacia terebinthus L.), Kermes Oak (Quercus coccifera L.), Pirnal Oak (Quercus ilex L.), Mule (Spartium L.), Rosary Bush (Sytrax officinalis L.).

CONCLUDING REMARKS

The average altitude in the research area is between 400-650 meters.

The average values of stone pine; Its dimensions are 24 meters, 63 years old and chest diameter is 44.5 (34-60) centimeters. It is the optimum growing environment for Stone Pine and Stone Pine has an average diameter of 84 millimeters per year.

Seeds are consumed as food and are very valuable. In this sense, on average, each cone is 213.3 grams and its length is 10.19 centimeters. Again, each cone has an average of 61.3 seeds and each seed is 155 millimeters long and weighs 0.68 grams.

In addition, there are elements belonging to Mediterranean vegetation alongside Stone Pine in the research area.

In addition to being a necessity of forest management, the protection and development of peanut and natural habitats for scientific reasons is one of the most important tasks for Turkish Forestry.

Considering the present structure and foundation of the forest with a customary understanding in this region, which is the largest of the rare natural distribution areas of Stone Pine in Anatolia planning and natural and artificial rejuvenation activities to increase the presence of red pine should be abandoned.

Taking into account the microclimatic and edaphic differences, this mountain is also known as Mazon Region 800-850 m altitude and horizontal distance 60-70 km from the sea, each suitable square meter should be allocated to stone pine to produce the most products. Where appropriate, conversion from calabrian pine to stone pine should be described as a return to the original species, not as species change.

Grafted saplings should be used as much as possible in rehabilitation and artificial rejuvenation studies. This will also help to solve social problems.

Young stone pine forests should be done without interrupting maintenance and pruning.

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Physical and Numerical Model Comparison for Dam Spillways[1]

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ABSTRACT

Dam spillways are very important hydraulic structures for safety of the dams. The design of these structures is commonly tested by physical hydraulic models before construction. Physical models not only very cost and time consuming but also can contain significant scale effects. This study presents physical and computational fluid dynamics models comparison based on a short literature revive and some CFD model results. The results show that the scale effect of Froude models is insignificant for flow characteristics such as free surface, velocity and pressure profiles of water flow. However, the air aeration performance of the spillway aerators using for protecting spillway surface from cavitation is significantly affected by physical modes scale named scale effects, while numerical model results with full-scale are compatible with the prototype measurements. Therefore, it is concluded that the full-scaled CFD model verified can be useful to design of the spillway aerator especially instead of small scaled physical models.

Keywords: Cavitation, Aeration, Spillway, CFD, Scale Effects.

INTRODUCTION

The dam spillways are very important hydraulic structures to control flood in the reservoirs. Although, there are a lot of different types of them, basically they can be categorized as controlled and uncontrolled (gated and ungated) spillways. Uncontrolled cute spillways commonly exposed to three significant problems during flood discharges. First, determination of the spillway capacity according to the maximum design discharge, second cavitional damage on the surface subject to high flow velocities, third, the energy dissipations at the downstream end of spillway. The hydraulic characteristics of the spillways are generally evaluated by physical Froude models before their applications. Froude models with small scales can include some scale effects du to disregarding surface tension and viscous effects represented by Weber and Reynolds numbers respectively. These scale effects for the small scaled models can be so important that some results observed them may deviate from their real values by several times (prototype observation). This is a big problem needs attentions by water resources developers. To avoid these scale effects, big scaled models close to real prototype dimensions can be used but they are very expensive and occupying space in the laboratories. How else can you overcome this problem? Can real-size numerical models be used instead of physical models? In this study numerical models for spillway aerator models which can include important scale effects were investigated and compared with scaled physical model results.

Several researchers stated that air–water flows observed in prototypes are difficult to reproduce in laboratory physical models due to scale effects (i.e. Valero, & García-Bartual, 2016, Haler, 2011, Chanson, 2009 and 2013). Borges et al. (2010) stated that the laboratory instrumentations for using the air-water mixtures are too expensive and contain significant drawbacks. Some research showed that the combination of computational fluid dynamics and physical hydraulic model can be a useful tool to analysis the hydraulics of water structures (Jha, & Bombardelli, Valero, & García-Bartual, 2016, Ozturk, & Aydın, 2008, Kumcu, 2016, Aydın, 2012, Aydın & Emiroglu 2013 and 2016). Valero & García-Bartual (2016) used an air entrainment model coupled with RNG k-ε turbulence model for calibration of air concentration and free surface flow over an ogee-spillway based on cell sizes. They concluded that the calibrated CFD models can be useful to understand actual performance of hydraulic structures such as spillways.

Scale Effects

Dynamic similarity requires same forces ratio together with geometric similarity. The effective forces on the free surface flows for incompressible flows are surface tension, gravitational, viscous, pressure, and mass forces. The ratio of first three forces to fourth force represent Weber, Froude, Reynold and Weber numbers. For an exact dynamic similarity, each of dimensionless numbers is same for model and prototype. Since the gravitational, mass and viscous forces are dominant in the free surface flows, Froude and Reynolds numbers must be equivalent to provide dynamic similarity for both model and prototype as follows:

$$Re_m = Re_p \Rightarrow \frac{V_m L_m}{v_m} = \frac{V_p L_p}{v_p} \text{ and } Fr_m = Fr_p \Rightarrow \frac{V_m^{\,2}}{gL_m} = \frac{V_p^{\,2}}{gL_p} \tag{1}$$

In which, V is averaged flow velocity, L is length, i.e. hydraulic diameter, g is gravitational acceleration, v is kinematic viscosity, subscripts m and p represents model and prototype respectively. Both of these similarities are possible by using fluid with different viscosity in laboratory conditions, as below.

$$\frac{v_m}{v_p} = \frac{L_m}{L_p}\frac{V_m}{V_p} = \frac{L_m}{L_p}\left(\frac{L_m}{L_p}\right)^2 = L_r^{\,3/2} \tag{2}$$

However, this is very difficult and too cost in practice, and so, the water is usually used in the laboratory model tests. In addition, if the flow contains intense air mixtures and turbulence such as bubbles flows in spillway aerators, drag forces between the phases (water and air), turbulent tensions, buoyancy forces and surface roughness can affect the Froude model test results especially for small scale. These relationships between model and prototype are very complicated. All of these disregarded effects are called as scale effects in the scaled model tests. Free surface flows are generally modelled according to Froude similarity law in laboratory conditions. Therefore, the scale effects should be also drawn attention in terms of accuracy of the results.

In order to determine the scale effect, some empirical and rough approaches were given comparing some prototype data in the literature. But, these relationships do not yield sufficient accuracy. Especially for two phases flows such as water-air mixture, small scaled Froude models can include considerable scale effects which can mislead the engineers. Kim and Park (2005) and Kumcu (2017) determined unimportant differences with respect to some flow characteristics such as water surface, pressure and velocity distributions between prototype and scaled models by using CFD models (Flow 3D) widely verified and used in free surface flows problems. However, in terms of air entrainment in spillway flows, several researchers (e.g. Pinto et al., 1982, Pinto, & Neidert, 1983, Wood, 1984, Volkart, & Rutchmann, 1984, Kokpinar, & Gogus, 2002, Aydın, & Ozturk, 2009) reported considerable scale effects by using physical and numerical models.

RESULTS AND DISCUSSION

Aydın, & Ozturk, (2009) and Aydın, (2016) studied air entrainment at spillway aerator by using CFD model. They found out a good agreement with the prototype data of Foz de Areia spillway aerator with average 9% error, while considerable scale effects were detected as 250% averagely by considering an empirical relationship by Kokpinar, & Goguş, (2002). When comparing to 1/25 scaled experimental data by Demiröz, (1985), it was obtained 22% of mean scale effects and up to 42% with respect to air entrainment rate. Some views from the numerical model of this spillway aerator with prototype dimensions were given in Fig. 1.

Figure 1: Numerical model results of the Foz do Areia Dam Spillway Aerator
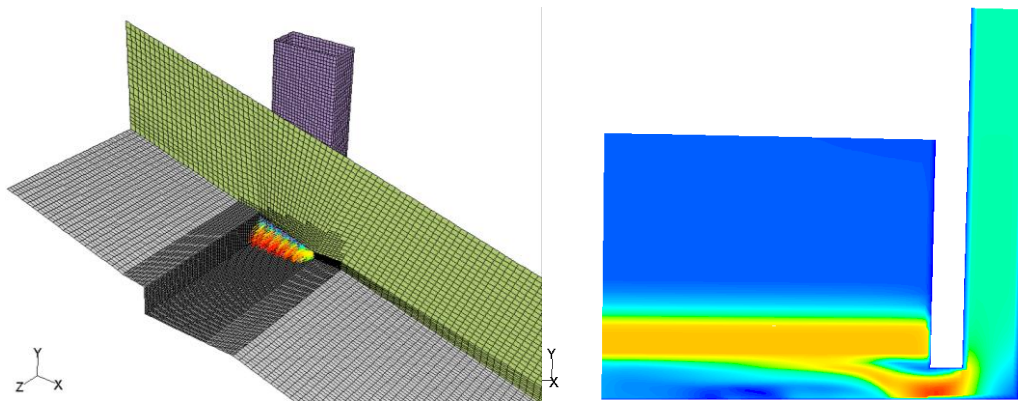
Source: Aydın, 2016

Ozturk et al., (2008) numerically analyzed a new type aerator called the bottom-inlet aerator by using CFD model (Fig. 2a). Then, Aydın, (2018) experimentally studied this aerator type using a physical model (Fig. 2b). Aydın, (2018) determined a scale effect factor of 2.17 for air entrainment rate according to results of an equation using CFD model with prototype dimensions given by Ozturk et al., (2008), in which scale effect factor describes as the ratio of prototype value to scaled model value.

Figure 2: Physical and numerical model of Bottom-inlet aerator
a) Numerical Model (Öztürk et al., 2008)   b) Physical Model (Aydın, 2018)
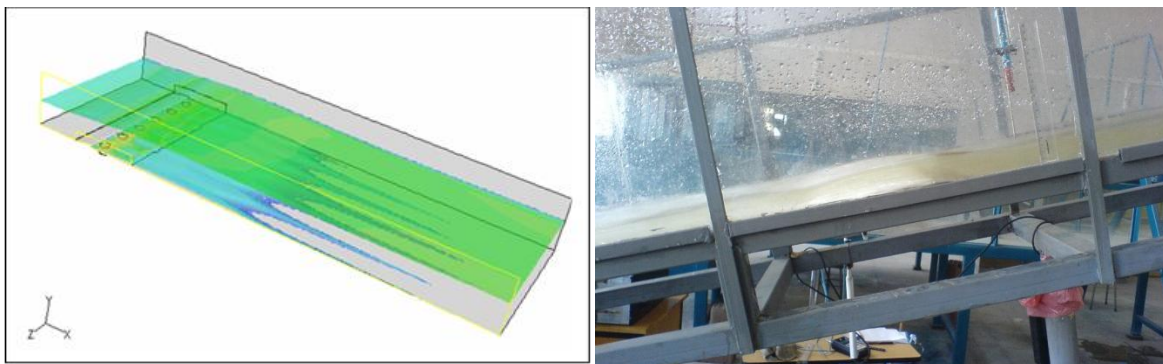
Aydın et al., (2017) analyzed aeration of huge dam outlet tunnel with 12m diameter by using two-phase CFD model and compared the scaled physical model results. They found the differences from 8.6% to 23.5% between 1/40 scaled model and prototype CFD results for air entrainment rate. These differences corresponds a range from 1.09 to 1.24 of scale effect factor. The CFD models for prototype and scaled physical model are shown in Fig.3.

Kaplan, (2017) evaluated aeration performance of Ilısu Dam spillway aerators by using a CFD model with high resolution hybrid mesh (Fig. 4). The design of this spillway aerator was revised, but any model test wasn't performed on this new design by the institution concerned. The numerical findings of the Kaplan, (2017) showed that the revised design was successful.

Figure 3: Numerical and physical models of the dam outlet tunnel (Aydın et al., 2017)
a) Physical model with full-scale   b) Numerical model with 1/40 scale
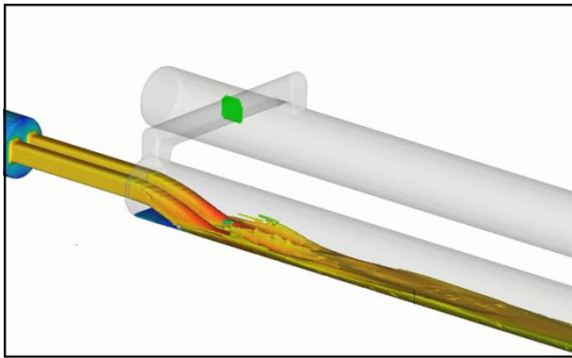
Figure 4: Numerical of the Ilısu Dam spillway aerator (Kaplan, 2017)
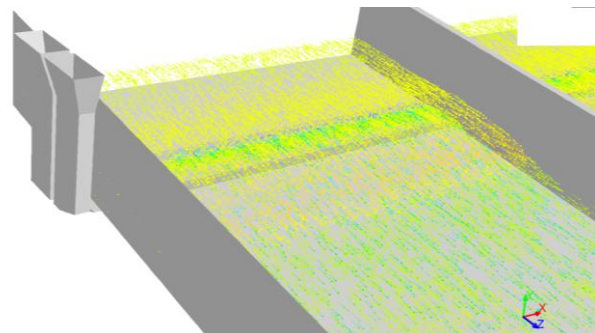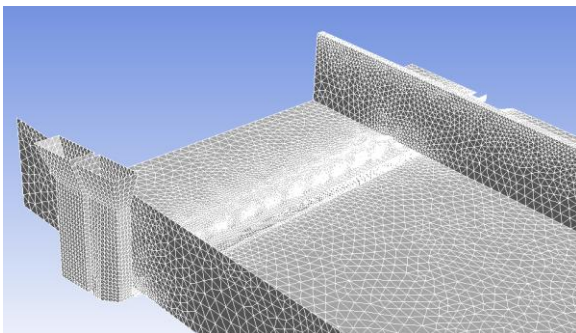
In addition to the above applications, the flow profiles and aeration performance an ogee-spillway have been investigated using Flow-3D with one and two-phase RANS models. The results showed that while free surface profiles from the CFD model with prototype dimensions are well consistent with 1/60 scaled physical model observations (Fig.5), a scale effect factor of 4.42 (442%) were determined for air entrainment amount. This factor were also determined as 3.36 (336%) according to the relationship by Kokpinar, & Gogus, (2002). Some illustrations from CFD simulation were given in Fig. 6. The developing of turbulent boundary layer on the spillway surface was showed in Fig.6b.

Figure 5: Numerical and physical models of ogee-spillway flow
a) Physical model with 1/60 scale   b) Numerical model with full-scale(prototype)
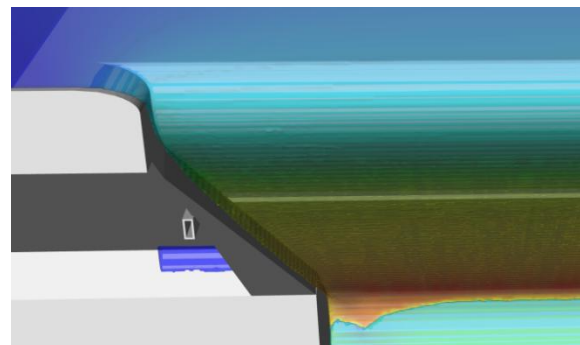
Figure 6: Spillway aerator of Kopru dam a) aerator galleries b) Boundary layer developing over the spillway surface

(a)   **(b)**
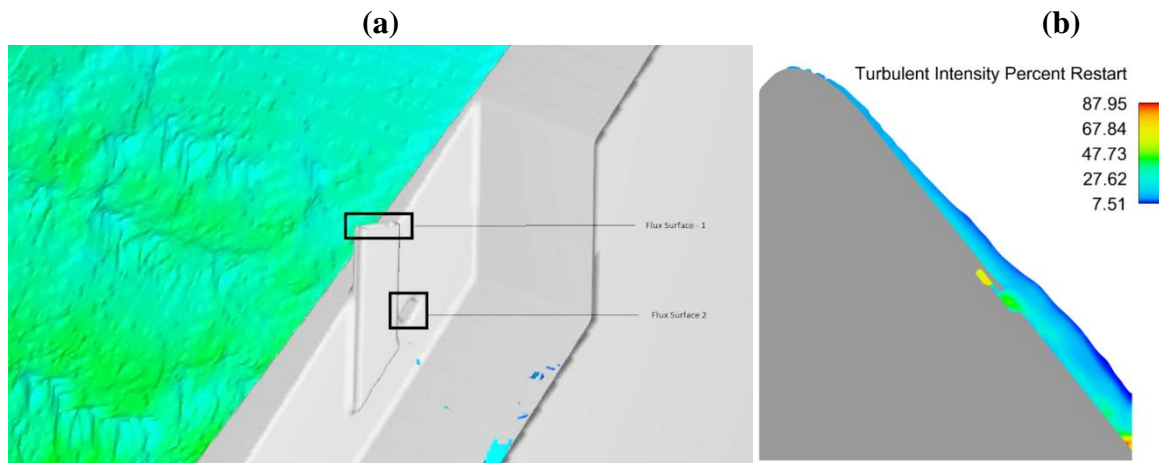
CONCLUSIONS

Physical models are conventionally used for testing of hydraulic structures before their construction. But these models are highly cost, time-consuming and required large spaces, also can include considerable scale effects especially for small scales. In this study a short review and some numerical model results have been presented to take attention of the concerns in the scope. The presented results indicated that scaled Froude models free surface flow characteristics such as free surface, velocity and pressure distributions are not affected by the model scale too much. On the other hand, Froude models of two-phase (air-water) mixture flow can be considerable scale effects in terms of air entrainment amount due to disregarded some effects, i.e, viscous, free surface tensions, turbulence, and slip effects. Therefore, the numerical models with the real prototype scale which are widely verified in the field may be used alternatively or together with physical model.

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Determination of The Nemrut Crater Lake Turkey Water Quality

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ABSTRACT

Nemrut Crater Lake is Turkey's largest the world's second largest crater lake. It lies within the borders of Bitlis Province to the west of the Van Lake basin. The average depth is 100m. Since 2013 Ramsar Wetland has been declared and taken under protection. The announcement of a geopark area is on the agenda. The most important source of feed is snow and spring water. The lake level is almost constant and the precipitation and evaporation balance have been established. For this reason, water quality is not changed much, but due to its volcanic nature it is thought to have a unique water quality. The aim of the study is to monitor and determine the specific water quality of Nemrut Crater Lake. For this purpose, 2 samples were taken from 5 points in June and August in 2018 and the water quality was examined and evaluated. It was found that the pH of the water was almost 8.5, it included Arsenic and Boron and the TOC level was very low.

Keywords: Nemrut Cater Lake, Water Quality, Heavy Metals.

INTRODUCTION

Nemrut Crater lake is located in Bitlis Turkey is the biggest crater lake of Turkey and second in the World. The altitude of this lake is 2250 m (Kuluöztürk and Dogru (2015)). The most important source of feed is snow and spring water. The lake water level is almost constant and the precipitation and evaporation balance have been established. For this reason, water quality is not changed much, but due to its volcanic nature it is thought to have a unique water quality (Url1; Url 2).

Water quality monitoring and long term limnologic analysis were being carried out all over the World for crater lakes The main purpose of this investigations are determining the unique water quality and monitoring the variations in water quality in long term (Larson (1996); Larson et al. (2007); Wondimu et al. (2008); Gunkel et al. (2008)).

Figure 1: Nemrut crater lake (Url 3)

The aim of the study is to monitor and determine the specific water quality of Nemrut Crater Lake. According to literature there are very limited study about the Nemrut Crater Lake but non of them dealed with the water quality. One study evaluate the natural radioactivy levels of the lake and it was determiend that the deepest side of the lake radioactivity was increased [1]. Another study investigates the water resource potential of the lake. According to this study 1 meter decrease for water level of the lake equals to rougly 350000 peoples annually water consuption or irrigation requirement of approximately 400 ha agricultural land (Kurttaş and Tezcan (2018)).

For determining the water quality, 2 samples were taken from 5 points in June and August in 2018 and the water quality was examined and evaluated. This is only preliminarly study and covers only the surface water.

MATERIAL AND METODS

Within the scope of the study, sampling and analysis study wetr conducted on 2 different dates in 2018 summer season. According to sampling study plan, samples were taken from 5 different points on the lake surface below the 50 cm depth from the surface. The coordinates of the sampling points are given in the Table 1.

Table 1: Coordinates of sampling points

Sampling Points	Coordinate
1	38.635885; 42.229324
2	38.634553; 42.214738
3	38.621815; 42.218419
4	38.619977; 42.208019
5	38.607486; 42.229267

Location of the lake and sampling points were given in Figure 2.

Figure 2: Location of the lake and sampling points

Devices used in the measurement, measured parameters and measurement methods are given in the Table 2 Numunelerde bakılan parametreler.

Table 2: Measured parameters, devices and methods used in the study

Parameter	Device	Method
TOC (Total organic carbon)	Teledyn Tecmar Torch TOC/TN Analyzer	Standard Methods 5310-B
TN (Total nitrogen)		Standard Methods 4500N-B
pH/temperature	Hach Hq40d Multimeter	USEPA Electrode Method 8156
Conductivity		USEPA Direct Measurement Method 8160
ORP (Oxidation reduxtion potential)		Direct Measurement Method 10228
Dissolved O_2		10360 Direct Measurement, LDO Probe (EPA)
NO_3^--N (Nitrate)	WTW Photolab 7600 UV Vis Spektrophotometer	Standard Methods 4500 NO_3^-- B
Alkalinity	-	Standard Methods 2320-B
Tubidity	WTW Turb 355 IR	ISO 7027 – DIN/EN 27 027
Metals	ICP MS	EPA 200.8 metodu

RESULTS

Water quality parameter results were given in Table 3. Results evaluated According to limit values given in Turkish Surface Water Quality Regulation (Official Gazette date and number 30.11.2012; 28483). According to results, except the O_2 and conductivty water quality level is class I but in terms of O_2 quality class was II and in terms of conductivity level is class III.

According to regulation, class I is represents very good water quality, class II represent good water quality but class III represets middle or polluted water. In terms of conductivity, it is thought that the high pH is due to the carbonates coming from the carbonate rocks around the lake.

The fact that Crater Lake is approximately 1900 meters above sea level is also thought to affect oxygen solubility in lake water. TOC, TN and turbidity values are quite low, pH is generally constant.

In addition, these types of crater lakes have unique qualities. Therefore, it should be monitored for many years in terms of water quality. it is considered to be more appropriate to evaluate water quality in itself.

Table 3: Water quality results

Date	Sample No	Parameters								
		TOC	TN	pH	Temperature	Conductivity	ORP	Dissolved O_2	NO_3^--N	Tubidity
		mg/L	mg/L	-	^{0}C	µS/cm	mV	mg/L	mg/L	NTU
26.06.2018	1	<0.05	0.5786	8.49	20.4	528	123.7	6.98	1.8	0.3
	2	<0.05	0.6703	8.51	19	551	54.9	6.72	1.8	0.46
	3	<0.05	0.4519	8.52	18.4	511	100.2	6.81	1.8	0.58
	4	<0.05	0.5247	8.52	18.4	516	164.8	7.01	2.1	0.28
	5	<0.05	0.3768	8.59	18.6	517	165.9	7.1	2	0.35
	Average	<0.05	0.5205	8.53	18.9	525	121.9	6.9	1.9	0.39
3.08.2018	1	<0.05	0.5786	8.49	20.4	528	123.7	6.98	1.8	0.3
	2	0.9453	0.1039	8.58	21.9	530	90.2	6.53	1.5	0.47
	3	0.6724	0.0116	8.5	20.4	526	106.9	6.77	3.2	0.29
	4	0.8329	<0.05	8.48	21.9	525	108.6	6.58	3.7	0.35
	5	1.1964	<0.05	8.54	20.6	526	111.7	6.73	1.6	0.13
	Average	0.9118	0.2314	8.52	21.0	527	108.2	6.72	2.4	0.31
Quality Class		I (BOD<4;COD<25)	I (<3.5)	I (6-9)	-	III (<1000)	-	II (6-8)	I (<3)	-

Metal measurement results of the samples were given in Table4 and Table 5. In terms of measured metal concentrations; metals other than arsenic, boron sodium potassium were below the limit of measurement.

Table 4: Metal measurement results of the samples I

Date	Sample No	Metals				
		Sn	Se	As	Sb	Hg
		mg/L				
26.06.2018	1	<0,05	<0,05	<0,025	<0,1	<0,025
	2	<0,05	<0,05	0,037	<0,1	<0,025
	3	<0,05	<0,05	0,034	<0,1	<0,025
	4	<0,05	<0,05	0,032	<0,1	<0,025
	5	<0,05	<0,05	0,032	<0,1	<0,025
3.08.2018	1	<0,05	<0,05	0,034	<0,1	<0,025
	2	<0,05	<0,05	0,035	<0,1	<0,025
	3	<0,05	<0,05	0,033	<0,1	<0,025
	4	<0,05	<0,05	0,032	<0,1	<0,025
	5	<0,05	<0,05	0,033	<0,1	<0,025

Table 5: Metal measurement results of the samples II

Date	Sample No	Metals															
		Cd	Pb	Cu	Cr	Zn	Fe	Mn	Al	Ba	Be	Ag	Ni	K	Na	B	Co
		mg/L															
26.06.2018	1	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,60	87,9	1,74	<0,005
	2	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,22	84,6	1,75	<0,005
	3	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	8,38	84,8	1,75	<0,005
	4	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,08	84,7	1,77	<0,005
	5	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,00	81,6	1,76	<0,005
3.08.2018	1	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,94	84,7	1,88	<0,005
	2	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,65	88,69	1,81	<0,005
	3	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,03	82,6	1,83	<0,005
	4	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,30	88,1	1,81	<0,005
	5	<0,002	<0,01	<0,02	<0,02	<0,1	<0,02	<0,02	<0,05	<0,02	<0,002	<0,02	<0,02	7,30	86,7	1,82	<0,005

Arsenic, boron sodium and potassium are thought to be in the structure of magmatic fluids and mixed to the lake water in this way. Arsenic (0.034<0.053) average concentration was below but Boron (1.792>0.707) was above the Turkish Surface Water Quality Regulation limits.

DISCUSSION

As a conclusion;

- These types of crater lakes have unique qualities
- Therefore, it should be monitored for many years in terms of water quality
- It is considered to be more appropriate to evaluate water quality in itself
- According to results water quality was class III.
- In terms of measured metal concentrations; metals other than arsenic, boron sodium potassium were below the limit of measurement

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Investigation of The Usage of Bitlis Stone As A Building Material in Terms of Product Toxicity

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ABSTRACT

In this study, the toxicity characteristics of Bitlis Stone, which is unique to Bitlis region and used as building material, was investigated by means of TCLP procedure.. Toxicity Characteristic Leaching Procedure (TCLP) is developed to investigate the mobility of both organic and inorganic analytes present in wastes. The experimental study was carried out according to the EPA Test Method 1311. Metal concentrations were measured on an ICP MS device according to the EPA 200.8 method. When the results are compared with TCLP limits, it was seen that the limit values for cadmium and lead heavy metals were exceeded. In this case, it is considered that this material can release these heavy metals to the environment in extreme conditions which may pose a risk. Also XRF of Bitlis Stone was investigated. According to results Si (51.9%), Al (18.3%), K (12.8%) and Fe (12.3%) oxides constitute the main components of Bitlis stone .

Keywords: Bitlis Stone, TCLP, Heavy Metals.

INTRODUCTION

Granular volcanic rocks are the result of volcanic eruptions. pyroclastic rocks are one of these formations (Şimşek et al. (2004), Erguvanlı (1994), Gevrek and Kazancı (1991)). Volcanic mechanism and wind consitute the Pyroclastics rocks and sedimentation occurs by welding to each other at high temperatures (above 500-600 °C) or bonding of glassy material fragments with recycled minerals (such as zeolite) (Şimşek et al. (2004), Erguvanlı (1994), Gevrek and Kazancı (1991), TS (1998).

Ignimbirite consist of mainly pumice, volcanic glass and a small number of lytic particles, flowing in high temperature, laminar flow system, and gravity control (Şimşek et al. (2004). Bitlis Stone is included to volcanic tuffs and one of the most widely used natural building stones in Bitlis city centre because it has low unit volume, weight and easy formability. Predominantly, It can be seen that stone used in historical monuments of Bitlis province with different colours. Nowadays high concentrate usage and development of technology limited its usage. Today, Bitlis Stone mainly used in building restorations and buildings in Bitlis rural areas.

In this study; the toxicity characteristic of Bitlis Stone, a construction material and extracted only Bitlis Region was investigated. The material known as Bitlis ignimbrite and its mainly constituted from SiO_2, Al_2O_3, K_2O, Fe_2O_3, Na_2O (respectively approx; 65%, 14%, 5%, 4%, 4%) (Koralay et al. (2014)).

Figure 1: Bitlis stone

TCLP (Toxicity characteristic leaching procedure) is developed to determine the mobility of both organic and inorganic analytes present in solid, liquid or multi-phase wastes (EPA (1992)). Rainwater or other liquids can interact with wastes while they are drained from storage areas. In this process, they can solve the pollutants in the waste content. This poses a health and environmental risk. TCLP is a preliminary step in the identification of non-volatile pollutants in solids and waste (Url1). Thus, in the worst case, it is used to determine the maximum heavy metal concentration that can leak from the waste (Bayraktar et. al. (2015)).

MATERIAL AND METHODS

Sample Preparation

EPA Test Method 1311 TCLP procedure was utilized for the experimental study. First, the material was grinded and sieved from 9.5 mm mesh size sieve. Then 100 g material were added to 2L extraction liquid and shaken for 18±6 hours. After shaking, sample was filtered from 0.8 µm glass fiber filter (EPA (1992), Bayraktar et. al. (2015)).

ICP Measurements

ICP-MS measurements of the extraction fluid filtered through a 0.45 µm membrane filter were measured according to the EPA 200.8 method (EPA (1994)). ICP measurements were conducted in Ağrı Ibrahim Çeçen University Science and Tehnology Application and Research Center.

XRF Measurements

X-ray fluorescence spectrometry (XRF) is a non-destructive analysis technique. It is used for the qualitative and quantitative analysis of the elements contained in solid, powder and liquid samples. By means of XRF varied elements in the content can be measured and reported as ppm or percentage (Url 2). XRF measurements were conducted in Bulent Ecevit University Science and Tehnology Application and Research Center.

RESULTS AND DISCUSSION

Gained trace metal TCLP results and limit values are given in Table 1. According to results it is seen that Cd and Pb heavy metals are exceeded the TCLP limits. In this case, it is considered that this material can release these heavy metals to the environment in extreme conditions which may pose a risk.

In the context of worst case scenario that the material was considered as waste material. In this context, waste material metal leakage was examined for waste storage. Compared to the USEPA limits, the amount of Cd and Pb trace metals leached from material was exceeded the TCLP procedure limits.

TCLP results indicated that this volcanic material should be carefully investigated in terms of toxicity before being used as building material. Also behaviors of this material in environmental conditions should be examined.

XRF results were given in Table 2. According to results SiO_2 (60.3 %) and Al_2O_3 (22.3%) were the main components of Bitlis stone. Also it includes Fe_2O_3 (6.5%) and Na_2O (3.5%). Trace amounts of MgO, TiO_2 and Cl exist in the stone formation.

Table 1: TCLP Liquid analysis results and limit values

Metals	TCLP		EPA land disposal restriction limit values (mg/L) (Bayraktar et. al. (2015); EPA 1994)
	leached to TCLP liquid (mg/L)	Limit (mg/L)	
Cr	ND	5	0.6
Ni	4.3		11
Zn	229		4.3
Cd	1.41	1	0.11
Pb	56	5	0.75
Hg	ND	0.2	-

ND: Not detected

Table 2: XRF Analysis results

Element	Compound	Concantration	Unit
Na	Na_2O	3.470	%
Mg	MgO	0.337	%
Al	Al_2O_3	22.328	%
Si	SiO_2	60.292	%
Cl	Cl	578.545	ppm
K	K_2O	6.415	%
Ca	CaO	0.000	ppm
Ti	TiO_2	0.625	%
Fe	Fe_2O_3	6.475	%
Sum	Sum	100.000	%

CONCLUSIONS

In this study, toxicity potential of Bitlis ignibrit obtained from volcanic terrain was investigated. When the results were examined, it was seen that the limit values of TCLP were higher than the limit values in terms of Pb and Cd heavy metals. These findings indicated that detailed toxicological investigations should be conducted before the material is used as construction material.

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The Parasitoid Complex of *Liriomyza huidobrensis* (Blanchard, 1926) in Cucumber Greenhouses in Izmir Province, Western Turkey

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ABSTRACT

Liriomyza huidobrensis (Blanchard) (Diptera: Agromyzidae) is an important pest in cucumber greenhouses in Çamönü (Menderes, Izmir) Turkey. This study was carried out during the spring and autumn seasons of 2016 and 2017 in cucumber greenhouses. Leaves were sampled weekly and kept in the laboratory to observe and count emerging leafminers and parasitoid adults. During this study five parasitoid species were collected. The braconids, *Bracon intercessor* Nees von Esenbeck and *Opius meracus* Fischer, occurred only in the spring. The eulophids, *Diglyphus crassinervis* Erdos, *Diglyphus isaea* (Walker) and *Neochrysocharis formosa* (Westwood), occurred in both the spring and autumn seasons. *Diglyphus isaea* and *N. formosa* were the predominant parasitoid species found. Among the parasitoids found, *O. meracus* was recorded for the first time as a Turkish species and *B. intercessor* was recorded for the first time in *L. huidobrensis.*

Keywords: Bracon intercessor, Diglyphus crassinervis, Diglyphus isaea, Liriomyza huidobrensis, Neochrysocharis formosa, Opius meracus, cucumber, Turkey.

Liriomyza huidobrensis has spread virtually worldwide from South America (Scheffer, 2000; Weintraub & Horowitz, 1995) in Turkey it was first found in 1994 in the western (Izmir province) and southern (Adana province) regions of the country in vegetable greenhouses (Civelek, 1999). It subsequently spread further within these regions, but not to other parts of the country, and is now an economic pest of great importance, especially in Izmir province, on cucumber and beans in greenhouses.

Liriomyza huidobrensis is highly polyphagous. Adult females perforate the upper and lower leaf epidermis with their ovipositor to feed and lay eggs. This behavior results in cosmetic damage to flower crops and also facilitates the spreading of various plant diseases (Civelek & Önder, 1997, Miranda, Leite & De-Clercq,1998). Furthermore, *L. huidobrensis* larvae feed in the spongy mesophyl leaf layer, which contains chloroplasts, thereby disrupting photosynthesis (Parrella, Youngman & Lebeck, 1985). Damage caused by *L. huidobrensis* is therefore both direct and indirect.

There are a number of parasitoids of *L. huidobrensis* recorded worldwide (Neder de Roman & Arch de Hamity, 1985, Schuster, 1998, Shepard, Samsudin & Braun, 1998). Most of the parasitoid species belong to three families of Hymenoptera: Braconidae, Eulophidae and Pteromalidae. Those species belonging to the Braconidae are endo- and ectoparasitoids on the egg and larval hosts, whereas those of the Eulophidae are solitary or gregarious ectoparasitoid on larval and pupal hosts. Because of the rapid increase and spread of this pest, growers in Turkey have frequently applied large quantities of insecticides, especially in greenhouse environments. Insecticides have a negative impact on beneficial fauna (Weintraub & Horowitz, 1998). To control the leaf-mining flies by non-chemical means, it is necessary to first identify key parasitoids species. The aim of this study was to identify the naturally occurring parasitoids in non-insecticide treated cucumber greenhouses.

This study was carried out during 2016 and 2017 in Çamönü (Menderes, Izmir, Turkey) on cucumber plants (*Cucumis sativus* L.) grown in non-insecticide treated commercial greenhouse conditions. There are two growing seasons each year, from April to August and August to November. Greenhouses were planted with Gordion F1 cucumbers on 10 April 2016, 12 August 2016, 8 April 2017 and 2 August 2017.

Greenhouses were constructed of an iron framework covered with solid polyethylene. Roof and window ventilation ports were covered with insect-proof netting. Ten samples of leaves infested with leafminers were randomly collected starting one week after planting and continuing until the end of production. The cucumber leaves were kept in plastic culture containers (30 x 20 cm) at 25°C and 65% relative humidity. A sheet of absorbant paper was placed between each leaf in the container to prevent contact and the possibility of mold growing in the humid conditions. The infested leaves were kept in the containers for 3 weeks and the emerging parasitoids were counted and recorded according to their collection dates. The classification of the braconid parasitoids was done by Dr. Ahmet Beyarslan (Trakya University, Turkey) and that of the Eulophidae by Dr. John La Salle (CSIRO Entomology, Australia). Data were analyzed by χ^2 (null hypothesis: all parasitoids would occur in equal numbers) each season.

During this study, two braconid species (*Bracon intercessor* Nees von Esenbeck and *Opius meracus* Fischer) and three eulophid species (*Diglyphus crassinervis* Erdös, *Diglyphus isaea* Walker and *Neochrysocharis formosa* (Westwood)) were found; results are shown in Table 1.

Table 1: Total number of *Liriomyza huidobrensis* and parasitoids reared from cucumber leaves.

Season	No. of Leaves	*Liriomyza huidobrensis*	*Bracon intercessor*	*Opius meracus*	*Diglyphus crassinervis*	*Diglyphus isaea*	*Neochrysocharis formosa*
1999 spring	160	695	4 a	13 b	3 a	5 a	8 b
1999 autumn	130	772	0	0	0	0	14
2000 spring	90*	144	0	4 a	1 a	8 b	17 b
2000 autumn	150	892	0	0	5 a	12 b	14 b

Different letters within the same row indicate significant differences (P < 0.05).
* Severe outbreak of a disease wilth resulted in plant death and caused premature termination of the trial.

Bracon intercessor were found only during one spring (1999) growing season. Although this parasitoid has been found in Lepidoptera, Coleoptera and other Diptera (Fischer, 1972), this is a first record in *L. huidobrensis* (F. Inanc, personal communication). *Opius meracus* was found only during the spring growing seasons. It is typically found in agromyzid flies (Fischer, 1972); however, this is the first time it was found in Turkey (Öncüer, 1991). *Diglyphus crassinervis* were found on leafminer-infested leaves in both spring and autumn seasons. *Diglyphus isaea* individuals were also found in both spring and autumn seasons. This important ectoparasitoid has been found worldwide on agromyzid species (Minkenberg & Lenteren, 1986) and its biology is well known (Benuzzi, 1992). *Neochrysocharis Formosa,* found in both spring and autumn seasons, was the most abundant parasitoid found in this study (Table 1). Cabello (1994) also reported *N. formosa* as the most abundant parasitoid from greenhouses in southern Spain.

The number of parasitized *L. huidobrensis* was relatively low because the greenhouse was made of solid walls (as opposed to screening) and the ventilation windows were closed with insect-proof netting. The results of these trials show that since two parasitoids, *N. formosa* and *D. isaea,* occurred almost every season, they could potentially be used for control of *L. huidobrensis*. Furthermore, since new records were established for Turkish fauna and for parasitoids of *L. huidobrensis*, this raises the possibility that there may be an even greater variety of leafminer parasitoids found should trials be conducted in unprotected crops.

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Biodiversity of Agromyzidae (Diptera) of Economic Importance in Turkey by Using Molecular Tecniques

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ABSTRACT

The *Liriomyza trifolii*, *L. congesta, Agromyza apfelbecki* and *Chromatomyia horticola* species have become important vegetable pests in the agricultural areas in Turkey. These species are not easily differentiated by their morphological characteristics. The aim of the present study was to obtain genetic markers to unambiguously distinguish these species and gain insight into genetic variation between the individuals of *L. trifolii* strains collected from various geographic locations in Turkey. Thus, four random primers were employed to generate RAPD markers. Different RAPD profiles were observed for the different species indicating that the RAPD-PCR analysis can be applied as a useful tool in quickly screening the strains to aid in discriminating these species that was routinely done via classical methods. Identification of biotypes of the species is crucial in order to designing control strategies to avoid the spread of the pests because of economic losses caused by the damages to vegetable crops. Our results show that RAPD is promisingly an effective, fast and economic way, hence proposed as a valuable alternative to traditional identification of the insect species and strains.

Keywords: Agromyzidae, leafminer, molecular identification; RAPD.

INTRODUCTION

Agromyzidae (leaf mining flies) is one of the largest fly families, with more than 2742 valid species belonging to 27 genera worldwide (Spencer 1990). From this family, about 1165 species were identified in the Palearctic region (Scheirs et al. 1999). Adults can be minute, with wing length of little more than 1 mm. The maximum size known is 6.5 mm. The majority of species are in the range of 2 to 3 mm. There is a high degree of host specificity (Spencer 1989). Agromyzids are typically phytophagous as their larvae live in tissues of living plants. Larvae of most leaf miners feed with the leaf parenchyma. Most species are miners in leaves where they produce a characteristic form of mine, in most of the cases a substantial aid in identifying the agromyzid. Some species are stem-borers or develop in roots, seeds or galls. One genus develops exclusively in the cambium of young and old trees. Most species are monophagous, a considerable number are oligophagous, and while very few are truly polyphagous (Spencer 1972). Common characteristic of 150 species are known as feeding regularly on cultivated plants. Normally, most of these species do not reach high population levels, but occasional outbreaks can occur. Some species are serious pests of cultivated plants such as *Liriomyza* spp. (Cerny & Bartak 2001; Spencer 1973). *Liriomyza* is a cosmopolitan group of pests that consists of more than 300 species. Larvae of this genus are polyphagous, attacking ornamental and vegetable crops in the families of Asteraceae, Brassicaceae, Cucurbitaceae, Fabaceae, Solanaceae, and many other families of plants. Infestation by *Liriomyza* spp. can cause both direct and indirect damages (Minkenberg & Van Lenteren 1986; Musgrave et al. 1975). Direct damage given by larval feeding on palisade parenchyma tissue can reduce the photosynthetic capacity of the plant up to 62 % (Johnson et al. 1983) and several infested leaves may fall (Cab 2001). Indirect injury occurs when both adult males and adult females feed. Also when females lay eggs, they may act as vectors for the disease (Matteoni & Broadbent 1988; Zitter & Tsai 1977).

Agromyzidae is one of the most important fly families in Turkey, because of their pest status especially on vegetable and ornamental plants in the greenhouses. The Turkish agromyzid fauna is poorly known. Until now, only 104 species have been identified in Turkey (Campobasso Et Al. 1999; Civelek 2002, 2003, 2004; Cikman & Civelek 2005; Civelek Et Al. 2000; Civelek & Demirkan 1998; Deeming & Civelek 1997; Giray 1980, Mart Et Al. 2005, Uygun Et Al. 1995; Civelek Et Al. 2007; in review).

The studies performed during the last 10 years have yielded new information regarding the detrimental effects of the insects especially on the agricultural economy. It has been reported that *Liriomyza huidobrensis* (Blanchard,1926), *L. sativae* (Blanchard, 1938), *L. strigata* (Meigen, 1830), *L. trifolii* (Burgess, 1880), *Agromyza apfelbecki* (Strobl, 1902), *A. frontella* (Rondani, 1875), *A. rondensis* (Strobl, 1900) and *Chromatomyia horticola* (Goureau, 1851) cause damages on numerous crops. Therefore, identification of these strains is crucial in order to design strategies to prevent the harmful effects on the economy.

Species identification for the Agromyzidae family is routinely done by inspecting male genital organs. However, it may possible that molecular methods such as RAPD can be potentially applied. The advantage of using molecular methods is that the genotipic characters

are the basis for classification and any form of the organism during the life cycle can be used as a source of genetic material. A study using PCR-restriction fragmen lenght polymorfizm (PCR-RFLP) method was performed by Scheffer et al. 2001 in order to identify the organism at the species level. Other molecular studies involving the Agromyzidae family have also been reported (Kox et al. 2005; Moreira et al. 1999; He et al. 2002; Scheffer 2000; Scheffer and Lewis, 2001; Scheffer and Wiegmann 2000; Scheffer et al. 2001).

To date, there are 114 species of the Agromyzidae family reported in Turkey. To our knowledge, no molecular studies have been carried out on the species of *Liriomyza trifolii*, *L. congesta, Agromyza apfelbecki* and *Chromatomyia horticola* collected from Turkey. Therefore, this study is the first in characterizing these species in that regard and could be a stepping stone for assessing the biodiversity and determining the insecticide resistance of the insect species at hand. Specificaly, in this study, the random amplified polymorphic DNA (RAPD) aprroach has been applied in order to assess the possibility in distinguishing some Agromyzidae species more rapidly.

MATERİALS AND METHODS

Agromyzidae specimens and identifications

This study was carried out during 2016 in some provinces of Anatolian part (Mugla, Aydın, Erzurum, and Antalya) of Turkey. Mugla, Aydın and Antalya are all located in the west with relatively close promiximity to each other. Erzurum is located in the east region of Anatolia. *Liriomyza trifolii*, *L. congesta, Agromyza apfelbecki* ve *Chromatomyia horticola* specimens were collected from both cultured and non-cultured plants during 6 months in 2016 (Table 1).

Table 1: Agromyzidae species used in this study

Locality Number	Species	Date of collection	Province	Host plant
1	*L. trifolii*	24.01.2017	Antalya/Calkaya	*Lycopersicon esculentum/ Phaseolus vulgaris*
2	*L. trifolii*	23.01.2017	Antalya/Kumluca	*L. esculentum/ Phaseolus vulgaris*
3	*L. trifolii*	30.09.2016	Mugla/Yemisendere village	Vegetable and wild plant
4	*L. trifolii*	01.10.2016	Mugla/Dokuzcam village	Vegetable and wild plant
5	*C. horticola*	18.01.2017	Mugla/Ortaca	*Brassica oleracea/Eruca sative*
6	*C. horticola*	23.01.2017	Antalya/Finike	*L esculentum/ Pisum sativum*
7	*L. sp*	19.01.2017	Mugla/Fethiye	*L. esculentum*
8	*A. apfelbecki*	14.12.2016	Aydın	*Cynara scolymus*
9	*L. congesta*	09.09.2016	Erzurum	*Medicago sativa/ Vicia sativa*
10	*A. apfelbecki*	14.12.2016	Aydın	*Cynara scolymus*
11	*L. sp.*	30.09.2016	Mugla/Yemisendere village	*Cucumis melo/ Solanum nigrum*

The adults were obtained by sweeping. Since the male genitalia are important characters for identification of leaf miners, slide preparations were made. The following general

procedures were applied: The abdomen of each male was boiled in 10% KOH, transferred into 5% glacial acetic acid for 5 minutes and subsequently transferred to 96% alcohol for 5 minutes. Then, the abdomen was further dissected under a stereoscopic microscope. The male genitalia were transferred into euparal on a micro mount pinned under the individual specimen in order to preserve the material perpetually. Identifications of the species were made as described by Spencer (1972, 1973, 1976, 1989, 1990).

Molecular Methods

DNA extraction

Specimens of *Liriomyza trifolii*, *L. congesta, Agromyza apfelbecki* ve *Chromatomyia horticola* were stored in % 70 ethanol in dry at room temperature before DNA extraction. Genomic DNAs were isolated from pupae or adults by using Lifton method (Bender et al., 1983). This method briefly includes the following steps: Individual flies were homogenized in 500 µl Lifton solution (0.1 M Tris-HCl, 0.05 M EDTA (pH=9.1)) with % 0.5 sodium dodecyl sulfate (SDS) and incubated at 65 ^{0}C for 35 minutes. Then, 250 µl 0.6 M potassium acetate was added and inverted to mix and left on ice for 60 minutes. The homogenate was centrifuged at 14.000 rpm for 10 minutes at room temperature and then supernatant was removed into a new microfuge tube. 500 µl phenol was added to supernatant, inverted to mix and centrifuged at 14.000 rpm for 5 minutes at room temperature. The aqueous phase was taken and 250 µl phenol, 250 µl chloroform: isoamylalcohol (24:1) was added and centrifuged at 14.000 rpm at room temperature for 5 minutes. In the next step, 500 µl chloroform: isoamylalcohol (24:1) was added into tubes and previous step was repeated. The supernatant was taken to a new tube and 1 µl RNAase (10 mg/ml) added and incubated at 37 ^{0}C for 30 min. After this step, 500 µl of 70 % ethanol was added and centrifuged for 15 min at 14.000 rpm. The pellet was washed with 80 % ethanol. After briefly drying, DNA was resuspended in 50 µl of MQH$_2$O and stored at 4 ^{0}C for overnight and visualized on 1 % agarose gel. Genomic DNAs samples were diluted to 25 ng of DNA / µl.

RAPD analysis

DNA was amplified by the RAPD-PCR technique. The 20 µl reaction mixture in each tube consisted of 1,5 µl 10x reaction buffer, 1,2 µl dNTP mix, 1 Unit Taq DNA polymerase of primer, 5 µl of template DNA, 4,1 µl of sterile distilled water. All polymerase chain reaction amplification reactions were performed in an PTC-100 Programmable Thermal Controller programmed with the following program: initial denaturing step at 94 ^{0}C for 30 s, 94 ^{0}C for 25 s, anneling 35 ^{0}C at 45 s, 72 ^{0}C for 1 min, next 35 cycles until from 2 to 5 step, 72 ^{0}C for 5 m and a final extension step of 4 ^{0}C until endless. Four 10mer random primers were used for amplification (primer F04 (5'-GGTGATCAGG-3'), primer I16 (5'-TCTCCGCCT-3'), primer P06 (5'-GTGGGCTGAC-3') and primer N07 (5'-CAGCCCAGAG-3')). Amplified DNA fragments were separeted in a % 1 agarose TBE gel at 60 Watts, stained with ethidium bromide and were photographed under Kodak EDAS 290 High Performance UV Transilluminator.

Dendogram analysis and estimation of genetic distances

RAPD bands produced by all primers were scored for the 11 individuals. A matrix has been created by taking into accout the presence (1) or absence (0) of the bands. Using this matrix, Genedist application in the PHYLIP program was used to calculate the genetic distance between every insect and all data was shown as a table. Also, JMP program was used to create the dendogram tree from the matrix.

RESULTS AND DISCUSSION

PCR amplifications were done using as template the genomic DNA isolated from the Agromyzidae specimens. The four primers used showed some same and different profiles. Illustrative examples of the RAPD results obtained with the primers F04 (5'-GGTGATCAGG-3'), I16 (5'-TCTCCGCCT-3'), P06 (5'-GTGGGCTGAC-3') and N07 (5'-CAGCCCAGAG-3') are shown in figures 1 and 2.
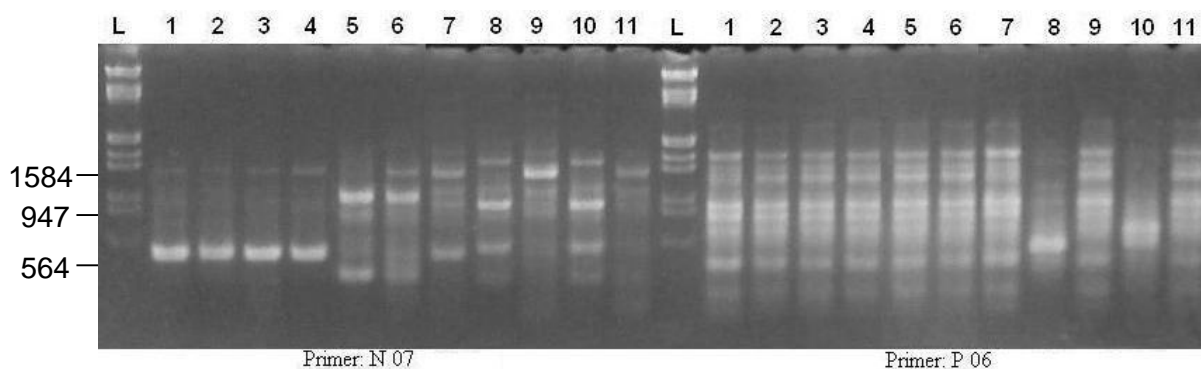
Figure 1. The RAPD profiles of the strains collected from several geographic locations in Turkey using primer N07 and P06. 1. *Liriomyza trifolii* 2. *L. trifolii* 3. *L. trifolii* 4. *L. trifolii* 5. *Chromatomyia horticola* 6. *C. horticola* 7. *L. sp.* 8. *Agromyza apfelbecki* 9. *Liriomyza congesta* 10. *Agromyza apfelbecki* 11. *L. sp.* "L" on the figure indicates ladder (molecular size markers) and numbers indicate the sizes in base pairs (bp). Each lane was numbered from 1 to 11, which corresponds to the name of the species given on Table 1. Primer names (N07 and P06) are shown below the gel picture.
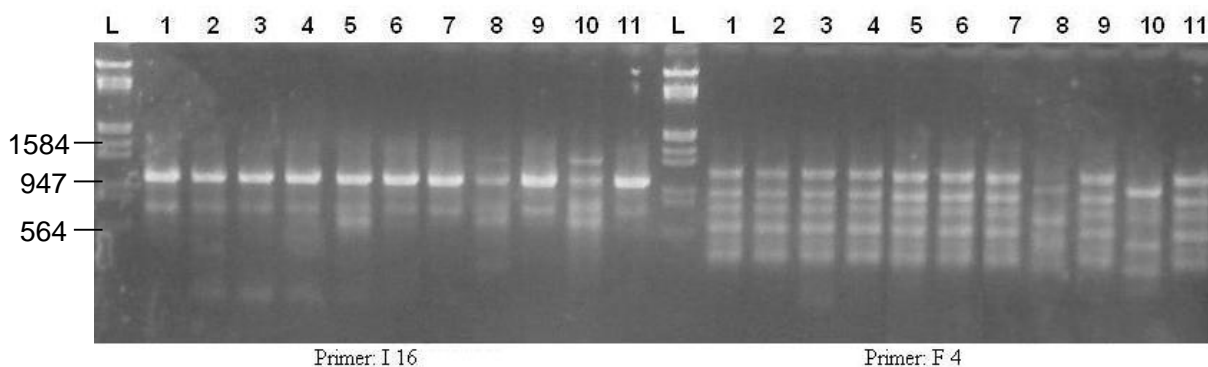
Figure 2. The RAPD profiles of the strains using primer I16 and F4. 1. *Liriomyza trifolii* 2. *L. trifolii* 3. *L. trifolii* 4. *L. trifolii* 5. *Chromatomyia horticola* 6. *C. horticola* 7. *L. sp.* 8. *Agromyza apfelbecki* 9. *Liriomyza congesta* 10. *Agromyza apfelbecki* 11. *L. sp.* Numbers and letters are as explained in the legend of figure 1. Primers used were I16 and F04.

The most striking result was produced when the primer N07 was used. The RAPD bands created by the primer N07 indicate that this primer could discriminate *L. trifolii* species from others. As seen in Figure 1, the RAPD band for the first four lanes (*L. trifolii*) created a PCR band around 500 kb, whereas the same band was not detected in the other lanes in which the PCR products obtained from the genomic DNA of *L. congesta*, *C. horticola* and *A. apfelbecki* were loaded. This primer, therefore, is a good candidate in quickly screening the strains explained here and can be used as a molecular tool in helping identify these insects.

In terms of comparing the individuals of the same species, *Liriomyza trifolii* collected from Mugla and Antalya regions showed the same RAPD profiles suggesting the low degree of polmorphism. This was expected because these regions are geographically and ecologically similar. More individulas collected from different locations and more primers are needed to study the poymorphism within a species.

The primer F04 produced the fragments that share the same pattern in all of the species except for *A. apfelbecki*. The DNA band for *A. apfelbecki* is single or double around 600 kb (Figure 1, lanes 8 and 10 for primer F04). This primer has given rise to numerous RAPD bands in other lanes. So, this primer can possibly be used in experiments involving *A. apfelbecki*.

In the case of primer P06, a bright band was detected in all of the strains. However, a polymorphism seems to be evident when considering other weak bands (Figure 2). On the other hand, primer F 04 produced 5 DNA bands in all except for lanes 8 and 10, which are *A. apfelbecki* (Figure 2).

During the classical identification steps involving the morphological approaches, specimens 7 and 11 could only be named as *L. sp.* due to limitations in the classical method. The molecular method has suggested that *L. sp* in lane 7 is *L. trifoli*, while the sample 11 is likely to be *L. congesta* (Figure 3).

Following the RAPD assessment, the genetic distances between the samples were estimated (Table 2). The values 0.1000 on the table indicate the least genetic distance or in other words the most genetically close individuals. For example, individuals 2 and 3 are very close to each other (0.1000). The most genetically distant individuals are found to be 7 and 8 (0.9538), which are *L. sp.* and *Agromyza apfelbecki*, respectively (Table 2, A7 and A10).

Table 2: Estimation of genetic distance between the Agromyzidae species after RAPD assessment.

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
A1	0.1000										
A2	0.9375	0.1000									
A3	0.9375	0.1000	0.1000								
A4	0.9375	0.1000	0.1000	0.1000							
A5	0.7647	0.7222	0.7222	0.7222	0.1000						
A6	0.8235	0.7777	0.7777	0.7777	0.8235	0.1000					
A7	0.1000	0.9375	0.9375	0.9375	0.7647	0.8235	0.1000				
A8	0.9524	0.9091	0.9091	0.9091	0.1500	0.9091	**0.9538**	0.1000			
A9	0.8750	0.8235	0.8235	0.8235	0.7647	0.8235	0.8750	0.9524	0.1000		
A10	0.2500	0.2381	0.2381	0.2381	0.3158	0.3000	0.2500	0.3846	0.1905	0.1000	
A11	0.7777	0.7368	0.7368	0.7368	0.7778	0.7368	0.7778	0.1905	0.8824	0.2273	0.1000

A dendogram was constructed based on the RAPD data generated in this study (Figure 3). The purpose in doing so was only to form clusters of the insect specimens for identification purposes, not for determining biological diversity. Certainly, more samples and primers are needed for a meaningful dendogram tree in concluding the biological diversity of these organisms. However, our results have shown that the RAPD-PCR analysis can be used in species identification. We propose that RAPD should be integrated into classical identification methods since it is faster, more economical and reliable. This technique will likely offer more solid and certain results when identifying these morphologically related organisms. One could screen more than 50 samples at one time as opposed to one using the classical method where the characteristics of the genital organ of males is the decisive point. Also, the RAPD technique can identify the female individuals, which is not easily possible by the classical method.

There are no RAPD-PCR studies found in the literature using these species. Most of the studies have taken advantage of the RFLP-PCR technique. Scheffer et al (2001) used the RFLP technique and showed the poymorphism between *Liriomyza huidobrensis* and *L. langei*. Similarly, Kox et al (2005) used the RFLP technique in analyzing the molecular differences between the species of *Liriomyza bryoniae, L. huidrobrensis, L. sativae* and *L. trifolii*. However, as important as these studies are, the RFLP technique has certain limitations as it takes acount only one or several genes or genome sites. The RAPD technique as shown by our results in this study will be more instrumental as it scans numerous DNA regions in the genome of the insect, randomly. Further studies will be performed using the RAPD-PCR analysis to achieve the goal of documenting the biological diversity, insecticide resistance status and evolutionary relationship of these economically important Agromyzidae species.
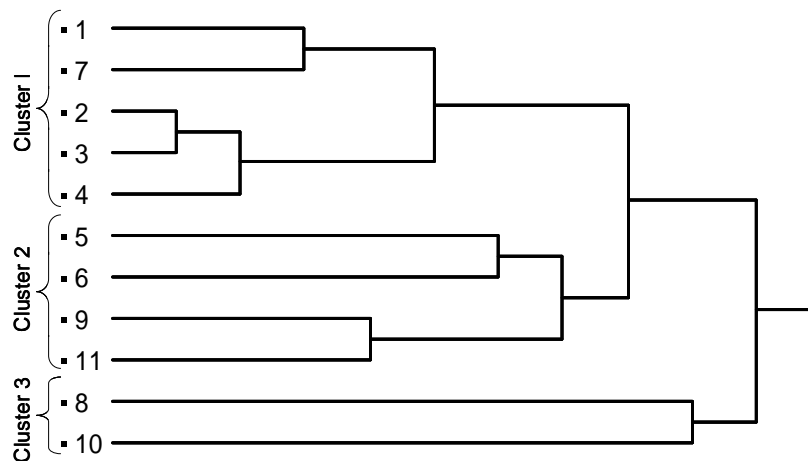
Figure 3. Dendogram based on the RAPD assessment for the Agromyzidae species. Numbers indicate the species whose names and collection sites are given on table 1. Three clusters are shown. Cluster 1 (1, 7, 2, 3 and 4) is composed of the species *Liriomyza trifolii* and *L. sp*. Cluster 2 species are *Chromatomyia horticola* (5 and 6) and *Liriomyza congesta* along with *L. sp*. (9 and 11). The species in the Cluster 3 (8 and 10) are *Agromyza apfelbecki*.

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The Efficacy of Two Different Neem [*Azadirachta Indica* A Juss (Melacaeae)] Formulations on The Larvae of *Liriomyza Huidobrensis* (Blanchard) and *Liriomyza trifolii* (Burgess) (Diptera: Agromyzidae)

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ABSTRACT

This study compared two different commercial neem insecticides with cyromazine for efficacy in controlling larval leafminers of *Liriomyza huidobrensis* and *L. trifolii*. Commercial cucumber greenhouses in Menderes (Izmir) and Ortaca (Mugla), Turkey were used for these trials. Replicated plots (15 m^2 each) were randomly established in each greenhouse and treated with NeemAzal T/S, Organica Neem Oil, or Trigard (cyromazine), all at manufacturer recommended rates, or left as untreated controls. Insecticides were applied when the average leaf density was 3-4 larvae/leaf. Leaf samples were taken at 3, 7, 10 and 14 days post-treatment, and live larvae were counted with a dissecting microscope. Both neem insecticides were effective against *L. huidobrensis* for 7 days; at 14 days, Neem Oil was significantly less effective than NeemAzal and both were significantly less effective than Trigard ($P < 0.001$). At 14 days post-treatment, the density of larvae in Trigard treated leaves was less than 3 larvae/leaf. Neem insecticides were only effective against *L. trifolii* for less than 7 days; there was no significant difference between their efficacy ($P > 0.05$). Trigard was effective against *L. trifolii* for about 14 days (larval densities were 3-4/leaf).

Keywords: NeemAzal, Neem Oil, cyromazine, *Liriomyza huidobrensis*, *Liriomyza trifolii*, cucumber, greenhouse, Turkey.

INTRODUCTION

The most notorious and widespread pests in vegetable greenhouses of the Aegean and Mediterranean regions of Turkey are the leafminers *Liriomyza huidobrensis* (Blanchard) and *L. trifolii* (Burgess) (Diptera: Agromyzidae) (Civelek, 1999). Both larvae and adults cause damage; the larvae of *L. huidobrensis* primarily mine the spongy mesophyll, where chloroplasts are located, whereas *L. trifolii*, mine the non-chloroplast-containing palisade mesophyll (Parrella and Bethke, 1984). The adult females of both species puncture both the upper and lower leaf surfaces to feed and lay eggs. This results in reduction of both plant vigor and yield, and in cosmetic damage to leaves and stems.

In recent years botanical insecticides have been increasingly used to prevent plant-damage caused by larvae of these species. Most botanical insecticides are considered organic and, as compared to other botanical insecticides, the extracts, oils and solutions derived from the neem tree are highly effective against many pests (Ascher, 1993), especially leafminers. Neem insecticides have physiological (insect growth regulating) and antifeedant effects on phytophagous insects (Ascher, 1993; Mordue and Blackwell, 1993). They are attractive for use in integrated pest management programs because of their low contact toxicity; they must be directly ingested by insects to be toxic (Schmutterer, 1988).

There have been a number of studies carried out on the effects of neem insecticides on the serpentine leafminer, *L. trifolii*, in the laboratory and field. Laboratory results are equivocal: Meisner et al. (1985) and Webb et al (1983) found no deterrent effect, while Dimetry et al. (1995) and Parkman and Pienkowski (1990) found reduction in fecundity. In field studies, similar equivocal results have been reported; when comparing endosulfan 35 EC to neem seed extracts, Jyani et al. (1995) found that endosulfan gave the best cost:benefit ratio, whereas Pawar et al. (1996) found that neem seed extract gave the best cost:benefit ratio in controlling *L. trifolii*.

Information on the effects of neem on the pea leafminer, *L. huidobrensis* is scarce; a laboratory study (Weintraub and Horowitz, 1997) showed that neem had a systemic effect on larvae when applied to the roots of bean plants and a translaminar effect when applied to leaves. To date there are no published field trials on the effects of neem insecticides against *L. huidobrensis*.

Herein, we report the effects of two different commercial, and therefore standardized, neem insecticides versus the synthetic insecticide cyromazine, on *L. huidobrensis* and *L. trifolii* larvae in commercial cucumber greenhouses.

MATERIALS AND METHODS

Study site and crops

Studies were carried out in 2016 in two commercial greenhouses located in Menderes (Izmir), Turkey. In 2017 two commercial cucumber greenhouses in Ortaca (Mugla), Turkey were used. All greenhouses (1000 m²) were made of an iron framework covered with solid

polyethylene. "Efes F1" variety cucumber seedlings were planted on 3 April 2016 and "Rapido F1" variety were planted on 6 April 2017. Plants were watered and fertilized according to local grower practices.

Insecticide application

NeemAzal T/S (Trifolio-M GmbH, Lahnau, Germany) was applied at a concentration of 5% (0.05% A.I.) and Organica Neem Oil (Organica Inc., NewYork, USA) was applied at 2 l/ha (0.5% A.I.), both according to the manufacturers' recommendations. For comparison, Trigard 75 WP (cyromazine 75%, Novartis) was applied at the recommended rate of 20g/100 l water. All treatments were applied with a low-pressure backpack sprayer. Insecticides were applied once in the late afternoon on 7 June 2016 and on 14 June 2017. Application dates were set when the pest density reached a level of 3-4 larvae/leaf (see below), the density at which insecticide treatment is advocated.

Experimental design and insect sampling

The experimental design was the same for both seasons. Within each greenhouse, 15 m^2 plots were randomly designated to be treated with one of the insecticides or remain as an untreated control. There was a non-treated buffer zone of 1 m between each plot to prevent spray drift to adjacent plots. Each treatment and control was replicated 5 times in each greenhouse.

To sample leafminers before insecticide treatment, a single infested leaf from each of 10 randomly selected plants within each plot was collected, brought to the laboratory, and examined under a stereo zoom microscope. Live larvae of *L. huidobrensis* and *L. trifolii* were counted and recorded. Sampling occurred once a week until an average density of 3-4 leafminers was observed, at which time insecticides were applied. After insecticide application, one infested leaf from each of 10 randomly selected plants was collected from each insecticide-treated plot 3, 7, 10 and 14 days following treatment. Leaves were similarly collected from non-treated control plots. All leaves were brought to the laboratory, where the number of live larvae were counted and recorded. Leaves were then set aside to allow larvae to develop to adults, and species were then identified.

Data analysis

Data were analyzed by CoStat Statistical Software (Minneapolis, MN, U.S.A.). Comparisons between the number of live larval leafminers in leaf samples from each treatment group and plot location were initially analyzed using a completely randomized multiple ANOVA, and means were separated by Tukey's HSD, T-Method. Having determined that there were no differences due to plot location, plot data within a treatment group were pooled and then analyzed by 1-way ANOVA. Means were separated by the Tukey's HSD, T-Method or Tukey-Kramer multiple range test.

RESULTS

Menderes, 2016

All leafminers from Menderes (Izmir) were identified as *L huidobrensis*. Results of a 1- Way ANOVA of the differences between treatments and controls, for each greenhouse, are shown on Table 1. Within 3 days of treatment, all three insecticides provided significant control over leafminer larvae as compared to non-treated controls (P < 0.001). However, by 7 days after treatment, Neem Oil was less effective than NeemAzal and significantly less effective than Trigard. By the end of the trials, both neem insecticides were significantly less effective than Trigard, but significantly more effective than non-treated controls (P <0.001). Trigard was effective against the larvae, maintaining their density below 3 larvae/leaf for a full two weeks.

Table 1: Efficacy of two neem formulations and cyromazine on live *Liriomyza huidobrensis* larvae in cucumber leaves from Menderes, spring 2016. Data are recorded as average of 50 leaves (+ S.E.)

Treatment	No. of Leaves	Days Post-Treatment				
		0	3	7	10	14
Greenhouse 1						
Neem Oil	50	3.9 + 0.3 a	1.1 + 0.2 b	2.4 + 0.2 b	5.1 + 0.2 b	6.5 + 0.2 b
NeemAzal	50	3.9 + 0.2 a	0.9 + 0.1b	2.0 + 0.2 b	3.4 + 0.2 c	4.5 + 0.3 c
Trigard	50	4.3 + 0.2 a	0.6 + 0.1b	0.7 + 0.1c	1.8 + 0.1d	2.9 + 0.2 d
Control	50	4.6 + 0.2 a	5.3 + 0.3 a	8.3 + 0.4 a	10.9 + 0.4 a	12.1 + 0.4 a
Greenhouse 2						
Neem Oil	50	3.5 + 0.3 a	1.5 + 0.2 b	4.0 + 0.3 b	4.6 + 0.4 b	6.1+ 0.6 b
NeemAzal	50	3.8 + 0.3 a	1.4 + 0.2 b	2.1 + 0.3 c	2.9 + 0.3 c	5.6 + 0.5 b
Trigard	50	4.0 + 0.3 a	0.6 + 0.1b	0.8 + 0.2 c	1.9 + 0.3 c	2.8 + 0.3 c
Control	50	4.2 + 0.3 a	10.9 + 0.6 a	3.4 + 0.6 a	12.9 + 0.8 a	13.2 + 0.6 a

Different letters within the same column indicate statistically significant differences (P < 0.05; df for main effects (treatments) = 3; df for error (replicates) = 196).

Ortaca, 2017

All leafminers from Ortaca (Mugla) were identified as *L. trifolii*. Results of a 1-way ANOVA of the differences between treatments and controls, for each greenhouse, are shown on Table 2. At the time of treatment, in greenhouse 1, there were some minor differences between the treatment plots for unknown reasons. However, in both greenhouses, within 3 days of treatment, all three insecticides achieved significant control over leafminer larvae as compared to non-treated controls (P < 0.001). In these trials, there was no significant difference

between the Neem Oil and NeemAzal treatments; both were significantly more effective than the controls, but significantly less effective than Trigard ($P < 0.001$).   In these trials, Trigard was effective in controlling *L. trifolii* for less than 14 days, insecticide application being recommended when larval density is 3-4/leaf.

Table 2: Efficacy of two neem formulations and cyromazine on live *Liriomyza trifolii* larvae in cucumber leaves from Ortaca, spring 2017. Data are recorded as average of 50 leaves ($\pm$ S.E.)

Treatment	No. of Leaves	Days Post-Treatment				
		0	3	7	10	14
Greenhouse 1						
Neem Oil	50	3.5 $\pm$ 0.3 ab	1.3 $\pm$ 0.2 b	5.6 $\pm$ 0.3 b	7.0 $\pm$ 0.3 b	14.4 $\pm$ 0.5 b
NeemAzal	50	4.1 $\pm$ 0.2 a	1.1 $\pm$ 0.1 b	5.2 $\pm$ 0.3 b	6.7 $\pm$ 0.2 b	11.7 $\pm$ 0.6 c
Trigard	50	3.2 $\pm$ 0.2 b	0.3 $\pm$ 0.1 b	1.3 $\pm$ 0.1 c	2.7 $\pm$ 0.1c	4.6 $\pm$ 0.1 d
Control	50	3.9 $\pm$ 0.3 ab	4.7 $\pm$ 0.5 a	14.9 $\pm$ 0.6 a	17.1 $\pm$ 0.4 a	27.6 $\pm$ 1.0 a
Greenhouse 2						
Neem Oil	50	3.3 $\pm$ 0.3 a	2.4 $\pm$ 0.2 b	5.2 $\pm$ 0.2 b	7.1 $\pm$ 0.2 b	11.9 $\pm$ 0.3 b
NeemAzal	50	3.8 $\pm$ 0.1 a	1.5 $\pm$ 0.1 bc	4.4 $\pm$ 0.1 b	6.5 $\pm$ 0.1b	11.1 $\pm$ 0.2 b
Trigard	50	3.2 $\pm$ 0.2 a	0.5 $\pm$ 0.1 c	1.5 $\pm$ 0.1 c	2.3 $\pm$ 0.1c	3.7 $\pm$ 0.1 c
Control	50	3.6 $\pm$ 0.2 a	13.1 $\pm$ 0.3 a	16.7 $\pm$ 0.4 a	21.1$\pm$ 0.3 a	28.2 $\pm$ 0.3 a

Different letters within the same column indicate statistically significant differences ($P < 0.05$; df for main effects (treatments) = 3; df for error (replicates) = 196).

DISCUSSION

Neem preparations are made by extracting the active ingredient, azadirachtin, from seeds of the neem tree. The solvents used for extraction, and even the ripeness of the neem seeds can affect azadirachtin content. Isman et al. (1990) have shown that the azadirachtin content greatly affects insecticidal activity, and argue for standardization. Therefore we used commercial neem insecticides, which have standardized azadirachtin content, and compared them with an effective synthetic insecticide, cyromazine. NeemAzal T/S is made from neem seeds and contains 1% of the active ingredient, azadirachtin. Neem Oil is derived from the fatty acid of the neem seeds and potassium salt (25%) and contains 2.5% active ingredient. These trials have shown that both these neem formulations are initially (up to three days after treatment) quite effective and comparable to cyromazine.

Against *L. huidobrensis*, the two neem preparations were effective for about 10 days, at which time there were again 3-4 larvae per leaf and re-application would be required. The NeemAzal preparation appeared to be more effective than the Neem Oil. At 10 days post-

treatment there were significantly fewer (P < 0.01) larvae than in the Neem Oil treatment, even though the amount of active ingredient was 0.05% in NeemAzal and 0.5% in Neem Oil.

However, against *L. trifolii*, both neem insecticides were effective for less than a week and there was no apparent difference in their activity, both requiring re-application after one week to maintain larval densities below 3-4/leaf. Further studies should be conducted to find more effective neem insecticides or to explore other methods of application, such as systemically through irrigation systems.

During recent years intensive research has been carried out to try to reduce insecticides in agricultural pest control and encourage integrated pest control. Research has focused on the replacement of synthetic insecticides with alternative products since it is well known that the indiscriminate and excessive use of pesticides creates serious problems, including pest resistance to insecticides. In the trials of this study, carried out in commercial greenhouses, very promising results were obtained with botanical insecticides. As the cost of neem insecticides decreases worldwide, it is hoped that they will be included with other translaminar insecticides for the effective control of leafminer pests.

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Investigation The Effect of Gradation Change on Electrically Conductivity in Conductive Asphalt Mixtures

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ABSTRACT

Snow and icing on road surfaces endanger traffic safety, and in some cases, it can even cause traffic interruption in highways sections such as bridges, tunnels, and entrances. Especially in structures such as bridge, icing is occurred much faster. Therefore, the use of methods of active anti-icing methods, which will prevent icing before it occurs, is becoming increasingly important in such road sections. Because of the passive anti-icing methods such as salting can damage asphalt pavements and bridge bearing systems so they are not preferred for bridge pavements. In this study the most commonly used bridge pavement type stone mastic asphalt mixtures were transformed into electrically conductive and two different graded conductive SMA Marshall specimens were prepared, resistivity measurements were performed and the obtained values were compared. The test results showed that the gradation change was effective on electrical conductivity.

Keywords: Electrically Conductivity, Stone Mastic Asphalt, Bridge, Anti-Icing.

INTRODUCTION

Transportation is the displacement of people and goods for a purpose that is considered useful (Yayla, 2013). There are some parameters exist for comfortable transportation. These are; fast, comfortable, safe, orderly and uninterrupted. Safety is among the compulsory objectives of road engineers and related researchers. The statistics indicated that cold weather conditions were the main causes of 10-15% traffic accidents annually, leading to enormous economic losses and deaths (Yehia *et al.*, 2000).

In winter, cold weather conditions lead to damaged and injured traffic accidents and delays due to snow and ice on the asphalt pavements. Particularly tunnel sections on highways, bridges, high slope sections (ramp-slopes), bus stops, clover intersections, intersections with different level and different level intersections where braking is frequent are the road sections where such problems can be experienced. Among these, the most dangerous road sections are bridges. In cold seasons, road sections such as bridges and viaducts frost much faster than other sections. Because the bottom of the surface of the bridges is open to air effects. The prevention of icing by means of innovative methods such as electrically conductive pavement is more critical, since the use of anti-icing solution and salt in bridges can cause corrosion and damage the asphalt pavements as well as the bearing system and steel construction.

In recent years, one of the new methods used in anti-icing asphalt pavements with electrical conductivity feature (Pan, 2014). The pavements can be heated by electric current and thus there is no icing problem on the road surfaces (Gürer, 2014). The first conductive asphalt concrete (CAC) application was developed by Minsk in 1968 as a new snow melting / defrosting agent. The conductivity of asphalt concrete is obtained by adding various conductive materials into the mixture. Current flowing through the CAC provides the necessary heat to prevent snow and ice on the road pavement's surface.

Stone Mastic Asphalt (SMA) type of asphalt pavements are often preferred in road sections such as bridges because of their long life. The aim of this study; converting to electrically conductive mixtures of traditional stone mastic asphalts used in road sections where the icing is most intense, such as bridges and tunnel and thus preventing the icing before it starts (Anti-Icing). In some previous studies, it was mentioned that conductive bituminous mixtures may be effective of aggregate gradation type in terms of electrical conductivity (Gürer & Gürgöze, 2017). This study showed that the conductivity properties of the specimens belonging to the two different series have the same conductive material components were different. It was concluded that aggregate gradation had an effect on electrical conductivity.

STONE MASTIC ASPHALT (SMA)

Stone mastic asphalt (SMA), also called stone-matrix asphalt, was developed in Germany in the 1960s with the first SMA pavements being placed in 1968 near Kiel. It provides a deformation-resistant, durable surfacing material, suitable for heavily trafficked roads. SMA has found use in Europe, Australia, the United States, and Canada as a durable asphalt surfacing option for state, urban roads and highways. SMA has a high coarse aggregate content that

interlocks to form a stone skeleton that resists permanent deformation. The stone skeleton is filled with a mastic of bitumen and filler to which fibers are added to provide adequate stability of bitumen and to prevent drainage of binder during transport and placement. Typical SMA composition consists of 70−80% coarse aggregate, 8−12% filler, 6.0−7.0% binder, and 0.3% fiber (Figure 1). The quality of the pavement is higher due to the higher bitumen and coarse aggregate content. It is especially used in pavements such as bridges, tunnels and highways with heavy vehicle traffic, which may cause rutting on the road pavement and also road sections which is maintenance applications are difficult (Gürer, 2014).

Figure 1: Differences between SMA and Hot Mix Asphalt (HMA) (Web 2019).
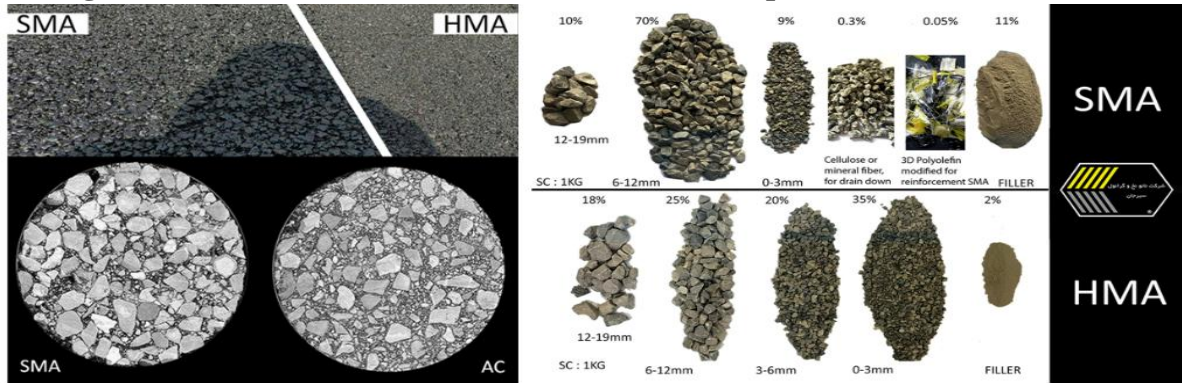
MATERIALS AND METHODS

Materials

In this study limestone and basalt based aggregate specimen was used to producing of SMA mixtures. Limestone was used in mineral fillers and fine aggregate components and basalt was used as coarse aggregate. The aggregate specimens were taken from KOLSAN Company and Afyonkarahisar City Asphalt Plant. The 60/70 penetration grade bitumen used as binder (ASTM D 946). The engineering properties of the bitumen are given in Table 1. Carbon fiber with 5 mm length was used as conductive component. The carbon fiber bobbin (code:24K A-49) specimen obtained from AKSACA Company in Yalova, Turkey. The carbon fiber properties were given in Table 2. Also, the gradation chart of the SMA series are shown in Figure 2.

Table 1: Enginering Properties of the Bitumen

Properties	Value	Standarts
Source	Aliağa / Türkiye	---
Penetration Grade	60/70	---
Penetration Grade (at 25°C)	63	ASTM D 5
Specific Gravity	1,060	ASTM D 70
Softening Point (°C)	49	ASTM D 36
Loss on Heating (%)	2	ASTM D 6
Flash Point	296	ASTM D 92
Ductility (at 25°C)	>100 cm	ASTM D 113
Viscosity (at 135°C)	0,420 Pa s	ASTM D 4402
Viscosity(at 165°C)	0,114 Pa s	ASTM D 4402

Table 2: Carbon fiber engineering properties

Fiber Properties	Value	Test Method
Tensile Strength (*MPa*)	4900	ISO 10618
Tensile Modulus (*GPa*)	250	ISO 10618
Strain (*%*)	2.0	ISO 10618
Density (*g/cm³*)	1.79	ISO 10119
Yield (*g/1000 m*)	1600	ISO 1889

Figure 2: Gradation chart of SMA specimens
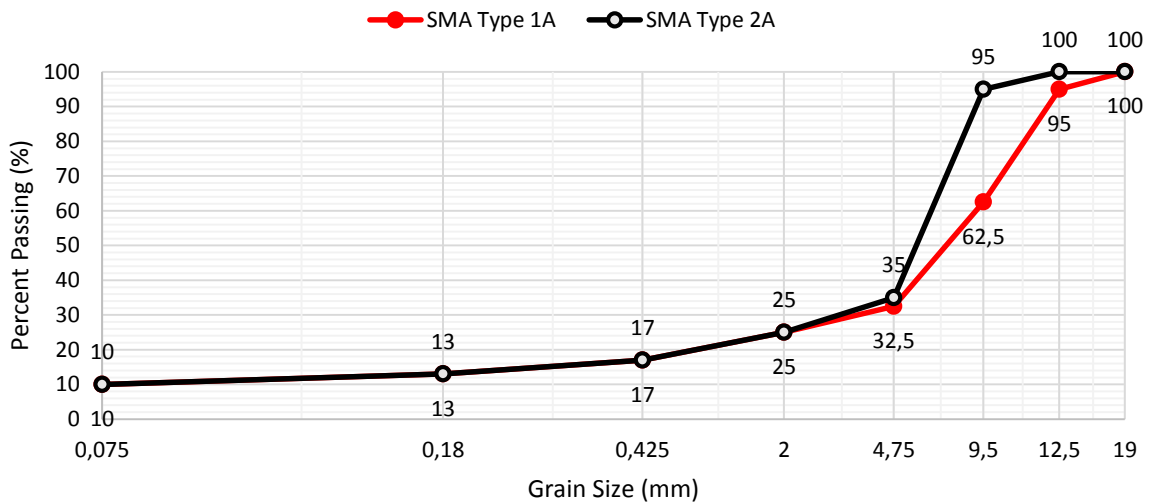
Method

In this study Electrical resistivity and ultrasound velocity tests were performed on the series of SMA specimens. Tests method was given in below.

Electrical resistivity measurements via two electrode method

A power supply (JWY30F DC) and a digital multimeter (UT33C) were employed to measure resistivity. The electrodes made of copper sheets were stuck to the cross profiles of a specimen by mechanic clamp. The stabilized power supply and digital multimeter were connected to the electrodes by the wires with crocodile mouth. Subsequently, the resistances under constant voltage (20 V) were measured. Resistivity of specimens (ρ) was calculated according to the equation (1).

$$\rho = R \times \frac{S}{L} \tag{1}$$

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where ρ = electrical resistivity (Ωm); L is the internal electrode distance (m); R is the measured resistance (Ω); and S is the electrode conductive area (m^2).

In order to electrode distance, specimen height were measured three different point and their average heights were used as L value (Yang *et al.,* 2013).

Ultrasound Velocity Tests

The ultrasound test, which is a test method generally used to determine the relationship between concrete compressive strength and concrete density in concrete samples, provides information about the density of the concrete over the velocity of the transverse wave through the concrete. There is a significant relationship between the density of the concrete and the supernatural wave. Sound is a kind of wave type, but its propagation is by transmission. In a low-density concrete, so in a concrete with more void, reaching of supernatural wave from one surface to other surface of the concrete is longer. In other words, the higher the amount of void in the concrete, the less the speed of the supersonic wave. In a concrete with a high density, the amount of void will be small and the transition time of the supernatural wave from one surface of the concrete to the other surface will be short, and therefore the speed of the transition of the sound wave will be higher (Erdoğan, 2003). Ultrasonic velocity measurements were performed on SMA specimens because the gradation differences could affect the density.

FINDINGS

SMA 1A and 2A specimen's resistivity change versus % bitumen by weight were shown in Figure 3 and 4.

Figure 3: SMA 1A specimen's resistivity change versus % bitumen by weight
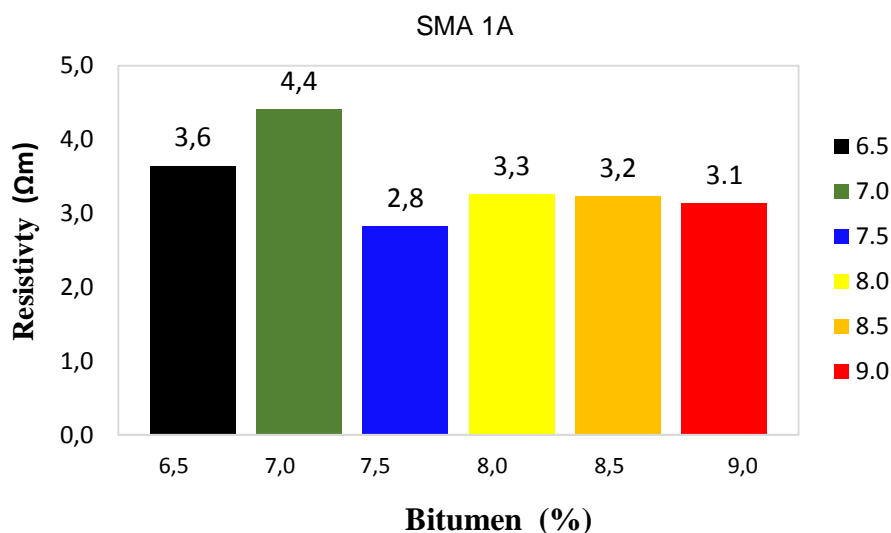
Figure 4: SMA 1A specimen's resistivity change versus % bitumen by weight
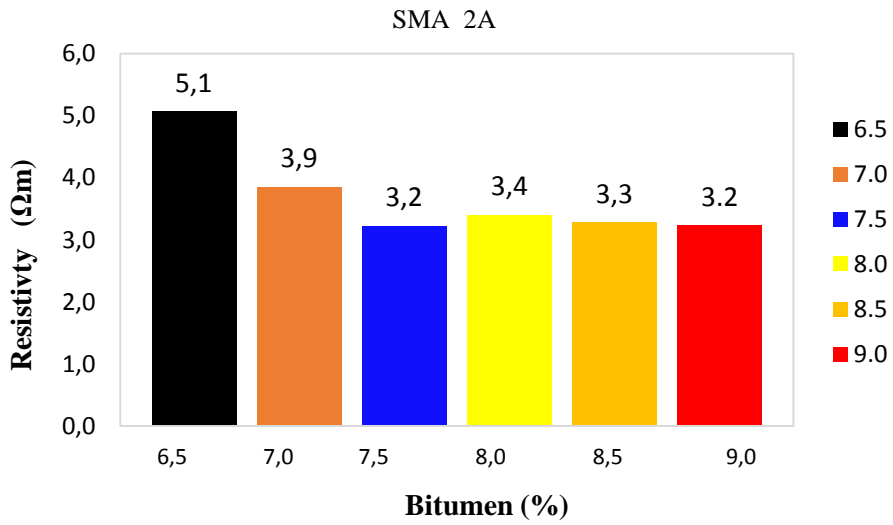
Resistivity values of 1A and 2A series are close to each other in bitumen % of 8.0, 8.5 and 9.0. As the density increases with increasing bitumen in all series, it is thought to increase in conductivity. After 8.0% bitumen percentage, the resistivity increase was almost fixed. The percentages of void created by the gradation change affect the resistivity value of the SMA series.

Ultrasonic velocity versus % bitumen by weight for SMA 1A and SMA 2A series was given in Figure 5.

Figure 5: Ultrasonic velocity versus % bitumen by weight for SMA 1A and SMA 2A series.
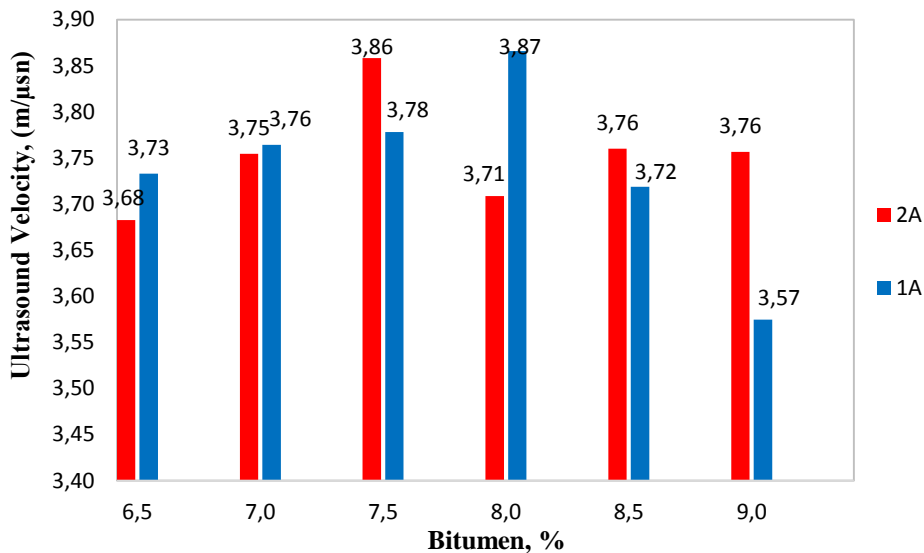
The figure is showed that the relationship between ultrasound velocity and gradation of the specimen. Because ultrasound velocity each of the series are different. The ultrasound velocities were increased with the increased bitumen amount in both series, after 8.0% bitumen, the velocities were decreased at both series. According to the Marshall design method, the highest density values are generally obtained in these bitumen ranges (7,5-8,0) for SMA. Ultrasound velocities are also high in the bitumen percentages where the material is dense.

CONCLUSIONS

As a result of the tests following conclusions can be drawn:

- It is generally thought that the gradation change has an effect on the conductivity properties of conductive SMA mixtures.
- The biggest factor in this is thought to be the percentage of void caused by the gradation change.
- In all graphs, it was observed that the density increases with thr increasing amount of bitumen also conductivity was increased.
- It was seen from the changes of the ultrasound velocities that there is a relationship between the ultrasound velocity and the gradations of the SMA 1A and 2A specimens.
- Ultrasound velocity are also high in bitumen percentages where the material is dense.

The results of the study can be further expanded by using different test methods.

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Contribution of Women to Home Economy Working in Dried Eggplant Production: Case of Gaziantep Province of Turkey

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ABSTRACT

Drying vegetable production is one of the most important agricultural activities where women participated in rural areas of Turkey. In this study, it was aimed to determine the contribution of women in dried eggplant production to home economy and to determine their socio-demographic characteristics in Gaziantep Province of Turkey. For this purpose, a face to face survey was conducted with 84 women in January -February period of 2018. According to the research results; it was found the average age of the women who participated in the survey was 35.46 and 40.5% were primary school graduates. The average family income level of the women was obtained as 2053.47 TL/ month. Also, it was determined that women worked in dried eggplant production 8,5 hours daily and 57 days in the season which lasted four months. It was found that women contributed to the household economy seasonally 4375 TL from dried eggplant production. Women stated that due to the dried eggplant production their social activities developed as well as contribute to neighborly relations, cooperation and sources owned.

Keywords: Dried Eggplant, Home Economics, Rural, Turkey.

INTRODUCTION

Throughout history, Anatolia has been home to many states, and as a result has left various cultural heritages. Food, which is one of the main elements of cultural richness, is included in this richness. One of the products with the most choices in this variety is eggplant. As a different flavor with every kind of sweet to salty, delicious recipes occur. For example; moussaka, roast, alinazik, imambayildi, kebab types of salads, appetizers, pickles and jams are often heard in the name. The indispensable recipe of our summer and winter tables, regardless of dry age, is stuffed.

Although Gaziantep city dried eggplant center in Turkey, India is the motherland of eggplant (Anonymous, 2017). Eggplant production undergoes a series of maintenance processes from soil preparation to harvest. Harvesting is done correctly and keeping frequent intervals has an important place in product quality and yield. When harvesting 10-30 eggplants from an eggplant, the yield varies between 2-13 tons per decare (Aybak, 2001; Günbay, 1992). In the year 2010 in Turkey, eggplant sowing area 26.754 ha, production was realized as 846.988 tons. In 2017, sowing area increased to 21.447,2 ha and production amount increased to 883.917 tons. In the province of Gaziantep in 2010, the sowing eggplant was 829,6 ha, and the production amount was 22.821 tons. In 2017, sowing area increased to 1.075 ha and the production amount increased to 30.603 tons. In the Oguzeli town in 2010, while the eggplant sowing area was 330 ha, the production amount was 9900 tons. In 2017, the cultivation area increased to 741 ha and the production amount increased to 22.971 tons (TUİK, 2018).

Oguzeli is the third central town of Gaziantep and is located next to the southeast of the Sacir stream. Oguzeli, which is a research region, is a settlement center open to advanced innovations with its richness of vegetation in terms of soil conditions and climate, which is close to Middle Euphrates in Southeastern Anatolia Region (Şengün and Boyraz, 2015). Oguzeli, which is dominated by the Mediterranean climate, has been identified in many climate researches where summers are hot and arid winters are warm and rainy. In terms of land use, it is observed that irrigated, dry and horticultural agriculture is widespread and livestock activities are carried out in meadow and pasture lands (Şengün and Boyraz, 2015). Dried vegetables production has come to the forefront due to climate characteristics. Eggplants, peppers, zucchini, tomatoes, acur and gumbo etc. products are offered to the market in winter by drying. 80% of the drying eggplant production in Turkey are realized in the Oguzeli. In this respect, it is known as a drying warehouse and has been an important source of commercial gain in the market (Anonymous, 2017). It has been determined that the women who live in the town assume the duties of carving and tying the drying business and thus women in the town contribute to the home economy.

When we examine the stages of eggplant drying, the heads of the eggplants collected from the field are cut and prepared for carving. The inside of eggplant is cleaned with special tools that they use for carving. The inside of the cleaned eggplants is arranged on 50 ropes. The eggplants are washed before going to the pavement and laid in the exhibition places called roofs. In preparation of drying, women are generally involved in engraving and string arrangement. In the remaining stages, it was determined that males took part (Figure 1).

Figure 1: Eggplant Drying Steps (Photo: Fatma Nur Akdeniz)

When the lifestyle of women living in rural areas is examined, she works at a very busy pace as a worker with free of charge to assist their spouses in fields such as fields and livestock. This is the same for women living in the city, but they support their homes by working in areas where they have developed. Women who contribute to the economy of the house through agricultural activities in rural areas do not have enough education and awareness (Önder, 2009). It should be ensured that the education programs to be applied to women are not only programs that develop and reinforce the women's domestic roles and that they are better positioned with programs that enable them to develop in every way. Aside from standing on their own feet, women's economic independence gives it the ability to be free in making decisions about their own health, their own development and their children when necessary (Türk, 2011; Altun, 2000). When women employment is mentioned, it is shaped as casual or unpaid family work in agriculture on its own behalf, while it is seen as working at home, part-time work and temporary work in industry and service sector (Karadeniz, 2011). In countries which economy based on agriculture and underdeveloped countries, women play an active role in agricultural activities and contribute to family income (Yıldırak et al., 2002).

In this study, it was aimed to determine the social and economic status of women in eggplant production in Oguzeli town of Gaziantep province, their level of satisfaction with their work and how much they contribute to the home economy during the production season.

LITERATURE REVIEW

In his study, Kaşkaloglu (1987) grouped the participation of women in agricultural activities in rural areas into three areas: family labor, wage-laborers and contributing to production and family economy within the home economy. In addition, it was stated that the Turkish women, who had a great contribution in agricultural production, successfully fulfilled the duties undertaken in the family structure.

Budak et al. (2004) stated that although theoretical and/or practical programs for animal production play an important role in women's production, they are far from adequate.

Önder (2009) found that women who contribute to the economy of the house by working both in the house and in agricultural activities in rural areas come after men in terms of responsibility and ownership while the workload is heavy. They also found that if women living in rural areas become more educated and conscious, they will contribute positively to agricultural activities and thus to the national economy.

Karadeniz (2011), his work has found that low female labor force participation and employment rates in Turkey. Besides, when women employment is mentioned, it is shaped as casual or unpaid family work in agriculture on its own behalf, while it is seen as working at home, part-time work and temporary work in industry and service sector.

In his study, Kulak (2011) determined that women's participation in production is closely related to the cultural structure and economic development level of the society in which they live. While the difference in socio-economic status between men and women decreases in big cities where women with a high level of education live, the difference increases as the level of education and income decreases; in rural areas, this difference has been reached to the maximum level. In this study, as in the farming community in the rural areas in Turkey it has been mentioned have mastered the traditional family structure. Production is controlled by older men; women, especially young women, have no say in this matter. In rural areas, women ensure the maintenance of the agricultural system and improve the economic welfare of the family by producing products for family consumption and market economy through the interaction of all inputs in the production process. In addition to undertaking domestic responsibilities such as cleaning, childcare, drinking water, fuel and food supply, women are actively involved in crop and animal production and non-agricultural income generating activities. In his study, he mentions the social structure of women in general and their position in the family.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

The data of the study were obtained from face to face interviews with women who produce dried eggplant in 84 households. The study was conducted in January -February period of 2018.

Statistical analysis techniques were used to evaluate the data obtained from the questionnaires. In this study, the descriptive statistics mean, frequency and percentage values were expressed. The relationships between the questions and variables were evaluated with chi-square, Anova, t test and the findings obtained later were tabulated.

Results

The average age of the women participating in the survey was 35.46 and the youngest participant was 16 years old and the oldest participant was 56 years old. The fact that the age of the female employees participating in the survey was at the age of decision-making shows that the data obtained consisted of reliable data. It was determined that the number of family members ranged from 2 to 9, the average household size was 5.45 people, and the average

number of children was between 3-4. Women's agricultural activity is approximately 6 years. When the family income level of women is examined, it is determined that the lowest income is 1000 TL/month and the highest income is 4500 TL/month and the average income level is 2053.47 TL/month. Women contribute at least 750 TL and 20.000 TL on average 4375 TL to the home economy at the end of the season (Table 1).

Table 1: Socio-economic characteristics of women

	Min.	Max.	Mean	Std. Deviation
Age (year)	16	55	35,46	11,08
Family size (Person)	2	9	5,45	1,76
Number of children	0	7	3,43	1,78
Duration of agricultural activity (year)	1	30	6,13	6,78
Family income level (TL/month)	1000	4500	2053,57	789,68
Contribution of dried eggplant production (TL/season)	750	20000	4375	3158,95

Source: Authors' estimations

It was found that 85.7% of the women who participated in the survey were married and 40.5% were primary school graduates. When the occupational status of their husbands was examined, it was found that 20% were unemployed, 19% were civil servants or retired, and 8.3% were engaged in farming. When the social security status of the family was examined, it was found that 83.3% had social security and 16.7% did not have social security (Table 2).

Table 2: Other characteristics of women

		Frequency	%
Educational level	Literate	8	9,5
	Primary school	34	40,5
	Middle School	21	25,0
	High school	18	21,4
	University	3	3,6
Marital status	Single	12	14,3
	The married	72	85,7
Husband's Occupation	Unemployed	17	20,2
	Worker	8	9,5
	Self-employment	10	11,9
	Farmer	7	8,3
	Artisan	10	11,9
	Officer	16	19,0
	Retired	16	19,0
Social security	Yes	70	83,3
	No	14	16,7

Source: Authors' estimations

66.7% of the women surveyed were engaged in agricultural activities. In addition, 77.4% of women did not have their own land (Table 3).

Table 3: Status of women in agricultural production and land ownership

		Frequency	%
Engaged with agriculture	Yes	56	66,7
	No	28	33,3
Ownership of farmland	Yes	19	22,6
	No	65	77,4

Source: Authors' estimations

It has been determined that women work 8 hours per day in dried eggplant production and average number of carved eggplants is 2630 per day. The average working period during the production season was 57 days. The daily carving fee (for 1000 pieces) was determined to be minimum 25 TL, maximum 275 TL, and average 81 TL (Table 4).

Table 4: Data on dried eggplant production

	Min.	Max.	Mean	Std. Deviation
Daily working hours	4	14	8,56	2,04
Number of daily eggplant carving	0	5500	2630,95	1161,84
Seasonal working days	30	81	57,54	12,40
Daily fee (1000 pieces) TL	25	275	81,82	49,51

Source: Authors' estimations

66.7% of women carve only eggplants. 39.8% of women stated that the most important reason for carving eggplant was to contribute to the home economy. 38.1% of the women were paid fees monthly and 27.4% were paid at the end of the season. 45.2% of the women stated that they produce vegetables as agricultural production. It was found that 32.1% of the women either produced alone or produced eggplant with all family members. When the satisfaction level of the women in the production of dried eggplant is examined, it is determined that 78.6% are satisfied and 21.4% are not satisfied. According to female workers, when the difficulties of dried eggplant production are evaluated, 26.2% cause wrist and neck pain, 22.6% cause insomnia and fatigue, 19% do not have any difficulty, 17.9% the hot weather conditions, 14.3% of the eggplant powder allergy as the difficulties of drying eggplant production stated. Women prefer to use eggplant residues in various ways. Eggplant residues are used as animal feed, fuel and cooking. The unused eggplant residues are thrown away. It was determined that the women who participated in the survey did all of them (Table 5).

Table 5: Other data on dried eggplant production

		Frequency	%
Eggplant carving and picking Status	Only carving	56	66,7
	Only Picking	1	1,2
	Both	27	32,1
Reasons of working in eggplant carving	Occupation	7	8,3
	Mandatory needs	26	31,6
	Additional income	33	39,3
	Free time	11	13,1
	School costs	7	8,3
Fee pick up time	Daily	12	14,3
	Weekly	17	20,2
	Monthly	32	38,1
	End of season	23	27,4
Working status of family in dried eggplant production	Alone	27	32,1
	Children and herself	23	27,4
	With her husband	7	8,3
	Whole family	27	32,1
Agricultural production other than dried eggplant production	No production	29	34,5
	Vegetable production	38	45,2
	Horticulture	9	10,7
	Animal Production	4	4,8
	Grain production	4	4,8
Satisfaction with dried eggplant production	Yes	66	78,6
	No	18	21,4
Health and other problems due to dried eggplant production	No problem	16	19,0
	Allergy	12	14,3
	Insomnia and fatigue	19	22,6
	Waist, wrist, neck pain	22	26,2
	Hot weather	15	17,9
Evaluation of eggplant residues	Animal Feed	4	4,8
	Food	5	6,0
	Fuel	7	8,3
	Garbage	8	9,5
	All	60	71,4
Total		84	100,0

Source: Authors' estimations

Women working in dry eggplant production were asked about Likert type questions and their opinions about eggplant carving. Women stated that; that strongly agree with an average of 4.08 the question "Is there a positive effect on your social life?"; not agree with an average of 2.40 the question "Does it have a negative impact on your social life?"; partially agree with an average of 2.65 the question "Does it interfere with housework?"; agree with an average of 3.88 the question "Does it create health problems?" ; partially agree with an average of 2.69 question "Does create any environmental pollution?" (Table 6).

Table 6: Women's thoughts on eggplant carving

	Strongly disagree %	Disagree %	Partially agree %	Agree %	Strongly agree %	Mean
Does it have a positive effect on your social life?	1,2	9,5	11,9	34,5	42,9	4,08
Does it have a negative impact on your social life?	25,0	11,9	44,0	6,0	13,1	2,40
Does it interfere with housework?	25,0	14,3	44,0	3,6	13,1	2,65
Does it cause health problems?	2,4	13,1	14,1	34,5	35,7	3,88
Does it create environmental pollution?	14,3	13,1	44,0	3,6	25,0	2,69
1: strongly disagree 2: disagree 3: partially agree 4: agree 5: Absolutely agree						

Source: Authors' estimations

The chi-square test was used to see the relationship between working hours and agricultural activities of eggplant carving in the production of female workers. According to the test, our chi-square value was 11,637. Since the p value was within the 95% confidence interval (0.003), our test was statistically significant, and it was found that there was a relationship between working hours according to the women's agricultural activity (Table 7).

Table 7: Comparison of working hours for eggplant carving according to agricultural activity

	Agricultural Activity				
Working hours	**No**	**Yes**	**Total**	**Chi-square**	**P**
4-7	57,1	23,2	34,1	**11,637**	**0,003**
8-11	53,8	26,3	47,6		
12-15	12,3	36,8	17,9		
Total	%100	%100	%100		

Source: Authors' estimations

In order to find out if there is a difference between the wages of women at the end of the season according to their monthly income, f test was applied. According to the results of the study, it was found that women with low incomes contribute 5173 TL to the home economy

on average, women with middle income make 3598 TL on average and women with high incomes contribute 2133 TL to home economy. The results were statistically significant as p 0,017 <0,05 in 95% confidence interval.

In order to understand which group is different from the income level groups, the second stage of the f test was performed by the Duncan test. P <0.05 was found to be statistically significant. Among income groups, low-income families contributed more to the home economy. Therefore, low-income families are different from the others (Table 8).

Table 8: Comparison of how the eggplant carving contributes to income groups at the end of the season (f test)

Additional Income	Income level	Frequency	Mean	Standard deviation	P
	Low income	47	5173,30	3688,535	0,017
	Middle income	31	3598,5	1920,264	
	High income	6	2133,3	1612,271	

a.b DUNCAN	Income	N	1	2
	High	6	2133,33	
	Middle	31	3598,55	3598,55
	Low	47		5173,30
	Sig. (p)		0,212	0,180

Source: Authors' estimations

In dried eggplant production, women whose husbands work are carving an average of 2361 eggplants, while women whose husbands do not work are carving 3008 eggplants on average. Since P value is <0.05, our result is statistically significant. When these results were examined, it was found that the number of eggplant carvings per day was higher in women whose husbands did not work (Table 9).

Table 9: Comparison of the number of eggplant carving according to the working status of their husbands (t test)

Working status of husbands	Eggplant Carving Number (Mean)	Standard deviation	T –test (p value)
Working	2361,22	1164,265	2,064 (0,011)
Not working	3008,57	1093,507	

Source: Authors' estimations

CONCLUDING REMARKS

This study was conducted with women in Oguzeli town of Gaziantep in Turkey. It was prepared to determine the socio-demographic characteristics of women working in the production of dried eggplant and how much it contributed to the home economy, and to show which stages and how these stages work in the work of women's dried eggplant. According to the results of the survey, 85.7% of the female workers surveyed are married and 14.3% are single. While the working women do not have their own social security, the social security status of the family is determined as 83.7% social security and 16.7% non-social security. The average duration of agricultural activity is 6 years. When the educational level of working women is examined, it is determined that 40.5% primary school 25% secondary school 21.4% high school graduates. The average age of working women was found to be 35.46. Women work about 8 hours in dried eggplant production. Eggplant carving fee consists of (1000 pieces) 25 TL. Monthly average family income was 2333 TL and daily average 66 TL and seasonal 4585 TL. Dried eggplants can increase the price considering the women who are not satisfied with the eggplant business. In addition, as the production of drying is done in front of the door and in empty lands, hygiene rules cannot be provided enough. By setting up more comfortable private places for working women in which the conditions for health compliance will be provided, enterprises can be established where the social security opportunity of the women whose weather conditions will decrease will be established and the works can proceed in a more professional way. In addition, because it is not made in a specific place, it causes 85% environmental pollution. In order to correct this situation, cleaning workers assigned by the municipality after the working hours of women can make landscaping. Workers with long working hours had low back, wrist neck pain, insomnia and fatigue. According to the results of the study, it was determined that 55.8% of the husbands of women worked more because they did not work. These women's husbands can be provided with jobs, so that they will work at normal pace instead of doing this at a busy pace. In addition, scholarships can be provided to 7.1% of students who work to cover school expenses. The production of dried eggplants has been as important as the production of pistachios. The market is also sold as Oguzeli eggplant. However, there is no producer organization to meet the needs of the producer and the intermediate producer. A producer organization can be established to support producers and to assist them when there is a need to direct them to innovations.

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Functional Foods and Importance in Consumer Preference

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ABSTRACT

The term of functional food identifies foods that contribute positively to health. Functional foods; it is all about food, fortified, enriched foods and dietary supplements, and these foods have the potential to improve mental and physical condition and reduce disease risks. Functional foods are also used instead of healthy foods, medicinal foods, designer foods, special nutritional foods and pharmacological foods. The term functional food is a term that emphasizes the relationship between food and health. The results have shown that there are many positive effects on health. There are three basic requirements for a food to be considered functional. These; foods (capsules, tablets or non-dust) are derived from natural contents, consumed as part of daily nutrition, include regulating specific processes in humans that delay the aging process, prevent disease risk and improve the immune system. They should draw attention to the high growth rates, although there is a brief history of functional food products in the world and in Turkey compared with other food products. The desire for good nutrition, protection from diseases and the increase of the elderly population increase the demand for functional foods. In this article, functional foods and the factors that affect the functional food preference of consumers are examined.

Keywords: Functional Food, Consumer Preference, Nutrition.

INTRODUCTION

Functional food term defines foods that contribute positively to health. The term relates to all foods, from fortified, enriched, improved foods and dietary supplements. These foods have the potential to improve mental and physical condition and reduce disease risks (Arai et al., 2006). The definition of functional foods is still under development. There are three basic requirements for a food to be considered functional;

* Foods (not capsules, tablets or powders) should be obtained from components that are present in their natural state.

* Should be consumed as part of daily nutrition,

* It should include regulating specific processes that delay the aging process in humans, prevent disease risk and improve the immune system (Bagchi, 2006).

The term functional foods is born in Japan. In the early 1980s, systematic and large-scale programs and functional foods in the country were initiated by the Japanese government with the development and analysis of food functions. Studies on the potential benefits of foods have increased considerably. Thus, the increasing public health hazard was tried to be reduced and the concept of specific foods for specified health (FOSHU) was established in 1991. At present, more than 1271 products with the FOSHU logo have been introduced and this number is increasing day by day (Fern, 2007; Yılmaz, 2010). Researchers state that the fastest growing subsector in the food sector is the functional food sector, followed by natural products.

FUNCTIONAL FOODS

* It's food, it's definitely not medicine.

* It should take place within the normal diet cycle.

* It should have a positive effect on the target functions other than nutritional value / basic nutrition.

* Functional foods should have good health and health improvement and disease-reducing effects that improve the quality of life.

* Its effectiveness should be demonstrated by objective, reliable, scientific researches (Başer, 2002).

Functionality in foods for healthy nutrition can be achieved in three ways (Yılmaz, 2010). As follows;

1. Reduction of fat and energy value; in general, fat reduction is possible by reformulating. This is achieved by combining the preselected food raw material with an appropriate amount of water, oil (animal or vegetable depending on the new composition), spices and other ingredients (fat substitutes). These ingredients provide products with desired properties such as sensory and technological properties, nutritional value, safe consumability, usefulness and enrichment of the composition by technological methods. Reducing fat also helps to limit energy intake. Dietary fibers used in this sense are used to reduce the amount of fat and energy.

2. Reduction of salt; dietary sodium intake is associated with an increased risk of hypertension and cardiovascular disease. In order to reduce sodium, other components with similar sensory, technological and microbiological properties should be used instead of sodium chloride added to foods. The amount of salt may be limited depending on the type of food products. Many compounds, including chlorine salts other than NaCl, such as potassium and magnesium salts, are used for this purpose.

3. Reduction of chemical additives; there are two basic methods to reduce the possible health risks caused by chemical additives. The first is to reduce or not add to the use of these additives in food production, and the other is to turn to natural ingredients that will provide the properties of these additives. As an example, instead of adding nitrate and nitrite in the production of sausage, stinging nettle and celery flour were added and positive results were obtained.

WHY DEMAND FOR FUNCTIONAL FOODS IS GROWING?

* Aging population

* Increased health expenditures

* Individual activity in health protection and development, autonomy in health care

* In terms of educational status, it is seen that consumers with high educational and socioeconomic levels are mostly oriented towards functional foods.

* Increasing scientific studies suggesting that the diet reduces and improves the risk of developing the disease

* Change of eating habits (Menrad, 2003; Siro et al., 2008)

Despite the rapid increase in research and investments on functional foods, the fact that this concept is new and the lack of relevant regulations causes various problems in the introduction of functional food products in the world. In the leading countries such as the USA and the EU, studies are continuing rapidly and care is taken not to mislead the labeling. In Turkey, the production can be made within the scope of Turkish Food Codex regulations and approval by the Ministry of Agriculture and Forestry and studies are being conducted in parallel with the EU harmonization process.

Turkey, for the first time in 1997, Turkey has issued Regulation Codex Alimentarius. Communiqué on General Labeling of Foods and Labeling Rules on Nutrition was published on 22.08.2002. With these regulations, general labeling and nutrition labeling rules of the foodstuffs presented to the consumer and rules concerning the promotion and advertising of foodstuffs are regulated.

The National Food Codex Commission (UGKK) made decisions on increasing the focus on functional foods. With the decision taken, it re-determined the rules about making health declarations in foods and increased the health declarations from four to nine.The amendment was published in the Official Gazette dated 07.07.2006 and entered into force. The scope has expanded as the UGKK has increased food groups from four to nine and expanded the range of previous food groups. Food ingredients containing cholesterol, fat, saturated fat, sodium, sugar alcohol, calcium, probiotic bacteria, prebiotic, omega3 fatty acid, soy protein and

vegetable sterol / stanol were able to use health statements (Anonymous, 2006). Examples of functional foods are given in the table 1.

Table 1: Prominent types of functional food (Kotilainen et al., 2006; Siro et al., 2008)

Type of functional food	Definition	Example
Fortified product	A food fortified with additional nutrients	Fruit juices fortified with vitamin C
Enriched products	A food with added new nutrients or components not normally found in a particular food	Margarine with plant sterol ester, probiotics, prebiotics
Altered products	A food from which a deleterious component has been removed, reduced or replaced with another substance with beneficial effects	Fibers as fat releasers in meat or ice cream products
Enhanced commodities	A food in which one of the components has been naturally enhanced through special growing conditions, new feed composition, genetic manipulation, or otherwise	Eggs with increased omega-3 content achieved by altered chicken feed

The desire for a healthy and good life continues to grow in the food and beverage industry around the world. Naturally healthy food sales worldwide reached $ 253 billion in 2017; functional / fortified foods totaled $ 247 billion. In a study in the United States, approximately two-thirds of adults reported that health status had a significant impact on food and drink intake decisions last year (Sloan, 2018). $ 500 million of the functional food market in Turkey is estimated to be late. Consumers' interest in the protection of health through food is growing avalanche, and as a result, it is foreseen that the functional food market will increase day by day. Consumer acceptance of the concept of functional foods, and a better understanding of its determinants, are widely recognized as key success factors for market orientation, consumer-led product development, and successfully negotiating market opportunities (Ares and Gambaro, 2007; Weststrate, Van Poppel, &Verschuren, 2002). Acceptance failure rates from recent food cases have shown that consumer acceptance is often neglected or at least far from being understood (Verbeke, 2005).

Confidence in functional foods in terms of consumer choice is examined in three categories.

(1) Those who find functional foods reliable,

(2) Suspicious approaches to functional foods

(3) Not related to functional foods

Some consumers perceive functional foods as natural and quality (Krystallis et al., 2008). Some consumers perceive them as foods that are risky and should be avoided because they are less natural than traditional food alternatives (Chen, 2011). It is also stated that the success factors that play an important role in the marketing of foods such as taste, usability and diversity in consumer choice are valid in functional foods. Functional food products are not homogeneously scattered over all segments of the food and drink market and consumer health concerns and product preferences may vary between markets. These products have been mainly launched in the dairy, confectionery, soft-drinks, bakery and baby-food market (Kotilainen et al., 2006; Menrad, 2003; Siro et al., 2008).

According to the UK-based research report, the ratio of functional foods in the market is as follows:

Milk and milk products	38.1%
Bakery and wholes	22.7 %
Beverages	12.5 %
Meat, fat and oils	8.1 %
Fish and eggs	7.4 %
Soy bean and products	5.8 %
Others	5.7%.

The report says that among all functional products, milk and dairy products and bakery products dominate 60% of the global market, but if energy drinks and relaxing drinks are included in the calculation, this group will be the largest segment (Leather Head Food Research, 2013).

Factors affecting consumer choice;

* Functional foods should be delicious.

* The brand name must be directly linked to the functional advantage of the product without regard to the guarantee of flavor of the product.

* The education level of the consumer is very important.

* It is necessary to attract the attention of the consumer by giving much information about the product in the media and to arouse curiosity in the consumer to try the product.

* The area where the product competes should be explained with the benefit of health, not with the product category.

* First-hand statements of satisfied consumers are very important.

* Environments where consumers can try the product should be created.

* Advertising containing negative messages about the product must be avoided.

* Functional products should be offered in the market.

* Observe the common and useful aspects of specific product groups and use them during product marketing and advertising. (Urala and Lahteenmaki, 2004; Siro et al., 2008)

CONCLISION

The positive contribution of functional foods to health has been scientifically proven. Functional foods are likely to contribute to reaching a society of healthy individuals. The basic point to be considered here is that functional food products are to know that they will not create miracles. There is no doubt that there are great duties and responsibilities for both producers and inspectors for safer functional food consumption.

Depending on the development of the economy and the rapid life of business, food is not used to provide only the necessary nutrients. Foods are also expected to have additional functions to prevent diseases and to ensure the mental and well-being of consumers. These demands provide great opportunities for the food industry. One of the strategies to strengthen food with functional components is to increase micro-nutrience and limit or eliminate unwanted components. These strategies can be initiated by nutritional supplementation at the production level of food and reformulation of food.

With increasing scientific data, both the academic community and the food industry need to make more efforts to inform and educate consumers about the health benefits of functional foods. As a result, the bio-state of the functional substances added should be maintained during processing and commercial storage. Misleading advertising affecting consumer choice should be avoided. Functional foods are being reshaped with each passing day according to developing technology, scientific studies and consumer demands. Studies on this subject should be accelerated.

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Grafting Success of Sultan Hawthorn Cultivar Grafted on some Clonal Rootstocks

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ABSTRACT

Using clonal rootstock is very important for reducing the size and shortening juvenile period of trees. The study was conducted to investigate the different clonal rootstocks on the grafting success in Sultan hawthorn cultivar (*Crataegus azarolus* L.). Scions of Sultan cultivar were grafted on apple (M9, MM106, MM111), pear (FOX11, OHF87), quince (Quince A, BA29), pyracantha clonal rootstocks, and hawthorn seedling rootstock (control) with whip grafting method on May 21 in 2018. The grafting take and bud sprout percentages were observed. The results of the study showed that graft success of Sultan cultivar was affected by the rootstocks. The highest percentage of grafting take was recorded on FOX11 (87.50%) and MM111 (66.67%) rootstocks. In addition, the bud sprout percentage was highest in M9 rootstock (81.48%). The results showed that some apple, pear, quince and pyracantha clonal rootstocks were found to be hopeful as rootstock for the hawthorn. However, graft incompability of between the hawthorn and these rootstocks should be examined by histologically or other methods.

Keywords: Hawthorn, Clonal Rootstock, Grafting Success.

INTRODUCTION

Crataegus species form a well-defined genus known as hawthorns that belongs to the tribe *Crataegeae* and subfamily *Maloideae* of the *Rosaceae (*Evans and Campbell, 2002*)*. The genus is located in the subfamily *Maloideae* and it is closely related to the genera *Pyracantha*, *Mespilus* and *Hesperomeles*. In addition, phylogenetic analysis of the genus shows that it is close to the genus *Malus* and *Pyrus* (Hummer and Janick, 2009).

The fruit, leaves, and flowers of the hawthorn are traditionally employed in the treatment of heart problems due to their antispasmodic, cardiotonic, hypotensive, and antiatherosclerotic effects. The fruits are consumed as fresh as well as using in the conserve and sweets (Tassell et al., 2010; Caliskan, 2015).

Turkey is one of the genetic origin areas for *Crataegus*, but few studies have attempted to describe the *Crataegus* species in Turkey. Studies by Donmez have contributed information about new and existing *Crataegus* species (Donmez, 2007) and currently, more than 30 *Crataegus* species have been detected.

In Turkey, hawthorn plants are known by different names, including 'alıç', 'yemişen' and 'haziran', and generally they are used as traditional medicine, ornamental plant, marmalade, and vinegar. Recently, the plantation of hawthorn orchards has become favored due to the genotypes with large fruit size and sweet-sour fruit taste (Caliskan et al., 2016).

Propagation is a major limiting factor for the hawthorn growing. Vegetative propagation with cuttings is not a usefully method because of their rooting is very difficult. So far, seeds have been used for rootstock production in hawthorns, and grafting and budding methods are applied on the seed rootstocks. However, there is a few study for the grafting methods and times on the grafting success and plant development in hawthorn. Caliskan and Karaman (2018) showed that whip grafting method applied in March and April was very successful for sapling production in hawthorn, but growing of seedling rootstock for grafting continues about two or three years. Besides, due to its juvenility, the long time required for seedlings evaluation was also a factor that affected the studies until obtaining the fruiting (Janick and Moore, 1975). Therefore, clonal rootstocks can be used for early production, uniformity of growth and cropping in the scion (Webster, 1995). As a matter of fact, some important fruit species such as apple, pear, cherry, and quince rootstocks are widely clonal propagated. Specially, high density orchards with apple, pear and quince rootstocks can be establishment.

Grafting success among the fruit species is mainly dependent on genetic affinity. For example, in European cultures, pear trees are propagated mostly by grafting on quince trees that allow dense planting. However, it can be incompatibility among some scion-rootstock combinations such as Burlett/Quince C (Musacchi et al., 2000). Badenes et al. (2013) indicated that loquat cultivars grown on Quince and *Pyrachantha* rootstocks can be extreme dwarf. The growing of dwarf trees greatly reduces the labor of pruning, flower -and fruit -thinning, fruit bagging, and harvest (Costes and Garcia-Villanueva, 2007).

The aim of the study was to investigate the grafting success in Sultan hawthorn cultivar on the different clonal rootstocks. Thus, some clonal rootstocks that can be easily reproduced and high density planted will be identified for hawthorn cultivation.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

The study was conducted in research area of the Department of Horticulture, Faculty of Agriculture, University of Hatay Mustafa Kemal. Sultan hawthorn cultivar was used as a scion. The cultivar has a large fruit size (15.03 g), TSS (15%) and titratable acidity (1.4%), and fruit skin color is green-yellow (Caliskan et al., 2018).

The scions were taken from main plants in January and they were stored at 4°C in a refrigerator until grafting time.

In the study, *Crataegus azarolus* L. seedling was used as rootstock. The scions of Sultan cultivar were grafted on apple (M9, MM106, MM111), pear (FOX11, OHF87), quince (Quince A, BA29), *Pyracantha* clonal rootstocks, and seedling rootstock (control) with whip grafting on May 21 in 2018.

Cultural applications such as removal of suckers below graft point, weeding, irrigation and fertilization were fulfilled at regular intervals. The grafting take and bud sprout ratio (%) were investigated.

The bud sprout percentage was observed within 30 days following grafting. The shoot length was measured by meter from the graft point and the shoot diameter was evaluated by digital caliper at a height 5 cm above the graft point.

Data were analyzed using SAS software (SAS, 2005). Variance analysis was formed with Tukey's Honestly Significant Difference (HSD) method at $p<0.05$. A completely randomized design was constructed with three replications. Each replication included 10 plants. The data expressed as percentage were transformed using the to the arc-sin$\sqrt{x}$ transformation.

Results

The values of grafting success of Sultan hawthorn cultivars on clonal rootstocks were shown in Table 1. The data displayed that grafting success of Sultan cultivar was statistically significant ($p<0.05$) depending on rootstocks.

The highest grafting take ratio was found in FOX11 (87.50%) whereas the lowest grafting take ratio was observed in M9 and MM106 rootstocks (14.81% and 17.39%, respectively).

Bud sprout ratios ranged from 35.71% to 81.48%. Bud sprout ratio was highest in M9 rootstock while it was lowest in BA29 rootstock (Table 1).

Table 1: Values of grafting success on clonal rootstocks of Sultan hawthorn cultivars

Rootstock	Grafting take ratio (%)	Bud sprout ratio (%)
Seedling	27.27 d	54.55 c
M9	14.81 e	81.48 a
MM106	17.39 e	73.91 b
MM111	66.67 b	12.50 f
FOX11	87.50 a	8.33 f
OHF87	29.63 d	44.44 d
Quince A	44.44 c	40.74 de
BA29	39.29 c	35.71 e
Pyracantha	47.62 c	38.10 de
HSD (5%)	8.68	7.50

The sapling characteristics of Sultan hawthorn cultivars on clonal rootstocks were presented in Table 2. Clonal rootstocks had significant effect ($p < 0.05$) on the mean graft shoot length and diameter values. No data was obtained on the MM111 rootstock. The longest graft shoot length was detected in Quince A (186.85 mm) whereas it was the lowest in M9 and *Pyracantha* rootstocks (86.84 mm and 93.42 mm, respectively).

Mean graft shoot diameter of Sultan cultivar was highest in Pyracantha rootstock (12.17 mm). The lowest mean graft shoot diameter was measured in M9, MM106, FOX11 and OHF87 rootstocks (7.29 mm, 7.34 mm, 7.78 mm and 7.79 mm, respectively). The sapling length of Sultan cultivar was longest in Quince A (431.67 mm) whereas it was lowest in FOX11, M9 and MM106 rootstocks (220.00 mm, 227.78 mm, 252.62 mm and, respectively). The number of suckers per sapling was highest in seedling (2.00) and *Pyracantha* (2.25) rootstocks. The number of lateral shoot per sapling was not statistically significant basing on rootstocks.

Table 2: Sapling characteristics of Sultan hawthorn on clonal rootstocks

Rootstock	Shoot length (mm)	Shoot width (mm)	Sapling length (mm)	Number of suckers per sapling	Number of lateral shoot per sapling
Seedling	109.24 bc	8.84 bc	227.78 d	2.00 a	0.00
M9	86.84 c	7.29 c	252.62 d	1.77 ab	0.15
MM106	143.05 b	7.34 c	292.00 bc	0.30 c	0.20
MM111	--	--	--	--	--
FOX11	113.92 bc	7.78 c	220.00 d	0.50 c	0.00
OHF87	104.48 bc	7.79 c	262.14 cd	0.14 c	0.29
Quince A	186.85 a	9.08 bc	431.67 a	0.50 c	0.00
BA29	114.04 bc	8.99 bc	270.00 cd	0.00 c	0.50
Pyracantha	93.42 c	12.17 a	307.50 b	2.25 a	0.00
HSD (5%)	39.43	2.19	30.75	1.07	NS

NS: not significant

CONCLUDING REMARKS

The mostly of rootstocks for a lot of temperate, subtropical and nut fruit species, including peach-nectarines, apricots, citrus and pistachio are propagated by seed. However, graft compatibility, growth and cropping of scions raised on seedling rootstocks are often extremely variable. Plants on a few of the seedling rootstocks would have been smaller in stature or shown other differences in habit, flowering and fruiting. Many clonal rootstocks have been successfully rooted using cutting or plant tissue techniques and any value to the early fruit tree propagator the selected clonal rootstocks must themselves have been easy to propagate. Currently, hawthorns are mainly propagated by seed due to it cannot enough rooting via cuttings. However, clonal rootstocks in some fruit species such as apple, pear and quince can be used as rootstock for high density planting. The results showed that pear rootstock OHF87, quince rootstocks Quince A and BA29 and *Pyracantha* were found to be hopeful as rootstock for the hawthorn. However, graft incompatibility of between the hawthorn and these rootstocks should be examined by histologically or morphological observations.

ACKNOWLEDGMENTS

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Comparison of Yield, Quality and Nutrient Contents of Hybrid and Standard Tobacco Varieties

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ABSTRACT

This study was carried out to compare the yield, yield parameters, mineral element concentrations, nicotine and sugar content between hybrid tobacco (Xanthi/2AxKaterini, NailxKaterini, KaterinixErbaa, CanikxErbaa) and standard tobacco (Xanthi-2A, Nail, Katerini, Canik, Erbaa) varieties. Tobacco plants were grown under controlled conditions, required macro (N, P and K) and micro (Fe and Zn) nutrients were applied. The experiment was laid out in split plot design with four replications. All matured tobacco leaves were harvested in three priming's and cured at sun. The leaf yield, leaf width, leaf length, number of leaves, N, P, K, Zn concentration, nicotine and sugar content of leaf samples were determined. According to the results obtained, leaf width, leaf length, number of leaves and leaf yield were higher in hybrid tobacco than standard tobacco varieties. While the average leaf yield of standard tobacco were 5.17 g plant^{-1}, hybrid tobacco yield were 5.78 g plant^{-1}. In terms of N, P and K concentrations of leaves, standard tobacco had higher values than hybrid tobacco. The reason for this difference can be explained by the decrease in mineral element concentrations that fall on the unit area due to the increase in width and height in hybrid tobacco leaves. While the average nicotine concentration of standard tobacco was 0.49%, hybrid tobacco appeared to have lower nicotine (0.39 %). Unlike nicotine, the average sugar concentration of standard tobacco (7.10%) was lower than that of hybrids (8.37%). As a result, it was found that hybrid tobacco was better than standard varieties in terms of quality parameters and yield.

Keywords: Tobacco, Hybrid, Quality, Nicotine, Yield.

INTRODUCTION

Tobacco is an annual crop originating in South America. The global market value of tobacco which differs from other agricultural products in production, use, domestic and foreign trade, is approximately 600-650 billion dollars (Anonymous, 2013a; Anonymous, 2013b; Anonymous, 2013c; Anonymous, 2013d). Tobacco has a total of 67 known varieties (Bürün and Emiroğlu, 1988), among them *Nicotiana (N.) tabacum, N. rustica* and *N. alata* are the widely cultivated species. The leaves of *N. tabacum* and *N. rustica* are used in the production of tobacco products such as cigarettes, cigars, pipes and so on, and leaves of *N. alata* is used in the production of hubble-bubble. Today, about 90% of the cultivated varieties belong to *N. tabacum* variety.

Yields of hybrid varieties are generally higher than non-hybrid varieties due to the heterosis phenomenon (hybrid crossbreeding or hybrid power). Heterosis usually causes growth in vegetative organs and an increase in the number of generative organs. In addition to the yield, heterosis may also be related to the earliness, adaptation to environmental conditions, resistance to diseases and pests and quality characteristics. Hybrid varieties can yield relatively better results under highly unfavorable conditions as in favorable conditions (Philouze, 1976).

In this study, the nutrient contents and the amount of synthesized matters in hybrid and standard tobacco varieties were compared, and the differences between the two groups were revealed. The results of the study showed that the leaf width and length of the hybrids and therefore the leaf yield were higher than the standard varieties. The nutrient contents of the hybrids were lower than that of the parents, and the results were attributed to the larger leaf area of hybrid plants compared to the standard varieties. The amount of nutrients taken per unit area decreased as the leaf area increased. The results of lower nicotine and higher sugar contents of hybrid lines compared to that of the parents are favorable for tobacco leaf quality.

LITERATURE REVIEW

In Croatia, performances of 6 F1 hybrids from four parents of Burley tobacco (TN 86, Saturn, Bs 32 and Bols 100) were investigated. Butorac et al. (2000) found significant differences between parents and hybrids and the best combination was obtained from TN 86 and Bs 32. In another study, Butorac et al. (2004) conducted a half-diallel hybridization in 4 Burley tobacco varieties (Saturn, TN 86, Bs 92 and Bols 100). The results indicated that Saturn had dominant alleles in leaf width, TN 86 in flowering days, Bs 92 in leaf length and yield, and Bols 100 in leaf number. In the same study, the highest yield (338 kg da^{-1}) was obtained from Saturn x TN 86, plant height (189 cm) from Bs 92 x Blos 100, leaf length (69.5 cm) from TN 86 x Bs 92 and leaf width (41 cm) from Bs 92 x Blos 100 hybrids. The authors also reported no significant changes in the leaf numbers of the parents and hybrids.

Gixhari and Sulovari (2010b) investigated some characteristics of the lines obtained by half diallel hybridization of eight different types of oriental tobacco (R2, Roskovec, Samsun-Bafra and Canik, Basma-Xanthi and Katerini, Nevrokop, Perustitza). The increase in leaf yield was reported between 2.8 and 4.7%. Aleksoski and Aleksoska (2011) determined the heredity

level and mode of total green and dry matter yield per plant of four tobacco varieties (Burley - B2/93, Suchum - S1, Suchum - S2 and Prilep - P-84) and six F1 tobacco hybrids. The results showed that S1 x S2 hybrids had positive heterosis in both green and dry matter yields, S1 x P-82 hybrid had positive heterosis in dry matter yield, S1 x P84 and S2 x P-84 hybrids had negative heterosis in green matter yield.

Dyulgerski and Dimanow (2012) examined the width and height of 7-8th and 13-14th leaves of Burley tobacco plant at the F1 level. The researchers conducted ten cross-fertilizations and the heterosis effect was found to be more important for the width of leaves compared to the length of leaves. In addition, heterosis was reported to be more pronounced in the lower hands than in the upper hands.

Korubin-Aleksoska et al. (2010) examined the changes in leaf length, leaf width and leaf area in the middle hands of F1 and F2 progeny of four oriental and semi-oriental tobacco varieties (Oriental Prilep P12-2/1, Pobeda P-2 and Collar YV 125/3 and semi-oriental Forchheimer Ogrodowny - FO). The results showed that, in both generations, P12-2/1 was dominant in leaf size and recessive genes were effective in P-2.

Yil et al. (2005) developed a male infertile Burley tobacco variety (Eyan 4) and the new variety was tested in many locations. The new variety was superior to control variety (Eyan 1) in the mean yield of 2.9%, the value of 5.8% and the price of 2.54%. In another study, an infertile male Burley tobacco variety (Eyan 6) was developed. The results revealed that Eyan 6 had higher quality than Eyan 1 and was more resistant to diseases (Guo-ping et al., 2008).

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

Five tobacco genotype (Parent-1 (Xanthi/2A), parent-2 (Nail line), parent-3 (Katerini), parent-4 (Canik-Malmawater) and parent-5 (Erbaa)) as the parents and 4 hybrid lines (hybrid-1 (Xanthi/2A x Katerini), hybrid-2 (NailxKaterini), hybrid-3 (KaterinixErbaa), hybrid-4 (CanikxErbaa)) which stand out from F1 hybrids obtained by half diallel hybridization (non-reciprocal hybridization) of 5 lines were used in the study. The experiment was laid out according to a randomized plot design with 4 replications. Experimental soil was in sandy-loam texture, low in organic matter (0.89%) content, alkaline character (pH 8.01) and very calcareous (11.8%). In the establishment of the experiment, basic fertilizer containing 250 mg kg^{-1} N (as $Ca(NO_3)2.4H_2O$), 100 mg kg^{-1} P (as KH_2PO4), 50 mg kg^{-1} S (as $CaSO_4.2H_2O$), 2.0 mg kg^{-1} Fe (as Fe-EDTA) and 2.0 mg kg^{-1} Zn (as $ZnSO_4.7H_2O$) was applied to all pots as a solution and mixed with the soils.

The greenhouse experiment continued for 95 days. Harvesting of matured tobacco leaves was completed in three hands. Leaves were air dried at sun and ground with an agate mill for subsequent analysis. A microwave was used to digest the leaf samples of tobacco varieties by using a mixture of 7 ml 35% H_2O_2 - 65% HNO_3 (2:5, v/v). After the completion of digestion, nitrogen (N), potassium (K), phosphorus (P), magnesium (Mg) and sulfur (S)

concentrations were determined by using an inductively coupled plasma optical emission spectrophotometry (ICP-OES; Varian Vista) (Jones et al., 1991).

Nicotine content of tobacco leaves was quantified by HPLC analysis using an Agilent technology 1260 series HPLC system (Agilent Technologies, Boeblingen, Germany) with a diode array detector. A reversed-phase ACE C18 column (Agilent Technologies) of 250 x 4.6 mm dimensions and 5 μm particle size was used in separation of the contents. Mobile phase of the system contained acetic acid in water (solvent A, 1%) and acetonitrile (solvent B). Alkaloid contents were detected using a UV at 324 nm and nicotine content of samples was determined using an authentic standard (Moghbel et al., 2015; Kinay, 2018). The contents of reducing sugars were analyzed considering Agilent Hi-Plex Columns for Carbohydrate, Alcohols and Acids application note using the Zorbax Carbohydrate column (4.6 x 250 mm and 5 μm particle size) (Kinay, 2018).

The data on leaf characteristics, plant nutrients, nicotine and reducing sugar contents were evaluated using analysis of variances (ANOVA) according to the experimental lay out of the experiment. The results were grouped according to the Duncan multiple comparison test (Wang et al., 2013). SPSS 21 statistical software was used in statistical computations.

Results

Leaf width, leaf length, number of leaves and leaf yield, nicotine and reducing sugar contents of tobacco parents and hybrids were presented in Table 1. The differences in leaf width between parent and hybrid tobacco were statistically insignificant. However, the mean leaf width of the hybrid tobacco (8.95 cm) was wider than that of the parents (8.4 cm). The leaf length of hybrid tobacco (15.8 cm) was higher than that of the parents (15.0 cm), though the difference was statistically insignificant. However, the leaf length difference was statistically significant in parent and hybrid tobacco varieties. For example, Hybrid-3 had a leaf length of 16.5 cm, while Hybrid-1 had a leaf length of 15.0 cm. The highest numbers of leaves were found in Canik cultivars, while the mean number of leaves in the hybrids was higher than that of the parents and the difference was statistically significant.

Leaf yield values of tobacco are important since the part of the tobacco plant used is the leaves. The most important characteristic affecting the yield is the genotype. The characteristics of leaf number, leaf width and leaf length cause yield differences between genotypes (Kinay, 2014). Leaf yields of hybrid tobacco varieties were significantly higher than that of the parents. The mean leaf yield of the parents was 30.3 g plant^{-1} while the mean leaf yield of the hybrids was 32.2 g plant^{-1} (Table 1). Leaf yield between the parents and the hybrids was statistically significant. The yield of parent-4 was 41.2 g plant^{-1}, while hybrid-4 yielded 38.0 g plant^{-1}.

Table 1: Leaf width, leaf length, leaf number, leaf yield, nicotine and reducing sugar contents of parent and hybrid tobacco

Genotypes	Leaf width (cm)	Leaf length (cm)*	Number of leaves**	Yield** (g/plant)	Nicotine (%)	Reducing sugar (%)
Parent-1	8.20	15.3^{ab}	24.0^{f}	5.00^{de}	0.68^{a}	7.26^{ab}
Parent-2	8.50	15.1^{ab}	24.5^{f}	3.87^{f}	0.46^{b}	9.04^{a}
Parent-3	8.90	13.8^{b}	28.0^{e}	5.30^{cd}	0.59^{a}	7.49^{ab}
Parent-4	8.40	16.5^{a}	41.2^{a}	6.90^{a}	0.39^{bc}	5.51^{c}
Parent-5	8.00	14.2^{b}	34.0^{c}	4.80^{e}	0.33^{bc}	6.19^{bc}
Hybrid-1	8.70	15.0^{ab}	32.2^{cd}	6.60^{a}	0.46^{b}	8.81^{a}
Hybrid-2	9.30	15.5^{ab}	28.0^{e}	5.77^{b}	0.41^{bc}	8.19^{a}
Hybrid-3	9.50	16.5^{a}	30.5^{d}	5.67^{bc}	0.39^{bc}	9.16^{a}
Hybrid-4	8.30	16.1^{ab}	38.0^{b}	5.07^{de}	0.30^{c}	7.32^{ab}
Parents average	**8.40**	**15.0^{ns}**	**30.3^{B}**	**5.17^{B}**	**0.49^{A}**	**7.10^{B}**
Hybrids average	**8.95**	**15.8^{ns}**	**32.2^{A}**	**5.78^{A}**	**0.39^{B}**	**8.37^{A}**

*$p<0.05$, **$p<0.01$, ns: non significant

Nicotine is an alkaloid that creates addiction in humans. The main source of nicotine is the tobacco, though can be found in small quantities in some other plants (Dominiak et al., 1984). Quality classification of tobacco can be made according to nicotine and sugar ratios. Tobacco with low nicotine and high reducing sugar contents is considered to be of higher quality (Kinay, 2018). The nicotine concentration of hybrids was lower than the parents. Mean nicotine concentration in hybrid tobacco was 0.39%, while the mean nicotine was 0.49% in parents.

The lowest nicotine concentration among the hybrids was obtained in hybrid-4 (0.30%) and the highest nicotine was in hybrid-1 (0.46%) while the lowest nicotine in parents was found in parent-5 (0.33%) and the highest nicotine concentration was in parent-1 (0.68%). Although the mean nicotine concentrations of hybrid tobacco were lower, their reducing sugar concentrations were higher compared to the parents. The mean reducing sugar concentration of hybrid tobacco was 8.37%, while it was 7.10% in parents. The highest reducing sugar ratio among the hybrids was obtained in hybrid-3 (9.16%), while the lowest ratio was observed in hybrid-4 (7.32%) (Table 1).

Leaf N, P, K, Mg and S concentrations of parent and hybrid tobacco lines were given in Table 2. The concentrations of N, P, K, Mg and S in hybrid tobacco lines were generally lower than the parents. The mean N concentration of the parent tobacco was 1.71%, which was 1.69% in the hybrids Similarly the mean P concentration in the parents was 0.26%, while it was 0.25% in the hybrids.

Table 2: Nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg) and sulfur (S) concentrations of parent and hybrid tobacco leaves

Genotypes	N* (%)	P* (%)	K* (%)	Mg* (%)	S** (%)
Parent-1	1.47^c	0.26^a	2.42^{bc}	0.71^a	0.11^c
Parent-2	1.58^{bc}	0.27^a	2.65^a	0.65^{ab}	0.11^c
Parent-3	1.94^{ab}	0.26^a	2.33^{bc}	0.61^{bc}	0.12^c
Parent-4	1.49^c	0.27^a	2.54^{ab}	0.66^{ab}	0.18^a
Parent-5	2.08^a	0.26^a	2.69^a	0.71^a	0.12^c
Hybrid-1	1.54^c	0.24^b	2.53^{ab}	0.58^{bc}	0.14^b
Hybrid-2	1.70^{abc}	0.27^a	2.64^a	0.64^{ab}	0.12^c
Hybrid-3	1.97^a	0.25^{ab}	2.37^{bc}	0.61^{bc}	0.11^c
Hybrid-4	1.55^c	0.24^b	2.31^c	0.54^c	0.12^c
Parents average	1.71^{ns}	0.26^A	2.53^{ns}	0.67^A	0.13^A
Hybrids average	1.69^{ns}	0.25^B	2.46^{ns}	0.59^B	0.12^B

*$p<0.05$, **$p<0.01$, ns: non significant

The N, P, K, Mg and S contents of hybrid tobacco cultivars were lower than those of the parents. Low amount of nutrient content per unit area can be attributed to the high leaf area of the hybrids.

CONCLUDING REMARKS

Tobacco is an important model plant in the application of plant breeding methods. The leaves of tobacco plant are used in the industry; therefore, the yield and quality values of leaves are important in the assessment of a tobacco variety. The results indicated that hybrid tobacco is better than the parents in terms of yield-yield parameters and quality characteristics (nicotine, reducing sugar). In addition, significant variation was observed in yield and yield parameters within the parents and the hybrids, used in the study. The results revealed the importance of research need on the efficacy of hybrid and standard varieties in nutrient uptake from soil.

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Importance and Effectiveness of Professional Organization in terms of Rural Development

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ABSTRACT

Today, when the world economy is becoming more effective on countries, the measures that countries can take to protect their economies and producers are gaining importance. In particular, the organization of producers is economically meaningful. Today, the farmers' organization in any part of the world is looking for a variety of ways to sell the product and enter those markets. For this reason, in order to protect our own producers and to have a say in the products we produce in the world, professional organizations are becoming organizations producing important policies. In particular, the development of political mechanisms for the development of agricultural policies and the development of political mechanisms in order to achieve the development of rural policies is necessary for our producers to come to the place they deserve in the world. Therefore, this study will discuss what can be done to increase the effectiveness of professional organizations in rural development.

Keywords: Rural Development, Organization, Agricultural Chambers, Farmers.

INTRODUCTION

As in developing countries, rural area and rural population are important factors affecting the development of the country. A large part of the rural population lives on income from agricultural production. Due to the problems arising from the peculiarities of agricultural production and the small size of the enterprises in agricultural production, the desired production and income increase in agriculture could not be achieved. In order to increase production, income and welfare in agriculture, it is very important that the producers are organized effectively (Eraktan, 2001).

In general, organization can be defined as bringing together individuals and institutions to act together, to express their problems, to produce and to perform related services. (Rehber, 1993). Organization is the gathering of individuals with similar problems to solve their problems (Talim et al., 2000). One of the most important ways to increase agricultural production, to obtain high quality products and to increase the living level of those engaged in agriculture is to organize the producers effectively. When the developed countries are examined, it is seen that agriculture has developed and industrialized and producers have been organized. Because it is possible to form agricultural policies, to determine the conditions of application and thus to influence political mechanisms, to be effective in the market, to realize the development of rural areas by increasing productivity by using modern production methods, but only with the organizational power, that is, with organized producers.

The organization model in agriculture is in the form of economic organization, policy-making organization and organization of voluntary organizations. Cooperatives are the economic arm of the farmer. Producer Unions are the policy, steering and lobbying arm. The Chambers of Agriculture is the professional branch that forms a bridge between the government and the farmer (Öner, 1992).

7.7% of the population in our country lives in towns and villages. This population has socio-economic opportunities below the national average. Nearly 90% of the agricultural holdings of the population engaged in agriculture are small agricultural holdings. Since these enterprises are economically inadequate, they often surrender to market conditions. The organization that comes to the fore is an inevitable necessity. Rural and agricultural development can be achieved through solidarity and organization rather than individual activities.

Chambers of agriculture is the most common and completed the nationwide organization of professional associations in Turkey. In this study, information will be given about producer organization and structure of agriculture chambers in European Union and Turkey.

AGRICULTURAL ORGANIZATION IN THE EUROPEAN UNION

Each EU member country has its own agricultural organization structure. Within the EU countries, the types of organizations that are appropriate to their conditions and the organizations of higher organizations that have formed with the participation of them have

various functions. COGECA (General Committee for Agricultural Cooperation in the European Union), which is structured with the participation of the existing cooperatives in the member countries, is an organization that combines the agricultural cooperatives in the EU under a single umbrella.

COGECA presents and discusses its specific issues in the lobbying environment of the European Commission, the Council of Ministers, the European Parliament, the Economic and Social Committee and the Regional Committee (www.cogeca.be-15.04.2019). COGECA is involved in the development and preparation of community policies on cooperatives and agriculture. COGECA is engaged in the development of relations between cooperatives, maintains statistics on cooperatives, conducts studies on cooperatives (taxation, cooperative law, cooperative training) and organizes symposia (Yercan, 2007).

Another farmer organization within the EU is COPA (Committee of Professional Agricultural Organizations). These include Chambers of Agriculture, Trade Unions, Farmers' Associations and some cooperatives. COPA is the developer and advocate of the multi-functional and sustainable European agricultural model. COPA is represented in the European Commission. COPA Agricultural Policy is highly effective in determining market orders and annual product prices (www.cogeca.be). Finding solutions to the problems of the agricultural sector has been identified as three main fields of study: coordinating agriculture, determining policies and representing all sectors together.

Figure: 1: Agricultural Organization in the European Union
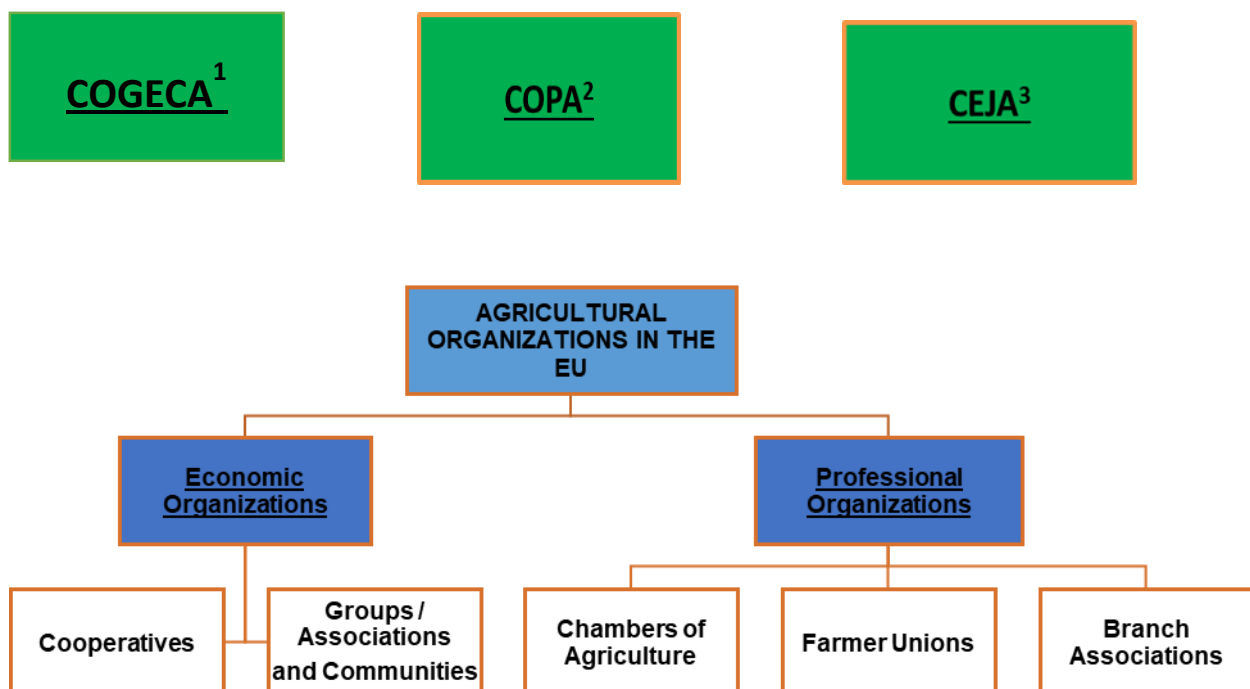
While the regional problems and demands of countries and countries are different, COPA acts as a lobbying institution in the preparation of Commission proposals that form the basis for decisions on agriculture, which means common interest for farmers. COPA seeks to defend the common interests of the masses of farmers with very different problems (Eraktan, 2003).

CEJA (The European Council of Young Farmers) is the top organization of young farmers within the EU. CEJA regularly participates in 24 agricultural committees of the European Commission. CEJA represents all young farmers and young people interested in agriculture as a whole, regardless of any political opinion. CEJA is in constant communication with EU institutions, decision makers and organizations on agricultural issues (Öner, 1992; İnan, 2004). Acting as a forum for communication and dialogue between young farmers and European decision makers, CEJA's main objective is to promote a younger and innovative agricultural sector across the EU 28 and to create good working and living conditions for young people setting up in farming and those who are already "Young Farmers".(www.ceja.org). EFA (European Federation of Agricultural Workers Union) is the top organization of trade unions in the agricultural sector. This federation aims to solve the problems of agricultural workers at EU level (Varol, 2005). Apart from these, it is seen that organizations are developing to include almost all of Europe.

The most important of these is the European Confederation of Agriculture. CEA (European Confederation of Agriculture) is an organization that covers all agricultural organizations in Europe. It includes more than 200 agricultural organizations from 30 countries. These include organizations such as farmers' unions and cooperatives. It aims to ensure the relationship and exchange among its members. It aims to represent and protect the interests of European agriculture, particularly economic, social and cultural issues, as a non-EU institution. (www.dardni.gov.uk/pr2000/pr000487.htm-12.05.2019).

CHAMBER OF AGRICULTURE IN THE EUROPEAN UNION

It is an organizational model in which the administration of research, education and farmer consultancy services are provided in the administration of a democratic rule which is based on the mandatory membership of the farmers and includes the distribution of EU aid in some places with different functions according to the countries.

As a productive professional organization, the chambers of agriculture have been established in many countries in a structure that differs according to the social and economic needs of each country and various functions have been installed. In the EU member states, chambers of agriculture are primarily civilian public institutions that advise governments on the protection and promotion of professional interests (Bartsch, 1975).

In the European Union countries, all producers are registered in the chambers and the state supports them by paying attention to the work of the chambers. Chambers of Agriculture play an effective role in agricultural policies in the EU. Governments prioritize the views of the

Chambers of Agriculture. The state transfers some of its services in agriculture to the chambers and provides financial support in this regard. The main task of the Chambers of Agriculture is the training of farmers in the agricultural sector, extension, senior consulting, research and supervision services. In cases where farmers cannot be organized as agriculture chambers, the Ministries of Agriculture assume these duties (Anonymous, 2003).

In Germany and France, there is a Chamber of Agriculture in each state or territory. In each village or town, there is a representative office of the Chamber of Agriculture. The delegates elected through the representations form the board of directors in the Regional Chambers of Agriculture. Regional chambers of agriculture also form the Central Union of Chambers of Agriculture through their delegates. In other countries, this structure manifests itself in different ways (Özkan, 1999). On average, 40% of the financing of the Chambers of Agriculture is provided by the state and the rest by farmers. The chambers of agriculture work together with cooperatives and farmers' unions in these countries to perform their technical services. Although farmers are generally active in the management of the Chambers of Agriculture, government officials also work in some countries.

In the Netherlands, the Chambers of Agriculture play an active role in producer training and implement the consultancy system in agriculture. The Chambers of Agriculture in the Netherlands are supported by the state in carrying out these activities. Agriculture chambers in Europe do most of the duties of the Ministry of Agriculture and Forestry in our country. While the Chambers of Agriculture were established in our country, the French Chambers of Agriculture were taken as a model. Today, the Chambers of Agriculture in France are responsible for keeping both the producer records and the real estate records of the agricultural land. The Chambers of Agriculture have undertaken extension services for producers. The Chambers of Agriculture of France are professional institutions with elected representatives. The Chambers of Agriculture of France, which gained a public structure with the law made in 1924, offers two types of services: public consultation and guidance. It has a say in the determination of agricultural, rural and food-oriented policies, drafting of laws and regulations and issues related to international European problems (Köroğlu, 2003).

ORGANIZATION IN TURKISH AGRICULTURE

One of the most important ways to increase agricultural production, to obtain quality products and to increase the level of life of those engaged in agriculture is to organize the producers effectively. Approximately 1/3 of the population in our country lives in both rural areas and is engaged in agriculture. This population has socio-economic opportunities below the national average. Nearly 90% of the agricultural holdings of the population engaged in agriculture are small agricultural holdings. A large number of small, dispersed and fragmented agricultural structure; technology makes it difficult to use input and labor efficiently (Özdemir, 2016). At the same time, the product pricing of small prices hampers the leading candidate and has to market at low prices in some places that cannot resist the market conditions. As a result of this, organization becomes an inevitable necessity.

The organization of the agricultural sector in Turkey, cooperatives, agricultural chambers, associations, public institutions providing services to the agricultural foundations and associations constitute basic structure. However, these formations are not sufficient in terms of their structure and function to meet the requirements of our agricultural sector.

It is possible to summarize the current agricultural organization structure in our country as follows:

Figure 2: Economic, Professional and Social Classification of Agricultural Organizations.

AGRICULTURAL ORGANIZATIONS		
ECONOMIC ORGANIZATIONS -Cooperatives and Senior Organizations	**PROFESSIONAL ORGANIZATIONS** -Chambers of Agriculture - Chamber of Agricultural Engineers	**SOCIAL ORGANIZATIONS** -Production Unions - Breeding Associations - Local Administration Unions (Village Service Unions, Irrigation Unions) -The Associations - Foundations -Turkish Cooperatives Institution

The most important part of this structure consists of cooperatives and chambers of agriculture.

CHAMBERS OF AGRICULTURE IN TURKEY

Turkey Chambers of Agriculture, defending the professional rights and interests of the producer is the largest professional organization. Their top organizations in Ankara, Turkey, which is the Union of Chambers of Agriculture. Chambers of Agriculture is the most common and completed the nationwide organization of professional associations in Turkey (Erdoğan, 2000).

The Chambers of Agriculture were first established in 1881 by a statute. In the period 1881-1897, the number of Chambers of Agriculture increased to 99, but the Chambers of Agriculture, which generally served as an advisory board, did not provide sufficient services at that time. It was prepared at the district level of the Chambers of Agriculture with a regulation issued in 1912. However, since the financial chambers of Agriculture could not be provided with sufficient funds, the chambers were still not very successful in fulfilling the duties expected from them. However, enacted in 1957 and implemented in 1963, "the Chambers of Agriculture and Turkey Union of Chambers of Agriculture" there are laws. Some articles of Law No. 6964 were first amended by Law No. 5184, which was enacted in 1971 and lastly in 2004. Chambers of Agriculture are the most important producer organizations established to meet the needs of members, to facilitate their professional activities, to protect their rights, to

follow and solve their problems, to ensure honesty and trust in the relations of farmers and the public (Özdemir 2016).

Their duties are: keeping farmer logs, supplying and distributing inputs to registered members, registering and registering harvesters, organizing agricultural courses, holding agricultural meetings. Turkey Chambers of Agriculture Union (TZOB) The task: make the necessary studies to be carried out in accordance with the general interests of agricultural policy, to announce to the public and government views about agriculture, protect the farmers' rights and interests. For this purpose, to prepare a report by using the opinions of farmers about the policies implemented (Anonymous, 2003). Thus, it is aimed to increase the contribution of the agricultural sector to the national economy and to improve the economic and social aspects of the farmers. It can be summarized as preparing new legislative proposals related to agriculture and conveying their opinions on these and representing farmers in national and international platforms.

Today, the number of Chambers of Agriculture has increased to 765 and has 5 million members. However, when compared with the EU, although it is such a widespread organization that represents a large number of producers, it cannot fulfill the duties and effectiveness expected from them.

CONCLISION

The small and inefficient land of our country and the ineffectiveness of the small and medium-sized enterprises due to the problems of unorganization in marketing reduces the contribution of the agricultural sector to the development. Efforts should be made to develop awareness of the need to solve organizational problems by social behavior rather than individual.

Necessary organizations should be made in order to make Turkish agriculture productive, sustainable, environmentally friendly, and competitive in international markets and equipped in an organizational sense. Although a sufficient number of producer organizations in the agricultural sector in Turkey, the lack of information that the manufacturer level, distrust of producers 'organizations, the inability to find solutions to the problems of producers' organizations, agricultural inputs, they cannot be active in areas such as product marketing and not achieve the desired success due to the failure of the organization administrator. In order to solve these problems, training activities should be conducted for producers in rural areas and producers' awareness about organization should be increased.

In order for the agricultural organizations to carry out healthy and appropriate studies on the issues falling within their field of duty, appropriate, long-term and consistent policies should be determined by the state and necessary legislative arrangements should be made. The state should support the organization of farmers and take additional measures to ensure that the existing ones can survive. In the organizational training activities for rural areas; short, medium and long term requirements should be determined and put into practice.

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Electricity Energy Saving Optimization at WWTP Aeration Tank Using Online Sampling and Cod Analysis Technique

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ABSTRACT

In this study, the equipment which increase the cost of operating wastewater treatment plant (WWTP) and the electricity consumption values of these equipment are examined. In general, more than 50% of the electrical energy consumed in the WWTP was observed to be caused by aeration tank. In this study, input parameters (CDD, Nitrate, Ammonia, pH, Colour, Conductive and Flow rate) used for WWTP operation were followed up for one year. After the analysis, it was determined that there was a direct connection between the energy consumption and the output parameter COD removal. In view of this analysis, an electrical energy saving optimization study was performed. In this study, it has become possible to measure the parameters of pollution (WWTP output values) according to today's information technologies and to monitor these values online in the operation of existing wastewater treatment plant. With the programming and optimization made within the scope of this study by taking COD value as reference, it was determined that the amount of air required for the ventilation tank would be calculated as 2 hours and accordingly, the energy consumption of the ventilation tank would be saved by 7-9% by using the blowers.

Keywords: WWTP, Energy Saving, Aeration Tank, Optimization.

INTRODUCTION

Nowadays, global economic developments, population growth, urbanization and rising living standards continuously increase electricity consumption (Gülsoy, 2017). Approximately 50% of the electricity generated in the world is consumed by the industrial sector (IEA, 2017). It is estimated that approximately 0.10-0.40% of the total electricity consumed worldwide is also used by Wastewater Treatment Plants (WWTP) (Wef, 2009). In the United States, 3 3-4% of the total electricity generated is consumed by drinking water and WWTP plants (Daw, 2012). As it is seen in the analysis and feasibility studies in the literature, electricity consumption of WWTPs is expected to increase in the next 20-30 years (Pitas, 2010). The risk of limited energy resources compared to the increase in electricity consumption is constantly expressed by scientists. This has a significant effect on electricity prices on a market basis (Petrecca, 1992). Non-industrial sector automotive, chemical, metal etc. sectors industrialists and scientists are constantly conducting analyzes and optimization studies to reduce the consumption values of electrical energy in their products and production processes (Thiede, 2013). Continuous increase in the cost and amount of electricity production, flue gases generated during the production of electrical energy, ash, particulate matter and so on. It has made electrical energy optimization studies more important nowadays because it also increases the amount of waste. While the design and operation costs of WWTPs are calculated, the initial purchase costs of electrical equipment are taken as reference, but over time the operating and maintenance costs of components such as motors, pumps and blowers, which use electrical energy, are gradually increasing. In general, this situation emerges as an unpredictable design parameter (FoE, 2006).

LITERATURE REVIEW

In recent years, studies have been carried out on electrical energy consumption in WWTPs.Due to the increase in energy costs, studies on energy optimization gained momentum.

Gülsoy (2017) Emphasizing on energy studies and optimization by benefiting from the developments in information technologies, he has worked on the possibility of saving energy in WWTP. In this study, he operated the blowers at the optimum level with linear programming according to the limitations of flow rate, pollution load, hot, discharge limit, etc. of wastewater. With his optimization, he found that there can be energy savings between 17-21%.

Hernández-Sancho (2011) Emphasized that the WWTP is the starting point of the energy saving studies and conducted studies on the consumption of electrical energy in 177 WWTPs in Spain. In this study, the effect of WWTP capacity on electrical energy consumption was found to be less in large scale plants. It found that the cost of electricity consumption per cubic meter of treated wastewater increased by 98% in small-scale WWTPs and by 46% in medium-sized WWTPs.

Li (2015) It was seen that the treatment technologies used in WWTP in HongKong significantly increased electricity consumption and this increase corresponded to 50-70% of the total electrical energy consumption (kWh) of the electrical energy used for biological processes

in wastewater treatment. In addition, it found that 30% of the total cost of operating WWTP was used in labor costs and 26% in electricity costs.

Panepinto (2015) stated that instead of more expensive investments in the WWTP, energy optimization can be achieved through energy optimization.

Minoglou (2013) modeled decision variables by linear programming according to four municipal solid waste technologies (incineration, composting, anaerobic and landfill) in Greece and found an inversely proportional correlation between cost and CO_2 emissions.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

In this study, the electrical energy consumption values of the Plajyolu WWTP in Kocaeli province are monitored daily for a year and the parameters that increase the electrical energy consumption of the plant are examined. With the business optimization model established within the scope of this study, it has been tried to minimize the electricity consumption in the WWTP by utilizing information technologies.

This study was carried out with reference to the Plajyolu WWTP used for the treatment of domestic wastewater from the western part of Izmit district center of Kocaeli province and the eastern part of Derince district center. Construction of the plant started in 1988 and the plant was completed in 1995 and commissioned. The plant was partially damaged in the 1999 Kocaeli earthquake and had to pause its operations for a while. The facility has been revised in 2009 in the form of a long aeration activated sludge process, which takes advanced nitrogen and phosphorus removal based on the Urban Waste Water Treatment Regulation and European Union discharge criteria, and the design values are given in Table 1 (URL-1, 2019).

Table 1: Plajyolu wwtp design values

Parameters	Input Value		Output Value		Removal Efficiency
	kg/day	mg/L	kg/day	mg/L	%
BOİ₅	8,559	133	257	4	0.97
KOİ	16,088	250	695	10.80	0.96
AKM	16,506	257	656	10.20	0.96
TN	2,059	32	234	3.64	0.89
TP	450	7	64	0.99	0.86

The facility was commissioned in 2009 with a population of 360,000 equivalent and a flow rate of 64,350 m^3 / day. The panoramic view of the facility located on Kocaeli Plajyolu is given in Figure 1.

Figure 1: Plajyolu wastewater treatment plant

The number and power of the devices with a power consumption of more than 2 kW are shown Table 2. In this study, the following power values are selected as units while analysis is performed.

Table 2: Energy Consuming Devices of the Facility

Pump	Power(kW)	Quantity	Total Power (kW)
Lifting	45.00	1	45.00
Sand	4.70	2	9.40
Blower	15.00	3	45.00
Ras Mixer	3.30	3	9.90
Anaerobic Mixer	5.50	4	22.00
Nitrification Mixer	5.30	12	63.60
Internal Circulation	2.50	6	15.00
Blower	160.00	4	640.00
Geri Devir	75.00	3	225.00
Decanter Feeding	15.00	3	45.00
Sludge Thickener Blower	30.00	3	90.00
Sum		44	1,209.90

As shown in Table 2, the facility has 4 blowers for the ventilation tank. Their power corresponds to 52.80% of the total power.

The wastewater flow to the facility between 2010 and 2017 and the consumption of electrical energy used for treatment of this wastewater are given in Figure 2.

Figure 2: Flow and electrical energy consumption of the plant
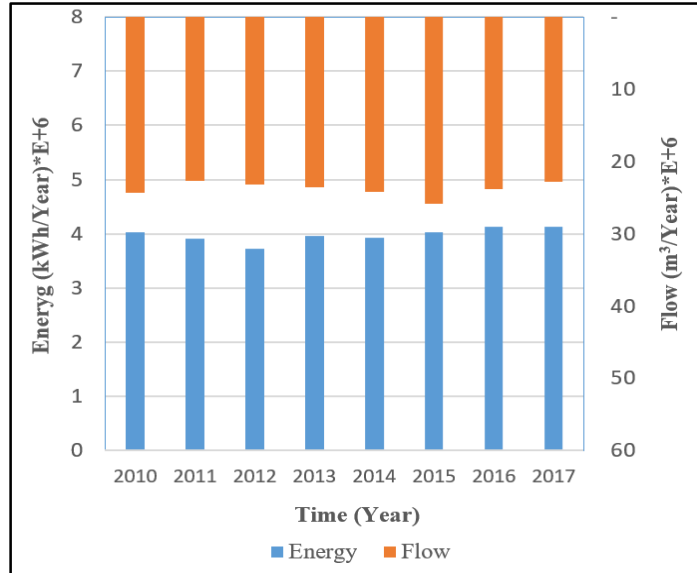
As shown in Figure 2, 23 million m^3 of water was treated on average in 8 years and consumed an average of 4 million kWh of energy per year for this treatment. In total, 190 million m^3 of water was treated in 8 years and a total of 32 million kWh of energy was consumed. The unit energy consumption of the facility between 2010 and 2017 is given in Figure 3.

Figure 3: Unit energy consumption of the plant
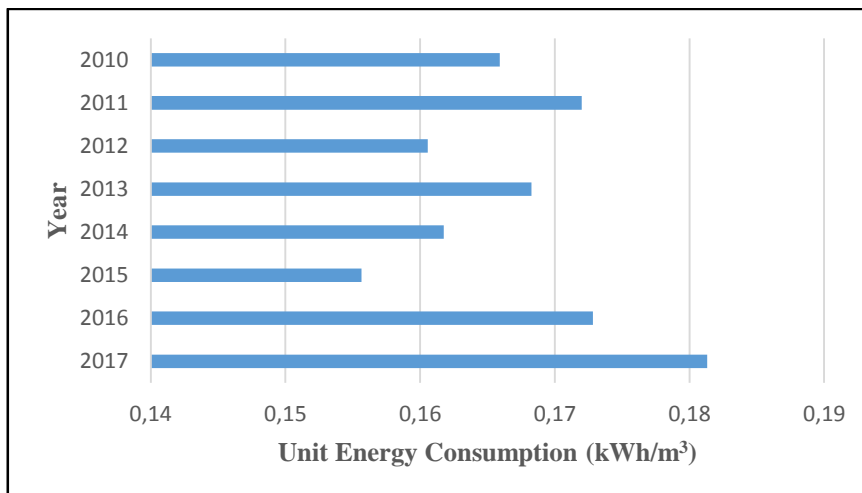
As can be seen in Figure 3, the average electrical energy consumption of the plant per 8-year m^3 wastewater was 0,17 kWh / m^3. In this study, it is observed that the maximum average electrical energy consumption per m^3 of wastewater has been realized in 2017 within the last 10 years. The minimum average electrical energy consumption per m^3 of wastewater was

realized in 2015. The average energy consumption per unit m^3 of wastewater generated during the years of operation may vary according to the amount of rainfall and the amount of domestic water used. For this study, taking into consideration such differences, the consumption values of electrical energy are generally shown over average values. Operating expenses and consumption values for 2017 and 2012 for which energy consumption is maximum and 2012 for which energy consumption are minimum are given in Table 3 comparatively.

Table 3: Operational data for the Plajyolu WWTP 2017

Parameters	Year	
	2012	**2017**
Treated Wastewater	23,155,330	22,815,772
Produced Mud (Kg)	9,040,140	9,570,120
Consumed Energy	3,717,747	4,136,545
Operating Cost (kWh/	3,226,301	5,840,033
Energy Cost (TL/ m^3)	0.16	0.18
Unit Cost (TL/ m^3)	0.14	0.26

As it is seen in Table 3, electricity energy expenses constitute 26% of total expenses in ATT operating expenses. As it can be understood from this ratio, WWTP are the facilities with high electrical energy expenses within the operational expenses. Monthly energy consumption of WWTP for one year and amount of wastewater treated is given in Table 4.

Table 4: WWTP energy consumption and wastewater amount in 2017

Months	Energy Consumption (kWh)	Treated Wastewater (m^3)	Unit Energy Consumption (kwh/m^3)
January	363,914	2,596,074	0.14
February	534,509	1,982,090	0.27
March	620,096	2,774,057	0.22
April	581,666	2,656,190	0.22
May	600,475	2,601,471	0.23
June	612,132	2,491,998	0.25
July	559,459	2,272,313	0.25
August	507,778	2,196,374	0.23
September	547,925	2,303,475	0.24
October	578,123	2,609,006	0.22
November	848,065	2,217,211	0.38
December	923,260	2,326,624	0.40
Average	606,450	2,418,907	0.25

As seen in Table 4, unit energy consumption of wastewater is calculated monthly and the average annual value is calculated as 0.25 kWh / m^3.

In Turkey, published in the Official Gazette dated 31.12.2004 and numbered 25687 "Water Pollution Control Regulation" According to the wastewater plant that produces are operated. In this regulation; The standard values for the discharge of domestic wastewater to receiving environments are determined as 120 mg / L for 2 hours composite sample and 90 mg / L for 2 hours composite sample (URL) of treated wastewater treated in areas with population over 100,000 (URL-2, 2019). Kocaeli Plajyolu WWTP which is taken as reference is also operated according to this article.

In the WWTP operation, a total of 12 samples are taken from the entrance and exit of the wastewater to the plant within 2 hours in a day and 24 hours of composite samples are obtained. These samples are analyzed in the laboratory and the pollution parameters of the wastewater entering and leaving WWTP are determined and the plant is operated. Ventilation tanks are one of the main units of WWTP and are supplied by air blowers. Ventilation tanks consume approximately 55% of the total electrical energy used in WWTP (Morgan, 2012). Figure 4 gives a general flow chart for the operation of WWTPs.

Figure 4: Facility flow chart
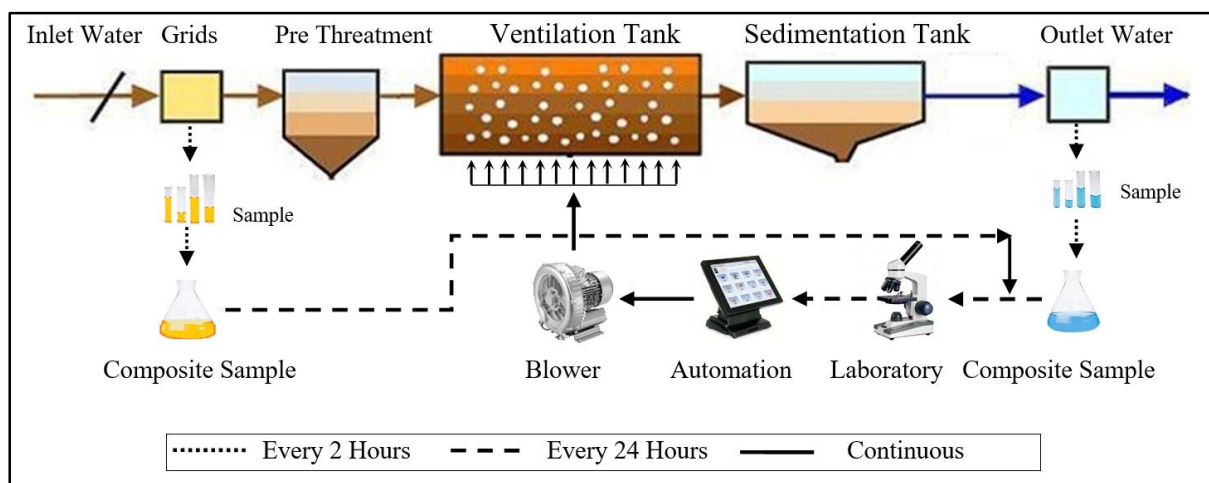
24 hours of composite samples are obtained from the wastewater entering the WWTP which is used as a reference and being removed from the plant every 2 hours. Composite samples are analyzed in laboratory and daily flow, COD (inlet) and COD (outlet) parameter values of wastewater are determined. The one-year output COD value of the facility and the ratio of the COD discharge limit value difference to the limit value according to the Water Pollution and Control Regulation are given in Figure 5.

As shown in Figure 5, there is the potential to save electrical energy between the treated wastewater COD value and the COD discharge limit according to the regulation.

Figure 5: Energy Saving Potential of the Facility
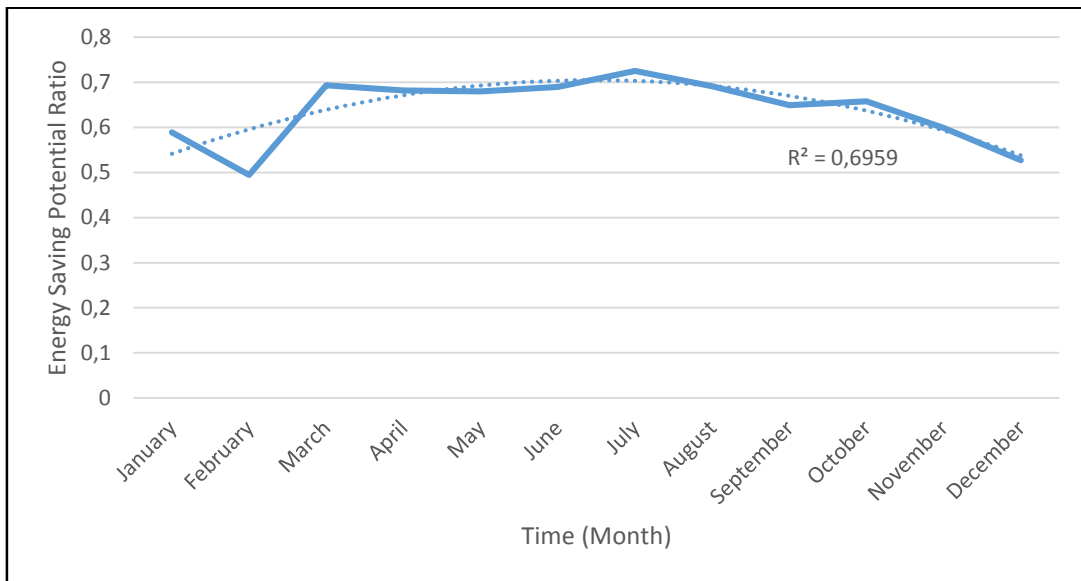
Resutls

Advances in technology make it possible to take instant samples from WWTP discharge water and analyze them in a short time. COD, Nitrate Ammonium, pH, Color and conductivity values can be measured with high accuracy by ultraviolet spectrometer or infrared spectrometer (Olson, 2005). In this study online measurements of COD, Nitrate Ammonium, pH, Color and conductivity parameters were performed by using ultraviolet spectrometer (Tethys), the UV spectrometer installed at the AAT output is connected to the existing automation (Scada) system and the measurements can be collected in the operating center within the facility. With this device, an online sample of wastewater was taken every two hours and COD output value was measured. According to these measured values, blowers were operated and required air was provided for the ventilation tank. The flow chart of the installed system is shown in Figure 6.

Figure 6: Model flow chart
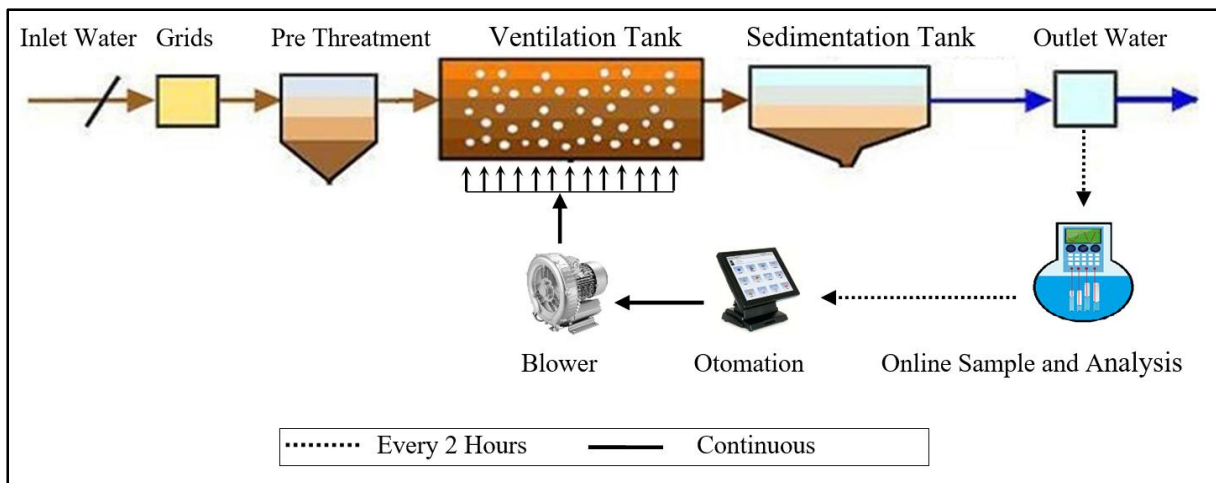
The flowchart shown in Figure 6 is implemented as four main phases.

In the first phase, an automatic sample was taken every 2 hours without changing the existing structure and COD analysis of these samples was performed. The average COD value was 13.45 mg / L and the average energy consumption was 246,12 kWh. These values were taken as reference.

In the second phase, an automatic sample was taken and analyzed every 2 hours by running the blower with a COD value of 25 mg / L. The average COD value was 26.33 mg / L and the average energy consumption was 237.97 kWh.

In the third phase, an automatic sample was taken and analyzed every two hours by running the blower with a COD value. The average COD value was 31.46 mg / L and the energy consumption was 229.87 kWh.

In the fourth phase, an automatic sample was taken and analyzed every two hours by running the blower with a COD value. The COD value was 40 mg / L and and the energy consumption was 223.87 kWh. Application values for each phase are given in Figure 7.

Figure 7: Application results
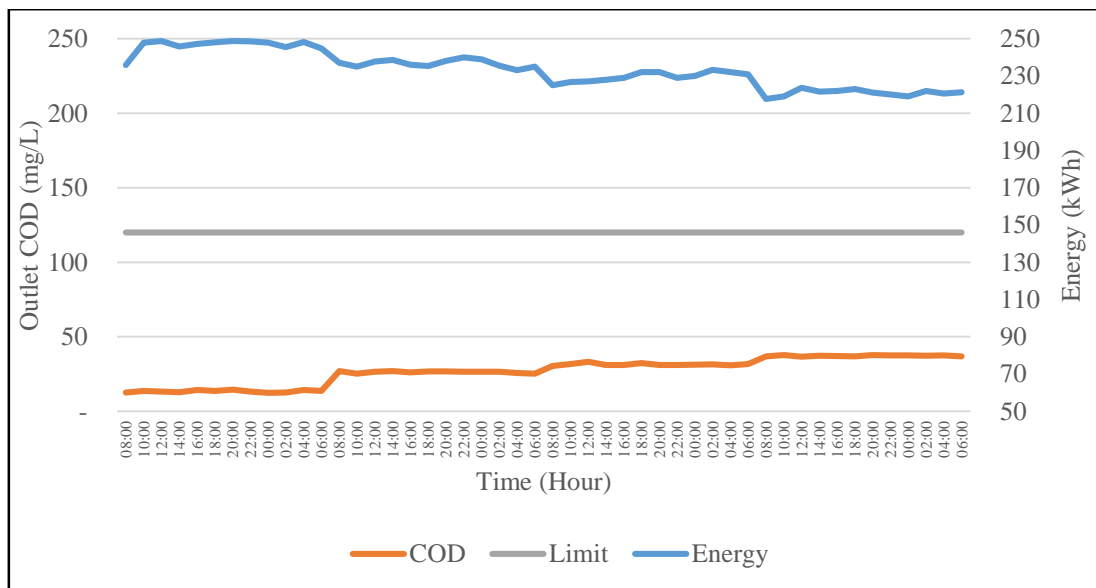
The plant was operated according to the flow prepared for 4 days. Amount of electricity consumed the unit electricity energy consumption values of COD divided by the discharge water COD value are given in Figure 8.

Figure 8: Unit consumption values

The figure shows a line chart with Y-axis "Energy (kWh) / COD (mg/L)" ranging from 10 to 19, and X-axis "Time (Day)" with values 1. Day, 2. Day, 3. Day, 4. Day. The trendline equation is y = -1,6764x + 19,794 with R² = 0,9898.
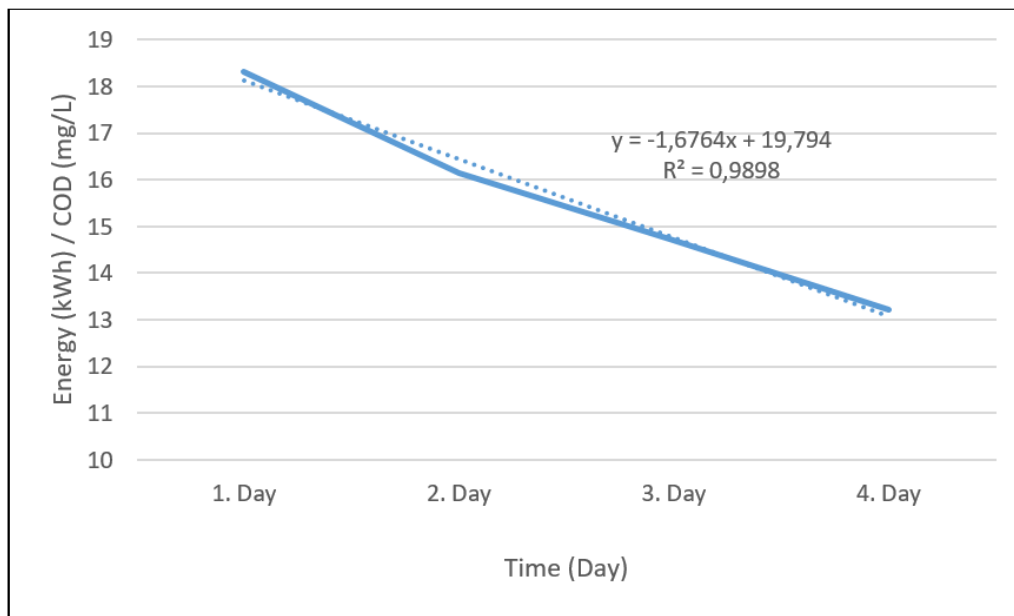
CONCLUDING REMARKS

Increasing energy production costs make economic optimization, while the amount of waste generated during the production of energy makes environmental optimization more important. With energy optimization, the efficient use of electrical energy in wastewater treatment plants as in all sectors becomes as important as the establishment of new power plants. Information technologies have become one of the most important tools used in the daily operations of enterprises due to the speed, quality increase, lowering the cost of services, bringing convenience, and the cost of owning technology. It is predicted that the development of processes based on optimum cost and energy consumption by making more use of information technologies in the design and operation phases of the treatment plants will contribute to the energy efficiency issue at both national and international level. Therefore, energy consumption will be reduced with the optimization of the operation of the ventilation tank. As a result of this study, the scientific findings given below are obtained.

1. As the wastewater COD discharge value approaches the discharge limit, the consumption of electrical energy consumed for the ventilation tank decreases.

2. By taking advantage of information technology, instant samples can be taken from wastewater entering and leaving the facility and analysis of this sample can be done in a short time.

3. Online monitoring of samples and values taken from the facility entrance and exit can be done.

4. By using the information technology opportunities, the discharge limit can be increased and energy saving can be achieved.

5. In this study, energy consumption decreased from 246.12 kWh to 223.87 kWh. Energy is saved on average 7-9% without exceeding the wastewater discharge limit.

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Sustainability in Rural Development and Young Farmer Approach

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ABSTRACT

In recent years, the decrease in agricultural population and the migration of young people from rural areas have increased rapidly in our country. In order to ensure economic sustainability in agriculture, it is important that the young population stays in the countryside. For this reason, as in many countries around the world, many models and supporting tools are being developed in our country to keep the young population in rural and agriculture. In our country, the Decision on the Support of Young Farmer Projects within the scope of Rural Development Supports numbered 2019/8540 published in the Official Gazette No. 29636 for young farmers is an important regulation in this regard. The limitation of social opportunities in rural areas, the inadequacy of the opportunities, the fragmentation of the enterprises and the shrinking of them, the inability to obtain sufficient income as a result of all these break the youth from agriculture and the countryside. For these reasons, future applications and measures to be taken in this regard gain importance in terms of sustainability in rural areas. Within the scope of the Young Farmers Project, 47,775 projects, which were accepted in 3 years between the years 2016-2017-2018, were given a total of 1,434,900 000 TL grant support. Under the program, project-based project topics; it covers subjects related to animal production, plant production, regional products, medicinal and aromatic plant production, processing, storage and packaging.

Keywords: Rural Development, Agriculture, Young Farmer.

INTRODUCTION

The rural area is evaluated with different approaches in legal arrangements and studies carried out for different purposes. Rural areas in general; the population density is low, economic life is based on agriculture, natural conditions and traditional values are effective in shaping life and social facilities such as education, health and communication are underdeveloped. Rural areas also refer to places that have strong social ties with the urban population and offer relaxation services for this population (Gülçubuk, 2005).

Rural development; to increase the living standards, income level and welfare by sustainable utilization of available resources outside urban areas. In this way, it is aimed to eliminate the development disparities between regions, to improve the agricultural structure and to increase the quality of agricultural production. It also includes identifying needs and priorities in existing structures in social, cultural and economic fields such as rural infrastructure, agricultural infrastructure, education, health, social security, organization, housing, transportation, communication, employment, marketing, rural tourism and local crafts. It refers to all the developer activities planned to improve the elimination of deficiencies in identified issues (Anonymous, 2002). In this study, the studies carried out within the scope of the young farmer project implemented in recent years in terms of rural development in our country in order to ensure sustainability in rural areas will be evaluated.

APPROACHES THAT AFFECT RURAL DEVELOPMENT POLICIES

Rural development approaches go back to the 1950s and change over time with various technological and socio-economic factors. This change also affects the applied rural development methods. Modernization in the 1950s and 1960s, state interventions in the 1970s, free market in the 1980s, participation and empowerment in the 1990s, and poverty prevention in the 2000s were the development approaches that had an impact on rural development policies. According to Ellis and Biggs (2001), the changes taking place in rural development thought in the world are as follows. In the 1950s and 1960s, modern production methods were used instead of traditional agricultural production methods. From the community development approach that was effective in the 1950s, the approach to the development of small farming was adopted in the 1960s.

In the 1970s, states became the only effective structure directing the agricultural sector. However, many problems have arisen in rural areas stemming from this interventionist structure of states. Within the scope of integrated rural development approach, small farming continued.

The 1980s and 1990s were the most effective changes in the field of rural development. In these years when the participatory rural development approach was developed, the top-down rural development approach, which was followed in previous periods, turned into a bottom-up and process approach. The liberalization of the market started in the 1980s, and the models of process, participation, empowerment and actor approaches were marked in the rural development policies of the 1990s. In the 2000s, a multi-sectoral approach has come to the forefront in the policies and practices of international organizations directing rural development

in reducing rural poverty and thus contributing to rural development. In the 2010s, rural development policies implemented, such as providing employment with multisectoral, integrated sustainable development, protection of rural heritage, poverty reduction, gender, poverty reduction, use of environmentally friendly technologies and partnerships with local collaborators in rural areas gain weight (Akın, 2016). In short, rural development policies that dominated modernization and state interventions in agriculture until 1980s had to seek different approaches with the concepts such as sustainable development, participation, governance and adaptation to changing service demands (Gülçubuk ve ark., 2015).

In terms of rural development in our country, the Ministry of Agriculture and Forestry, especially related institutions and organizations are implementing programs, projects, investments and supports to improve work and living conditions in rural areas. The IPARD program, which has been implemented in the context of the EU harmonization process, is of particular importance. 75 percent of this program budget was met by the EU and the rest from the national budget through TKDK projects. The budget is around 2.1 billion euros and consists of grants to be used. This includes the LEADER program, which aims to mobilize local action groups, the Young Farmer support of the Ministry, grants from development agencies and other support for rural development. All of these programs, projects, investments and supports are aimed at improving the working and living conditions of rural people and thus preparing the ground for rural and rural return. These studies, which require large, medium or small-scale investments, should be very well designed, sustainable, carried out in accordance with their purpose, scaled in a way that they will not be idle and designed to provide social benefit (Yavuz ve Dilek, 2019).

RURAL DEVELOPMENT STUDIES IN TURKEY

Turkey also rural development, in particular the 1st and 2nd 5-year development plan periods is towards community development versatile rural planning, the central village model, has until recent years with applications such as village city model. Policies for rural areas in Turkey showed the effects of the modernization efforts of the republican era in agriculture and rural area development programs. Modernization movements that started with the establishment of the Republic also affected the development efforts towards rural areas. During the Republican period, where a significant portion of the population lived in rural areas and the economy was predominantly based on agriculture, special attention was given to rural development. In this period, the Village Law no. 442 entered into force in 1924, the tithe tax was abolished in agriculture in 1925, and support for grain prices started in 1932 and in 1940 Village Institutes were established. Afterwards, studies were carried out within the framework of EU membership and harmonization. After the called and 1963 planned period, rural development in Turkey, to boost regional development and regional development with the aim to reduce the differences since the 1970s, with many rural indigenous and funded by foreign resources development projects and programs of regional development projects have been implemented. The main purpose of the rural development projects is to increase the income and living levels of the farmers' families, to prevent migration from rural areas to cities, to create

new production areas, to provide infrastructure services and to increase agricultural income (Akın 2016).

The project-based support activities for rural areas are in the form of grants and partly loans and are offered within the scope of rural development projects and financial support programs. Some of the important projects are listed below:

- Çorum Çankırı Rural Development Project (1976-1984)
- Erzurum Rural Development Project (1982-1989)
- Bingöl-Muş Rural Development Project (1990-1999)
- Yozgat Rural Development Project (1991-1998)
- Erzincan-Sivas Rural Development Project (2004-2010)
- Ordu-Giresun Rural Development Project (1998-2005)
- Agricultural Extension and Applied Research Projects
- Eastern Anatolia Basin Development Project

In addition, the Ministry of Agriculture provides modern irrigation, machinery and equipment support for the modernization of agricultural infrastructure, and animal and animal husbandry grants for the development of meat and dairy farming. Young farmer project, which will invest in rural areas, does not have a paid job and includes young farmers between 18 and 40, grant support up to 30.000 TL for projects related to production of plant and animal production, local agricultural products and medicinal and aromatic plants, social support project applications such as SODES. In addition, studies such as IPARD-I Program covering the years 2007-2013, IPA-II covering the years 2014-2020 and IPARD-II, which is the sub-component of the EU, have been carried out for international membership.

YOUNG FARMER PROJECT

In order to provide sustainability in agriculture, support entrepreneurship of young farmers, increase income level, create alternative income sources, and support projects aimed at agricultural production in rural areas that will contribute to the employment of young population in rural areas, young people living in rural areas will apply to local agricultural, medical and local agricultural products. in the scope of the payment of grants up to thirty thousand TL for the projects for the production, processing, storage and packaging of aromatic plants, Decree Law No. 639 dated 3/6/2011 on the Organization and Duties of the Ministry of Food, Agriculture and Livestock, dated 18/4/2006 and The Young Farmer Project was implemented with the Support of Young Farmer Projects within the Scope of Rural Development Supports, which were put into force by the Law No. 5488 and the Cabinet Decision dated 16/2/2016 and numbered 2016/8540 (Anonymous, 2019).

11,077's young farmers benefiting from the project in 2016 in Turkey has benefited 14,970 women and 3,893 men, including support from the project owner. Of these 14,970 projects; 10,500 bovine and ovine livestock, 2,030 beekeeping, 525 poultry and silkworm, 1,915 fruit, greenhouse, fungus and medicinal and aromatic plant cultivation. At the end of the

evaluations, 337 million TL of this grant was allocated for cattle / sheep and livestock projects, 68 million TL for beekeeping and poultry projects and 45 million TL for crop production projects. In 2017, 16,067 people were granted grants under the Young Farmer Project. In this support, 8,375 cattle, 165 buffalo, 2,860 cattle, 1,020 livestock facilities and animal procurement, 1,423 beekeeping, 513 poultry breeding facilities, 50 silkworm breeding facilities, 67 grants were granted in the fields of seedling-sapling, ornamental plant production facility and 92 medicinal aromatic and geographically marked products (Anonymous, 2019).

In 2018, 503 million TL was allocated from the budget to support young farmers within the scope of Young Farmer Project. Supports, cattle, sheep and goats, plant construction, beekeeping, poultry farming, mushrooming, controlled undergrowth plant, production of geographically marked foods, silk insect production, medicinal and aromatic plant production, processing, storage and packaging, open-field ornamental plant breeding, orchard, viticulture, fruit production. The application which was 540 thousand 112 in 2016 decreased to 135 thousand 921 in 2017. However, the female farmer increased from 41% to 60%. A total of 1 billion 443 million TL is planned to be granted in the three-year program and 931 million 350 thousand TL has been donated.

CONCLUSIONS AND RECOMMENDATIONS

Employment in the agricultural sector, a significant part of the population in developing countries such as Turkey, also if, given the state support for establishing a stable structure of the agricultural sector is inevitable.

Rural development and agricultural policies in Turkey with the EU to adapt and restructure the IPARD program has been tried out in rural development with sustainability and participation expectations. There are question marks about how much this semi-subsistence agricultural structure in our country can actually be transformed into agricultural enterprises and achieve sustainability. Here, especially with the young farmer project, more comprehensive studies are needed to ensure the sustainability and sustainability of young people in agriculture. Participation in the development of the world, environmental sustainability, is in the direction of organization. In our country, rural development studies should be considered as a whole as soon as possible.

Instead of import-based policies implemented in recent years, structures that will modernize agricultural holdings that address the rural area as a whole should be established as soon as possible. Here, participatory and democratic policies should be implemented, especially considering our regional and local characteristics. In particular, the promotion of young people and women becomes even more important. Thus, we prevent rural poverty and urban migration. Here, it is important to increase the organization based on the cooperative model used in developed countries.

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Exergy Analysis of Horizontal Ground Source Heat Pump Using Al_2O_3/Ethylene Glycol-Water Nanofluid

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ABSTRACT

Heat transfer plays an important role for ground source heat pumps. But low heat transfer rate of liquids (water and ethylene glycol etc.) prevents performance increase. Since a solid metal has a greater thermal conductivity than a fluid, the suspension of metallic nanoparticles into the fluid can help to increase the thermal conductivity of this fluid. Exergy analysis, design of energy systems is a powerful tool for optimization and performance evaluation. Furthermore, exergy analysis of heat pump system helps to identify energy loss and possible improvements. therefore, it is important to perform exergy analysis on GSHPs in order to see performance values. In this study, an exergy analysis of a ground source heat pump system used for heating purposes was performed. Various operating parameters of the system were examined the exergetic efficiencies of the system were determined. Also, the parameters obtained from experimental results and exergy transport and destruction were determined. The GSHP system which was examined was established in Sivas Cumhuriyet University in Turkey. The exergetic efficiencies of the system were calculated to be 75.3% and 75.9%, respectively, for base fluid (ethylene glycol-water) and nano-fluid (Al_2O_3/ethylene glycol-water (Al_2O_3 volume concentration 0.1%)). The results show that the use of nano-fluid increases exergy efficiency.

Keywords: Exergy Analysis, Ground Source Heat Pump, Alumina Oxide Nano-Fluids.

INTRODUCTION

Ground source heat pump (GSHP) systems involve the use the ground as heat source/sink to a heat pump. GSHPs are divided into horizontal and vertical according to the ground heat exchanger (GHE) types (Kavanaugh & Rafferty, 2014). The most obvious difference between horizontal and vertical GHEs is their orientation. Horizontal GHE are generally simpler, lower-cost installation and they are buried at relatively shallow depths (Chiasson, 2016). Thus, the horizontal GHE configuration is a prudent choice for buildings where sufficient land area is available (Chiasson, 2016; Sanaye & Niroomand, 2010). But the thermal efficiency of the horizontal GHE is greatly influenced by the pipe type, pipe configuration, trench depth and fluid circulating in the heat exchanger (Benazza, Blanco, Aichouba, Río, & Laouedj, 2011; İnallı & Esen, 2004).

For GSHP systems the water is mixed with a certain amount of ethylene glycol, so the freezing of the heat transfer fluid is prevented. But low heat transfer rate of liquids (water and ethylene glycol etc.) prevents performance increase. Since a solid metal has a greater thermal conductivity than a fluid, the suspension of metallic nanoparticles into the fluid can help to increase the thermal conductivity of this fluid. This mixture, called nano-fluid, has received great interest and has been researched recently (Ahmadi, Mirlohi, Alhuyi Nazari, & Ghasempour, 2018; Paul, Chopkar, Manna, & Das, 2010; Sanaye & Niroomand, 2010; Sridhara, 2009; Zhai, Li, Wang, & Li, 2019). Therefore, the use of these fluids in GSHPs is an issue that should be investigated. However, these studies should be supported with energy and exergy analysis of the systems.

Exergy analysis is an important phenomenon for engineering systems and is related to the second law of thermodynamics (Çengel & Boles, 2013). The first law of thermodynamics allows us to address the problems related to the energy balance of the system. But the second law of thermodynamic analysis, it describes the limits of what the system can do. Exergy analysis, design of energy systems is a powerful tool for optimization and performance evaluation (Bejan, 2016; Çengel & Boles, 2013). Furthermore, exergy analysis of heat pump system helps to identify energy loss and possible improvements (Kotas, 1985). therefore, it is important to perform energy and exergy analysis on horizontal GSHPs in order to see performance values (Choi, Ooka, & Shukuya, 2018; Gonçalves, Gaspar, & da Silva, 2013; Shukuya, 1994).

In this study, exergy analysis of a GSHP with nano-fluid (Al_2O_3/ethylene glycol-water at a volume concentration of 0.1%) support was performed. The GSHP system which was examined was established in Sivas Cumhuriyet University in Turkey.

SYSTEM DESCRIPTION

The investigated GSHP system is shown in Fig. 1. This system consists of a U type ground heat exchanger, heat pump unit, accumulation tank, and fan unit in the building. In the test system, approximately 73 m (including 12 m to the surface) pipe was used as GHE. GHE pipes are made of polyethylene and have a diameter of 40 mm (SDR11). Considering the

climatic conditions (cold climate zone) of Sivas where the system is installed, 25% ethylene glycol was added as volume concentration. This fluid was analyzed by adding Al_2O_3 nanoparticles (dispersed in water, 8 nm diameter, gamma structure) at a volume concentration of 0.1 vol%.

Figure 1: Schematic diagram of the GSHP system (for heating). (A: compressor; B: fan units; C: condenser; D: capillary tube; E: evaporator; F: ground heat exchanger; G: reversing valve.

The heat pump unit was used to climate a test room of 3x7x2.3 m^2 in heating mode and the indoor temperature was set to 21°C. This value is the comfort temperature value for heating recommended by WHO (WHO, 2007). The design load of the test room in which the system is installed was calculated as 2.2 kW. In addition, R410A was used as the refrigerant in the heat pump.

The experiments were conducted between 11-28 December 2018 and each experiment was repeated twice for 8 hours daily.

ANALYSIS METHODOLOGY

COP of the heaters

The COP of the heat pump unit can be calculated with the given Eg. 1.

$$COP_{hp} = \frac{Q_H}{W_{hp}} \qquad [1]$$

Where W_{hp} is the mean power of the heat pump.

COP of the system

The overall COP of the system can be calculated by Eg. 2.

$$COP_{sys} = \frac{\sum_{i=1}^{n} Q_H}{\sum_{i=1}^{n} W_c + W_{fu} + W_{hp} + W_{cp}} \qquad [2]$$

Where W_c is power of the compressor, W_{fu} is power of the fan unit, W_{cp} is power of the circulation pump.

Fluid exergy and exergy destruction

The general exergy balance can be expressed below Eq. (3). The exergy change of a system is equal to the difference between the net exergy transfer through the system ($X_{in} - X_{out}$) and the exergy destroyed (X_{des}) within the system as a result of irreversibility.

$$X_{in} - X_{out} - X_{des} = \Delta X_{sys} \qquad [3]$$

The exergy of a closed system (or systems without mass flow) of mass m is

$$X = \underbrace{(U - U_0) + P_0(V - V_0) - T_0(S - S_0)}_{physical\ exergy} + \underbrace{m\frac{v^2}{2}}_{kinetic\ exergy} + \underbrace{mgz}_{potential\ exergy} \qquad [4]$$

Where U is the internal energy, P is the pressure, V is the volume, S is the entropy, m is the mass, v is velocity of the system relative to reference, g is the gravitational acceleration, z is height of center of gravity relative to reference level. If the equation given above is arranged on a unit mass basis, the following equation is obtained.

$$\phi = (u - u_0) + P_0(v - v_0) - T_0(s - s_0) + \frac{v^2}{2} + gz \qquad [3]$$

ϕ is the exergy of a system without mass flow on a unit mass basis. If the exergy of the flow energy is added to this equation, the exergy of the flow stream is obtained, and it is expressed as follows:

$$= \left(u - u_0\right) + P_0\left(v - v_0\right) - T_0\left(s - s_0\right) + \frac{v^2}{2} + gz + \underbrace{\left(P - P_0\right)v}_{\text{the exergy of flow energy}} \quad [4]$$

If this equation is edited, it can be written as follows.

$$= \underbrace{\left(u - Pv\right) - P_0\left(u_0 + P_0 v_0\right)}_{\left(h - h_0\right)} - T_0\left(s - s_0\right) + \frac{v^2}{2} + gz \quad [5a]$$

$$\psi = \left(h - h_0\right) - T_0\left(s - s_0\right) + \frac{v^2}{2} + gz \quad [5b]$$

Where ψ is referred to as flow exergy and h is the enthalpy. If the equation is rearranged by neglecting potential and kinetic exergy, flow exergy can be written as follows.

$$\psi = \left(h - h_0\right) - T_0\left(s - s_0\right) \quad [6]$$

When a given mass enters or leaves a system, exergy in the amount of ψ for $m\psi$ will accompany it. Therefore, the exergy transfer by mass can be written as follows.

$$X_{mass} = m \cdot \psi \quad [7]$$

The exergy analyses for the system components

The exergy destructions in the system components are calculated as follows, respectively:

Compressor

$$\dot{X}_{des,c} = \dot{m}_{ref} \cdot \left(\psi_1 - \psi_{2,real}\right) + \dot{W}_c \quad [8a]$$

$$\dot{W}_c = \dot{m}_{ref} \cdot \left(h_{2,real} - h_1\right) \quad [8b]$$

Condenser

$$\dot{X}_{des,con} = \dot{m}_{ref} \cdot \left(\psi_{2,real} - \psi_3\right) + \dot{m}_{air} \cdot \left(\psi_6 - \psi_5\right) \quad [9]$$

Capillary tube

$$\dot{X}_{des,ct} = \dot{m}_{ref} \cdot \left(\psi_3 - \psi_4\right) \quad [10]$$

Evaporator

$$\dot{X}_{des,eva} = \dot{m}_{ref} \cdot \left(\psi_4 - \psi_1\right) + \dot{m}_{air} \cdot \left(\psi_7 - \psi_8\right) \quad [11]$$

Fan unit

$$\dot{X}_{des,fu} = \dot{m}_{ref} \cdot (\psi_5 - \psi_6) + \dot{Q}_{fu} \cdot \left(1 - \frac{T_0}{T_{air,in}}\right) \qquad [12]$$

Ground heat exchanger

$$\dot{X}_{des,ghe} = \dot{m}_{fluid} \cdot (\psi_7 - \psi_8) + \dot{Q}_{ghe} \cdot \left(1 - \frac{T_0}{T_{soil}}\right) \qquad [13]$$

Second law efficiency

There is no consensus in the literature on a comprehensive second law efficiency. The second law efficiency for various continuous flow systems by Çengel (Çengel & Boles, 2013) is expressed as a general definition as follows:

$$\eta_{II} = \frac{Exergy\ recovered}{Exergy\ supplied} = 1 - \frac{Exergy\ destroyed}{Exergy\ supplied} \qquad [14]$$

In mathematical terms:

$$\eta_{II} = \eta_X = \frac{\sum X_{out}}{\sum X_{in}} = \frac{\sum X_{in} - \sum X_{des}}{\sum X_{in}} = 1 - \frac{\sum X_{des}}{\sum X_{in}} \qquad [15]$$

The following equation can be obtained if Eq. 15 is arranged for the adiabatic compressor, ignoring the potential and kinetic energies. However, entropy generation S_{gen} must be zero or positive, but it cannot be negative.

$$\eta_{II,c} = \frac{W_{in}}{W_{real,out}} = \frac{\psi_2 - \psi_1}{h_2 - h_1} \qquad [16]$$

$$\eta_{II,c} = 1 - \frac{T_0 \cdot S_{gen}}{h_2 - h_1} \qquad [17]$$

$$S_{gen} = S_2 - S_1 \qquad [18]$$

RESULTS AND DISCUSSIONS

During the calculations for the system energy losses from the ground heat exchanger, the expansion valve and pipes were neglected. The dead state pressure and temperature were taken 101.3 kPa and 0.01°C and, respectively. Exergy analyzes were calculated separately for base fluid and nano-fluid supported systems. Refrigerant and water properties were taken from Solkane 8.0 and EES software. The experiments were conducted between 11-28 December 2018 and each experiment was repeated twice for 8 hours daily.

Temperature, pressure, enthalpy, entropy, mass flow rate, specific exergy and exergy ratio for the system using base fluid and nano-fluid are given in Tab. 1 and Tab. 2, respectively. In addition, specific exergy and exergy rates were calculated for each system component. Exergetic analysis of the system was performed with the help of Tab 1 and Tab. 2. The exergetic analysis results are given in Tab. 3 and Tab. 4, respectively, for the system using base fluid and nano-fluid.

According to the results of the analysis, exergy efficiencies were calculated as 75.34% and 75.91% for the use of base fluid and nano-fluid (0.1% Al_2O_3) for GSHP system, respectively. For these values, although the difference is low, the important point here is the exergy efficiency of GHE using nano-fluid, and the effect of nano-fluid on the GHE exergy efficiency is clearly apparent. Exergy efficiency in GHE were calculated as 75.55% and 81.02%, respectively. There was a difference of approximately 7%.

In the exergetic analysis results given in Tab. 3 and Tab. 4, the exergy efficiency of the condenser and the evaporator is very low. By reducing the irreversibility of these units, the exergy efficiency of the whole system can be increased.

Table 1: Exergy analysis results of horizontal ground-source heat pump heating system with U-type heat exchangers

	Name of element	Fluid	Phase	Temperature, T (°C)	Pressure, P (bar)	Specific enthalpy, h (kJ/kg)	Specific entropy, s (kJ/kg K)	Mass flow rate, $\dot{m}$(kg/s)	Specific exergy, ψ (kJ/kg)	Exergy rate, $\dot{E}x = \dot{m}\psi$ (kW)
0		Air	Dead state	0.01	1.013	9.459	0.0341	-	0	0
0'		EG-Water	Dead state	0.01	1.013	0.1036	4.31×10^{-6}	-	0	0
0''		R410A	Dead state	0.01	1.013	439.15	2.0966	-	0	0
1	Compressor inlet / Evaporator outlet	R410A	Super heated vapor	1.10	7.69	423.25	1.8210	0.0083	59.383	0.493
2	Compressor outlet / Condenser inlet	R410A	Super heated vapor	57.51	22.20	455.11	1.8283	0.0083	89.249	0.741
3	Condenser outlet	R410A	Liquid	36.50	22.20	259.60	1.2003	0.0083	65.283	0.542
4	Evaporator inlet	R410A	Mixture	-1.15	7.69	259.60	1.2190	0.0083	60.175	0.499
5	Condenser fan inlet	Air[1]	Gas	21.71	1.013	39.06	0.1403	0.1240	0.591	0.073
6	Condenser fan outlet	Air[2]	Gas	34.63	1.013	52.42	0.1873	0.1240	1.113	0.138
7	Ground heat exchanger EG-Water inlet	EG-Water	Liquid	2.76	1.10	11.71	0.0423	0.4500	0.064	0.029
8	Ground heat exchanger EG-Water outlet	EG-Water	Liquid	3.46	1.60	14.70	0.0529	0.4500	0.142	0.064

[1] Relative humidity : 0.42

[2] Relative humidity : 0.20

Table 2: Exergy analysis results of the nano-fluid assisted horizontal ground-source heat pump heating system with U-type heat exchangers

	Name of element	Fluid	Phase	Temperature, T (°C)	Pressure, P (bar)	Specific enthalpy, h (kJ/kg)	Specific entropy, s (kJ/kg K)	Mass flow rate, $\dot{m}$ (kg/s)	Specific exergy, ψ (kJ/kg)	Exergy rate, $\dot{Ex} = \dot{m}\psi$ (kW)
0		Air	Dead state	0.01	1.013	9,459	0,0341	–	0	0
0'		Al2O3/EG-Water[1]	Dead state	0.01	1.013	0.1139	4.23×10^{-5}	–	0	0
0''		R410A	Dead state	0.01	1.013	439.15	2.0966	–	0	0
1	Compressor inlet / Evaporator outlet	R410A	Super heated vapor	2.15	7.95	423.59	1.8190	0.0084	60.269	0.506
2	Compressor outlet / Condenser inlet	R410A	Super heated vapor	57.39	22.42	454.54	1.8257	0.0084	89.389	0.751
3	Condenser outlet	R410A	Liquid	36.90	22.42	260.33	1.2026	0.0084	65.385	0.549
4	Evaporator inlet	R410A	Mixture	-0.13	7.95	260.33	1.2208	0.0084	60.414	0.507
5	Condenser fan inlet	Air[2]	Gas	22.40	1.013	40.52	0.1454	0.1240	0.658	0.082
6	Condenser fan outlet	Air[3]	Gas	35.55	1.013	54.28	0.1938	0.1240	1.197	0.148
7	Ground heat exchanger EG-Water inlet	Al_2O_3/EG-Water	Liquid	3.40	1.10	14.40	0.0520	0.4500	0.091	0.041
8	Ground heat exchanger EG-Water outlet	Al_2O_3/EG-Water	Liquid	4.12	1.60	17.48	0.0630	0.4500	0.177	0.080

[1] Al_2O_3 volume fraction of 0.1%

[2] Relative humidity : 0.42

[3] Relative humidity : 0.20

Table 3: Exergetic analysis results of horizontal ground-source heat pump heating system with U-type heat exchanger

Item number	Component	Exergy destruction (kW)	Exergy of the product of a component P (kW)	Exergy of the fuel component F (kW)	Exergy efficiency (%)	Energy (first law) efficiency (%) or COP
I	Compressor	0.017	0.248	0.264	93.74	80
II	Condenser	0.134	0.065	0.199	32.51	-
III	Capillary tube	0.042	0.499	0.542	92.18	-
IV	Evaporator	0.042	0.035	0.077	45.72	-
V	Condenser fan	0.064	0.065	0.128	50.42	65-80
VI	Ground heat exchangers	0.011	0.035	0.047	75.55	-
I–IV	GCHP unit	0.235	0.847	1.082	78.29	-
I–VI	GCHP system	0.310	0.947	1.257	75.34	$4.42^a – 4.82^b$

[a] Heating coefficient of performance of the whole system.

[b] Heating coefficient of performance of the heat pump unit.

Table 4: Exergetic analysis results of the nano-fluid assisted horizontal ground-source heat pump heating system with U-Type heat exchanger

Item number	Component	Exergy destruction (kW)	Exergy of the product of a component P (kW)	Exergy of the fuel component F (kW)	Exergy efficiency (%)	Energy (first law) efficiency (%) or COP
I	Compressor	0.015	0.245	0.260	94.09	80
II	Condenser	0.135	0.067	0.202	33.15	-
III	Capillary tube	0.042	0.507	0.549	92.40	-
IV	Evaporator	0.040	0.039	0.079	49.23	-
V	Condenser fan	0.065	0.067	0.132	50.81	65-80
VI	Ground heat exchangers	0.009	0.039	0.048	81.02	-
I–IV	GCHP unit	0.232	0.858	1.090	78.72	-
I–VI	GCHP system	0.306	0.963	1.269	75.91	$4.53^a – 4.94^b$

[a] Heating coefficient of performance of the whole system.

[b] Heating coefficient of performance of the heat pump unit.

CONCLUSION

In this study, exergy analysis of a nano-fluid supported GSHP system was performed. The experiments were conducted between 11-28 December 2018. The GSHP system which was examined was established in Sivas Cumhuriyet University in Turkey. The results provided significant information about system performance. An exergy analysis is presented to demonstrate the performance of the system. The results obtained from the study are as follows:

a. According to the results of exergy analysis, the efficiency of nano-fluids (vol. 0.1% Al_2O_3) was increased by 0.8% in overall system performance.

b. Although the increase in overall system performance seems low, the GHE exergy efficiency change has reached 7%.

c. The results show that the use of nano-liquid increases the exergy efficiency.

d. By reducing the irreversibility of the condenser and the evaporator, the exergy efficiency of the whole system can be increased.

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Patomorphology and Apoptosis in Experimental Diabetic Nephropathy

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ABSTRACT

The aim of this study vas evaluated by histopathologycal and apoptical of kidney damage in rats with streptozotocin induced diabetes. Sixteen rats were randomly divided into two groups as control group (n = 8) and rats with twice dose (streptozotocin, 60 mg/kg, ip) of diabetic group. At the end of the last given of streptozotocin 90. days, the rats were sacrificed and the kidneys were removed for histopathological and immunohistochemical examination. For histological analysis tissue sections were stained with hematoxylin–eosin, for the immunohistochemical studies sections were stained with caspase-3, caspase-8, caspase-9 and TUNEL assay method. Histopathologically, the kidney in the diabetic group showed glomerular sclerosis, thickening, and membrane hyalinization, tubular atrophy, tubular dilatation, cellular vacuolization, and reabsorption droplets in tubule lumens. In the interstitium inflammation, and fibrosis also were seen. Immunohistochemically, increased caspase-3 immunoreactivity in the tubular epithelial cells and few glomerular and interstitial cells. Caspase-8 and caspase-9 were reactive in tubules. In general, diffuse immunoreactivity in tubules, glomerules and interstitium were observed in TUNEL staining. These results indicate that all component in the kidneys of diabetic rats were damaged.

Keywords: Diabetic nephropathy, Histopathology, Apoptosis.

INTRODUCTION

Diabetes mellitus (DM) is a chronic disorder resulted from insufficient insulin excretion or ineffective insulin excretion, characterized by hyperglycemia and leads to impairment in carbohydrate, fat and protein metabolism. Incidence of DM is gradually increasing worldwide, as in our country according to World Health Organization (WHO) data (2006). While DM directly leads to many clinical symptoms, complications of the disease cause severe morbidity and mortality. Retinopathy, dermatitis, neurologic, cardio-vascular and renal impairment are the most common complications. Diabetic nephropathy (DN) which is seen in 44% of the patients and accepted as a clinical finding is usually overlooked due to the absence of evident findings at the first stages of the disease. The chronic period during which symptoms emerge and histo-pathologic damage is formed is defined as "end-stage renal failure" and the patients become dialysis-dependent at this stage. Therefore it leads to high treatment costs and mortality. (Dereli et al, 1999; Estacio et al, 2000; Krolewski et al, 1996; Ozougwu et al, 2013)

While many factors play a role in DN development, genetic disorders, elevated plasma glucose, renin-angiotensin system, glomerular hyper-filtration and free oxygen radicals are among the important factors. Hyperglycemia and glucose toxication also play a role in patho-genesis of nephropathy. Chronic hyperglycemia leads to glomerular sclerosis through leading to an elevation in inflammatory mediators and nitric oxide release in arterial endothelium. However hyperglycemia alone is not enough for nephropathy development. While glucose accumulation also leads to similar reactions, elevated glucose affects cells through causing cell proliferation and an increase in extra-cellular matrix and TGF-β. Excess glucose leads to a reduction in anti-oxidants like nicotinamide adenine dinucleotide phosphate (NADPH) and thereby an increase in free radicals in tissues. Increased free oxygen radicals cause damage in vascular endothelium. Consequently, Na+-K+ ATPase activity decreases in the cells and sodium accumulation occurs which results in edema and dysfunction. While these changes lead to inflammation and necrosis, they trigger apoptosis. The histo-pathologic findings in the acute phase are not pathognomonic for diagnosis of DN. Pathognomonic histologic findings develop with the impairment in vascular structure in chronic phase. Although histo-pathologic findings are mostly formed in glomerular structure, interstitial, tubular and vascular structures are also reported to be influenced. (Sarnak et al, 2003; Tunçdemir et al. 2018; Warram et al, 2000; Zhang et al, 1997; Phillips and Steadman, 2002)

The present study aims at investigation of patho-morphologic changes and apoptosis in diabetic nephropathy.

LITERATURE REVIEW

Diabetes mellitus is a chronic metabolic disease which develops from carbohydrate metabolism disorder and characterized by hyperglycemia, leads to damage in many tissues and organs. Diabetes-induced tissue damage mainly results from inflammatory, metabolic and vascular changes (Estacio et al., 2012; Krolewski et al., 1996; Ozougwu et al., 2013). Chronic renal failure which is defined as diabetic nephropathy and leads to significant mortality develops mainly due to hemodynamic factors. Renal disorder which is quite insidious

progresses without exhibiting clinical symptoms except proteinuria and results in end-stage renal failure (Dereli et al.,1999, Locatelli et al.,2004; Warram et al.,2000).

Krolewski et al. (1996) reported that micro-vascular damage developing from increased inflammatory factors like cytokine, chemokine and free radicals due to hyperglycemia and glycol-toxicity plays a major role in diabetic nephropathy although etio-pathogeneis is not fully explained yet.

Sarnak et al. (2003) stated that while elevated free radicals and cytokine release lead to vascular endothelium damage, they also trigger thrombosis and coagulation. Histo-pathologic lesions are formed in renal tissue, particularly in glmerules as the result of this damage in micro-vascular structure.

Mauer et al. (1990) have reported that this pathology in glomerules in diabetic nephropathy is quite important for diagnosis. While glomerular sclerosis is the most evident finding in the early period, thickening in Bowman's capsule and basal membrane also pull attention.

Philips and Steadman (2002) reported that they mostly encountered chronic findings in renal biopsy as it is accepted as end- stage nephritis. The changes in tubulo-interstitial tissue are observed together with glomerular hypertrophy. The authors also stated that the sclerosis in glomerular tissue could convert to a nodular structure and the thickening in glomerular capsule is quite prominent.

Kumar et al. (2004) observed arterio-sclerosis in interstitial arteries and glomerular capillary and stated that significant fibrozis was evident in tubulo-interstitial fields and tubular basal membrane thickening , tubular dilation and atrophy were also evident. Detected the presence of apoptosis both in tubules and interstitial tissue in biopsy specimens of the patients with diabetic nephropathy.

Tuncdemir et al. (2018) detected that oxidation markers like malondialdehyde (MDA), advanced oxidation protein products (AOPP) and protein carbonyl (PC) increase in real tissues of the rats with experimentally-induced diabetes in their comprehensive study. The authors also examined the renal tissues of diabetic rats immuno-histochemically with apoptotic, anti-apoptotic, caspase-3 and TUNEL methods and found apoptosis particularly in tubular cells and glomerular structures.

Zang et al. (1997) detected the presence of apoptosis in tubule epithelium cells of the rats with experimentally-induced diabetic nephropathy with immuno-histochemical methods. All three studies revealed that apoptosis was formed in tubular epithelium cells, particularly in proximal and distal tubules and they also revealed the presence of localized apoptotic cells in interstitial cells.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

A total of 16 male Wistar albino rats weighing 200-250 g, aged 5-6 weeks were used. Rats were adjusted to laboratory environment one week before the study. Rats were randomly divided to two groups as Group I (Control group) and Group II [Diabetic group which included the rats which were administered streptozotocin (STZ, 60 mg/kg, Sigma, MO, USA; 0.05 M citrate buffer; pH 4.5) twice daily with 3 day intervals] with 8 rats in each. Plasma glucose measurements were done at 48th h following STZ. The rats which were detected to have 16.7 mmol/L or above plasma glucose level were accepted as diabetic. Rats were anesthetized at 90th day following the last STZ administration and renal tissues were removed with proper methods and fixed with 10% buffered neutral formalin for histo-pathologic and immuno-histochemical examinations. The tissue samples were embedded in paraffin blocks. Sections of 5 µ were stained with hematoxylin-eosin (HE).

Immmuno-histochemical staining was done with streptavidin-biotin-peroxidase (ABC) method in accordance with primary antibody protocol. The sections were treated with pH 6.0 citrate buffer at 700 W for 20 min in microwave oven and incubated in caspase-3, caspase-8 and caspase-9 primary antibody, waited in diamino benzidine (DAB) for 3 min as chromogen. Harris hematoxylin was used for ground staining.

TUNEL (Terminal Dexynucleotidyl Transferase mediated Deoxyuridine Triphosphate Nick and Labeling) marking was done in accordance with the instructions of the manufacturer (In Situ Cell Death Detection Kit, POD, Roche, Germany).

Glomerules, tubules, interstititum and vascular parameters were evaluated histo-pathologically. While no pathologic lesions were detected in kidneys in control group, significant damage was detected in kidneys of the rats in study group (Figure 1). Significant hyperemia and mesengial cell proliferation were observed in glomerular capillary. Also, enlargement was detected in Bowman's capsule. Some glomerular structures were seen to be atrophic and cellular infiltrations were detected in surrounding tissues. Fibrosis was detected in peri-glomerular fields. Widespread atrophy and localized tubular dilations were observed in tubules. Protein aggregates were encountered in some tubule lumens.

Figure 1: Histomorphological changing, HxE.
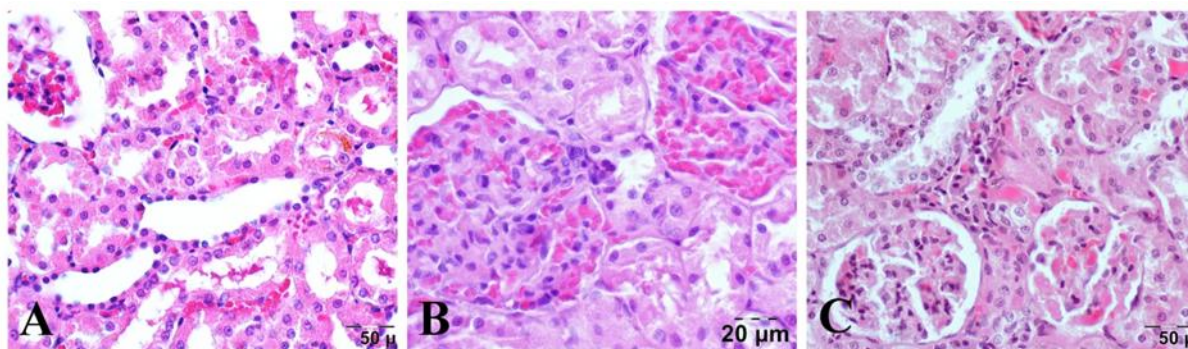
Significant and widespread immune positivity pulled attention in kidneys with diabetic nephropathy in immuno-histochemical caspase-3, caspase-8, caspase-9 and TUNEL staining performed for detection of apoptosis (Figure 2). Tubule epithelium cells were seen to show intense positive reaction particularly against caspase-3 antibody. In addition, positive cells were detected in interstitial tissue, although not intense. Positive reaction was detected to be intense particularly in proximal tubules in staining done with caspase-8 and caspase-9 however immune positivity was detected also in distal tubules. Localized immune positivity was detected in glomerules and interstitium, too. Tubule epithelium and vascular endothelium were also seen to be widespread positive in almost every field of the tissue in TUNEL staining.

Figure 2: Apoptotic reaction of kidneys with diabetes. A: Caspase-3, B: Caspase-8, C: Caspase-9, D: TUNEL staining.
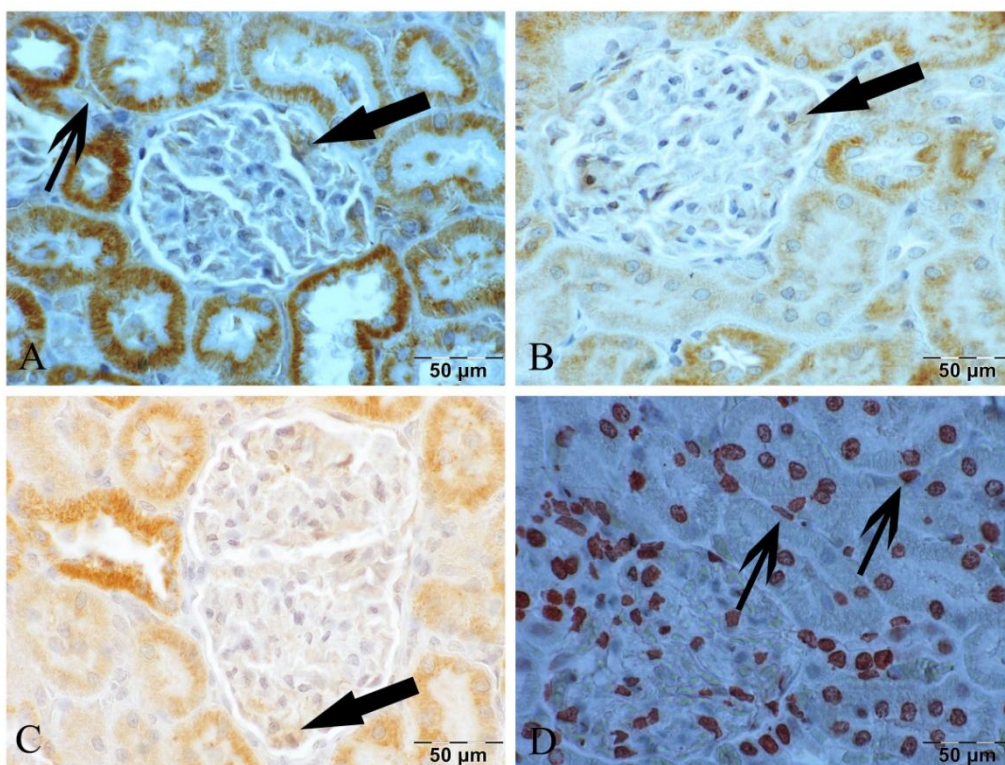
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Effect of Bread Wheat Varieties on Grain Sterol (Campesterol, Stigmasterol and Betasitosterol) Concentration of Zinc Applications

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ABSTRACT

Plant sterols are a group of steroid alcohols with various bioactive characteristics for human health. Phytosterols inhibit cholesterol absorption in intestines and thus reduce blood cholesterol levels. Zinc is plant micronutrient which is involved in many physiological functions its inadequate supply will reduce crop yields. In this study, the effect of zinc (Zn) applications on the concentration of Campesterol, Stigmasterol and Betasitosterol of two different bread wheat cultivars (Yunus and Osmaniyem) in the greenhouse conditions was investigated. Zinc applications ($ZnSO_4.7H_2O$) were carried out in 1.0 (Control) and 5.0 (Zn 5) mg Zn kg^{-1} doses as the soil fertilizing. Zinc application showed statistically significant increases in grain Zn concentrations of both Yunus and Osmaniyem varieties. Zinc application has resulted in an increase of 49% in grain Zn concentration of Yunus varieties and 137% in Osmaniyem varieties. Parallel to the increase in the Zn concentration by Zn application, an increase of 42% in the concentration of Campesterol, 57% in the concentration of stigmasterol and 21% in the concentration of betasitosterol was observed in the grain of Yunus varieties. Similarly, there was a rise of 11% in the concentration of Campesterol, 18% in the concentration of stigmasterol and 11% in the concentration of betacitosterol of the Osmaniyem varieties. It is observed that the possibility of Zn participating in stain of Campesterol, Stigmasterol and Betasitosterol seems to be high.

Keywords: Zinc, Campesterol, Stigmasterol, Betasitosterol, Bread Wheat.

INTRODUCTION

Plants are another effective factor in combating diseases. Carotenoids in plants, antioxidant vitamins, phenolic compounds, terpenoids, sterols, indoles and fibers have been reported to play an important role in reducing the risk of chronic disease (Schauss et al., 2006). In particular, sterols in plants are called phytosterols. Phytosterols are steroid alcohols belonging to the Triterpene family (Nurmi, 2012). Phytosterols are found in plants as free alcohols or as their precipitates (Nurmi, 2012). Phytosterols are found naturally in vegetable products, especially vegetable oils. In a study on the effects of phytosterols on human health, it has been reported that individuals have low-density lipoprotein i.e. cholesterol-lowering effects with phytosterol intake, but the magnitude of cholesterol-lowering between individuals may vary depending on various factors (Rudkowska, 2010). In addition to the cholesterol-lowering effects of phytosterols, positive effects on health such as anti-inflammatory (anti-inflammatory), anti-atherogenic (supporting cardiovascular health and preventing heart attack, stroke and other cardiovascular diseases and plaque formation), antioxidant and anticancer are also seen (Rudkowska, 2010). Although cereals and cereal products contain low amounts of phytosterol from oilseeds, cereals are more involved in human nutrition compared to consumption rates (Taşan, 2008). It is reported that the major sterols found in wheat in large amounts are Beta-sitosterol, Campesterol, and Stigmasterol (Moreau et al., 2002). Bread and other cereals obtained from wheat are grouped as cereals and foods made from cereals in terms of phytosterol concentrations (El, 2008). As being also more bread consumption in Turkey, a large portion of people's energy needs is met from the bread. Especially B group vitamins, especially Ca, Fe, Zn and mineral substances such as amino acids, high in the shell and embryo portion of wheat, is found in low concentrations in the endosperm (Kotancilar et al., 1995). Phytosterols in wheat are important for human health and their importance has been demonstrated in many studies. Increasing the amount of phytosterol in plants will cause a decrease in the amount of serum cholesterol in humans consuming these plants. Although there are various studies on the amount and variety of phytosterol amounts of cereal and cereal products, the scarcity of the knowledge is expressed by Piironen et al. (2000). There has not been much research on the relationship between phytosterols and plant nutrients.

In this study, the effect of zinc (Zn) applications on the concentration of Campesterol, Stigmasterol and Betasitosterol of two different bread wheat cultivars (Yunus and Osmaniyem) in the greenhouse conditions was investigated.

LITERATURE REVIEW

Phytosterols by inhibiting the absorption of cholesterol in the intestine, blood, and LDL (low-density protein) cholesterol levels have a lowering effect (Taşan et al., 2006). Jones et al. (2000) reported that sterols reduce serum cholesterol and LDL cholesterol levels.

Ye et al. (2010) reported that β-sitosterol is effective against carcinogenesis (cancer cell), prostate cancer, and colon cancer in their research on the production of herbal medicine from β-sitosterol. Similarly, Yamaya et al. (2007) reported that β-Sitosterol has anti-cancer effect and this is important for human health.

Karaoğlu and Kotancılar (2001) reported that dietary fiber in cereal products reduces the risk of cancer in the digestive tract and that cereals have positive effects on blood cholesterol levels and coronary heart disorders.

When the effects of daily use of phytosterols on human health are examined, interesting results are obtained. Some studies have shown that cholesterol decreases in both men and women when sterol ester (a mixture of campestanol and sitostanol) margarines are used for at least one year (Piironen and Lampi, 2004). Sterols cannot be synthesized in the human body (Mathur, 2012), and the sterols used in nutrition are gaining increasing attention recently due to their relationship with public health (Yücel, 2006).

In some studies, the amount of phytosterol to be taken daily at least 186-310 mg /day (Nurmi et al., 2008), 150-400 mg /day (Cantrill, 2008) and 150-440 mg /day (Koschutnig et al., 2010).

Cereals are generally described as a good source of sterol (Dutta, 2003). Phytosterol and especially phytosterol, which are the most valuable human compounds in terms of human health, are understood to have significant potential in the formation of a healthy diet in whole grain flours and various cereal fractions (embryo, bran) (Taşan, 2008).

On some cereal products, Normen et al. (2002), in general, the distribution of phytosterol was reported to be β-sitosterol 62%, Campesterol 21%, Stigmasterol 4%, β-sitostanol 4% and Campestanol 2%.

Tosun et al., 2019, grain Campesterol, Stigmasterol and Betasitosterol concentrations of 20 different bread wheat cultivars were determined and the relationships between phytosterols and grain mineral nutrients were identified. Correlations analysis revealed that Campesterol had significant positive correlations with nitrogen (r=0.356[**]) and manganese (r=0.327[*]) and significant negative correlations with calcium (r= -0.432[**]) and zinc (r= -0.424[**]). Stigmasterol had significant negative correlations with calcium (r= -0.291*) and zinc (r= -0.466**) and significant positive correlations with manganese (r=0.256*). Betasitosterol had significant positive correlations with nitrogen (0.342[**]) and manganese (0.323[*]) and significant negative correlations with calcium (-0.387[**]), zinc (-0.468[**]) and phosphorus (-0.284[*]).

## METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

Yunus and Osmaniyem bread wheat varieties were used in the experiment carried out under greenhouse conditions. In the experiment, which was carried out in 4 replications according to randomized plot design, a soil was used with clay texture, low amount of ornate substance (0.12%), alkali character (pH: 8.82), very calcareous (17.8%) and low level of useful Zn concentration (0.11 mg Zn kg^{-1}). As a basic fertilizer for the establishment of the experiment in all pots 300 mg kg^{-1} N (in the form of Ca $(NO_3)_2.4H_2O$), 100 mg kg^{-1} P (in the form of KH_2PO_4), 50 mg kg^{-1} S (in the form of $CaSO_4.2H_2O$) and 2.5 mg kg^{-1} Fe (Fe-EDTA form) was

applied to the soil by mixing as a solution. Zinc doses were given 1 mg kg^{-1} Zn (Zn1) for low (control) Zn applications and 5 mg kg^{-1} Zn (Zn5) (ZnSO$_4$.7H$_2$O form) for high Zn applications. Water requirement of the plants was made with pure water until harvest time and with a moisture content close to the field capacity (around 70%). Plants were harvested at the end of the ripening spike. The harvested grain samples were burned in the microwave device according to wet burning method (Kaçar and İnal, 2008) and Zn concentrations were determined in ICP-OES (Inductively coupled plasma optical emission spectrometer) device (Kaçar and İnal, 2008). The phytosterol compositions (Campesterol, Stigmasterol and Betacitosterol) found in the grains of the varieties used in the research were analyzed using the method of "994.10 olan (AOAC, 2000), Gas Chromatography-Mass Spectrometer (GC-). MS). The effects of zinc application on the grain Zn, Campesterol, Stigmasterol and Betacitosterol concentrations of the plants were determined to be statistically significant by one-way analysis of variance (ANOVA) test. The effects of the doses were subjected to the DUNCAN multiple comparison test. SPSS 21.0 package program was used for statistical analysis.

Results

It was observed that there were statistically significant (p <0.01) increases in grain Zn concentrations of both Yunus and Osmaniyem cultivars with zinc application. While the Zn concentration was 21.0 mg kg^{-1} in the control (Zn 1) application of the dolphin cultivar, Zn concentration increased to 31.2 mg kg^{-1} in Zn 5 application. In the Osmaniyem cultivar, Zn concentration increased from 17.1 mg kg^{-1} in Zn 1 application to 40.5 mg kg^{-1} in Zn 5 application. With zinc application, a concentration increase of 48.5% in the Yunus cultivar and 136.8% in Osmaniyem cultivar occurred (Figure 1).

Figure 1: Effect of zinc applications on grain zinc concentrations.

Zinc (mg kg^{-1})
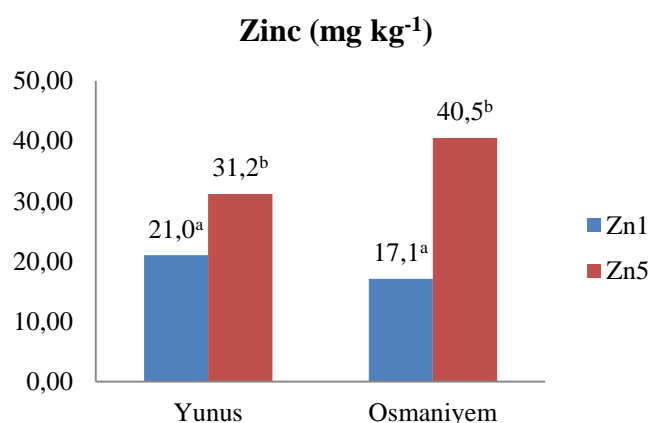
It was found that Zn applied at different doses compared to the control application doses from the soil at four different locations under field conditions led to increases in grain yield of paddy which ranged from 12% to 180% (Slaton et al., 2005). Yılmaz et al. (1997) reported an output of 34 mg kg^{-1} Zn concentration for the application in the field conditions of wheat plants from the soil and leaves with a control condition of 9 mg kg^{-1} grain Zn concentration.

Similar to the increase in Zn concentration in the grains of Yunus and Osmaniyem wheat varieties with Zinc application, Campesterol, Stigmasterol and Betasitosterol concentrations of all cultivars were also increased statistically significant ($p < 0.01$ and $p < 0.05$) (Figure 2). The concentration of Campesterol of Yunus Cultivar was 5.34 mg kg^{-1} under Zn 1 dose conditions and 7.61 mg kg^{-1} under Zn5 conditions (42.5% increase), Stigmasterol concentration was 2.13 mg kg^{-1} in Zn 1 dose and 3.35 mg kg^{-1} in Zn 5 dose. a (57% increase), Zn 1 dose of Betasitosterol concentration was 136 mg kg-1, while the dose of Zn 5 was 165 mg kg^{-1} (21% increase). Similarly, the Campesterol concentration of Osmaniyem cultivar was 9.78 mg kg^{-1} under Zn 1 conditions and 10.86 mg kg^{-1} under Zn 5 conditions (11% increase), Stigmasterol concentration was 3.96 mg kg^{-1} in Zn 1 dose and 4.68 mg kg^{-1} in Zn 5 dose (18% increase), while the concentration of Betasitosterol in Zn 1 dose was 256 mg kg^{-1}, Zn 5 dose with 285 mg kg^{-1} was seen to increase (11%) (Figure 2).

Figure 2: Effect of zinc applications on grain Campesterol, Stigmasterol and Betasitosterol concentrations.
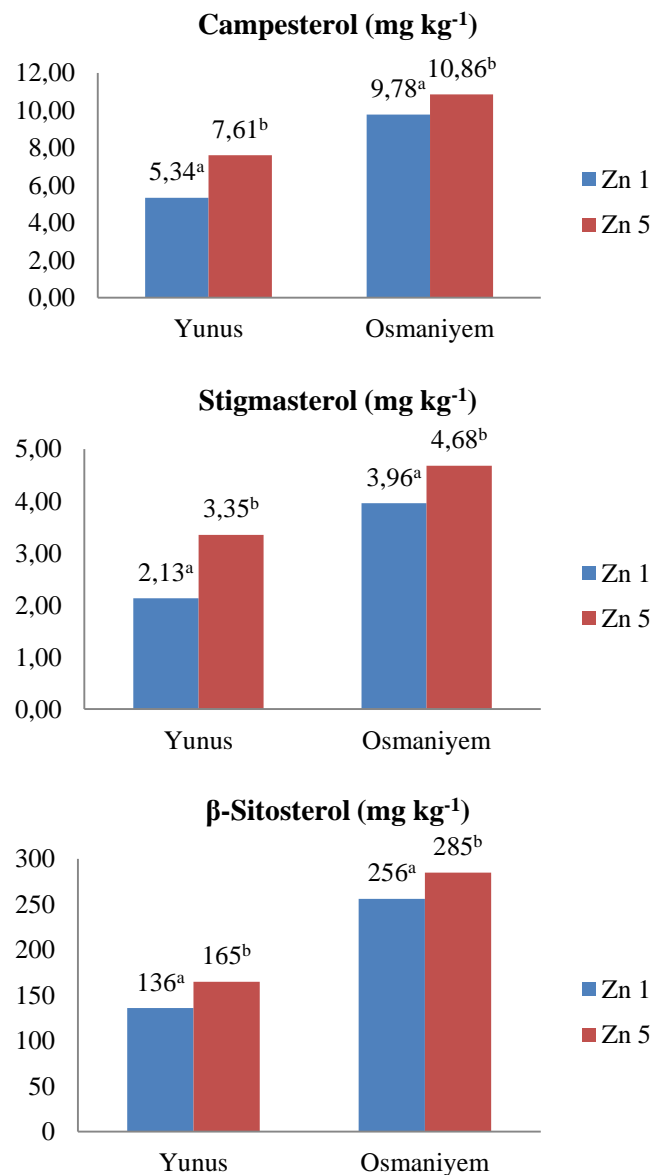
The most important function of zinc in the plant is the direct involvement in protein synthesis and the role of more than 300 enzymes directly or indirectly. Zinc is especially involved in the structure of the hormone auxinin (IAA) in the plant, and therefore, the growth points of the plants require a high level of Zn (Marschner, 1995; Çakmak, 2000). Plant sterols are an important component of the interaction between the free hydroxyl group protein and phospholipids. Sterols participate in the control of cell membrane-bound metabolic processes involving the action of several specific sterols. Sterols also play an important role in cell and growth processes in plants as precursors for brassinosteroids (Piironen et al., 2000). Betacytocyticols, a fraction of sterols, have been reported to strengthen plant membranes and regulate the water permeability of the phospholipid double layer in the cell membrane (Ness, 2003; Schaller, 2004; Banas et al., 2005). In addition, Lindsey et al. (2003) reported that there is a relationship between plant hormones and sterol synthesis. As it can be seen from the literature, it is thought that there is a relationship between Zn and plant sterols because zinc is involved in important metabolic events such as the integrity of the hormone auxinin (IAA) and the integrity of phospholipid and sulfhydryl membranes and plant sterols are included in similar components. Because the increase in the concentration of Campesterol, Stigmasterol and Betasitosterol in parallel with the increase of grain Zn by soil and leaf application of Zn confirms this thesis.

CONCLUDING REMARKS

In recent years, scientific studies have clearly demonstrated the relationship between balanced nutrition, diet and diseases, and epidemiological studies point to the role of diet in the prevention of chronic diseases. Changing nutritional habits to consume more fruits, vegetables and cereals is an effective and practical approach to the prevention of chronic diseases. With such an approach, it is emphasized that the number of cancer cases in the USA can be reduced by one third. Today, there are not many studies about the relationship between plant sterols and plant nutrients. According to the results, it has been found out that zinc element may be related to synthesis of Campesterol, Stigmasterol and Betasitociterol. The data obtained will contribute to the basic knowledge needed for further research on the genetic and biochemical basis of the relationship between plant sterols and nutrients.

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Particulate Matter Concentrations in Summer Season in a Broiler House

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ABSTRACT

The aim of this study is to determine the summer time concentration of particulate matter (PM) in a commercial broiler houses in the Bursa region of western Turkey. In this study, PM concentrations and indoor environmental conditions such as temperature, relative humidity was measured continuously for four consecutive days in summer months. A pDR-1500 Aerosol Monitor (Thermo-Fisher Scientific, USA) was used for particulate matter concentrations measurements. The daily average exhaust PM concentrations overall of study were measured as 1.25 mg/m3 . The maximum and minimum concentrations were obtained third measurement day as 14.44 and 0.07 mg/m3 . The obtained PM concentrations were exceed limit values($20 \mu g/m3$) for livestock houses published in European Directives "Air QualityDirective".

Keywords: Broiler, Concentration, Particulate Matter.

INTRODUCTION

According to the FAO database, Turkey has one of the largest broiler populations with 293 million head in 2014 in the world. This amount is equal to 16% of the European broiler inventory. Broiler production is a significant source of livelihood for Turkish people, especially in western Turkey, and is one of the largest livestock sectors. Broiler production in Turkey has steadily improved, as evidenced by the recent emergence of large broiler farms with modern houses in the Bursa region.

Concentration of particulate matter is of particular concern to broiler producers. Particulate matter (PM) associated with animal feeding operations is a concern for the chickens, occupants and the surrounding community. The adsorbed odorants and bacteria on PM may pose health hazards on worker and chicken, and environmental contamination for surrounding of broiler house. Baseline measurements of concentration of PM are the first step toward assessing the environmental impact of animal feeding operations and evaluating effectiveness of dust control strategies (Redwine et. al.2002, Shi et.al 2011).

Particulate matter (PM) in livestock houses consider as an indoor pollutant causing negative effects on animal performance and efficiency (Cambra-Lopez et al. 2009, Al Homidan et.al. 2003, Donham and Leininger 1984), and on the health and welfare of workers (Cambra-Lopez et al. 2009).

Particles are breathed by animal and worker can penetrate in the respiratory system, negative effect on animal's and human's respiratory health, contributing to increased occurrence of chronic cough and/or phlegm, chronic bronchitis, allergic reactions and asthma-like symptoms amongst livestock farmers (Radon et al., 2001).

The air quality monitoring in broiler houses will become more important in a few years for the Bursa region, and additional scientific studies are required to address indoor air quality in broiler houses. There have been a little number of studies on PM concentration in broiler houses.

The aim of this study is to determine the summer time concentration of particulate matter (PM) in a commercial broiler houses in the Bursa region of western Turkey.

LITERATURE REVIEW

Lacey et.al. (2003) studied on Emissions rates for particulate matter less than 10μm (PM10) from commercial tunnel–ventilated broiler houses in central Texas. They were analyzed using linear regressions to develop emission rates as a function of bird weight for broilers on litter. Indoor temperature and relative humidity were not found to be significant factors affecting PM concentrations and emissions.

Wang-Li et al. (2013) investigated particle size distributions (PSDs) and concentrations of total suspended particulate (TSP) in a tunnel ventilated high-rise layer house under different operational conditions. They used six low-volume (1 m^3 h^{-1}) TSP samplers to collect PM samples on two floors of the high-rise layer houses across four seasons through day/night sampling protocols. The day/night sampling design was to examine animal activity impact. The PM samples were analyzed by a multi-wave length laser diffraction particle size analyzer (LS13 320) for PSDs characterized by mass median diameters (MMDs) and geometric standard deviations (GSDs). They found that the mean TSP concentrations ranged from 1.0 to 5.33 mgm^{-3}. TSP concentrations in winter were higher than in summer; concentrations on the 2nd floor were higher than that on the 1st floor; concentrations of daytime samples were higher than those of nighttime samples. Animal activity (represented by day/night samples) had the highest impact on TSP concentration as compared to other influential factors (spatial, seasonal, ventilation). No significant seasonal variations of MMD and GSD were observed in most of samples. Majority of day/night MMDs and GSDs demonstrated no significant differences. In their study, PM10 fractions ranged from 23.25% to 38.55%. They obtained a significant seasonal variation for PM10 mass fractions.

Campra Lopez et. Al. (2015) conducted a study to compare co-located real-time light scattering devices and equivalent gravimetric samplers in poultry and pig houses for PM10 mass concentration, and to develop animals pecific calibration factors for light scattering samplers. They found that indoor PM10 concentrations ranged from 0.47 to 8.45 mg m^{-3} in poultry houses.

Lin et al. (2017) carried out a study to quantify emissions of particulate matter (PM10 and PM2.5) from cage-free layer houses in California. They observed that PM10 and PM2.5 concentrations in the houses depended on the activity of birds, ventilation rate and relative humidity of the ambient air. They monitored PM10 and PM2.5 concentrations for only three months from January to March. In their study, the indoor PM10 concentrations ranged from 284 to 5012 and averaged 1576 ± 656 mg m^{-3}

Hayes et.al. (2013) carried out a study to determine PM10 and PM2.5 concentration and emission air quality level in two aviary laying hens houses. PM10 and PM2.5 concentrations were measured by using tapered element oscillating microbalances (TEOMs). Monitoring period included nineteen consecutive months. At the end of the study, daily mean indoor concentrations were obtained as 2.3 mg m^{-3} for PM10, and 0.25 mg m^{-3} for PM2.5.

Fabbri et.al. () monitored two poultry houses with deep-pit and ventilated belt systems. They measured PM10 and PM2.5 concentrations for continously 1 week. They found that average concentrations for PM10 and PM2.5 are 2.01 and 0.59 mg^{h-1} for deep pit system, 0.78 and 0.26 mg h^{-1} for ventilated belt systems.

Winkel et.al. (2016) measured PM concentrations in 36 animal barn with 13 different animal species. They found that mean PM concentration in broiler house 1931 μm m^{-3} while PM concentration ranged from 486 to 3784 μm m^{-3}. They also measured inhalable PM as mean 4392 μm m-3 for broiler houses. In their study, a diurnal variation observed and there is sharp

drop in the PM10concentration was found in the evening when the lights went off (around 20:00), followed by a sharp rise in the early morning when the lights were turned on again (around 04:00).

Yang et.al. (2017) carried out a study to asses the environmental quality of different poultry houses in Shandong,Province, China. The concentration of fine particulate matter in the chicken houses ranged from 114 μg/m^3 to 230 μg/m^3.The annual average guideline value of 10 μg/m3 for fine particulate matter was chosen to represent the lower end of the range over which significant effects on survival have been observed in the American Cancer Society (ACS) study.

Shen et.al. (2018) investigated the distribution of the PM in different size fractions and NH3, as well as analyzing the physicochemical properties of fine particulate matter (PM2.5) in an enclosed layer house.The detection was taken from 5:00 to 21:00 in everyPM10 and TSP at the front were 80.92 and 148.54 µg/m3, dramatically lower than the middle and rear of the layer house (P < 0.05, Figure 3A). However, there were no significant differences among different heights or between east and west.

## METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

A broiler farm in Bursa, west of Turkey, was selected for the study that monitored total PM concentrations. Selection of the farm was based on its production scale and management practices being representative of the current and growing trend of broiler production facilities in Bursa region.

Table 1 showed structural features of monitored broiler house. The monitored broiler house had mechanical ventilation system with four ventilation fans. Feces dropped to the bedding material on the concrete floor. Hay and rice hull are generally used in monitored broiler house as bedding material.

Table 1: General features of selected poultry

Location	Akçalar
Housing System	Floor system on litter
Capacity	10 000
Density m^2/bird	33
Ventilation System	Mechanic
Manure System	Litter+Manure
House Direction	North-East

Figure 1: Broiler house overview and side view
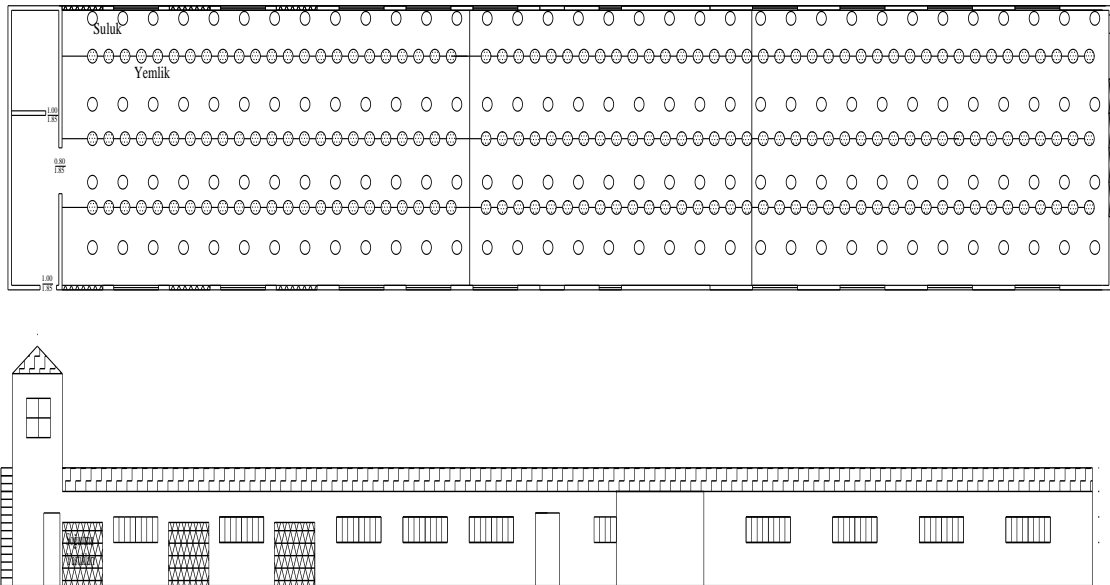
In this study, PM concentrations and indoor environmental conditions such as temperature, relative humidity was measured continuously for four consecutive days in summer months. A pDR-1500 Aerosol Monitor (Thermo-Fisher Scientific, USA) was used for particulate matter concentrations measurements.

Indoor air temperatures, relative humidity (RH) and air velocity in monitored house were measured at 5 min intervals throughout the experiment using portable temperature/RH/air velocity meter with hot-wire probe (Model 435-2, Testo, Germany). Outdoor temperature/RH/air velocity data was taken from governmental meteorology station near the monitored broiler houses.

The data obtained monitored broiler houses was statically analyzed by using JMP 7. The general linear model was used to determine significance of differences among pollutant PM emissions.

Results

Indoor Environmental Conditions

The daily environmental conditions averages were obtained from hourly environmental conditions averages during measurement period. Indoor environmental conditions measured in broiler house have been given in Table 2.

Indoor temperature, airflow rate and relative humidity ranged between 20-32 °C, 0.07-5.8 m^3/h.bird and 34-80%, respectively. The present study showed that in the barn, the mean temperature and relative humidity and air velocity of air was 29oC, 54% and 0.21 m s-1, respectively. Obtained average mean temperature and relative humidity values showed that indoor environmental conditions didn't provide to bird's demand about environmental

conditions, except some minimum values. Maximum temperature value was obtained around 15:00 in first measurement day while minimum temperature was occurred around 05:00 in fourth measurement day.

Table 2: Mean temperature and relative humidity and velocity of air in poultry,

MD		T	RH	AV
	Ave.	29	47	0.23
1	Max.	30	55	0.44
	Min.	27	41	0.04
	Ave.	29	52	0.17
2	Max.	32	64	0.41
	Min.	26	38	0.04
	Ave.	30	56	0.18
3	Max.	32	64	0.43
	Min.	27	45	0.01
	Ave.	28	61	0.26
4	Max.	31	69	0.67
	Min.	26	51	0.05

PM Concentrations

The daily average exhaust PM concentrations overall of study were 1.25 mg/m^3. The daily average ambient concentrations of pollutant PM incoming air to the monitored broiler houses were measured 0.1 mg/m^3. The differences among measurement days for PM concentration were statistically significant ($P<0.01$).

Table 3: Particulate matter concentrations in a broiler house in summer season

Measurement Days	PM Concentration (mg/m^3)			
	Avg	Max	Min	SD
1	0.87[c]	4.01	0.13	1.21
2	1.48[b]	5.11	0.07	1.65
3	2.03[a]	14.44	0.07	3.21
4	0.62[d]	1.69	0.08	0.52

Hourly variation on obtained PM concentrations were investigated in measurement days. The average mean PM concentrations were measured 0.82 mg/m^3 for day time and 0.99 mg/m^3 for night time. The differences between day and night time concentrations wasn't significant ($P>0.05$) during study period. The maximum exhaust PM concentrations were measured around 05:00 am in first measurement day.

The effects of environmental conditions on PM concentrations were analyzed for each and all measurement days. Temperature, relative humidity and air velocity measured in this study were compared with PM concentrations using regression analyze. Hourly PM concentrations statically affected from relative humidity ($P>0.01$). Temperature and air velocity had nonsignificant effect on PM concentrations in this study.

CONCLUSION

The obtained PM concentrations were exceed limit values ($20\mu g/m^3$, Cambra-Lopez et.al.2010) for livestock houses published in European Directives "Air Quality Directive". Therefore the producer should apply some mitigation techniques to reduce PM concentrations in broiler house.

Pollutant PM concentrations in animal barns affect workers' health as well as broiler. Different countries worldwide have some regulations to protect workers' health in animal barns. These regulations set limits for a time-weighted average (TWA) over 8 h and a short exposure threshold limits. According to Turkish regulations on workers' health, the exposure limit of PM was established as 0.05 mg/m^3 for TWA over 8h (Kilic, 2013). The average PM concentrations in this study were exceed exposure limits in these regulations.

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Preliminary Results of Mogador Apricot Cultivar under Protected Cultivation

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ABSTRACT

This study was carried out to evaluate the Mogador apricot cultivar under protected cultivation in Hatay, Turkey. The Mogador cultivar was planted at plastic cover and open area with planting spaces of 2.5x3.0 m in June 2017. Phenological variables such as first blossoming, full bloom, end of bloom and harvest time and pomological variables such as fruit weight, fruit diameter, fruit length, flesh/seed percentage, total soluble solids (TSS), pH and acidity were investigated. Fruit color measurements were performed by Minolta color (CR-300). The fruit weight was highest in open area (46.77 g) than protected cultivation (37.98 g). Protected cultivation had lower values for soluble solid content (9.0%). The results showed that protected cultivation provided earliness of 12 days when compared to open field. We indicated that fruit quality characteristics of Mogador cultivar was highest in the open area than protected cultivation, however, early ripening of Mogador cultivar under plastic cover allows a highly profitable fruit growing.

Keywords: Apricot, Protected Cultivation, Earliness, Fruit Quality.

INTRODUCTION

Turkey is the main apricot producer and exporter in the world with total production of 750,000 t of apricots (TUIK, 2018). Turkey has great potential for export of its fresh apricots because of its ecological advantages compared to France, Spain, and Greece. Recently, the production of fresh apricots for exports had rapidly increased mainly in the Mediterranean region of Turkey (Caliskan et al., 2012; Tuzel and Bahar, 2018). Recently, fresh apricots are produced mostly in coastal regions, especially in Mediterranean and Aegean Sea regions of Turkey (Caliskan et al., 2012).

Apricot fruits have a beneficial effect on human health because of antioxidants and anti-inflammatory and immune-stimulating functions that can be attributed to the content of many phenolic compounds. It is also a rich source of carotenoids and vitamin C (Hegedũs et al., 2010; Sochor et al., 2010).

Economic developments and changes in lifestyle are increased significantly to demands for fruit quality and safety. The fruit production in outside the season is insufficient to meet the needs of consumers. Therefore, early fruit production in the season is gaining increasing attention (Liu, 2018).

The countries of Mediterranean region have important advantages for protected cultivation due to the mild winter allows production under simple plastic cover. Protected cultivation is mainly located on the south coast, where the ecological conditions are favorable for protected cultivation without additional heating in Turkey. Banana, strawberry, apricot, plums and peach-nectarines under cover are produced for earliness (Tuzel and Öztekin, 2015). However, stone fruits with low chilling requirement and high fruit quality should be preferred for protected cultivation (Layne et al., 2013).

Kuden et al. (2007) displayed that some apricot cultivars under protected cultivation were earlier harvested (before 5-8 days) than open area in Adana (Turkey) ecological conditions.

Layne et al. (2013) showed that high tunnels can advance harvest by as many as 30 days for peach-nectarines. Lang et al (2014) displayed that apricots are harvested between June 28 and July 28 under high tunnels in Michigan conditions. The tunnel-grown apricots were slightly vigor than those grown with no cover and blush on red-skinned cultivars reduced under tunnel. In addition, the chilling requirement varies considerably between cultivars, and growers attempt to match appropriate cultivars with the environment where they will be grown. When apricots are planted in locations where sufficient winter chilling is lacking, poor fruit set and irregular vegetative growth are frequently encountered (Ledbetter and Krueger, 2017). The late frosts are also very critical for the apricot cultivation and high tunnels can be solving the problem (Yao et al, 2019).

Fernandez et al. (2018) indicated that protected cultivation has rapidly expanded in many regions all over the world, particularly in those with mild winter climatic conditions.

Greenhouse production in Mediterranean ecology is mainly depend on low-technology cold greenhouses. In addition, Aman et al. (2018) demonstrated that protected fruit cultivation has developed very quickly and widely and now it has become an important area in fruit cultivation.

This study was carried out to evaluate the Mogador apricot cultivar under protected cultivation in Hatay province, eastern Mediterranean region of Turkey.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

The study was conducted at Department of Horticulture, Faculty of Agriculture, Hatay Mustafa Kemal University, in 2019. Mogador cultivar was planted to open and cover area with 2.5 m x 3 m in June 2017. The cultivar was cultivated on Myrobolan 29C rootstock.

The side height of the greenhouses was 1.9 m and the highest point was 3.0 m and it was without heated and fertigation system was used for irrigation and fertilization.

The coverage was made by 300 m-thick with UV+IR. The plastic was covered from end of January to ripening and was full opened after harvest. During this period, the ventilation of the protected area was carried out depending on the weather condition. On cold days (below 10°C), the plastic cover was closed to prevent heat loss whereas the plastic cover on sunny and hot days (above 25°C) was opened from about 10:00 am to 16:00 pm.

Phenological variables such as first blossoming, full bloom, end of bloom and harvest time and pomological variables such as fruit weight, fruit diameter, fruit length, flesh/seed percentage, total soluble solids (TSS), pH and acidity were investigated. A total of thirty fruits were taken randomly from trees.

Fruit weight (g) was measured with a scale which is sensitive to 0.01 g (Shimadzu BL-3200). Fruit length (mm), width (mm), length (mm) and height (mm) were measured by a digital caliper (Mitutoyo, 0–150 mm).

Total soluble solids (TSS) content was determined with a digital refractometer (Atago, PAL-1) and pH measurements were performed using a pH meter (Orion pH meter). Acidity (expressed as malic acid %) was determined by titrating with 0.1 N NaOH up to pH 8.10. The TSS/Acidity was used as an indicator of taste quality (Ledbetter et al., 2006)

Fruit color measurements as L, a*, b*, Chroma (*C*) and hue angle (*h°*) value were performed by Minolta color (CR-300). Thirty fruits of Mogador cultivar were randomly selected and were measured on the two opposite skin or flesh surfaces of fruits. The L* value indicate darkness and high L* values represent lightness. Negative a* value indicate green color and positive a* value indicate red color. The *C* value shows color intensity. The *h°*, is a trait that has been indicated to be effective in predicting visual color appearance (Francis, 1980)

The trunk diameter, 10 cm above the budding union, and thirty annual shoot length was measured in December.

The data were analyzed by using SAS software and procedures (SAS, 2005). Analysis of variance tables were constructed with Fisher's Least Significant Difference (LSD) method at p≤0.05.

Results

Results of trunk diameter and shoot length for the Mogador cultivar were given in Table 1. The difference was not significant for tree trunk diameter. Mogador had the highest shoot growth value (44.25 cm) under protected cultivation whereas it had the lowest (32.70 cm) in open area.

Table 1: Tree trunk diameter and shoot length values of Mogador cultivar

System	Tree trunk diameter (mm)	Shoot length (cm)
Protected	55.97	44.25 a
Open	53.99	32.70 b
LSD (5%)	NS	8.76

NS: Not significant.

According to Table 2, flowering times ranged from 25 February to 05 March in protected cultivation and from 07 March to 22 March in open area. The harvest dates was affected by the cultivation system and protected cultivation showed 12 days earliness when compared to open area.

Table 2: Phenological stages of Mogador cultivar

System	Bud Swelling	Red Calyx	First Flowering	Full Flowering	End of Flowering	Harvest Date
Protected	08 February	19 February	25 February	27 February	05 March	26 April
Open	23 February	01 March	07 March	11 March	22 March	08 May

The cultivation system was significant for fruit weight, fruit height and flesh/seed ratio values (Table 3). All of these traits were highest in open field (46.77 g, 44.45 mm and 20.91 g, respectively) than protected cultivation (37.98 g, 39.72 mm and 17.07, respectively). However, fruit width, fruit length, fruit firmness and seed weight characteristics were not affected by cultivation systems.

Table 3: Fruit quality characteristics of Mogador cultivar

System	Fruit Weight (g)	Fruit Width (mm)	Fruit Length (mm)	Fruit Height (mm)	Fruit Firmness (kg-force)	Seed Weight (g)	Flesh/Seed Ratio
Protected	37.98 b	38.94	40.52	39.72 b	3.51	2.22	17.07 b
Open	46.77 a	40.59	43.46	44.45 a	3.33	2.24	20.91 a
LSD (5%)	5.81	NS	NS	1.27	NS	NS	1.70

NS: Not significant.

The data of chemical characteristics for the Mogador cultivar were shown in Table 4. The cultivar had the highest the soluble solid (TSS) content, pH and acidity in open area than protected cultivation. The difference was not significant for TSS/acidity values.

Table 4: Fruit chemical characteristics of Mogador cultivar

System	TSS (%)	pH	Acidity (%)	TSS/Acidity
Protected	9.00 b	3.22 b	1.38 b	6.52
Open	11.10 a	3.35 a	1.77 a	6.27
LSD (5%)	0.53	0.10	0.20	NS

NS: Not significant.

Cultivation system was not significant on the L and *C* values. The a* value indicating red color, was highest in open area (9.59). Mogador cultivar had the highest b* values (50.65) in the open area, showing yellow color. The cultivar grown in protected area with the lowest h^o value (76.78) had the intense color (Table 5).

Table 5: Fruit skin color values of Mogador cultivar

System	L	a*	b*	*C*	h°
Protected	63.22	4.37 b	44.02 b	44.35	76.78 b
Open	63.71	9.59 a	50.65 a	49.60	84.47 a
LSD (5%)	NS	4.40	6.39	NS	6.24

NS: Not significant.

Fruit flesh color values were shown in Table 6. Cultivation system was not significant on the L and a* values. Mogador cultivar had the highest b* values (55.41) in the open area. Mogador cultivar had the highest the *C* value (52.65) in open area whereas the cultivar had the highest h^o value in protected cultivation (Table 6).

Table 6: Fruit flesh color values of Mogador cultivar

System	L	a*	b*	*C*	h°
Protected	60.45	5.74	43.95 b	37.80 b	79.85 a
Open	68.01	8.05	55.41 a	52.65 a	70.54 b
LSD (5%)	NS	NS	0.54	6.92	1.38

NS: Not significant.

CONCLUDING REMARKS

Early production is one of the most important reasons for growing fresh apricot in the Mediterranean region of Turkey. In recent years, Mogador cultivar is commonly cultivated for open areas for the earliness in the region. On the other hand, protected cultivation for the stone fruits such as apricot, peach-nectarines and plum led to earliness. This study was conducted to evaluate earliness and some fruit quality properties of Mogador cultivar grown in protected

cultivation. The results showed that protected cultivation provided precocity of 12 days when compared to open field. The data showed that considerable variations existed in fruit quality of the cultivar based on cultivation system. Especially, cultivation system effect was significant on variables such as fruit weight, flesh/seed ratio, TTS, acidity, fruit skin color b* and h^o and fruit flesh color b*, C and h^o of Mogador cultivar. We indicated that fruit quality characteristics of Mogador cultivar was highest in the open area than protected cultivation, however, early ripening of Mogador cultivar under plastic cover allows a highly profitable fruit growing. However, more detailed researches are needed on fruit quality, yield and chilling requirements of the cultivars in fruit cultivation under cover.

ACKNOWLEDGMENTS

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The Importance of Total Polyphenols Content in Red Wine

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ABSTRACT

Numerous factors impact the quality of wine. The major contributors to the sensory properties and one of essential compounds in wine are phenolic compounds. These compounds represent one of the most important groups in wine, determining not only the wine colour, but influencing the taste (bitterness and astringency) and fragrance. They also contribute to the wine chemical properties as they interact with other compounds including other polyphenols, polysaccharides and proteins. It is known that they act as antioxidant with mechanisms involving free-radical scavenging that have positive role in human health. The correlation between total polyphenols content and antioxidant potential was confirmed in literature as strongly positive dependent. Besides, the adjustment of SO_2 levels in wines are in correlation with total phenolic content, showing that smaller adjustments are needed with higher content of total phenolic compounds. It is shown that higher content of phenolic compounds ensures wine microbiological and oxidative stability, significantly reduces the load of wine with total sulphite and is involved in the stabilization of colour during wine aging. This research will contribute to the improvement in the knowledge of the technological importance of total polyphenols content in wine, i.e. the relationship with wine quality parameters will be considered, as the understanding of this issue is one of the major challenges in oenology research.

Keywords: Red Wine, Total Phenolic Content, Antioxidant Potential, Wine Quality

INTRODUCTION

Wine is the main agro-food product and one of the most drinking alcoholic beverages in the world with beneficial influence on human health. Wine is consisted of more than several hundred compounds and among them many can be found a very low levels but with important role in wine evolution and its final quality (García-Guzmán et al., 2015). The essential wine substances are water (74–87%, w/w), ethanol (10–15%), organic acids (0.05–0.7%), saccharides (0.05–10%), phenolic compounds (0.01-0.2%) and glycerol (Soleas et al., 1997). However, in different types of wine have been identified even over 500 different substances, of which 160 are esters. Phenolic compounds have long been considered to be basic components of wines and over 200 compounds have been identified. Very important parameter that should be monitored is polyphenolic substances, due to their high influence to the wine sensorial properties such as colour, bitterness, astringency and aromatic complex (Boulton, 2001). Besides, there are increasing number of reports on their positive impact on human health as they act as antioxidant and can be found in many food products (Luceana et al., 2010). Generally, phenolic compounds are divided into two groups: flavonoid compounds (flavonols, flavan-3-ols and anthocyanins) and into non-flavonoid (hydroxycinnamic and hydroxybenzoic acids and stilbenes). All of them have specific role in wine, i.e. for colour is responsible the anthocyanins; hydroxybenzoic and hydroxycinnamic acids act as copigments; while flavan-3-ols contribute to the bitterness and astringency. Flavan-3-ols can be found not only as monomers but also as oligomers and polymers, and these are named condensed tannins or proanthocyanidins. Condensed tannins are grape-derived compounds and have huge importance to the quality of red wine due to their bitter and astringent characteristics (Peleg et al., 1999; Gawel, 1998), and they have a role in the long-term stability of wine colour (Somers, 1971; Vivar-Quintana, Santos-Buelga, & Rivas-Gonzalo, 2002). The concentration of polyphenolic compounds in wine depend on many factors that include the grape variety, cultivation system, vineyard location, soil type, climate, applied agro-techniques, time of the harvest, winemaking process and ageing (Di Majo et al., 2008).

Observed literature data related to correlation between wine polyphenols concentration and antioxidant activity are insufficient and partly contradictory (Di Majo et al., 2008), due to differences between grape varieties and wines, as well as in the contents and proportions of particular phenolic compounds. Therefore, it is complicated to compare the literature data and sometimes not possible due to differences in used methodological approaches and applied methods.

There are studies showing that antioxidant properties are in correlation with total polyphenols content in wine (Höner, Cervellati & Neddens, 2002; Lachman et al., 2009), with anthocyanins content (Pellegrini et al., 2002) and with the content of hydroxicinnamates (Markis et al., 2003). Some others claim that there is present a statistical correlation between antioxidant properties and total polyphenols and only the flavonoid fraction without consideration of nonflavonoids (Zafrilla et al., 2003; Katalinić et al., 2004). Arnous, Makris, and Kefalas (2002) showed that the antiradical activity is due to the flavon-3-ol fraction and not to the anthocyanins. Besides, if these bioactive compounds, which act as antioxidants, are

present at sufficient levels, the need for addition of additives such as SO_2, ascorbic acid etc... can be significantly reduced, considering the fact that these additives are related to some allergies that are caused by wine consumption (Stratil, Kubáň & Fojtová, 2008). The paper will be focused on latest results published regarding to the importance of polyphenol content as antioxidant agent and its influence on overall wine quality, as well as, the relation with other wine chemical parameters.

Total polyphenols as antioxidant agent

Recently, in last few decades, total polyphenols in wine, particularly flavonoids have been focused by many researchers, as it was proven that moderate wine consumption is associated with health-promoting effects due to the presence of these compounds. Kim et al. (2013) studied the effect of polyphenols from berry fruit on cardiovascular diseases and showed that polyphenols have beneficial effect on function of heart, arteriosclerosis and heart attacks, of cardiovascular diseases, and reduces risk of diabetes and hypertension. Functional group distribution and its number, molecular weight and the conjugation degree determine the ability of phenolic compound to act as antioxidant. Most polyphenols have in their structure, two continuous hydroxyl groups on the aromatic ring, called a catechol group, which has a great affinity for free radicals on nearby molecules. However, there are contradictory and confused data about the correlation between the antioxidant capacity and the polyphenolic contents of wine. Some possible explanations for these contrary results were given by (Di Majo, 2008). Different phenolic compounds possess different response which is based on the OCH3 and OH groups and their position on the ring, i.e. the influence on the antioxidant activity by different phenolic compounds is not the same (Finotti & Di Majo, 2003). Saint-Criq de Gaulejac, Provost, and Vivasournal, (1999) showed that the antioxidant activity increase with the level of polymerization and Arnous, Makris, and Kefalas (2002) observed differences within polymeric and monomeric form of anthocyanins. Di Majo (2008) also proposed that there is possible antagonism or synergy between different polyphenols and radicalic molecules that can be found in wine. Di Majo (2008) confirmed that the concentration of certain phenolic compounds is responsible for wine antioxidant activity, i.e. wines with higher concentration of catechins had higher values of antioxidant activity, while quercetin had the lowest influence on the antioxidant activity. However, they showed that highest contributions to antioxidant activity have catechin, myricetin, gallic acid and peonidin3-O-glucoside and that the vintage has no influence on the antioxidant capacity.

Mitić et al. (2014) suggested that anthocyanins, as type of phenolic compound, may not be the one with most powerful ability for radical scavenging that occur in grape berry skins and later in wine, and showed a high significant correlation between total phenols and total flavonoid content with antioxidant activity. Đorđević et al. (2018) demonstrated the antioxidant activity of three Merlot wines and their protective effects corresponded to the abundance of phenolic components. Recently, Pajović Šćepanović et al. (2019) observed strong correlation between total phenol content with antioxidant activity for Montenegrin red wines (Vranac, Kratošija and Cabernet Sauvignon). They also observed low correlation of the antioxidant capacity with the content of low- and high-molecular proanthocyanidins and anthocyanins,

while no correlation was found for individual non-flavonoid compounds, phenolic acids and stilbenes. Similar results were also obtained by Generalić Mekinić et al. (2019) whose results for Crljenak Kaštelanski wines showed that antioxidant activity is in strong correlation with the content of total phenolics and certain individual phenolic compounds (particularly ones with catechol type structure), while minor role is given to the content of anthocyanins.

As it was mentioned, there are many factors that influence the concentration of polyphenolic compounds in wine. Researchers focused a lot on all of these influencing parameters, but mainly on differences between grape varieties, applied agro-techniques in vineyard and winemaking process. Košmerl et al. (2013) investigated the correlation between the content of total polyphenols, anthocyanins, and antioxidant potential, and found that there is poor correlation among yield and these parameters (Table 1). In their work, Montenegrin autochthonous grape varieties were examined, i.e. Vranac and Kratošija that are used for winemaking of top quality red wines. Besides, they observed a positive linear dependence of antioxidant activity on total polyphenols content for Kratošija wines, while for Vranac wines this correlation was low. However, the stronger DPPH• scavenging and reducing power ability was determined for wine of Vranac variety and lower values were obtained for Kratošija. As the Montenegrin autochthonous grape variety Vranac is very popular and spread out in the countries of Balkan region and as it gives wines with high anthocyanin and polyphenol content, as well as the with high antioxidant activity, this grape variety was observed by many authors from Balkan region. As applied agro-techniques in vineyard are also important for the grape and wine quality in term of obtaining higher total phenolic content, Bogićević et al. (2015) examined the effect of early leaf removal and cluster thinning treatments on the quality of grape and wine of Vranac and Cabernet Sauvignon varieties grown in Montenegrin vineyards and observed that early defoliation and cluster thinning in both varieties raised the concentration of anthocyanins and proanthocyanidins.

Table 1: Content of total polyphenols (γ_P), mass concentration of anthocyanins (γ_A), reducing power (C_R) and DPPH. scavenging ability ($c_{DPPH.}$) in relation to yield of variety (Duncan test, $\alpha = 5\%$)

Grape variety	Yield of variety (t/ha)	γ_P (mg gallic acid/L)	γ_A (mg cyanidin-3-glucoside/L)	C_R (mg L)$^{-1}$	$c_{DPPH.}$ (mmol/L)
Kratošija	6	1851±17[a]	164±2[a]	0.971±0.027[c]	154±1[a]
	8	1601±44[b]	158±2[b]	0.927±0.031[d]	139±0[b]
	10	1380±8[c]	147±1[c]	0.977±0.017[c]	118±0[c]
	12	1265±13[d]	145±2[c]	1.033±0.017[b]	108±1[e]
	15	1316±40[d]	146±1[c]	1.082±0.014[a]	111±1[d]
Vranac	8	2032±82[a]	223±5[b]	1.099±0.028[b]	166±1[a]
	10	1829±18[b]	237±3[a]	1.135±0.009[a]	159±1[b]
	12	1693±50[c]	201±1[c]	1.089±0.019[c,b]	146±2[c]
	15	2072±19[a]	223±6[b]	1.061±0.009[c]	157±2[b]

Different letters in index indicate significant differences (95% confidence) between wines
Source: Košmerl et al. (2013)

Mitić et al. (2016) evaluated antioxidant activity of nine Vranac wines produced from different regions (Table 2). All examined wines were 2009 vintage and from three countries (Montenegro, Serbia and Macedonia) and they observed that wines from Montenegro achieved the highest level of total polyphenols (3830.32 mg GAE/L), as opposed to Macedonian (3808.20 mg GAE/L) and Serbian ones (3551.43 mg GAE/L), and also wines from Montenegro obtained the highest total antioxidant activity particularly wines under commercial labels Crnogorski Vranac followed by Vranac Pro Corde. Besides, they determined the mean concentration of the phenolic content of wine Vranac from the Balkan region 3729.9 mg GAE/L, while Di Majo et al. (2008) measured 2360–3730 mg GAE/L for Sicilian red wines. Luceana et al. (2010) measured 3200–5900 mg GAE/L for Brazilian red wines. But, Ertan Anli and Vural (2009) measured lower values, 1070–2410 mg GAE/L, for Turkish red wines. Also, Vranac from the research of Mitić et al. (2016) obtained the percentage of antioxidant activity from 74.40 to 86.12%, while the Cabernet Sauvignon also from the Balkan region obtained 71.30–83.53% (Radovanović & Radovanović, 2010). And for the red wines from Croatia it was 54.6–82.6% (Katalinić et al., 2004). Šućur et al. (2016) also confirmed higher total phenol and total anthocyanin content in wines of Vranac grape variety, comparing to Kratošija with lower total phenol and total anthocyanin content in the winemaking phase after malolactic fermentation and aging of three months. Raičević et al. (2017) investigated the influence of winemaking technologies, i.e. (traditional and modern) fermentation techniques and the use of different oenological means such are enzyme, oak chips and grape tannins, during the two vintages in Vranac wines and concluded that modern fermentation techniques in fermenters with addition of all examined means gave wines with higher content of polyphenolic compounds, and in same way observed grouping of wines according to the vintage and maceration method. In research of Pajović Šćepanović, Wendelin & Eder (2018), Montenegrin varietal red wines were also characterized by determining phenolic composition in wines from different Montenegrin winemaking regions, and observed that varietal wines showed specific profiles for the examined phenolic groups. In their research Vranac wines achieved the highest content of anthocyanins, the highest content of flavan-3-ols was determined in Cabernet Sauvignon wines, while Kratošija had the highest content of hydroxycinnamic acids. In their research, the discrimination and separation of phenolic groups was observed according to the grape variety, but to a smaller level to their geographical origin. Generalić Mekinić et al. (2019) concluded that the use of commercial pectolytic enzymes has slightly negative influence on the total phenolic concentration as well on the antioxidant properties of wine, but extraction yield and phenolics responsible for colour were increased, and in that way preventing loss of colour and make maceration time shorter. Radonjić et al. (2018) investigated the influence of three different commercial yeast on total phenolic compounds and some individual phenolic compounds in young varietal wines from the vintage of 2013, grown in Montenegrin vineyards and observed statistically significant influence of different commercial yeast on all analyzed individual phenolic compound, and Cabernet Sauvignon obtained the highest content of the sum of analysed phenolic compounds, followed by Kratošija and Vranac. Some additional analysis by Radonjić et al. (2019) showed that Vranac contained the highest content of stilbenes and a significant increase of their concentration was observed in all wines inoculated with commercial yeast. In this research, it was also observed that the highest total content of phenolic

compounds after malolactic fermentation was determined in Vranac wines, followed by Cabernet Sauvignon and then Kratošija.

Table 2: Total phenol content (TP) and total antioxidant activity (TAA) of wines, data are reported as mean±SD (n = 3); bars with no letters in common are significantly different (p < 0.05) in the same column

Wine, vintage	Producer, origin	TP, (mg gallic acid/L)	TAA (mmol TE/L)
Vranac, 2009.	Vinoprodukt Čoka, Subotica, Serbia	3528.04±28.53[fg]	13.22±0.20[c]
Vranac, 2009.	Rubin Kruševac, Serbia	3478.70±23.23[g]	13.00±0.26[c]
Vranac, 2009.	Vino Župa, Aleksandrovac, Serbia	3647.52±9.49[ef]	13.79±0.26[cb]
Crnogorski vranac, 2009	Plantaže 13. jul, Montenegro	3935.19±22.68[ab]	15.02±0.35[a]
Vranac-Pro corde, 2009.	Plantaže 13. jul, Montenegro	3850.50±21.65[cd]	14.79±0.20[a]
Crmnički Vranac-Barrique, 2009.	Vinarija Mašanović-Virpazar, Montenegro	3705.22±18.59[edc]	13.82±0.20[cb]
Vranac, 2009.	Povardarie, Negotino, Macedonia	3868.54±19.17[b]	14.41±0.26[ab]
Tga za jug, 2009.	Tikveš, Macedonia	3693.81±15.79[ed]	13.63±0.17[c]
Vranac, 2009.	Skovin, Macedonia	3862.23±17.51[b]	4.50±0.26[ab]

**Source:** Mitić *et al.* (2016)

Interaction of phenolic compounds with other wine constituents

Theories regarding to the evolution and reactivity of the phenolic compounds in wine are fundamental in order to understand the role of phenolic compounds in final wine attributes. During grape processing, alcoholic fermentation and after during aging of wine, phenols, that are native to grape variety were transformed into complex compounds, modifying wine in term of colour and sensory perceptions. Observing the chemical structure of phenolic compounds, it is important to pay attention on their reactivity to oxygen, their susceptibility to electrophilic aromatic substitution, and their ability to form hydrogen bonds and to participate in hydrophobic interactions (Nollet & Gutierrez-Uribe, 2018). These reactions are cause of some healthy and sensory wine properties. For example, electrophilic aromatic substitution reactions, as well the oxidation reactions which form quinones improve stabilization of wine colour, while oxidation also decrease astringency of red wine.

The main interactions between wine tannins and other macromolecules such as polysaccharides and proteins have important influence on the colloidal behaviour and astringency of wine. In regard to the reactions of anthocyanins, it is important to consider that they change the wine colour in dependence of pH and due to their reactions among them and with other wine compounds, and they also react with SO_2 present in wine. Besides, during the process of winemaking, grape derived anthocyanins may undergo degradation due to reactions

in an excess of oxygen in which insoluble complexes of brown compounds can be formed (Waterhouse, Sacks, & Jeffery, 2016). However, copigmentation that represent the noncovalent reaction ensures the red colour of wine (Boulton, 2001), as well as the transformation of anthocyanins into other new pigments. One of the most important phenomenon occurring in the process of wine aging is formation of new anthocyanin-derived pigments via covalent binding with other wine compounds and the main reason is their stability and less bleaching in contact with SO_2 in comparison to grape derived anthocyanins (Sarni-Manchado et al., 1996; Bakker & Timberlake, 1997; Asenstorfer, Hayasaka & Jones, 2001). Their structure range from the low molecular weight such are pyranoanthocyanins (Sarni-Manchado et al., 1996), flavanyl-vinylpyranoanthocyanins (Mateus et al., 2003), to the large polymers such as the red tannin–anthocyanin adducts (Remy et al., 2000).

Figure 1: Illustration of three families of pyranoanthocyanins (pinotins, portisins, vitisins) found in wine
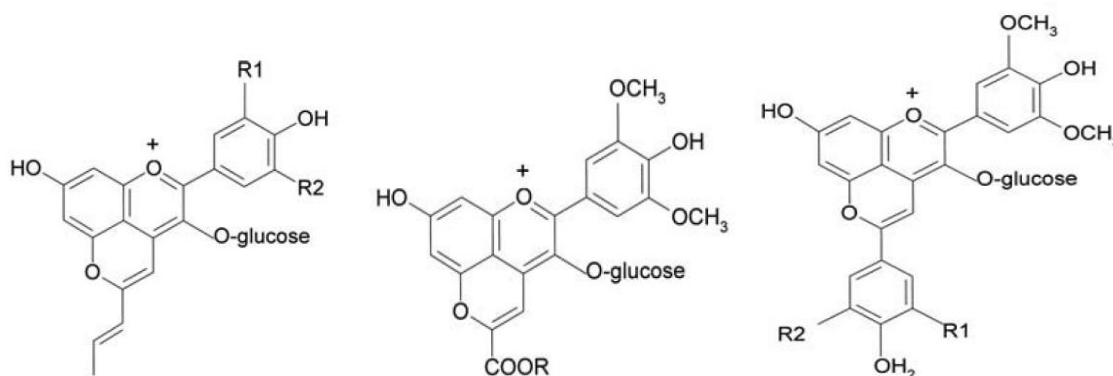
Regarding to the group of flavan-3-ols and condensed tannins, it is important to note that their contribution is not limited only to the sensation of bitterness and astringency. They can improve the colour of red wine also due to copigmentation or the formation of new pigments (Francia-Aricha et al., 1997). Besides, in dependence of their structure, they consume oxygen or react with products of oxidation, therefore represent key compounds that improve wine stability and longevity (Da Silva et al., 1991). Their antioxidant property is also very strong due to their ability to bind proteins and form stable complexes with metal ions, having positive impact on human health which was reported in the literature (Bagchi et al., 2000; Schroeter et al., 2010; Nunes et al., 2016).

CONCLUSION

There is a lot of number of variables affecting the final phenolic composition of red wine, beginning from the chosen grape variety and reactions occurring in grapes influenced by applied agro-techniques and clime conditions that can differ from vintage to vintage. Then, there are numerous factors that impact the diffusion of phenolic compounds from grape must to wine and their changes from the young wine to the wine found on the shelf. Researchers put a huge effort to deal with all of these factors, what resulted with huge number of reviews and studies published in regard to this topic. However, it is clear that wine characteristics depend a

lot on phenolic compounds and their reactions, but the role of phenolic groups on the sensory perception of wine still need deeper knowledge and more research.

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Determination of Consciousness Levels of Associate Students on Environmental Pollution: Example of Bursa Uludag University

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ABSTRACT

Environmental problems have become one of the critical issues of discussion today by the growth of population, industrialization, urbanization and the use of pesticides. Environmental problems, which are caused by pollution in water, air, soil, solid waste, visual, odor and noise areas, are increasing with the lack of environmental consciousness in the society. Family, educational institutions, mass media, and non-governmental organizations have important roles in the development of environmental awareness. Environmental consciousness has a dynamic structure that can develop throughout life. It is of utmost importance that university students, who will take part in the solution of current and future environmental problems and have an essential place in transferring information to future generations, can apply environmental knowledge to their daily lives and to be able to comprehend the dimensions of the danger posed by environmental pollution and to raise awareness in this sense. In this study, a survey was conducted to determine the awareness of associate students studying at Bursa Uludag University Gorukle Campus on environmental pollution and the obtained data were evaluated.

Keywords: Bursa, Consciousness Level, Survey, University.

INTRODUCTION

Many problems such as nutrition, unemployment, a decrease of agricultural land and housing problem with the increase in population in recent years have emerged (Yalılı Kılıç, 2018). These problems lead to the deterioration of the natural life and pollution of the environment. The environment is polluted due to various reasons such as leaving the garbage randomly to the environment, discharging the wastewater to the receiving environment without treatment, using wrong incineration techniques, polluting the agricultural land and human, and animal and plant health are adversely affected (Güney, 2004; Güney, 2008).

Reducing environmental pollution depends on people's knowledge and sensitivity. Environmental awareness can be developed and expanded by spreading ecological awareness to the society, collecting wastes separately, increasing recycling awareness, making harmless sprayings in agriculture, reducing, and treating wastewater (Erten, 2006; Karpuzcu, 2012).

In this study, a survey was conducted to determine the level of knowledge of environmental awareness among the students of Bursa Uludag University Health Service Vocational School and the results were evaluated.

MATERIALS AND METHODS

In this study, the survey was applied to associate students studying at Health Service Vocational School of Bursa Uludag University. The 175 students who participated in the survey were asked through face-to-face interviews. A total of 20 questions given in Table 1 were asked to determine the level of awareness of environmental pollution.

Table 1: Survey questions

1. According to you, which is the main cause of environmental problems? ▦ Tourism　　　　　　　　　　　▦ Population growth ▦ Industrilization　　　　　　　　▦ Urbanization
2. Do you think the studies for solving environmental problems are sufficient? ▦ Enough　　　　　　　　　　　　▦ Not enough ▦ Not intended　　　　　　　　　▦ No comment
3. Would you like to participate in the events organized for the environment? ▦ Yes, I actively participate ▦ No, I just follow with mass media ▦ I join ▦ No comment
4. Which of the following methods is more effective for raising environmental awareness to society? ▦ Mass media (radio, newspaper, TV) ▦ Environmental lessons throughout the education life ▦ Environmental events ▦ I think society is conscious enough

Table 1: Survey questions (continued)

5. According to you, what is the definition of erosion?
- It is a landslide
- It is a soil erosion
- It is an inefficient soil
- It is a natural disaster

6. According to you, what is the reason of soil pollution?
- Overuse of pesticides
- Indiscriminate evacuation of garbage
- Destruction of forests by people
- All

7. What do you prefer to buy products when you shopping?
- I prefer to buy products with a recycle sign in the packaging
- I prefer economic products
- I buy as much as I need
- No comment

8. How to remove the glass, paper, plastic, metal, battery wastes from your house?
- I will throw it in garbage bin
- I will throw it in recycle bin
- I will give it to the garbage collectors

9. According to you, which are the most important sources of air pollution?
- Traffic
- Industry
- Use of fuel in housing
- Forest fires

10. Which of the following expresses your opinion about base stations?
- Contact
- Quality of operator
- Radioactive pollution
- No comment

11. According to you, how is our country in terms of water resources?
- Water rich country
- Water shortage country
- Water poor country
- No comment

12. What do you think about clean production applied in factories?
- An economically profitable practice
- Water and energy saving is an approach to help
- It is an application for increasing efficiency
- No comment

13. How do you react to the activities that cause environmental pollution of individuals, institutions or factories?

- I'm warning myself
- I complain to the relevant authority
- I'd be uncomfortable, but I can't spare time for that
- I'm not interested

14. What is the reason of water pollution?
- Unsuitable discharge of factories
- People's arbitrary behavior (picnic etc.)
- Water resources are not adequately protected
- All

15. Do you think that the treatment of drinking and wastewater treatment plants is adequate in Bursa?
- Yes
- No
- No comment

16. According to you, what is the reason of image pollution?
- Poles and cables used in distribution
- Exterior of old and dilapidated buildings
- Caregiving gardens
- Non-aesthetic workplace facade and billboards

17. What is the environmental problem that significantly affects Bursa?
- Air pollution
- Water pollution
- Solid waste pollution
- Image pollution
- Odor
- All

18. How often the municipality of the place collects garbage?
- They gather regularly in the morning and evening
- In every two days
- Collecting, but the containers are insufficient
- It's not regular

19. What do you prefer to be near the place where you live?
- Park, garden, forest
- Mall
- Factory
- Highway

20. Do you have any idea about green houses, which are more valuable in the construction sector, respectful to nature, ecological, comfortable and reduce energy consumption?
- Yes
- No
- I heard it, but I don't know what it means

RESULTS

The survey results obtained from this study are given in Figure 1-20. In the first question, the students were asked about their opinions about environmental problems. According to students studying at Health Service Vocational School, industrialization is the most important environmental problem (Figure 1). For finding an adequate solution to these environmental problems, the studies are not enough as seen in Figure 2.

When the students were asked if they participate in the events organized for the environment, 47% of them want follow with mass media (Figure 3). As seen from Figure 4, the students thought that mass media (radio, newspaper, TV) is more effective for raising

environmental awareness to society. The students' response that the definition of erosion is soil erosion in question 5 (Figure 5). When they asked about the reason of soil pollution, they said that overuse of pesticides, indiscriminate evacuation of garbage, and destruction of forests by people are the main reasons (Figure 6).

In question 7, the students were asked about what they prefer to buy products when they were shopping. Most of them said that they buy as much as they need (Figure 7). For learning their thoughts about recycling, they were asked how to remove the glass, paper, plastic, metal, battery wastes from their house. Nearly half of the students throw them in the garbage bin (Figure 8). As seen in Figure 9, according to the students, the industry is the most important sources of air pollution. In question 10, the students were asked about their opinions about the base stations; 43% of them said that it is radioactive pollution (Figure 10).

When the students were asked about our country's water resources, they replied Turkey is a Water-rich country (Figure 11). The students were asked what they thought about clean production applied in factories; 31% of them said that clean production is water and energy-saving process (Figure 12). When the students's reactions to the activities that cause environmental pollution of individuals, institutions or factories were asked, 30% of the students complain to the relevant authority, 34% of the students are uncomfortable, but can't spare time for that (Figure 13). According to the students, unsuitable discharge of factories, people's irresponsible behaviour (picnic etc.), and water resources are not adequately protected are the reasons for water pollution (Figure 14). They also think that drinking and wastewater treatment plants are not adequate in Bursa (Figure 15).

When the reason for image pollution was asked, according to 29% of the students, the reason is non-aesthetic workplace facade and billboards, 33% of the students, the reason is the exterior of old and dilapidated buildings (Figure 16). In question 17, what is the environmental problem that significantly affects Bursa were asked and according to the students's water pollution, air pollution, image pollution, solid waste pollution, odor are the main environmental problems of Bursa as seen from Figure 17.

When the students were asked about how often the municipality of the place collects garbage in question 18, 29% of them said that they gather regularly in the morning and evening, 27% of them said that they collect in every two days, 25% of them said that collecting, but the containers are insufficient, 19% of them said that collecting is not regular (Figure 18). In question 19, the students were asked what they prefer to be near the place where they live, 66% of them prefer to park, garden, the forest should be near they live (Figure 19).

The students were asked about green houses, which are more valuable in the construction sector, respectful to nature, ecological, comfortable and reduce energy consumption, nearly half of them said no, 27% of them told heard it, but don't know what it means (Figure 20).
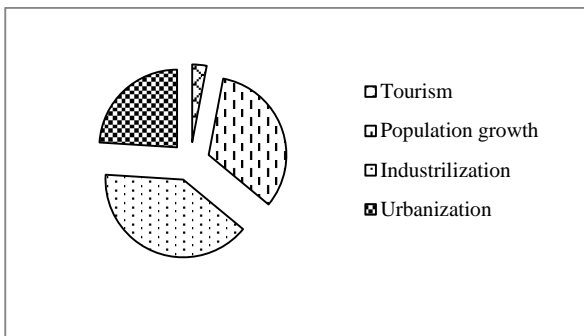
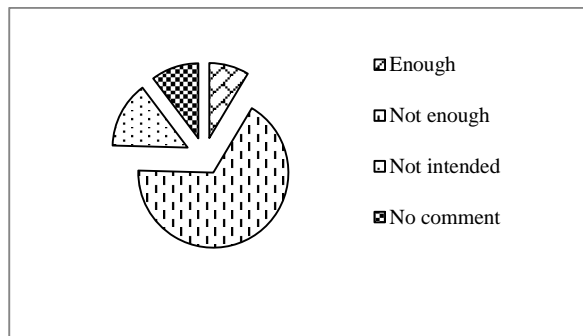**Figure 1: The opinions about environmental problems**

- Tourism
- Population growth
- Industrilization
- Urbanization

Figure 2: The opinions about finding an adequate solution to environmental problems

- Enough
- Not enough
- Not intended
- No comment
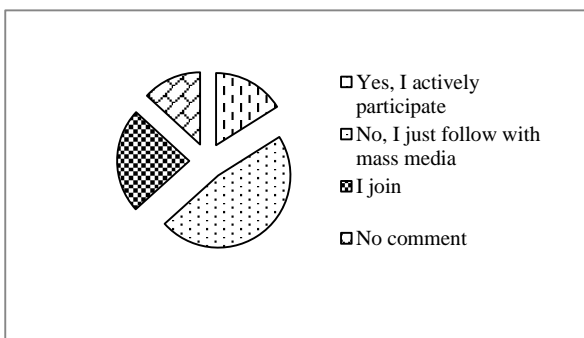
Figure 3: The opinions about the participating in environmental events

- Yes, I actively participate
- No, I just follow with mass media
- I join
- No comment
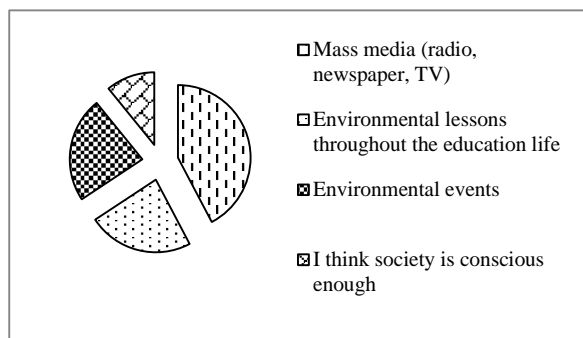
Figure 4: The opinions about the best way to gain environmental awareness

- Mass media (radio, newspaper, TV)
- Environmental lessons throughout the education life
- Environmental events
- I think society is conscious enough
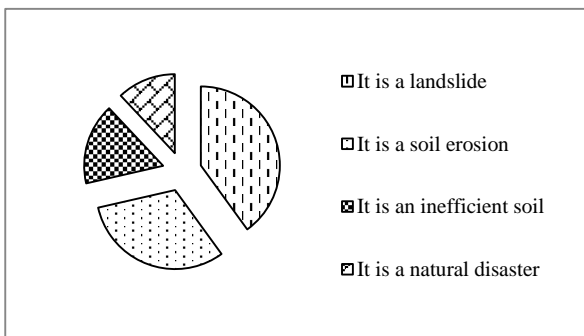
Figure 5: The knowledge about the definition of erosion

- It is a landslide
- It is a soil erosion
- It is an inefficient soil
- It is a natural disaster
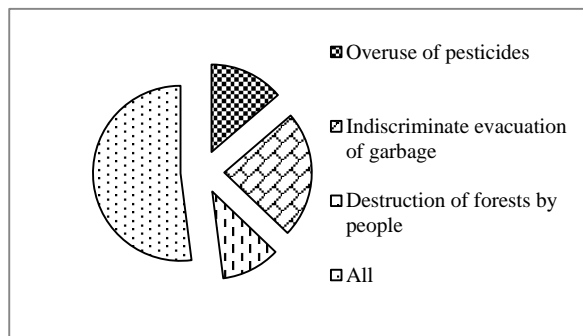
Figure 6: The opinions about soil pollution resources

- Overuse of pesticides
- Indiscriminate evacuation of garbage
- Destruction of forests by people
- All
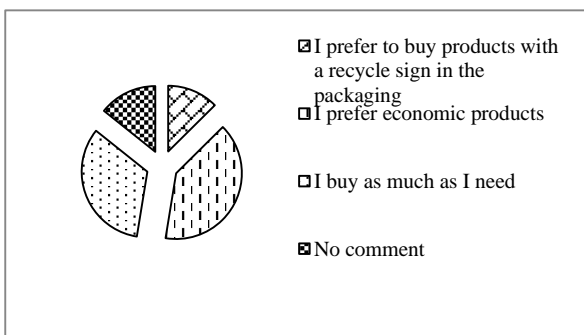
Figure 7: The opinions about chosing the products when shopping

- I prefer to buy products with a recycle sign in the packaging
- I prefer economic products
- I buy as much as I need
- No comment
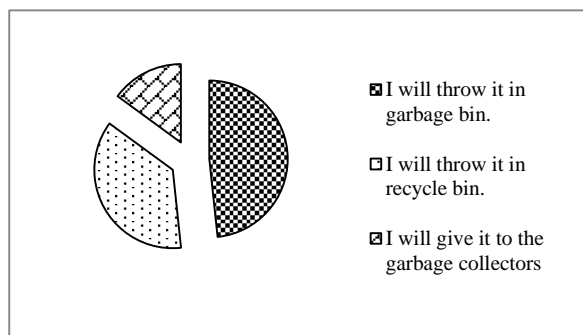
Figure 8: The removing of paper, glass and plastic wastes

- I will throw it in garbage bin.
- I will throw it in recycle bin.
- I will give it to the garbage collectors

246

□ Traffic

□ Industry

☒ Use of fuel in housing

☑ Forest fires
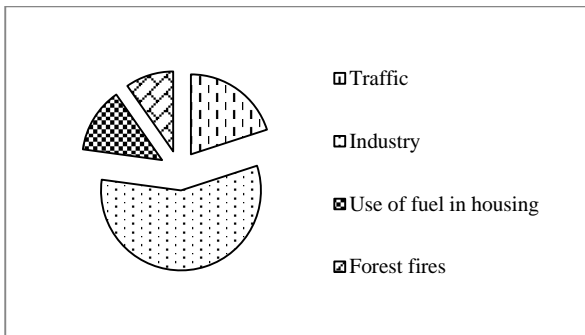
Figure 9: The opinions about the most important air pollution resource

□ Contact

□ Quality of operator

☑ Radioactive pollution

☒ No comment
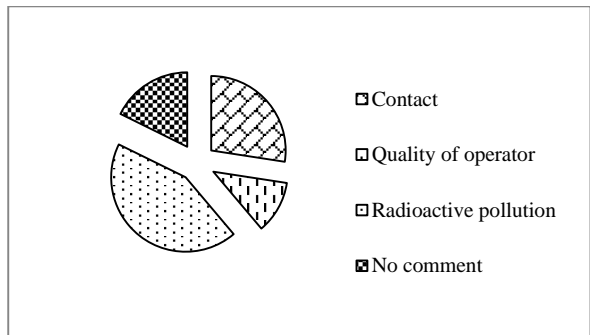
Figure 10: The knowledge level about the bas station

☑ Water rich country

□ Water shortage country

☒ Water poor country

☒ No comment
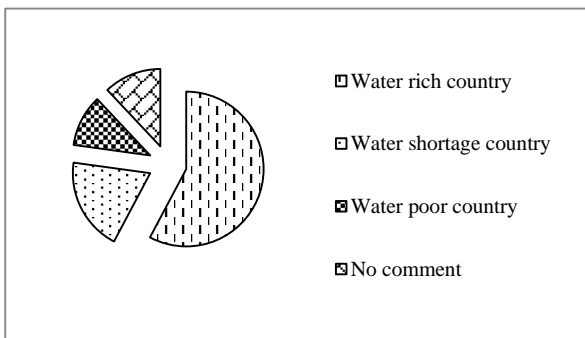
Figure 11: The opinion about our country's water resources

☑ An economically profitable practice

□ Water and energy saving is an approach to help

□ It is an application for increasing efficiency

☒ No comment
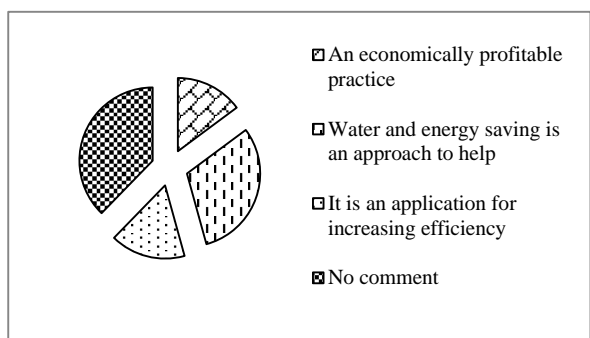
Figure 12: The opinions about clean production

□ I'm warning myself

□ I complain to the relevant authority

□ I'd be uncomfortable, but I can't spare time for that

☒ I'm not interested
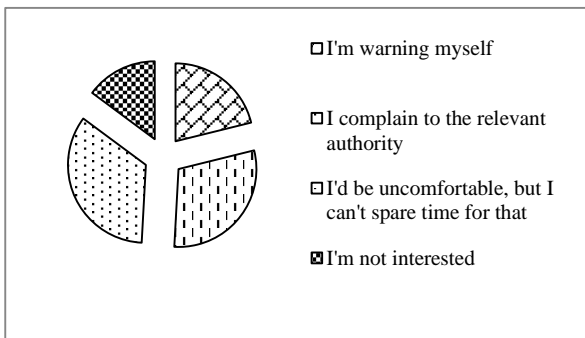
Figure 13: The attitude towards environmental pollution

☑ Unsuitable discharge of factories

☑ People's arbitrary behavior (picnic etc.)

□ Water resources are not adequately protected

☒ All
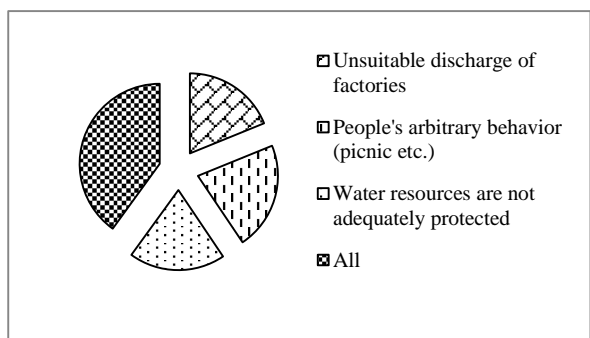
Figure 14: The opinions about water pollution

□ Yes

□ No

☒ No comment
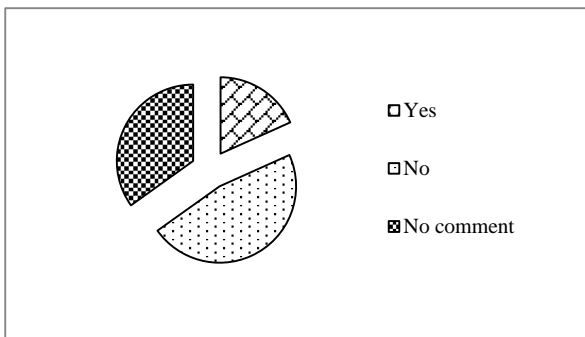
Figure 15: The opinions about drinking and wastewater treatment plants works

☑ Poles and cables used in distribution

□ Exterior of old and dilapidated buildings

□ Caregiving gardens

☒ Non-aesthetic workplace facade and billboards

Figure 16: The opinions about image pollution resources

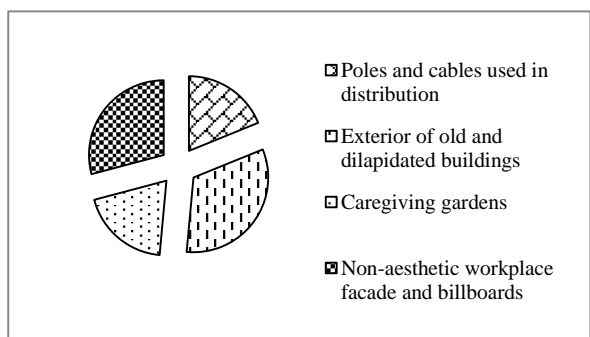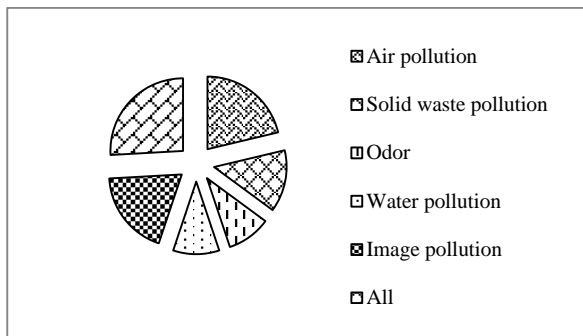**Figure 17: The opinions about Bursa's environmental problems**

- ⊠ Air pollution
- ◻ Solid waste pollution
- ▥ Odor
- ◻ Water pollution
- ⊠ Image pollution
- ▢ All
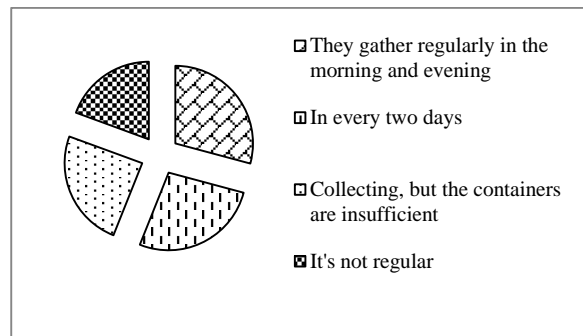
Figure 18: The opinions about how often the garbage is collected in the municipality

- ◻ They gather regularly in the morning and evening
- ◼ In every two days
- ▢ Collecting, but the containers are insufficient
- ⊠ It's not regular
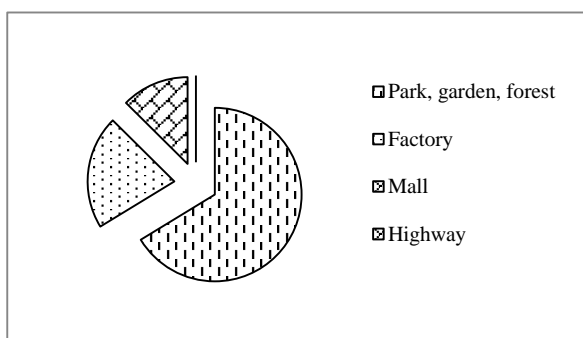
Figure 19: The opinions about what should be near the place of living

- ◻ Park, garden, forest
- ◻ Factory
- ⊠ Mall
- ⊠ Highway
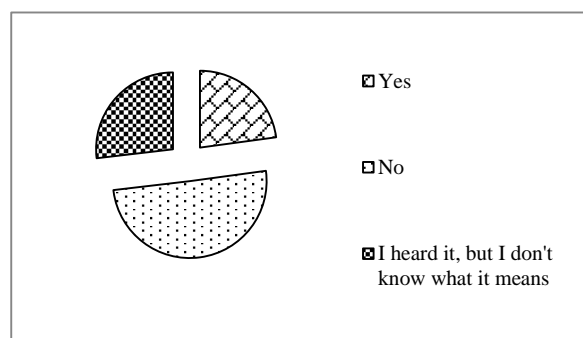
Figure 20: The knowledge level about the green houses

- ⊠ Yes
- ◻ No
- ⊠ I heard it, but I don't know what it means

CONCLUSIONS

The results of this survey was applied to associate students studying at Health Service Vocational School of Bursa Uludag University are summarized below.

- When the survey results are considered in general, students are aware that human beings are the basis of environmental pollution.

- They think that with the increase in population, natural resources will be depleted and other problems will increase.

- Students do not find the studies done to solve environmental problems sufficient.

- Accordingly, public, institutions and organizations should increase their efforts in the field of environment.

- Students either do not participate in environmental activities or follow the mass media.

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Environmental Effects of Heavy Metals and Removal from Industrial Wastewater

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ABSTRACT

Most of the wastewater exposed as a result of industrial activities include heavy metals. Heavy metals have become an important issue in recent years due to their involvement in surface waters and groundwater and the potential risks of living things. Non-biodegradable heavy metals tend to accumulate in the living organism. Although some of the heavy metals are required at certain concentrations for necessary activities, they show various toxic properties at high concentrations. Other alternative methods are preferred because physical and chemical methods used in heavy metal removal from wastewater cannot completely remove heavy metals. The oxidation, reduction, precipitation, membrane filtration, ion exchange, electrochemical processes, biological processes, and adsorption are in these methods. Although all of these technologies are used, adsorption is the most suitable method for removing heavy metals from wastewaters. Compared to conventional methods, the adsorption process has the advantage of low operating costs, minimization of disposed chemical and biological sludge volume, and high efficiency in detoxification of very dilute wastes. In this study, the information about heavy metals originating from industries is given. Also, due to the harmful effects of heavy metals on the environment and human health, the adsorption process used for removal of heavy metals from industrial wastewater before discharge is detailed.

Keywords: Adsorption, Heavy Metal, Treatment, Toxicity.

INTRODUCTION

Heavy metals are present in industrial wastewater, landfill leachate and leachate from mining sites. These waters mix into the receiving environments, such as lakes, rivers and underground waters and accumulate in sediments. Therefore, they protect pollution values without losing even kilometres away from the discharge point (Kahvecioğlu et al., 2004).

A significant amount of heavy metals in wastewater is also present in treatment sludges. Dissolved parts reach surface waters and seas and remain in these regions. Heavy metals can be mobilized again to reach drinking water and food chain. Heavy metals that reach the food chain cannot be excreted chemically or biologically and accumulate in the body (Siegel, 2002).

Heavy metals, which are the source of toxicity, are defined as metals with a density greater than 5 g/cm^3 (Çimen, 2014). This group includes more than 60 metals including lead, cadmium, chromium, iron, cobalt, copper, nickel, mercury and zinc (Kahvecioğlu et al., 2004).

Heavy metals pass through water resources, industrial wastes or acid rains as they dissolve the soil. Consequently, the heavy metals present in the composition, and the dissolved heavy metals reach the river, lake and groundwater. Heavy metals transported to water are highly diluted and partially precipitate to the water base by forming carbonate, sulphate, sulfur compounds and enrich in this area. Due to the limited adsorption capacity of the sediment layer, the heavy metal concentration of the water increases continuously (Rether, 2002).

The release of heavy metals into the environment due to rapid industrialization causes great concern. Cadmium, zinc, copper, nickel, lead, mercury and chromium are commonly found in metal plating, mining activities, smelting, battery manufacturing, tannery, oil refinery, paint manufacturing, pesticides, pigment-dye production, printing and photographic industrial wastewater (Williams et al., 1998). Types of heavy metal discharged from industries are given In Table 1 (Rether, 2002).

Table 1: Types of heavy metal discharged from industries

Industry	Cd	Cr	Cu	Hg	Pb	Ni	Sn	Zn
Paper	-	+	+	+	+	+	-	-
Petrochemistry	+	+	-	+	+	-	+	+
Chlorine-alkali production	+	+	-	+	+	-	+	+
Fertilizer	+	+	+	+	+	+	-	+
Iron-steel	+	+	+	+	+	+	+	+
Energy production	+	+	+	+	+	+	+	+

In this study, the information about heavy metals is given, and removal methods of heavy metals are introduced. Also, adsorption, one of heavy metal removal methods, is detailed.

VARIOUS HEAVY METALS AND ENVIRONMENTAL EFFECTS

Heavy metals are classified as vital and non-vital according to their degree of participation in biological processes. Those identified as vital must be present in a certain concentration in the organism structure, and since these metals participate in biological reactions, they must be regularly taken up through food. For example, copper is an indispensable part of red blood cells and many oxidation and reduction processes in animals and humans (Bigersson et al., 1988).

However, non-vital heavy metals can affect the psychological structure even at deficient concentrations and cause health problems. The best examples of this group are mercury bound to sulfur enzymes (Duffus and Worth, 1996).

Whether a heavy metal is vital also depends on the organism being considered. For example, while nickel is toxic to plants, it must be present as a trace element in animals.

The effects of heavy metals on human metabolism are classified as below:

• Affecting chemical reactions
• Affecting physiological and transport systems
• Affecting building blocks as carcinogenic and mutagen
• Acting as allergens
• Affecting specific

Lead

Lead is the first metal that causes the most important damage to the ecological system by human activities. Lead is spread to the atmosphere as metal or compound and is the most important heavy metal causing environmental pollution. Lead mines and metal industries, battery and battery factories, petroleum refinery, paint industry and explosive industry wastewater is also found to lead to unwanted concentrations of pollution (Çimen, 2014).

Cadmium

Cadmium has toxic effects on living things and foods, drinking water, air, cigarettes, working environment air can enter the human body. No absorption through the skin. The proportion of cadmium in the atmosphere in industrial areas is much higher than in rural areas (Kahvecioğlu et al., 2004).

Copper

The effect of copper on plants and organisms varies according to the chemical form and size of the body. It is a fundamental structure component for giant living beings, while it is a poison for small and straightforward living beings. Copper and its compounds are therefore widely used as fungicides, biocides, antibacterial agents and insecticides against pests and

molluscs. Taking a small amount of copper ions disrupts the copper balance of the body, inhibits enzyme activity, and disrupts the normal functioning of the liver, brain and kidneys (Sayılı and Akman, 1994).

Zinc

The most important uses of zinc are; dry battery making, plating (galvanizing) and alloys. Zinc metal and many compounds show a low toxicity effect compared to other heavy metals (Dündar et al., 2012).

Nickel

Nickel, which is toxic at an inevitable overdose (0.18-5 ppm), has three types of toxicological effects. These are carcinogenic, respiratory and dermatological (allergic) effects (Anonymous, 2019a).

Cobalt

Cobalt has important applications in strategic and industrial applications and the military field. While cobalt is mostly used as a superalloy in jet engine turbines, it is also used as an alloying element in alloys, high-speed steels, tool steels, diamond tools and cutting inserts to provide materials with magnetic properties, corrosion protection and improving mechanical properties. The compounds are used as catalysts in the oil and ceramic industry and as a drying agent for pigments, inks and varnishes in paints (Anonymous, 2019a).

HEAVY METAL REMOVAL METHODS

Wastewaters containing heavy metal pollution are generally acidic waters with low biological oxygen demand (BOD). Reaching the receiving environment of metal-containing wastewater affects aquatic life and requires the use of expensive treatment techniques to obtain drinking water (Türkman et al., 2001).

Table 2: The removal methods of heavy metals

	Neutralization	Precipitation	Flotation	Filtration	Sedimentation	Ion exchange	Electrolysis	Electrodialysis	Ultrafiltration	Reverse osmosis	Adsorption	Biological reatment	Chemical Oxidation	Liquid oxidation	Distillation	Incineration/drying
Heavy metals	-	+	#	#	#	+	+	+	+	+	-	-	+	+	#	+

- + appropriate / possible   # combined method   - not available

Many economic and effective methods have been used in literature studies for heavy metal removal, and new separation techniques have been developed. Ion exchange, chemical

precipitation, reverse osmosis, evaporation, membrane filtration, adsorption, such as easy to apply and economical methods are widely used for heavy metal removal. The removal methods of heavy metals are given in Table 2 (Anonymous, 2019b).

It is known that traditional methods for removing heavy metals from the environment create new environmental problems are inadequate and expensive. Electrochemical, physical and chemical methods such as chemical precipitation, chemical oxidation and reduction, electrochemical methods, recovery by evaporation, filtration, ion exchange, membrane technology applied for the removal of heavy metals from wastewaters often require high operating costs and the resulting solid waste sludges are difficult to process. It is not commercially practical. Many chemical requirements and unpredictable metal removal are some disadvantages of these techniques. The advantages and disadvantages of easy and economical methods used in heavy metal removal are given in Table 3 (İleri, 2000).

Table 3: The advantages and disadvantages of metal removal methods

Method	Advantage	Disadvantage
Chemical precipitation and filtration	Simple, cheap	Difficult separation at high concentrations Inactive Waste sludge formation
Electrochemical methods	Recovering metal	Expensive Only effective at high concentrations
Chemical oxidation and reduction	Inactivation	Ambient sensitivity
Ion exchange	Efficient treatment and recovery of pure waste metal	Sensitive to particles and expensive resins
Evaporation	Obtaining pure waste	Excess energy requirement Expensive Waste sludge formation
Reverse osmosis	Obtaining pure waste for recycling	High pressure Membrane size Expensive
Adsorption	Activated carbon use of sorbents	Application for all metals

Adsorption

Adsorption is the process of adhering to the porous solid surface of chemical substances in wastewater which are difficult to be treated by other treatment methods by chemical and physical bonds. Adsorption process can be applied in intermediate stages as well as after biological and chemical treatment to obtain water with desired properties. The type of adsorption used in water and wastewater treatment is liquid-solid adsorption. The deposition or

distribution of dissolved substances at the interface depends on the relative gravitational force of the adsorbate and solvent. The rate of adsorption of substances by solid adsorbents from aqueous solutions is an important factor in the application of this process for water quality control.

Activated carbon is used to remove these pollutants, which cause toxicity, color and odor pollution. In the first stage, the contaminant is transported through the solution to the solid surface (film diffusion), in the second stage the contaminant reaches the bonding points in the surface/pores of the surface (pore diffusion), and in the final stage sorption occurs. It is necessary to regenerate granular activated carbon which has exhausted adsorption capacity. The values understand the necessity of this in the quality of the leaving water. Generally, the regeneration of activated carbon is done by heat treatment at 900 °C. Organic compounds adsorbed at this temperature are destroyed by burning. Regeneration of powder activated carbon is not possible (Forster, 2003; Humphrey et al., 1997).

Adsorption Types

The adsorption of the adsorbate in a solution by the adsorbent takes place mainly in 4 stages (McKay, 1996):

1. Diffusion of the adsorbate present in the gas or liquid phase towards a film boundary covering the adsorbent (bulk solution transport).
2. The adsorbate coming into the film layer passes through the stationary portion into the pores of the adsorbent (film mass transfer/boundary layer diffusion).
3. Intraparticle diffusion of the adsorbent by moving through the pore cavities to the surface where adsorption will occur (intraparticle diffusion).
4. Finally, the adsorption of adsorbent to the adsorption of the pore surface (sorption) occurs.

Physical Adsorption

The physical adsorption is an exothermic event. The adsorbed material is held on the surface with the help of weak Van der Walls forces. The process is reversible, and by changing the process conditions, the adsorbed material is easily removed from the surface. It is characterized by a low adsorption temperature of about 10,000 calories per molecule adsorbed. In contrast to the physical adsorption process, negative adsorption, which shows a reduction in surface concentration, is also frequently encountered. This process is called desorption. In general, components or process conditions (adsorbed, T, P, concentration) that cause an increase in surface free energy lead to negative adsorption. Both kinds of surface phenomena (surface concentration increase and decrease) are expressed with the term sorption (Kahvecioğlu et al., 2004).

Chemical Adsorption

The chemical adsorption is a form of adsorption formed by the adsorption of particles adsorbed by atoms bonded to the adsorbed surface. The durability of the chemical bond varies.

However, the bonds formed are stronger than the bonds in physical adsorption. Chemical adsorption is often encountered in solid catalyst reaction systems. Adsorption energy is between 20,000-100,000 calories per mole of adsorbed. Depending on whether the event is exothermic or endothermic, this value is approximately the same as the reaction temperature in chemical reactions (Kahvecioğlu et al., 2004).

Change Adsorption

Exchange adsorption refers to the adsorption of ions to charged areas under the influence of electrostatic attraction forces. Ion exchange is included in this class. Here, the adsorbent and the adsorbent surface must have opposite electric charges to attract each other. Ions with high electrical charge and small ions are better adsorbed (McKay, 1996; Sarıkaya, 2000).

CONCLUSIONS

Acids, toxic metals and detergents that cause industrial pollution, pollute rivers, lakes, seas and groundwater. Acids as a result of industrial activities; toxic and harmful fumes and vapors of heavy metals such as lead, zinc, copper and arsenic are released into the environment.

Because of the toxic properties of heavy metals exceeding the absorbing capacity of nature, the effects of polluting the ecosystem endanger human health. However, these elements are used in the industry, and a certain amount of industrial waste enters the food chain. Therefore, heavy metal contents of wastewater from pollution sources should be treated before being released to the environment and reduced to below the permissible values according to various water standards.

In this study, information about the methods used to remove heavy metals from industrial wastewater before discharge due to their harmful effects on the environment and human health is given.

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Efficiency Assessment of Indoor Environmental Conditions in a Broiler House Using Temperature-Humidity Index

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ABSTRACT

Indoor environmental conditions are a major factor for the broiler in terms of bird welfare. Optimum temperature and relative humidity conditions in indoor environment in broiler houses should be provided to prevent heat stress, good feed conversion ratio, higher productivity and less mortality. The goal of this study was to assess efficiency of indoor environment conditions in a broiler house operated in Bursa region using temperature humidity index (THI). The average mean and maximum THI values were 28 and 31, respectively and it varied from 25 to 31. According to THI results obtained in this study, indoor environmental conditions in monitored broiler house were insufficient for broiler in all measurement days.

Keywords: Broiler, Heat Stress, Temperature-Humidity Index.

INTRODUCTION

Environmental conditions play a significant role in poultry houses to provide desired productivity levels. Especially indoor temperature and relative humidity have direct impacts on productivity and physiological activities of hens. broiler are able to keep body temperatures and some mechanisms only within certain temperature intervals in comfort region for temperature and they can not adapt to high temperatures and relative humidity. Broilers are more sensetive against heat stress to catch higher production performance and feed conversion ratio (Lin et al., 2006).

Broiler chicken is a homeotherm that can live comfortably only in a relatively narrow zone of thermoneutrality. Far away from thermoneutrality, higher temperatures with higher relative humidity result heat stress as a negative conditions for bird living. On the other hand lower environmental temperature increases feed intake and decreases body weight gain and feed conversion ratio, thus negatively influencing the performance of broiler chickens (Blahova et al., 2007). Therefore, efficiency of indoor environmental conditions as vital factor should assess in broiler house. Temperature-humidity index (THI) integrate the effects of temperature and humidity is a one of the thermal comfort indices in animal barns and may offer a means to predict the effects of thermal conditions on bird performance (Thom, 1958, Purswell et al., 2012). THI is highly used and has been developed for various farm animals.

In hot and humid regions, the chicken are exposed to thermal stress during summer season. The hot and humid climate have a decreasing impact on feed consumption and growth rate in broilers. Heat stress conditions are commonly considered as a product of ambient temperature and relative humidity (RH) (Yahav, 2000). Certain thermal comfort indices based on the correlation of physiological responses of a particular species to these climatic conditions such as wet-/dry-bulb temperature index (WD index) has been experimentally determined to assess the effects of thermal stress. The poultry researchers used the term temperature-humidity index (THI) instead of WD index. The THI is usually based on rectal temperature, respiratory rate or heart rate response to temperature and humidity combinations. The THI is a single value representing the combined effects of air temperature and RH associated with the level of thermal stres. The hot, humid climate has a negative impact on the performance and well-being of broilers. Particularly during summer, the temperature and humidity remains much above the thermally comfortable zone of broilers significantly influencing the metabolizable energy requirement for maintenance. The temperature-humidity index can be used to account for the effects of heat stress on performance of broiler breeder pullets and it should be employed in energy models for accurate prediction of their MEm in such areas (Behura et.al. 2016).

Estimating thermal comfort in modern poultry production is important that acclimatization systems can be triggered at appropriate time reducing losses and increasing yield. Although current literature presents some thermal comfort indexes which are applied for this estimation those are based just on ambient thermal conditions and do not consider important factors inherent to the animals such as genetics and capability of adaptation, generally providing an inadequate estimation of the birds' thermal comfort (Naschimento et.al. 2011).

THI find out effects of dry and wet bulb temperature on broilers. But, it doesn't consider importance of ventilation rate on indoor temperature in broiler house. Impact of ventilation rate on temperature should integrate temperature humidity index. Because the ventilation rate in broiler houses mitigate heat stress in modern broiler production facilities such as tunnel-ventilated houses. This is especially the case with broiler production. Because chicken is more sensitive than other animal species for changes in indoor climatic conditions in houses (Tao and Xin 2003).

The aim of this study was to determine thermal comfort level of hens in a broiler house operated in Bursa region through efficiency assessment of indoor environmental conditions using THI.

LITERATURE REVIEW

Many scientist from different universities in worldwide studied to assess effects of thermal conditions on farm animals and develop a thermal comfort index as a predictor of production efficiency for various species, dairy cattle (Kabuga, 1992, Cargill and Stewart, 1966, Johnson et al., 1962, 1963, Bianca, 1962) also laying hens (Egbunike, 1979,Zulovich and DeShazer, 1990), hen turkeys (Xin et al., 1992), and tom turkeys (Brown-Brandl et al., 1997) and broilers (Chepete et al., 2005).

St-Pierre et al. (2003) determine economic lossess due to heat stress in the United States due to heat stress. They also calculated daily maximum and minimum Temperature Humidity Index (THI values) using daily maximum and minimum temperature and relative humidity. To determine milk losses, daily maximum THI values and hours with higher THI values than threshold THI value (70) for heat stress in dairy cattle were used .

For semi-arid climate regions throughout the production cycle, Chepete et al. (2005) modeled a THI for broilers chicken by using production parameters in naturally ventilated house. But it has limited application in heavy (> 3.2 kg) broilers reared for breast meat production.

Behura et.al. (2016) was conducted a study to examine the influence of relative humidity (RH) on the ME requirement for maintenance (MEm) of broiler breeder pullets by incorporating effective temperature-humidity index (THI) as a factor in energy prediction equation. Three groups of broiler breeder pullets in summer and winter were housed according to their 7th week body weight (BW). From 8th week onwards, feed restriction was practiced to achieve target BW of 2.2 kg at 20th week. The weekly feed intake was derived using ME prediction model. The dry-bulb temperature (Tdb), wet-bulb temperature (Twb) and RH were recorded daily. The Tdb, Twb and THI during summer were higher ($p<0.05$) than winter. The metabolizable energy for maintenance (MEm) during summer (168.72 kcal/kgW0.75) was significantly ($p<0.01$) higher than the MEm during winter (132.80 kcal/kgW0.75). The correlation between MEm and climatic factors were highly significant ($p<0.01$) during summer unlike winter. Regression analysis also exhibited a similar trend. During summer, $R2 = 0.449$ for effective Tdb and 0.629 for effective Twb indicating significant contribution of Twb to

MEm. The THI, a measure of thermal stress, should be incorporated in energy models for accurate prediction of MEm for broiler breeder pullets in hot and humid tropical climates.

Naschimento et.al. (2011), developed the Fuzzy thermal comfort index (FTCI) aiming to estimate broilers' thermal comfort considering that the mechanism used by the birds for losing heat in environments outside the thermoneutral zone is the peripheral vasodilatation, which increases the surface temperature. Measurements of surface feathers and skin temperature of birds were used. The FTCI was developed using the data of two experiments which provided 108 distinct environmental scenarios. Infrared thermal images were used for registering surface temperature of feathers and skin, as well as the birds' feathering degree. For the same scenarios of thermal environment both FTCI and the temperature and humidity index (THI) were compared. Results validated the FTCI for estimating broilers' thermal comfort, being specific for the estimation of danger conditions usually found in housing in tropical climate countries. This characteristic is advantageous in models which estimate broiler thermal welfare, as occurrence classified as dangerous may lead to economical downward in avoiding productive losses.

Dozier et al. (2007) indicate that indoor temperature less than 21.1°C in broiler house is called the thermoneutral zone (TNZ). They observed heavy broilers panting at air temperatures more than TNZ . Production efficiency as metabolic energy decrease as a result of panting. Because metabolic energy is diverted from growth and development to maintaining homeothermy. For heavy broiler, existing estimation for TNZ can not be applicable and so we need further investigation. Therefore we should reveal the production responses of broiler chickens under varied thermal environments and heat stress and losses in production can be limited through predictive control.

METHODOLOGICAL ASPECTS AND RESULTS

Methodological Aspects

Broiler house, selected for experimental purposes, is located in Bursa of Marmara Region of Turkey. Broiler house is 39 m long, 8,6 m wide and 2.2 m height. General properties of broiler house are shown in Table 1. Figure 1 shows monitored broiler house overview and side view. Monitored broiler house ventilated mechanical using fans. Four fans with a diameter of 150 cm were used in mechanical ventilation system. In the summer period, cooling pads besides the ventilation were used to decrease the indoor temperature. At the beginning of this study, there were a total of 10000 hens with 29 days aged in broiler house.

Table 1: General features of selected poultry house

Location	Akçalar
Housing System	Floor system on litter
Capacity	10 000
Density m²/bird	33
Ventilation System	Mechanic
Manure System	Litter+Manure
House Direction	North-East

Figure 1. Broiler house overview and side view
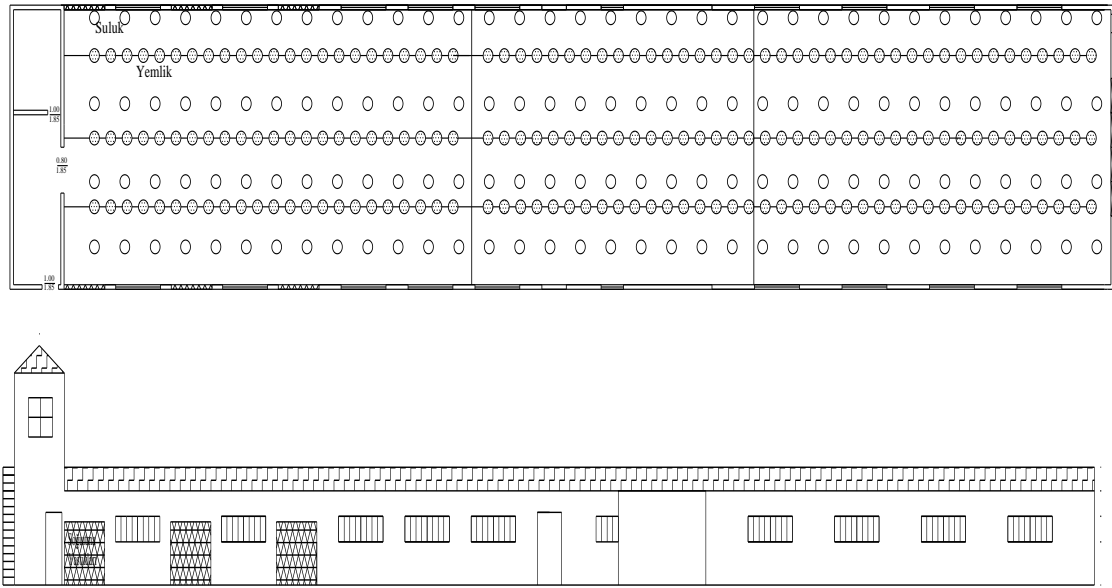
In this study, measurements of environmental conditions such as temperature, relative humidity and air velocity were continuously performed four days for 24 hours in the indoor environment in monitored broiler house. A multifunction temperature and humidity meter (Model 350 XL-454, Testo AG, Germany) was used in measurements.

THI values was calculated by the following eq 1 for broilers (Tao and Xin, 2003).

$$THI = 0.85 T_{db} + 0.15 T_{wb} \qquad (eq.1)$$

Where,

T_{db}= Dry bulb temperature (°C),

T_{wb}= wet bulb temperature (°C) at a particular time.

The wet-bulb temperature in the THI equation was calculated using dry bulb temperature and relative humidity (eq 2, Stull R., 2011)

$$T_w = T \, atan[0.151\,977(RH\% + 8.313\,659)^{12}] + atan(T + RH\%) - atan(RH\% - 1.676\,331) + 0.003\,918\,38(RH\%)^{32}\, atan(0.023\,101 RH\%) - 4.686035 \qquad (eq.2)$$

Where,

T= Temperature (°C)

RH= Relative humidity (%)

Atan= The arctangent function uses argument values as if they are in radians.

The air velocity is also important factor affected heat stress in animal barns. Therefore, air velocity value should be added THI equation. New equation is named temperature humidity velocity index (THVI). In this study THVI values also were calculated by using eq 3 (Tao and Xin, 2003).

$$THVI= (0.85*tdb + 0.15*U)*V^{0 - 058} \tag{eq.3}$$

Results

The average max. and min. values of T, Relative humidity, air velocity, Twb, during measured four days have been illustrated in Table 2. The present study showed that in the barn, the mean temperature and relative humidity and air velocity of air was 29oC, 54% and 0.21 m s-1, respectively.

Table 2: Mean temperature and relative humidity and velocity of air in poultry,

MD		T	RH	AV	W-BT
	Ave.	29	47	0.23	21
1	Max.	30	55	0.44	23
	Min.	27	41	0.04	19
	Ave.	29	52	0.17	22
2	Max.	32	64	0.41	26
	Min.	26	38	0.04	17
	Ave.	30	56	0.18	23
3	Max.	32	64	0.43	26
	Min.	27	45	0.01	19
	Ave.	28	61	0.26	22
4	Max.	31	69	0.67	27
	Min.	26	51	0.05	19

Table 3 shows THI and THIV values calculated for monitored broiler house. The average mean and maximum THI value was 28 and 31, respectively and it varied from 25 to 31. The mean THIV and Tw values were 31 and 22, respectively.

Table 3: THI and THIV values in monitored broiler house

MD		THI	THIV
	Ave.	28	30
1	Max.	29	30
	Min.	26	31
	Ave.	28	31
2	Max.	31	32
	Min.	25	30
	Ave.	29	32
3	Max.	31	33
	Min.	26	34
	Ave.	27	29
4	Max.	31	31
	Min.	25	29

CONCLUSION

According to THI results obtained in this study, indoor environmental conditions in monitored broiler house were insufficient for broiler in all measurement days. When it is looked THI values at temperature humidity index chart for poultry, monitored broiler house is in Alert region for first and fourth days and Danger region for second and third days. On the other hand, THIV value showed that air velocity in monitored broiler house is weak for broiler chickens. Therefore, the broiler producer must take measure to improve indoor environmental conditions in his broiler house. As a result of this study, the broiler producer should operate his evaporative cooling system or increase ventilation rate as a measure in terms of environmental condition control systems

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Pre-Restoration Studies of Edirne Hidirlik Bastion

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ABSTRACT

Hidirlik Bastion is the largest bastion in Edirne with its surrounding area of approximately 1800 meters. Main Entrance Building consists of Ward Building, Artillery Rooms, Artillery Batteries, Trench and Courtyard. The first fortification constructions in Edirne were started against the danger of Russian invasion in 1829. Hidirlik Bastion, the largest of the bastions defending Edirne in the Balkan War, has an important place in the First Balkan War in 1912. The Hidirlik Bastion has lost its importance after the Balkan wars. Although it was used from time to time, it could not resist the destruction caused by unconscious use and after World War II, the Bastion was never used. The strength and functionality are essential in bastions with a military defence structure. The shape, width, height and strategic importance of the place or the hill to be defended are of paramount importance in terms of the plan and architecture of the bastions. In addition to its historical importance, Hidirlik Bastion, which is a first degree monument, is located in HidirlikMevkii in the city center of Edirne. It has been observed that the bastion has been severely damaged during the passing time, that the stones have been removed and taken away and there have been depressions. During the restoration works of Hidirlik Bastion, geophysical studies were conducted in 9 areas including magnetic and ground penetrating radar (GPR) methods at the exit of the bastion tunnel in the parts of the HidirlikBastion which are not visible or covered. The geophysical studies carried out in the bastion yielded supportive results and the locations of the compartments without access in the bastion were identified. It was found that the artillery batteries that were buried under the ground, the ventilation ducts in the chambers, the chimneys, the cistern and the channel. Studies in all areas have been transformed into maps. Restoration and excavation planning could be done according to the maps.

Keywords: Edirne, Hidirlik Bastion, Geophysics, Ground Penetrating Radar, Magnetics, Restoration.

INTRODUCTION

Before the restoration works of Hidirlik Bastion, located in Hidirlik neighborhood of Edirne Province, it is aimed to plan the restoration and excavation according to the geophysical studies in the sections that are not visible or covered, except the visible structures. In this direction, geophysical studies were carried out inside the bastion and at the exit of the bastion tunnel. The areas belonging to the geophysical studies carried out in the bastion in a total of 9 areas are shown in Figure 1.

Figure 1: Geophysical study areas in Hidirlik Bastion

GEOPHYSICAL STUDIES

In the scope of geophysical studies, measurements of Ground Penetrating Radar (GPR) and magnetic methods were taken. The areas where magnetic measurements are carried out and the GPR profile measurement directions are given in Figure 2.

GPR Method

Underground research is based on collecting information from underground with electromagnetic frequencies as ground penetrating radar system defined by many names such as underground penetration, underground radar. The design of the GPR system is defined in a wide range and is generally made according to the choices appropriate to the application to be

made. The depth of the target, the target size and the area to be investigated are effective. In this way, the application areas of the GPR method are quite wide with the system to be selected correctly. In general, GPR data is applied in specified grid areas at regular intervals.

Figure 2: Sketch showing the survey area and the GPR measurements made. The red lines show the GPR profile direction and location
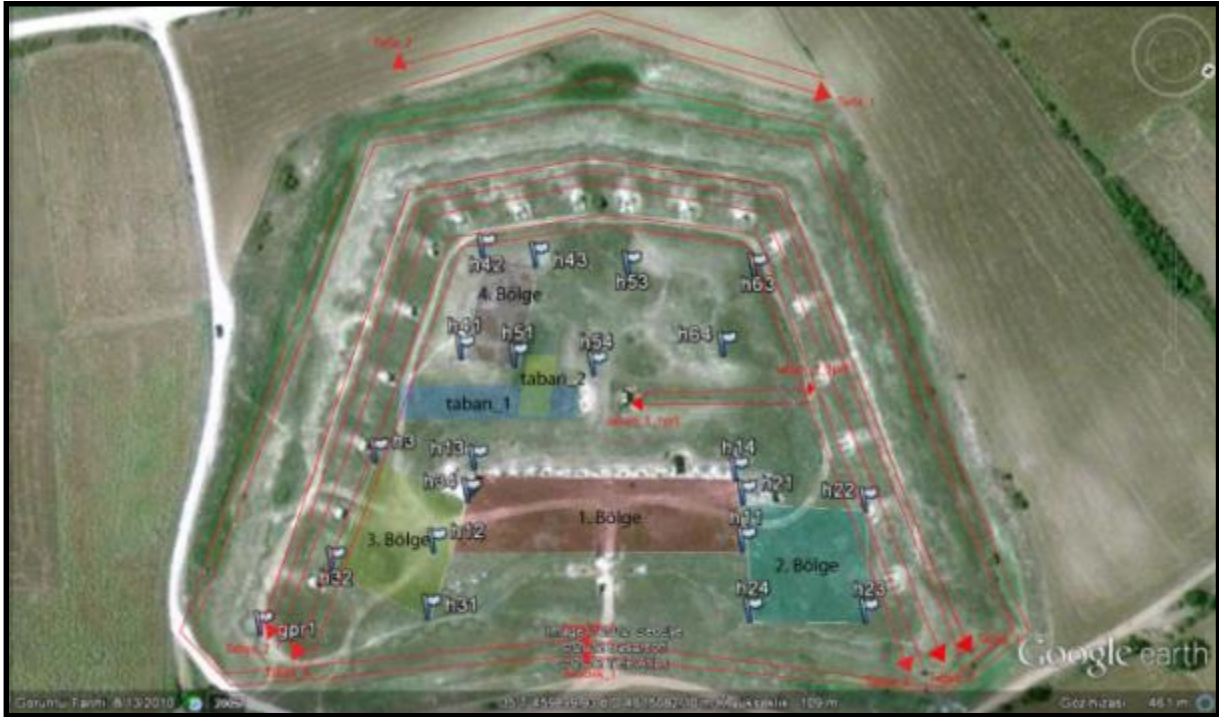
In general, the method deals with the difference between the original signals produced by the electromagnetic signals produced by antennas during the round trip journey (Conyers, 2004). GPR signals reach the target by determining their speed according to the physical and chemical properties of the travel environment and collect information about the target. Since the speed of the environment is also known when travel time is known, the depth of the target can also be determined precisely. The travel time of the GPR signals is determined in nanoseconds (10^{-9} sec). In this way, the antennas above ground collect information by moving at fixed or variable intervals between 2 - 20 cm. The depth at which radar antennas will penetrate depends on two main factors; frequency of antenna and characteristics of soil structure in the application area (water content in general). The independently reflected waves (also called the waveform) are collected digitally by reflecting them from the underworld, so that many traces are obtained and brought together and profiled as 2-dimensional vertical sections. By obtaining a large number of profiles together in the grid, both 2D and 3D underground images can be obtained.

GPR measurements were taken in 9 sites in the study area. During the measurements, Mala brand GPR instrument was used and the depths to be reached were approximately the first 10 m and measurements were taken with a 250 MHz frequency antenna which can produce the information of this depth (Figure 3a).

Since the measurements made outside the bastion to check whether the tunnel passing through the centre of the bastion outside of the bastion continue or not, the 50 mHz antenna was used in the studies carried out in this area (Figure 3b). Evaluations of the obtained profiles were made on radagrams. As a result of the processing and modelling of the collected data, unnatural structural elements (cavities, war material, room, etc. structures) are shown on GPR radagrams (Figure 4) (Buyuksarac et al., 2014a).

Figure 3: (a) Ground radar (GPR) measuring device and its use during field measurement, (b) 50 MHz frequency GPR antenna assembly.

Figure 4: GPR measurements in the basement after processing.


When the GPR images given in Figure 4 are examined, the structure observed especially in Site-4 is noteworthy. The structure, which is estimated to be the deep part of the cannon base, is 3 m thick as can be seen from the cubic 3-D model given in Figure 5. The fact that this structure was not observed in other areas leads to the idea that the gun deployed here

has a relatively high weight compared to the other cannons and the barrel diameter is high. The stratified representation of this structure is given in Figure 6. The yellow and cream coloured areas on the north and south sides of this building were considered as spaces.

Figure 5: Cubic representation of the depth model of the structure observed in the region
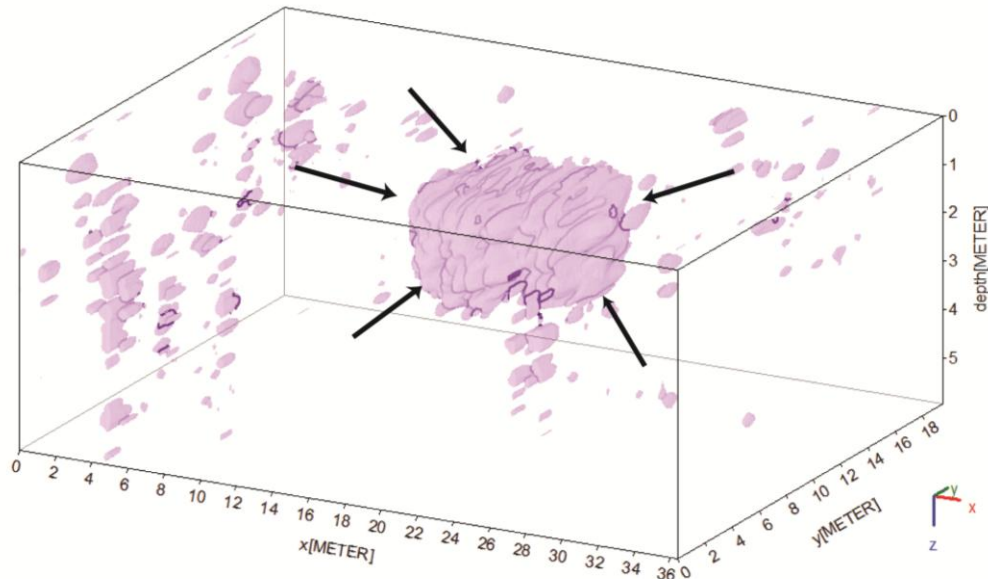
The topographic elevation of the battery chambers is easily distinguished from the GPR measurements made in the area where the ball batteries surround the bastion. The structural characteristics of the battery chamber are also defined (Figure 7).

Magnetic method

Magnetic method is one of the basic geophysical methods used in the exploration or exploration of different structures and minerals in the underground magnetization sensitivity. Some corrections are made on the data until the anomaly is reached in the magnetic field measurements. These corrections are a systematic or random error correction (Arısoy et al., 2007; Buyuksarac etal., 2006; Buyuksarac et al., 2014b).

The magnetic dipole field Fo also has two components, F_{IGRF} and Fs. F_{IGRF} (International Geomagnetic Reference Field) indicates the dipole area assumed to be in the centre of the earth, and Fs indicates the annual change of the dipole area. F_{IGRF} and Fs are published every 5 years by IAGA (International Association of Geomagnetism and Aeronomy). Fz refers to daily changes and instantaneous changes. Daily changes are measured according to the purpose of the magnetic study, at a fixed point near the inspection site, during the study the changes of the magnetic field are determined and then applied to the field data.

The existence of instant changes is determined by asking the observers or by observing sudden changes in the measurement values in the study area. Measurements should be repeated on days when instantaneous changes are high.

Figure 6: Layered structure representation of the region. The floor of the building is observed at the level of 2.5 meters, while gap structures are observed on both sides (north and south)
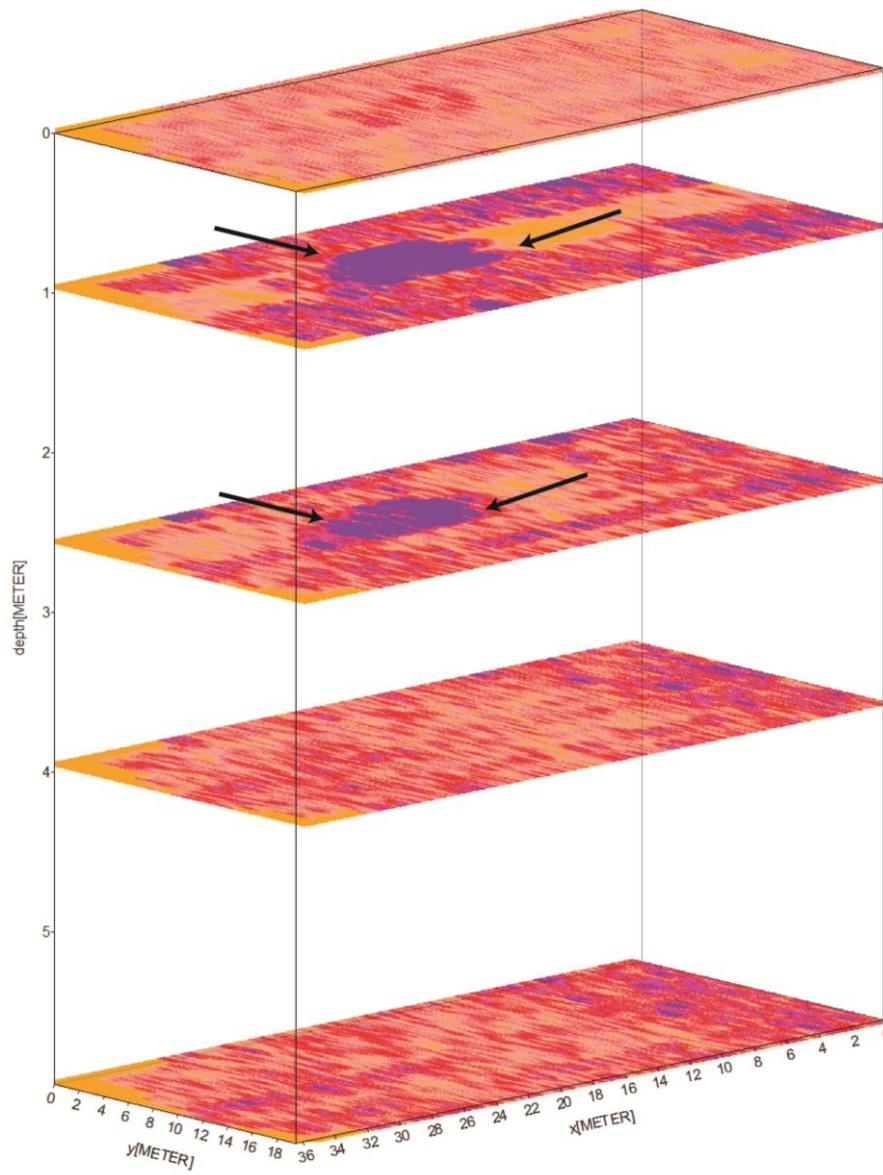
Figure 7: (a) GPR measurement on the ball battery chamber, (b) processed data, and (c) battery chamber structure
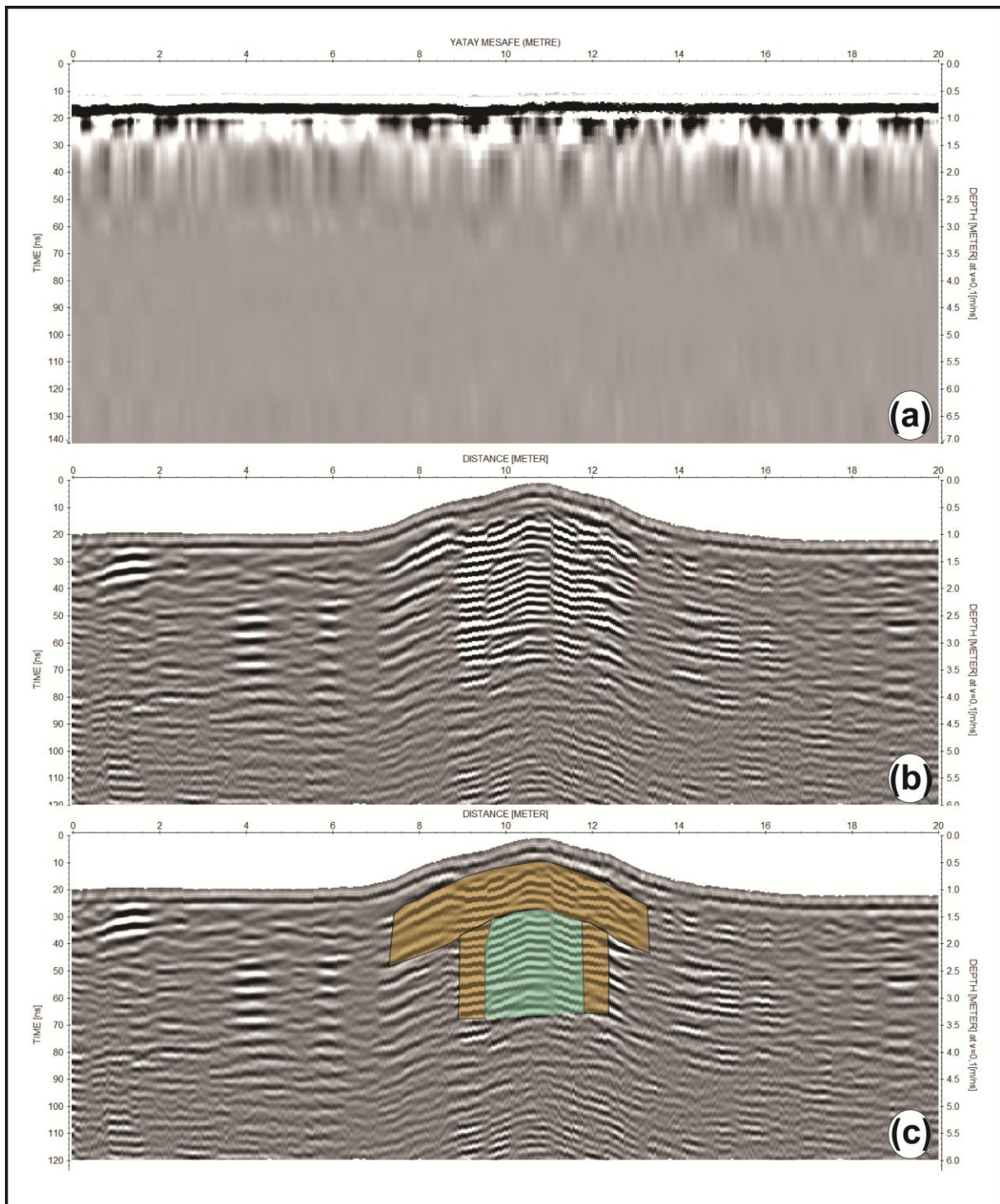
In the magnetic measurements made in the study area, the total component of the earth magnetic field was measured. Geometrics G-858 brand magnetometer was used during measurements. The sensor of the magnetometer is caesium vapour and its sensitivity is 0.01 nT. The measurements were made by taking a measurement every 1.5 meters in each profile with 1 m profile spacing. During the application of the method, the sensor was held in the north-

south direction and measurements were taken in the direction of the magnetic field. The measurements were gridded by Kriging method with GEOSOFT Oasis Montage commercial software. Grid anomaly maps of the magnetic measurements made in the study area are widely given throughout the area (Figure 8).

Reduction to Pole

The shape of the gravity anomaly depends on the structure of the anomaly. In contrast, the magnetic anomaly also depends on the magnetization of the structure and the direction of the earth magnetic field. Therefore, interpretation is more complicated in magnetic anomalies.

Figure 8: Magnetic anomaly map generated throughout the base obtained by application of magnetic method
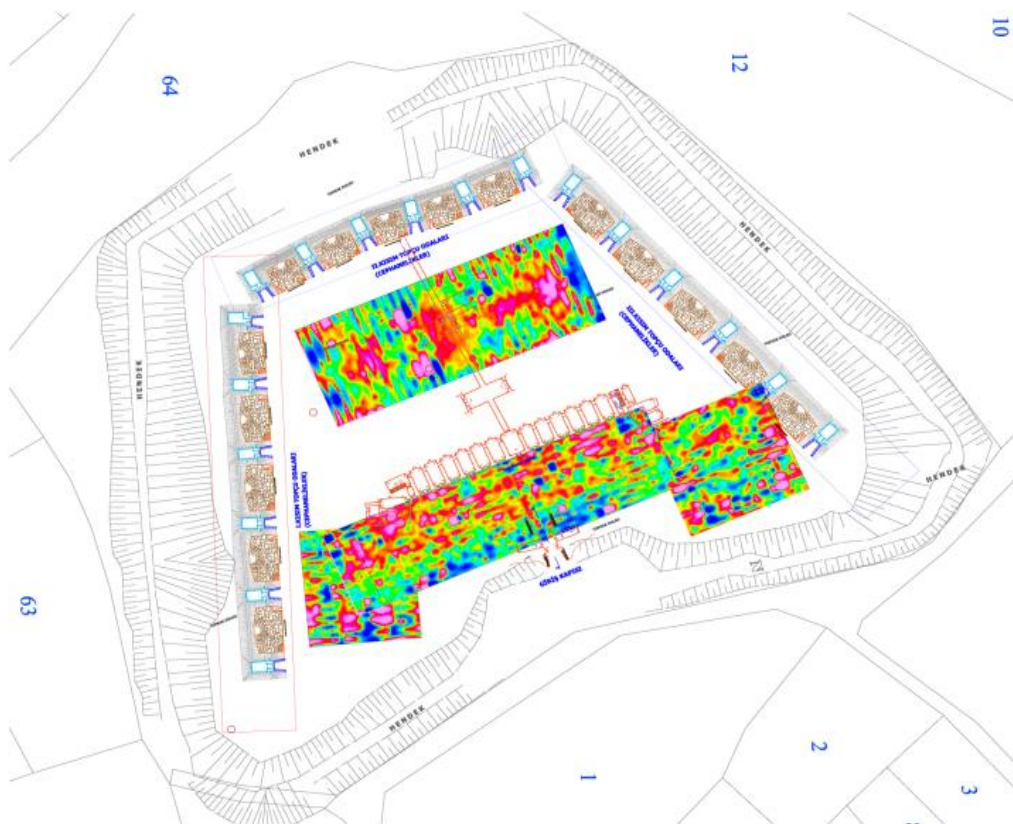
Pole reduction was applied to the trend-removed magnetic data. Polar displacements have been observed in some anomalies with the application. In this embodiment, the magnetic inclination angle is 55° and the deflection angle is 4°.

Analytical Signal Method

It was first proposed by Nabighian (1972, 1974). Accordingly, the conversion of the magnetic field into the frequency medium creates the analytic function. The real part of this function is the horizontal derivative of the field and the virtual part is the vertical derivative of

the field. The most important feature is that the amplitude of the analytical signal is a bell-shaped symmetrical function and lies directly on the boundaries of the structure. The amplitude of the analytical signal is directly located on the structure of the anomaly and its maximum value is on the edges of the structure.

Analytical signal was applied to the pole-reduced anomaly map in the study area (Figure 9). With the application, the places where the underground structures causing the magnetic anomaly give the most severe anomaly were identified. Analytical signal map and pole reduction process were evaluated and important anomalies were identified.

Figure 9: Application of analytical signal belonging to bastion

RESULTS

According to the magnetic and GPR geophysical studies carried out in all parts of Hidirlik Bastion, which covers 9 areas in the study area, except the structurally observed parts of the Hidirlik Bastion, the following conclusions have been reached.

SITE-1: The finding of number 1 may be a space. Being close to the structure reveals the possibility of this cavity being sewer. The finding 2 may be a block structure. Finding 3 gives the impression of a pit or cavity structure. Finding 4 gives the appearance of a block structure. Findings 5 are rubble and old road remains. The finding 6 is the interior and the ruins of the existing structure.

SITE-2: Findings 1 and 2 are old building remains. The finding 3 may be debris aggregates.

SITE-3: Finding number 1, building remains, finding block number 2 and finding areas that are likely to be road number 3.

SITE-4: Findings 1 and 2 are large gaps. The entrance to the cavity in the north is probably around 10 meters from the north. The ball battery platform, which is seen on the surface in the middle of the area, continues towards the deep and is probably made for very heavy cannons.

SITE-5: Findings 1 and 2 describe the underground structure, but there may be metal objects in these structures.

SITE-6: 1 shows a very large flat structure similar to the ball battery platform and there is a block structure in the middle section. Structures 2 and 3 are probably space structures.

The construction properties of the cannon bastions surrounding the bastion were revealed by the GPR measurements made in sites 7, 8 and 9.

There is no evidence that the underground tunnel, which is an important structure of Hidirlik bastion, continues out of the bastion.

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EUAS "Çan" Thermal Power Plant Moisture Analysis in Areas Provided for Limestone Desulphurization Purposes

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ABSTRACT

In the EUAS Çan Thermal Power Plant, which is located in Çan district of Çanakkale province, the desulphurisation process is carried out by flue gas desulphurisation method in order to keep the amount of sulfur dioxide (SO2) gas generated when coal is burned under the limit values set forth in the Regulation on Large Combustion Plants. For this purpose, limestone is used as desulfurization material. The limestone used is obtained from three different limestone areas. Production processes in limestone quarries are carried out by open operation method and blasting is performed during the material purchase. The materials taken from the limestone fields are crushed and sieved in the crushing-sieving mill and then shredded and transferred to the thermic power plant. Due to the general character of the limestone formations in this region, the fractures are very fractured and cracked, and the cracks have reached the slit size and the slits are filled with clay and silt. During the operation, the blasting process is disintegrated and disintegrated with the dislocation of limestone layers, clay and silt. This situation does not cause problems during the rainy seasons, adhering to the limestone crumbs during the rainy periods, causing an increase in humidity. On the other hand, it causes a change in the composition of limestone due to silica contained in clay and silt. Geophysical studies were carried out on the limestone operation sites in order to identify the existing problem and to identify the real dimension of the difficulties associated with the operation. Within the scope of the studies, geophysical methods were widely used for measurements by underground radar (GPR) and electrical resistivity methods. The results show that the contamination of the clay on the limestone is caused by natural rainfall.

Keywords: Thermal power plant, Limestone, Çan, Desulphurization, Geophysics.

INTRODUCTION

The flue gas desulphurisation process is carried out by flue gas desulphurisation method in order to keep the amount of Sulfur Dioxide (SO_2) gas generated under the limit values specified in the Large Combustion Plants Regulation when coal is burned in the EÜAŞ 18 Mart Çan Thermal Power Plant established in Çan district of Çanakkale. For this purpose, limestone is used as desulphurizing material. The limestone used is obtained from three different limestone sites. Production operations in limestone quarries are carried out by blasting and open operation method. The materials taken from the limestone fields are crushed and sieved in the crushing-sieving-grinding facility and then transferred to the thermal power plant by grinding (Figure 1).

Figure 1: (a) EÜAŞ 18 Mart Thermal Power Plant and limestone sites on Googleearth view, (b) Panoramic view of the limestone production site located within the boundaries of Çan district, (c) Panoramic view of the limestone production site located within the boundaries of Yenice district.

As the general character of the limestone formations in this region is quite fractured and cracked and the crack widths are high in some places, the cracks have reached the crevice size and the crevices have been filled with clay and silt (Figure 2). The blasting process, which is carried out during operation, is broken and poured together with the removed limestone layers, clay and silt. This is not a problem during rainy seasons, but during rainy periods, it clings to limestone crumbs, causing moisture to increase. On the other hand, due to the silica in the clay and silt, it also changes the composition of the limestone. Geophysical studies have been carried out at the limestone operation sites in order to identify this existing problem in situ and to identify the real extent of the difficulties associated with the operation. Within the scope of the studies, geophysical methods have been widely measured with underground radar (GPR) and electrical resistivity methods.

Figure 2: Limestone unit with crevices formed and filled with clay and silt

GEOPHYSICAL STUDIES

Two methods were applied within the scope of geophysical studies. These methods are Ground Penetrating Radar (GPR) and Electrical Resistivity Tomography (ERT) measurements. Geophysical measurements were applied as three profiles at different production stages of the enterprise in limestone production sites. It is aimed to reach information such as underground layers, loose-tight layer separation, underground layer slopes and fracture levels in limestone in the selected directions, respectively.

Electrical Resistivity Tomography (ERT) Method

Electrical Resistivity Tomography (ERT) method, two electrodes (current electrodes) to give an artificial current to the ground and the other two electrodes (potential electrodes) in response to this potential (voltage) difference is based on the determination of a parameter called the apparent resistivity of the underground. The aim of the ERT method is to determine

the geological structure of the underground according to the electrical resistivity and to present it visually. The positions of the current and voltage electrodes relative to each other are called electrode arrays. In this study, dipole-dipole electrode alignment was used on the determined profiles (Erginal et al., 2013; Ekinci et al., 2013). Measurements were performed for a total of 13 levels and the electrode spacing was selected as 2 m. After collecting the apparent resistivity values for each profile (Figure 3), a tomographic inverse solution algorithm was used to obtain a ground electrical section (Loke and Barker, 1996).

Figure 3: Electrical Resistivity field application

Resistivity tomograms of 6 electrical resistivity measurements taken at the limestone production sites in Çan and Yenice districts are given. The reason why the same colour scales are not used for the resistivity changes in tomograms is that the resistivity data have very large values and they are in a variable range although they are quite high for each section.

When the first tomogram called Çan-1 is examined, it is observed that the resistivity values vary between 100 and 12000 ohm-m. The low resistivity values represented by the blue hues indicate the material in the cracks and voids in the limestone blocks. Especially in the middle of the profile, there are quite large fractured limestone blocks between 12-20 meters in horizontal distance und at a depth of approximately 2.5 m. These voids are filled with clayey-silty material. Again, green and yellow tones show quite fractured units. However, massive limestone blocks, which are observed in red color starting from approximately 22 meters in

horizontal distance and from a depth of about 3-4 m, start (Figure 4a). As a continuation of the first profile in the Çan-2 Profile tomogram, massive blocks, which are represented by red color at the beginning of the profile, continue up to 20 meters. From this distance, blocks with large crack sizes are observed. In this profile, the low resistivity represented by blue colors up to a depth of 1-2 m shows that these regions are quite cracked (Figure 4b). It is seen that massive blocks continue in the beginning sections of Çan-3 profile with fractured cracks towards the end of the profile. Especially after 20 meters fracture crack sizes are more (Figure 4c).

Figure 4: (a) Resistive tomogram called Çan-1, (b) Resistive tomogram called Çan-2, (c) Resistive tomogram called Çan-3.
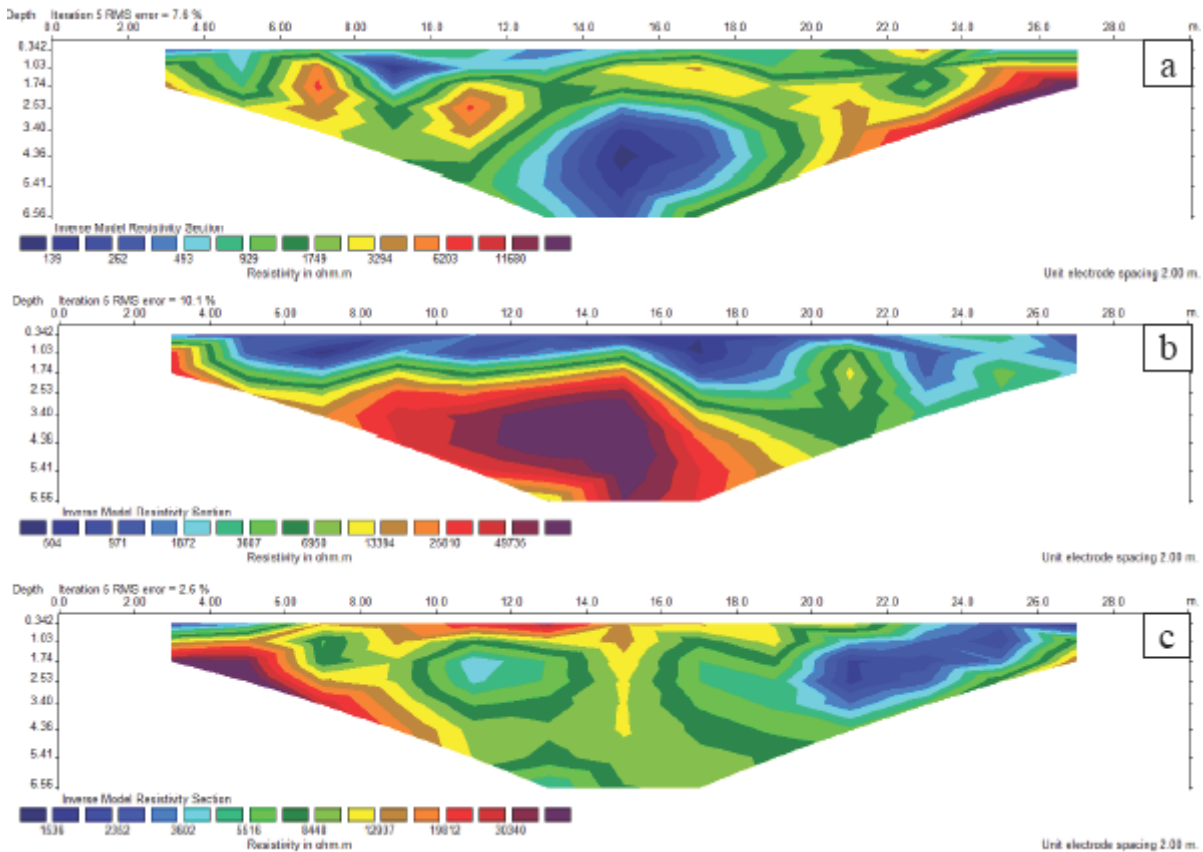
As a result of the measurements made in the limestone production area near the Nevruz Village of Yenice district, silty and clayey units are easily observed alongside the limestones in this area. This decrease in the resistivity values indicates the humidity. In Yen-1 tomogram, clayey and high moisture content units are observed up to the first 12 m horizontal distance. Resistance values increase from this distance, but it is observed that the values do not take as high as expected. The reason for this is that the moisture content of the fractured materials in the limestones is high (Figure 5a). In the Yen-2 profile, silty-clayey units are observed up to a depth of 1-2 m and there are massive limestones underneath. However, as we move towards the end of the profile, the fracture rate increases in the limestones (Figure 5b). The Yen-3 profile shows that the fractured structures are high and the partially low resistivity values observed

from 12 m horizontal distance indicate that the fractures in limestone blocks are quite large and the fractured cracks are filled with silty-clayey units (Figure 5c).

Ground Penetrating Radar (GPR) Method

Underground research is based on collecting information from underground with electromagnetic frequencies as ground penetrating radar system defined by many names such as underground penetration, underground radar. The design of the GPR system is defined in a wide range and is generally made according to the choices appropriate to the application to be made. The depth of the target, the target size and the area to be investigated are effective. In this way, the application areas of the GPR method are quite wide with the system to be selected correctly. In general, GPR data is applied in specified grid areas at regular intervals. In general, the method deals with the difference between the original signals produced by the electromagnetic signals produced by antennas during the round trip journey (Conyers, 2004).

Figure 5: (a) Resistivity tomogram called Yen-1, (b) Resistivity tomogram called Yen-2, (c) Resistivity tomogram called Yen-3.
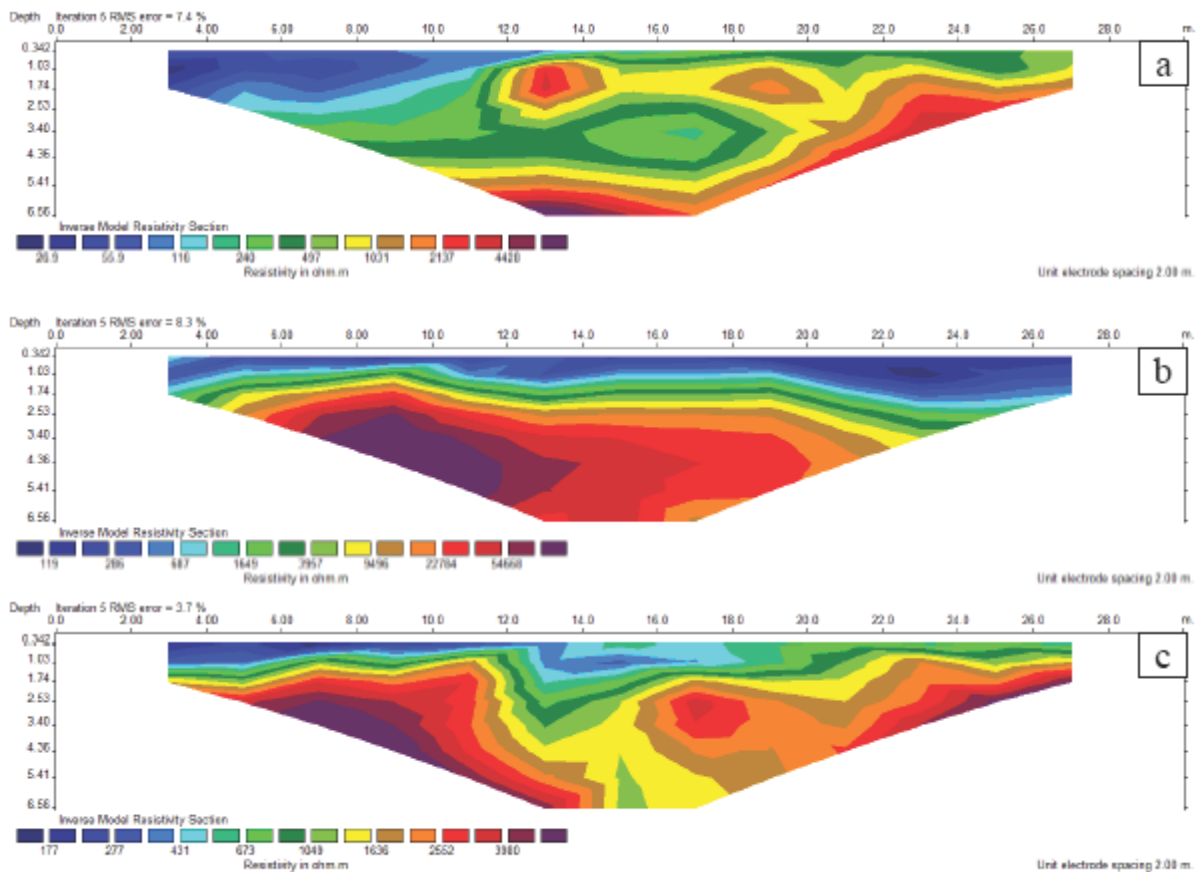
GPR signals reach the target by determining their speed according to the physical and chemical properties of the travel environment and collect information about the target. Since the speed of the environment is also known when travel time is known, the depth of the target can also be determined precisely. The travel time of the GPR signals is determined in nanoseconds (10^{-9} sec). In this way, the antennas above ground collect information by moving

at fixed or variable intervals between 2 and 20 cm. The depth at which radar antennas will penetrate depends on two main factors; frequency of antenna and characteristics of soil structure in the application area (water content in general). The independently reflected waves (also called the waveform) are collected digitally by reflecting them from the underworld, so that many traces are obtained and brought together and profiled as 2-dimensional vertical sections. By obtaining a large number of profiles together in the grid, both 2D and 3D underground images can be obtained (Büyüksaraç et al., 2014a).

During the measurements taken in the study area, Mala brand GPR instrument was used and the depths to be reached were approximately the first 10 meters and measurements were taken with the 250 MHz frequency antenna which can produce the information related to this depth (Figure 6) (Büyüksaraç et al., 2014b).

Figure 6: Ground Penetrating Radar (GPR) measuring device and its use during field surveying

The underground radar (GPR) measurements were carried out in three different profiles of 30 m length in two different fields. The profiles were taken in different production steps. GPR profiles were processed and transformed into 2-dimensional underground sections. Structures up to a depth of about 8 meters were exposed in the sections and the structural conditions of this section were identified. Diagrams for a total of 6 profile GPR ratings for the two areas are shown in Figures 7 and 8. After the GPR measurements, the data were modeled by applying Hilbert Transform in order to make the stone structures in the underground more visible. While dark anomalies are observed in the places where the stone structures are massive, it is observed that in the cracked and humid areas the lighter colored and in some places the stone structure is lost. Amplitude (amplitude) values vary between "- 5333/5333" in the case of massive structures "-3333/3333" in the fractured parts and "-2667/2667" in the moist regions. With this amplitude change, the difference between the crack condition of the underground stone structure and the humidity condition was revealed. The same findings were observed in the ERT profiles applied on the same lines as the GPR profiles.

CLIMATE AND HYDROLOGIC CONDITIONS

The effect of climate on limestone production needs to be determined due to different climatic conditions, which is the main problem in limestone production sites. The high moisture content of the limestone during the extreme rainy season, the swelling of the clay by taking water due to the presence of clay and silt, the moistening of the silt and the sticking of the silt on the limestone crumbs, the moisture and silica content of the material delivered to the thermal power plant could not be provided for a long time. In order to understand how this situation arises, it is necessary to make comparisons between the amount of rainfall and rainy season in Çanakkale. Accordingly, in December and January, when production was most problematic, average precipitation decreased to 102.7 mm in December and 84.7 mm in January between Çanakkale and 1975-2009. On the other hand, the precipitation amounts obtained from the Çanakkale Meteorology Directorate in November / December-2012 and January-2013 are obtained. Accordingly, the total rainfall in November/December-2012 was 223.2 mm and the total rainfall in January-2013 was 160.4 mm. On the other hand, moisture content values of samples taken from limestone production sites (Figure 9) were measured.

Figure 7: Radagram and 2-dimensional evaluation section for Çan (a) Çan-1 profile, (b) Çan-2 profile, (c) Çan-3 profile
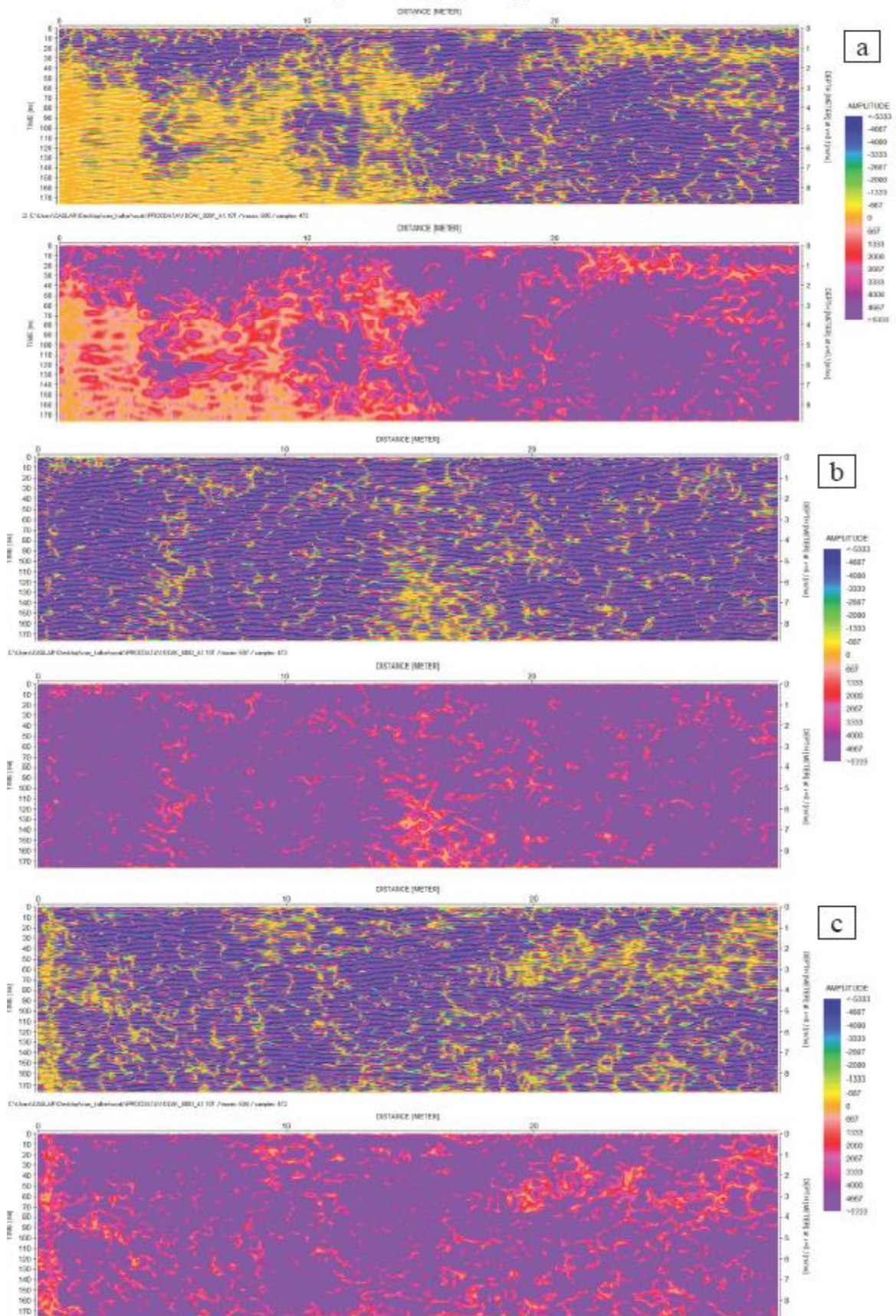
Figure 8: Radagram and 2-dimensional evaluation section for Yenice (a) Yen-1 profile, (b) Yen-2 profile, (c) Yen-3 profile

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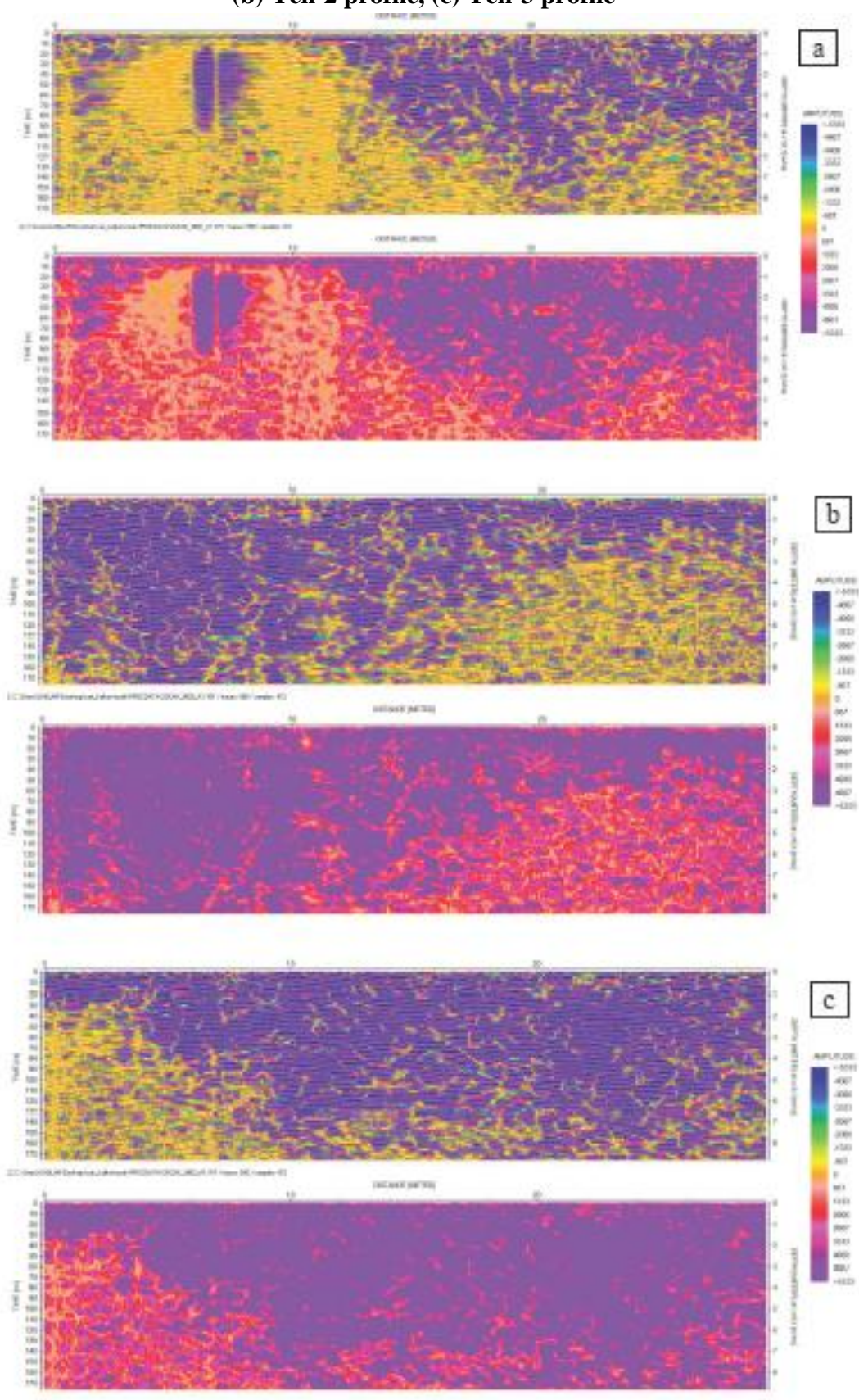
Figure 9: Samples from production sites

The moisture content of the samples was between 2.7 - 3.2%. These values indicate a range of values well above the acceptable moisture content determined in the technical specifications determined by EÜAŞ.

RESULTS

After the studies based on ERT and GPR methods, the results were evaluated after the completion of the necessary data processing steps. Definitions have been made about the underground structures, depth and dimensions defined by the anomalies. The meteorological conditions in the area where the limestone production sites are located and the moisture measurement results on the samples were evaluated. The limestone unit, which is extremely cracked and fractured due to the formation of limestone fields, is disassembled with clay and silt during the operation due to clay and silt filling between cracks, crevices and fractures.

- In the rain-free periods, this situation can be solved by the separation of clay-silt and limestone during crushing-sieving and grinding, whereas during rainy periods, clay and silt adheres to the limestone fragments and increases the moisture content and silicon content of the limestone.

- The increase in humidity during the rainy periods and the drying time required to overcome the silicification problem make it impossible to ensure timely production of materials in accordance with the technical specifications between the contractor and the thermal power plant.

- It is observed that the resistivity values vary in a very wide range in the limestone production area in Çan. Low resistivity values refer to fractured cracked, extremely moist limestone levels. In particular, there are quite large fractured fractured limestone blocks at a depth of approximately 2.5 m. These voids are filled with clay-silty material.

Massive limestone blocks start from a depth of about 3-4 m. Massive blocks up to 20 meters are observed. From this distance, blocks with large crack sizes are observed. The fracture crack sizes vary in limestone production sites and reach the slit size as shown in the profile diagrams.

- As a result of the measurements made in the limestone production area 2 near Nevruz Village of Yenice district, silty and clayey units are easily observed in this area. Unexpectedly very small values in the resistivity values indicate the humidity caused by excessive rainfall. In general, fracture-fracture systems developed irregularly. Limestone levels, which show very low values, intensify in the first 2 meters and become massive at lower levels. However, the fracture-fracture ratio of the limestones increases as the sides of the limestone field move towards the end of the profile.

- It has been observed that similar findings have been obtained in the ERT profiles applied in the same lines with the GPR profiles.

- According to the moisture measurements of the samples taken from the production sites, it is understood that the sample humidity is in the range of 2.7-3.2% and this value is much higher than the moisture content defined in the specification as 1%.

- According to the rainfall status information obtained from the Çanakkale Meteorology Regional Directorate, the rainfall values measured as 22.2 mm and 160.4 mm in November / December-2012 and January-2013, respectively, are well above the average rainfall for many years (1975-2009). Intermittent rainfall does not provide the necessary conditions for drying, so there is constant humidity during this period. This situation adversely affects the conditions required for limestone production. In addition, the fact that limestone is extremely cracked and fractured and that the fractures are filled with clay and silt causes the limestone to be produced together with clay and silt. On the other hand, during the rainy period, the clay-silt unit cannot be prevented from sticking on the limestone fragments during production. The amount of moisture in the air and the excess fog of the Çan region are quite long. Under these conditions, it is not possible to achieve the quality required by the Thermal Power Plant on all rainy days.

- The reason for not producing the desired quality in November-December-January subject to the examination was due to the conditions mentioned above.

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Örnek Bir Şaft Dolusavağın Akım Koşullarının Hesaplamalı Akışkanlar Dinamiği (HAD) İle Analizi

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ÖZET

Şaft (kuyu) tipi dolusavaklar, genellikle arazi ve dere şartlarının, baraj gövdesinin sağ veya sol sahilinde dolusavak inşasına imkân vermediğinde uygulanan bir dolusavak seçeneği olarak karşımıza çıkmaktadır. Şaft dolusavaklar, genellikle ek bir tünel maliyetine neden olmamak için var olan dipsavak tüneline bir dirsek vasıtasıyla bağlanır. Bu tip dolusavaklarda dikkat edilmesi gereken en önemli kısım, şaft giriş ağzının boyutlandırılmasıdır. Şafttan geçirilmesi gereken debi miktarı belirlendikten sonra en uygun tasarım belirlenir. Bu çalışmada, şaft tipi dolusavakların tasarımında kullanılan hususlar incelenmiştir. Buna ek olarak, laboratuvar ortamında elde edilen bir şaft dolusavağa ait maksimum debide ortaya çıkan durumlar, Hesaplamalı Akışkanlar Dinamiği (HAD) kullanılarak sayısal ortamda modellenerek, şaft giriş ağzı akım durumu, bu alandaki hızlar, geçirilen debi miktarı karşılaştırılarak değerlendirmeler yapılmıştır.

Anahtar Kelimeler: Dolusavak, Şaft Dolusavak, HAD, Flow-3D.

Analysis of The Flow Conditions of a Sample Shaft Spillway with Computational Fluid Dynamics (CFD)

ABSTRACT

Shaft (drop) type spillways are generally used as a spillway option when land and stream conditions do not allow the construction of spillways on the right or left coast of the dam body. Shaft spillways are usually connected via an elbow to the existing outflow tunnel to avoid the cost of an additional tunnel. The most important part of this type of spillways is the dimensioning of the shaft inlet. After determining the amount of flow required to pass through the shaft, the most appropriate design is determined. In this study, the subjects used in the design of shaft type spillways are investigated. In addition, the cases that occurred at the maximum flow rate of a shaft spillway obtained in the laboratory were modeled in the numerical environment by using Computational Fluid Dynamics (CFD), and the flow conditions of the shaft inlet, the velocity in this area and the amount of flow passed were evaluated.

Keywords: Spillway, Shaft Spillway, CFD, Flow-3D.

GİRİŞ

Baraj planlanırken, barajın inşa edileceği dere yatağının sağ ya da sol sahilinde klasik olarak nitelendirebileceğimiz bir dolusavak yapısına yeteri kadar yer olmadığı durumlarda şaft dolusavaklar uygun bir alternatif olarak görülür ve tercih edilir. Şaft dolusavaklar kontrolsüz bir dolusavak olarak nitelendirilir. Şaft dolusavaklarda rezervuar su seviyesinin tasarlanan yüksekliği aşmaması için giriş ağzı ve şaft kuyusu belirli hesaplamalar yapılarak tasarlanır. Bir barajda şaft tipi bir dolusavak planlandığında, dolusavağın bulunacağı yer ve kot seçimi maliyet açısından önemlidir. Bu sebeple şaft dolusavaklar büyük oranda dipsavağın geçtiği güzergâh üzerine inşa edilerek dipsavak tüneliyle doğrudan ya da bir dirsek yardımıyla birleştirilir. Konuyla ilgili olarak literatürde var olan bazı çalışmalar aşağıda verilmiştir.

Liu vd. 2018, kuyu tipi dolusavaklarda farklı bir giriş yapısı geliştirmiştir. Deneysel ve 3 Boyutlu sayısal olarak çalışılan kuyu dolusavakta, suyun kuyu yapısından dönerek düşmesini sağlamak amacıyla savak girişi vorteks oluşumunu sağlayacak şekilde, kret yüksekliğini de artırarak, dönme hareketi sağlayan bir giriş yapısı tasarlamıştır.

Emiroglu ve Kaya 2011, trapez labirent savakların debi katsayısını belirlemek amacıyla; farklı Froude sayıları, farklı savak yükseklikleri, farklı savak açıları ve farklı savak uzunlukları kullanarak toplam 672 deney gerçekleştirmiştir. Çalışmadan elde edilen verilere ışığında, labirent yan savaklardan elde edilen debi katsayısının dikdörtgen kesitli yan savaklara kıyasla 1.5 ila 5.0 kat daha fazla olduğu gözlemlenmiştir.

Zhao vd. 2006 düşük yükseklik-çap oranına sahip olan düşülerde vorteks (girdap) performansını deneysel olarak incelemiştir. Çalışmada, yok denecek kadar bir eğime sahip yatay bir yaklaşım kanalı ile şaft birbirine bağlanmıştır. Çalışmada, duvar ve su jeti basınçlarının yanında, aynı zamanda su deşarj olurken çıkış tünelinde meydana gelen hava sürüklenme oranı da ölçülmüştür.

Pfister ve Chanson 2014, iki fazlı akım var olan prototip verilerinin deneysel ortama aktarılırken belli bir ölçek oranında modellenmesi sonucu doğacak ölçek etkilerini belirtmiştir. Bu etkileri bertaraf etmek için kullanılan ve halen uygulanmakta olan yöntem ve faktörlere atıf yapılarak bunlara ek olarak da bazı yeni bazı faktör ve yöntemler de geliştirmek amaçlanmıştır.

Bu çalışmada, DSİ (2017) tarafından laboratuvar ortamında 1/20.83 ölçekli fiziksel model deneyleri yapılan örnek bir şaft dolusavağın, maksimum debide gösterdiği deney sonuçları ile HAD analizinden elde edilen prototip sayısal verileri kıyaslanmıştır. Elde edilen veriler yorumlanarak dolusavak kapasitesi ve sayısal modelin etkinliği tartışılmıştır.

MATERIAL and METOD

Fiziksel Model

Bu çalışmada, Diyarbakır il sınırları içerisinde Şeyhan Çayı üzerinde inşa edilen Kale Barajı dolusavağı örnek model olarak kullanılmıştır. Kontrolsüz şaft tipi doluşacağın şaft çapı 5 m, şaft yüksekliği 56.91m, şaft kesit alanı 19.64 m^2, maksimum su yükü 2.22 m olup,

dolusavağın 1/20.83 ölçekli fiziksel model çalışmaları Devlet Su İşleri (DSİ, 2017) tarafından gerçekleştirilmiştir. Bu model çalışmasına ait bazı görseller aşağıdaki şekilde verilmiştir.

Şekil 1: Fiziksel model çalışmaları (DSİ, 2017)
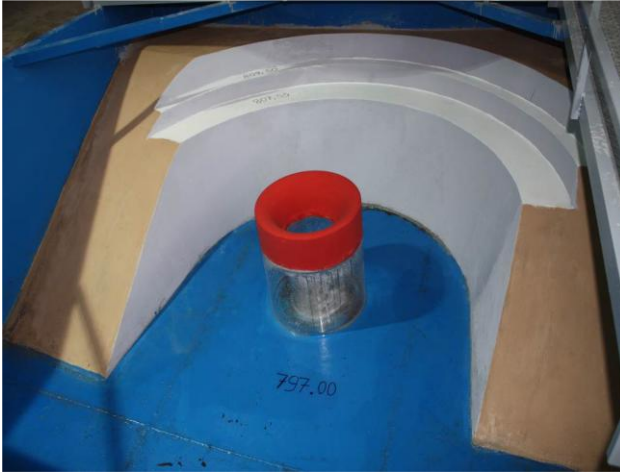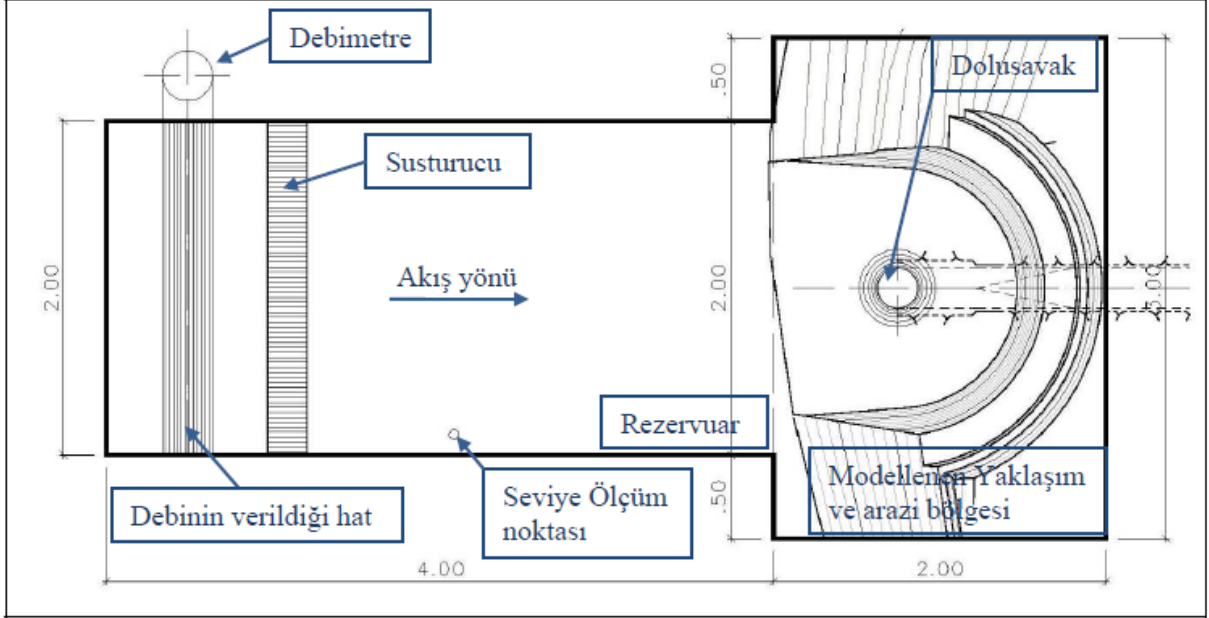
Şaft dolusavaklarda tasarım yapılırken maksimum debi değeri kullanılarak boyutlandırma yapılır. Bu tip dolusavaklarda boyutlandırma yaparken en çok dikkat edilmesi gereken kısım şaft giriş ağzının boyutlarıdır. Düşük su yüklerinde savağın deşarj edeceği debi:

$$Q = CLH^{3/2} \qquad (1)$$

Formülü kullanılarak hesaplanır. Burada: *C: savak katsayısı, L: savak uzunluğu, ve H: savak su yüküdür.*

Bu formül aynı zamanda normal düz bir savaktan geçen debi değerini bulmak için kullanılan formüldür. Formülü, giriş ağzı dairesel olan şaft dolusavaklara göre uyarlayacak olursak:

$$Q = C_0(2\pi R_s)H_0^{3/2} \tag{2}$$

Olarak ifade edilir. Burada: *C₀: H₀ ve R_s değerine bağlı olarak değişiklik gösteren savak katsayısı, R_s: Şaft giriş ağzı yarıçapı, ve H₀: tasarlanan su yüküdür.*

Sayısal Model

Çalışmada, FLOW-3D sayısal analiz programı kullanılmıştır. FLOW-3D, akışkan hareketlerini simule etmeye yarayan gelişmiş bir yazılımdır. FLOW-3D, birçok endüstriyel ve tasarım uygulamalarında, fiziksel işlemlerde sıvıların ve gazın dinamik davranışını araştıran birçok bilim adamı, akademisyen ve mühendisler için kullanımı kolay ve çok yönlü bir HAD simülasyon ortamıdır. FLOW-3D aynı zamanda, mikroakışkanlar, tıbbi cihazlar, su altyapısı, havacılık, mürekkep püskürtmeli baskı, kıyı hidroliği, enerji ve otomotiv gibi geniş bir alanda hassas değerlerde kapsamlı bir analiz çıktısı sunan serbest yüzeyli ve çok fazlı uygulamalara yoğunlaşmaktadır (Flow Science, 2014).

FLOW-3D kullanılan akışkan hareketinin temel denklemi aşağıdaki gösterilmiştir:

$$V_F \frac{\partial \rho}{\partial t} + \frac{\partial}{\partial x}(\rho u A_x) + R\frac{\partial}{\partial y}(\rho u A_y) + \frac{\partial}{\partial z}(\rho w A_z) + \varepsilon\frac{\rho u A_x}{x} = R_{DIF} + R_{SOR} \tag{1}$$

Burada: *V_f*: Akışkanın hacim oranı, ρ: Akışkanın yoğunluğu, *R_{DIF}*: Türbülans difizyon terimi, *R_{SOR}*: Kütle kaynağıdır.

Akışkan hareketinin momentum denklemi ise FLOW-3D'de şu şekilde verilmektedir:

$$\frac{\partial u}{\partial t} + \frac{1}{V_F}\left\{uA_x\frac{\partial u}{\partial x} + vA_yR\frac{\partial u}{\partial y} + wA_z\frac{\partial u}{\partial z}\right\} - \varepsilon\frac{A_y v^2}{xV_F}$$
$$= -\frac{1}{\rho}\frac{\partial p}{\partial x} + G_x + f_x - b_x - \frac{R_{SOR}}{\rho V_F}(u - u_w - \delta u_s)$$
$$\frac{\partial v}{\partial t} + \frac{1}{V_F}\left\{uA_x\frac{\partial v}{\partial x} + vA_yR\frac{\partial v}{\partial y} + wA_z\frac{\partial v}{\partial z}\right\} - \varepsilon\frac{A_y uv}{xV_F}$$
$$= -\frac{1}{\rho}\left(R\frac{\partial p}{\partial y}\right) + G_y + f_y - b_y - \frac{R_{SOR}}{\rho V_F}(v - v_w - \delta v_s) \tag{2}$$
$$\frac{\partial w}{\partial t} + \frac{1}{V_F}\left\{uA_x\frac{\partial w}{\partial x} + vA_yR\frac{\partial w}{\partial y} + wA_z\frac{\partial w}{\partial z}\right\}$$
$$= -\frac{1}{\rho}\frac{\partial p}{\partial z} + G_z + f_z - b_z - \frac{R_{SOR}}{\rho V_F}(w - w_w - \delta w_s)$$

Burada: (G_x, G_y, G_z): Kütle ivmesi, (f_x, f_y, f_z): Viskoz ivmeleri, (b_x, b_y, b_z): Gözenekli ortamlarda akım kayıpları, $U_w = (u_w, v_w, w_w)$: Kütle kaynağının hızı, $U_s = (u_s, v_s, w_s)$: Kütle kaynağının kendisine göre kaynağın yüzeyindeki akışkanın hızını ifade etmektedir.

Sayısal model olarak kullanılan şaft tipi dolusavağın prototipi, proje verilerine bağlı kalınarak 3 boyutlu haliyle Solid Works çizim programı kullanılarak hazırlanmıştır. Şekil 2'de orijinal proje durumuna göre hazırlanan bu model gösterilmektedir.

Şekil 2: Orijinal proje durumu dolusavak geometrisi
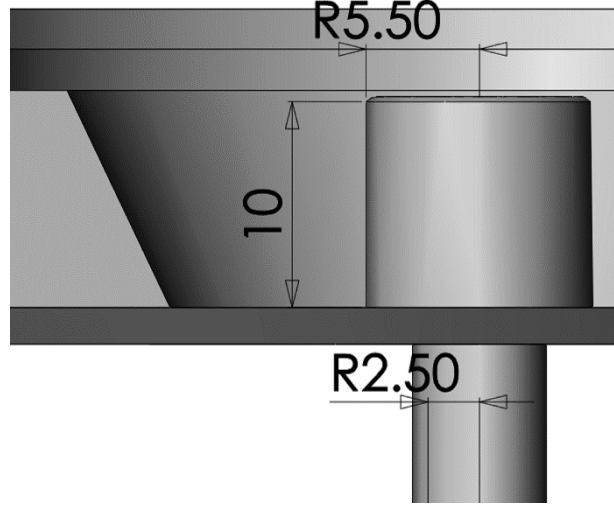
Sayısal Model Meş Yapısı

Hazırlanan sayısal modelde iki adet 0.15 m kübik meş kullanılmıştır. İlk meş yapısı, dolusavak giriş yapısını da kapsayacak şekilde dolusavak giriş yapısı boyunca devam etmektedir. İkincisi meş yapısı ise dolusavak giriş ağız yapısının sonlanarak şafta bağlandığı noktadan başlayarak şaft boyunca devam etmektedir. Birinci ve ikinci meş ağında, toplam olarak 13,824,868 kübik hücre bulunmaktadır (Şekil 3).

Şekil 3. Oluşturulan prototip model meş yapısı
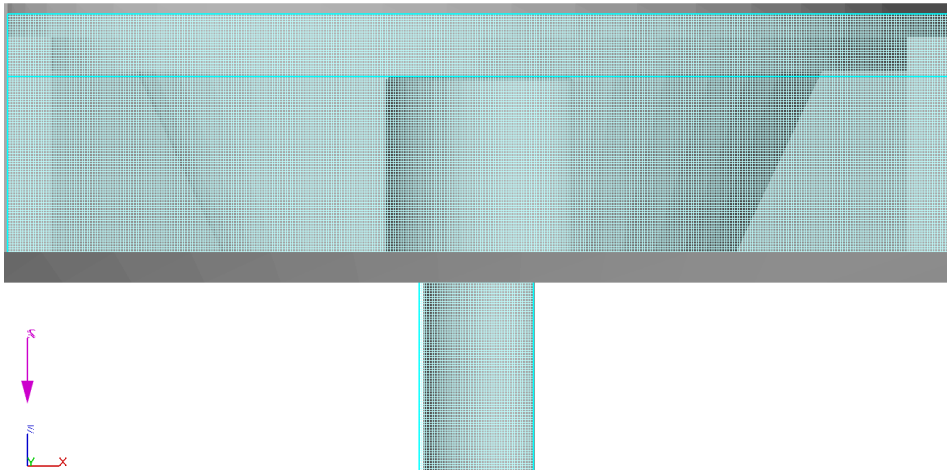
BULGULAR

Daha önce deneysel ortamda elde edilen model çalışmasında maksimum debiye ait verileri sayısal ortama aktarılmıştır. Laboratuvarda gerçekleştirilen model deneyinde 1/20.83 oranında ölçeklendirme uygulanmıştır (DSİ, 2017). HAD'a aktarılan geometrik modelde ise prototip verileri kullanılarak hesaplamalar gerçekleştirilmiştir. Dolusavakta kullanılan maksimum taşkın debisi, deneylerde yapılan sonuçlarda 2.18 m nap yükünde geçildiğini göstermiştir. Bu bağlamda, laboratuvar verileri sayısal ortama aktarılırken maksimum debi değil, bu debiyi sağlayan su yükü kullanılmıştır. DSİ'nin deney sonuçlarına göre bu su yükünde rezervuar yüzünde meydana gelen ortalama salınım ise 5 cm olarak ölçülmüştür.

Tablo 1 de 2.18 m su yükünde laboratuvarda ve HAD analizlerinde ölçülen ortalama debi değerleri gösterilmektedir. Laboratuvardan elde edilen değer (DSİ, 2017) ile sayısal ortamdan alınan değerler arasında %6'lık bir fark gözlemlenmiştir. Bu denli büyük yapılarda, analiz ve deneysel çalışmalar sonucunda ölçek etkilerinin meydana gelebilmesi oldukça mümkündür. Konu ile ilgili olarak literatürden de edinilen bilgiler üzere de %6'lık fark bu tür bir çalışmada kabul edilebilir bir değerdir.

Tablo 1. Deneylerden ve HAD analizlerinden alınan savak su yüksekliği ve ortalama debi değeri

Ortalama Su Yükü (m)	Debi (m³/s) (Deney, DSİ, 2017)	Debi (m³/s) (HAD)	Debi Hata Yüzdesi (%)
2.18	216.43	230.25	6.00

Şekil 3 de, 2.18 m lik su yüküne ait sayısal simülasyon hız konturları X-Y ekseninde gösterilmektedir. Bu su yüküne ait analizler incelendiğinde, 150 s sonunda akımın kararlı hale geçtiği gözlemlenmiştir. Şekil 4 de verilen görsellerde 30, 60, 90, 120 ve 150. saniyeye ait savak giriş ağzında meydana gelen hız değerleri sunulmuştur. Şekiller incelendiğinde 30. ve akımın karalı hale ulaştığı 150. saniyedeki hızlar ve su giriş modellerinin oldukça benzer olduğu gözlemlenmektedir.

Şekil 5'de, Y-Z ve X-Z düzlemlerine ait 150. saniyede kuyu içerisinde oluşan akımın hız dağılımları gösterilmektedir. Şekiller incelendiğinde kuyu çapının debiyi iletmede oldukça yeterli olduğu gözlemlenmektedir. Şaft dolu savaklardan geçen debi miktarı giriş ağzı geometrisine bağlı olduğu da şekillerden gözlemlenebilmektedir. Bunlara ek olarak şaft uzunluğun, akım hızıyla doğru orantılı olduğu anlaşılmaktadır. Şekilde şaftın sonlarına doğru akım hızının yaklaşık 30 m/s'ye ulaşmaktadır. Bu hızlarda kavitasyon meydana gelebileceğinden, bu bölgede kavitasyon indeksi hesapları yapılmalıdır.

Şekil 4: 2.18 m'lik su yüküne ait zamana bağlı hız konturları

t= 30 s

t=60 s

t= 90 s

t= 120 s

t= 150 s

Velocity Restart (m/s)

15.00
11.25
7.50
3.75
0.00
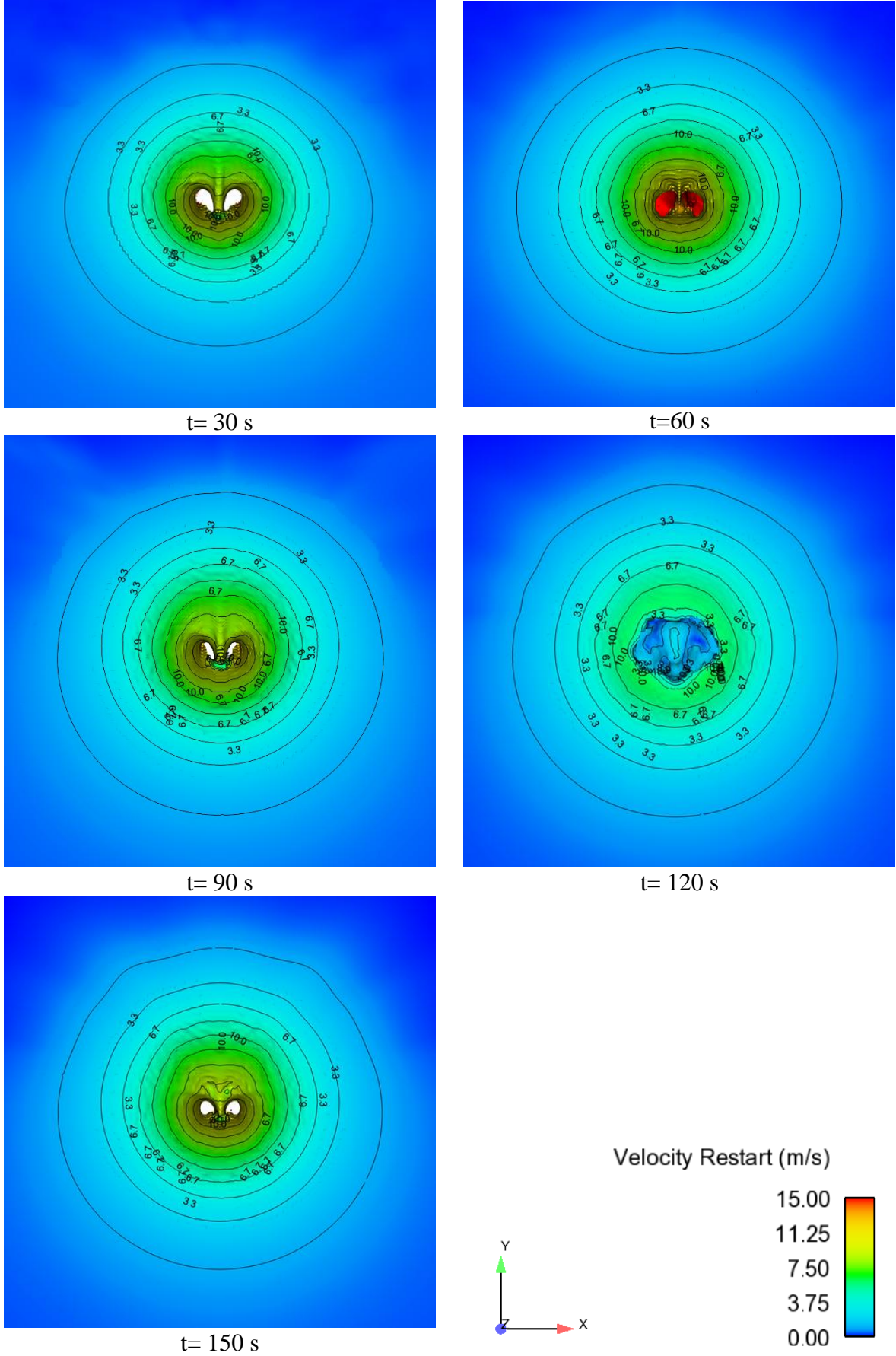
Şekil 5: 2.18 m su yükünde dolusavak boyunca oluşan hız konturları
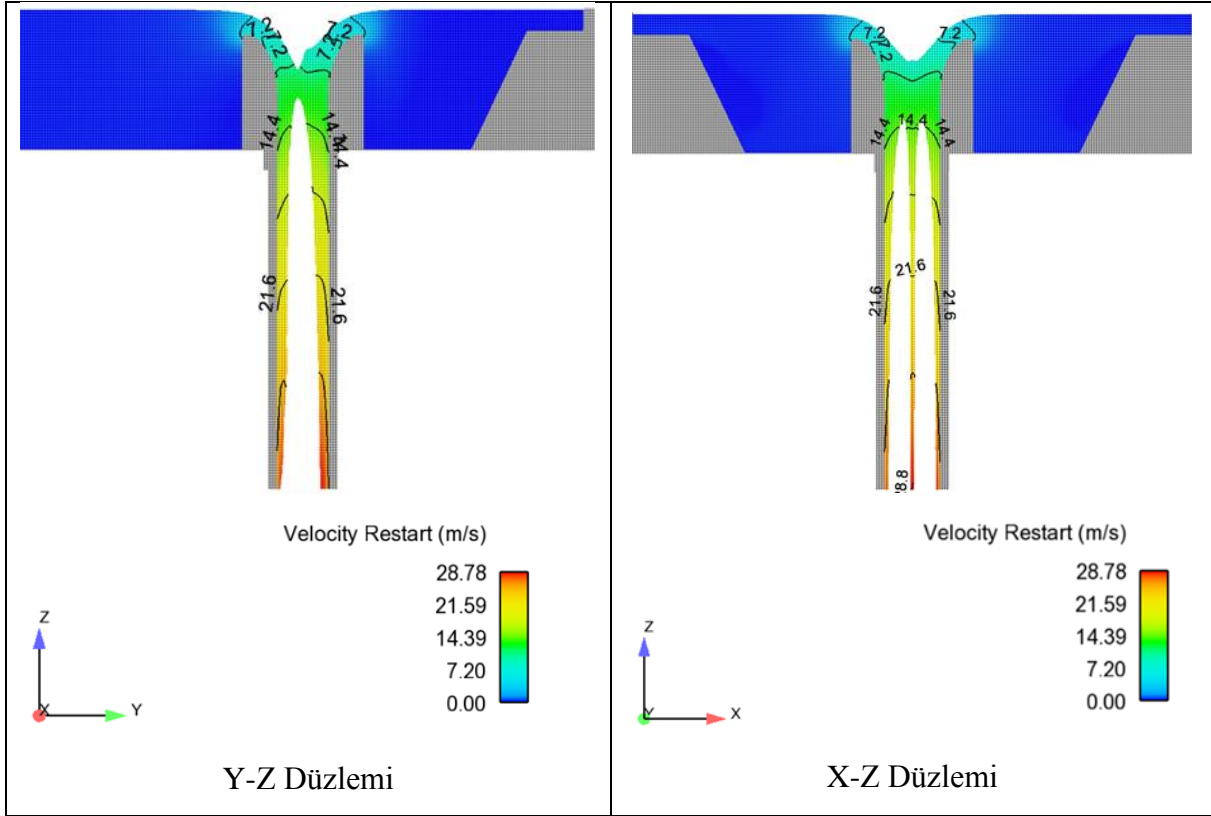
SONUÇLAR

Bu çalışmada örnek bir şaft dolusavaktan geçmesi istenen maksimum debi miktarı için gereken 2.18 m'lik su yükünde meydana gelen akım durumu incelenmiştir. Şaft dolusavağa ait laboratuvar ortamından elde edilen model verileri, gelişmiş hesaplamalı akışkanlar dinamiği yöntemi kullanılarak prototip boyutlarında tasarlanmıştır. Çalışma sonucunda elde edilen veriler aşağıdaki gibi sıralanabilir:

✓ Laboratuvar ortamında model deneylerinden elde edilen 2.18 m'lik su yüküne karşılık gelen debi değeri, HAD analizinden elde edilen prototip veriler ile kıyaslanarak %6 fark bulunmuştur. Bu fark ölçek etkileri dikkate alındığında oldukça kabul edilebilir bir farktır.

✓ Şaft giriş ağzındaki hız değerleri, 30, 90 ve 150. saniyede benzerlik göstermektedir. 120. saniyede akım boğulmuş görünse de, 150. saniyede kararlı hale gelerek boğulma olayı kaybolmaktadır.

✓ Şaft savaklarda geçirilmesi istenen maksimum debiye göre, uygun şaft giriş ağzı tasarımı yapılması oldukça önemlidir.

✓ Şaft sonunda, akım hızından dolayı kavitasyon riski doğmaktadır. Kavitasyon hesabı yapıldıktan sonra havalandırma sistemine gerek olup olmadığına karar verilmelidir.

✓ Bu çalışma sonuçları, bu tip savakların farklı tasarımlarının ve verim ve kapasitelerinin araştırılmasında sayısal modellerin kullanılabileceğini göstermiştir

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Gemilerde Eğitim ve Talimlerin Minimum Dinlenme Zamanı Bakımından Uygulanabilirlik Analizi

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ÖZET[2]

Gemiler ticari ömürlerinin büyük bir kısmını açık denizde geçirmektedir. Bu gemilerde çalışan gemiadamları da aynı şekilde çalıştıkları sürenin büyük bir bölümünü açık denizde, kara yaşantısından izole bir şekilde idame ettirmektedirler. Bu sebeple gemiadamları, gemide yaşanabilecek herhangi bir acil durumla başa çıkabilecek yetkinlikte olmalıdırlar. Bu yetkinlikler bazı ulusal ve uluslararası kurallar tarafından belirlenmiş eğitim ve sertifikalandırmalar ile kazandırılmaktadır. Kazanılan yetkinlikler ise gemilerde periyodik olarak uygulanan talimlerle pekiştirilmektedir. Fakat günümüzde gemilerin daha hızlı çalışması, daha fazla liman operasyonu yapması, seyirlerinin daha kısa sürmesi, personel sayılarının azaltılması, teknoloji ile birlikte gemilerin karmaşık hale gelmesi, bakım tutum ihtiyaçlarının artması gibi sebeplerle gemiadamlarının üzerlerine düşen iş yükü artmaktadır. Dünya da gemiadamlarının çalışma ve dinlenme saatleri, yaşam şartları gibi konular üzerine de benzer şekilde uygulanması gereken ulusal ve uluslararası kurallar mevcuttur. Fakat mevcut iş yükü göz önüne alındığında birçok gemiadamı, hak ettiği biçimde dinlenememektedir. Zaten yoğun olan iş yüküne talim ve eğitimler eklendiği takdirde ise maksimum çalışma süreleri aşılmaktadır. Bu durumda gemiadamları ya eğitim almaktan ya dinlenmekten feragat etmek zorunda kalmaktadır. Bu çalışma da gemiadamları çalışma ve dinlenme düzenleri, talim ve eğitimler bakımından değerlendirilmiş ve kişi başına düşen iş yükü bakımından uygulanabilirlikleri değerlendirilmiştir.

Anahtar Kelimeler: Gemiadamı, Talim, Eğitim, Dinlenme, STCW, MLC.

ABSTRACT

Ships spend a large part of their commercial life in the open sea. Seafarers who works on these ships also maintain a large part of their working time in the open sea as isolated from shore lives. For this reason, the seafarers should be capable of dealing with any emergency situation on board. These competencies are gained through training and certification, which are determined by some national and international rules. This gained competencies are strengthens by periodical drills and trainings onboard. But nowadays, the workload of the seafarers is increasing due to reasons such as the faster operation of the ships, the longer port operations, the shorter the voyage, the reduction of the number of personnel, the complexity of the ships with the technological devices and the increase of the maintenance needs. In the world there are national and international rules that should be applied on the subjects such as working hours and living conditions. But given the current workload, many seafarers cannot be rested as deservedly. If training and training is added to the intensive workload, maximum working time is exceeded. In this case, the seafarers are forced to give up training or their rest time. In this study, the seafarers working and resting hours were evaluated based on drills and trainings in terms of international arrangements.

Keywords: Seaman, Drill, Training, Rest Hours, STCW, MLC.

GİRİŞ

Gemiler ticari ömürlerinin büyük bir kısmını açık denizde geçirmektedir. Bu gemilerde çalışan gemiadamları da aynı şekilde çalıştıkları sürenin büyük bir bölümünü açık denizde, kara yaşantısından izole bir şekilde idame ettirmektedirler. Bu sebeple gemiadamları, gemide yaşanabilecek herhangi bir acil durumla başa çıkabilecek yetkinlikte olmalıdırlar.

Ticari faaliyet yürüten gemilerde çalışan gemiadamları aynı zamanda yükleme, tahliye, gemi bakım tutumu, seyir ile ilgili işler gibi birçok işten de sorumludur. Tüm bu faaliyetler için gemiadamlarına görev ve sorumluluklar paylaştırılmış ve çalışmaları çeşitli vardiyalara bölünmüştür. Gemiadamları bu vardiyalarında sorumluluklarında olan işleri yaparken vardiya dışında da diğer işler ile ilgilenmektedirler.

DENİZCİLİK VE GEMİADAMI

Denizcilik doğası gereği birçok tehlike (bkz: **Şekil 1**) barındırmaktadır. Denizde yapılan çok küçük bir hata, çok büyük sonuçlar doğurabilmektedir. Denizde kazaları önlemenin temel ilkeleri emniyet bakımından iyi donatılmış gemi ve iyi eğitilmiş gemiadamıdır. Birçok denizci denizde emniyetle ilgili eğitim eksikliği sebebiyle hayatını kaybetmiştir.

Şekil 1: Denizde Yaşanan Bazı Tehlikeler

Uluslararası Denizde Can Emniyeti Sözleşmesi (SOLAS) üye ülkelere bağlı gemilerde bulunacak minimum emniyet standartlarını ortaya koymaktadır. SOLAS'ın amacı bir geminin yolcularına ve personeline tehlike oluşturmaksızın, her türlü emniyet teçhizatı ile donatıldıktan sonra denize açılmasını sağlamaktır. SOLAS gemilerde can emniyetini korumak üzere sağlanması gereken şartları ortaya koyar.

Denizcilik mesleğinin tehlikelerini aşmak için her denizcinin bu tehlikelere karşı eğitimli olması gerekir. Denizde hayatta kalmanın ana unsurlarının bir tanesi de eğitimdir. Role talimleri gerçek bir acil durum varmış gibi yapılması gerekir. Gemide bir talim yapıldığında tüm gemi personelinin katılımı zorunludur. Gemi personeli, kendilerine gemiye katıldıklarında verilmiş olan role kartları ve devamlı güncel tutulan role cetvelindeki görevlerini bilmek zorundadır. Denizciler her an acil durumla karşılaşabileceklerinin bilincinde ve acil duruma müdahale edebilecek yetkinlikte olmalıdır. (Dragomir and Utureanu, 2016)

Bu yetkinlikler bazı ulusal ve uluslararası kurallar tarafından belirlenmiş eğitim ve sertifikalandırmalar ile kazandırılmaktadır. Günümüzde gemilerin daha hızlı çalışması, daha

fazla liman operasyonu yapması, seyirlerinin daha kısa sürmesi, personel sayılarının azaltılması, teknoloji ile birlikte gemilerin karmaşık hale gelmesi, bakım tutum ihtiyaçlarının artması gibi sebeplerle gemiadamlarının üzerlerine düşen iş yükü giderek artmaktadır. Yoğun çalışan bazı gemilerde gemiadamları dinlenmekten öte üzerlerine düşen işleri yetiştirecek zamanı dahi bulamamaktadır.

ÇALIŞMA ŞARTLARI

Son 20 yılda deniz taşımacılığı 4 kat artış göstermiştir. Buna bağlı olarak denizcilerin iş yükü de önemli ölçüde artmıştır. Bu durum aynı zamanda çalışma ve dinlenme saatlerine riayetsizliğin artışına da sebep olmaktadır. Bu durumun farklı sebepleri bulunmaktadır. Bunlarda biri hala devam eden gemideki personel sayısını azaltma eğilimidir. İkincisi artan iş yoğunluğu ve üçüncüsü ise ISM, ISPS gibi sürekli yenilenen ve artan kurallardır. (Simkuva *et al.*, 2016)

Dünya da gemiadamlarının çalışma ve dinlenme saatleri, yaşam şartları gibi konular üzerine de benzer şekilde uygulanması gereken ulusal ve uluslararası kurallar mevcuttur.

Deniz İş Kanunu

Maritime Labour Convention (MLC 2006)

Standards of Training Certification and Watchkeeping (STCW)

Bu sözleşme ve kanunların farklılıkları olsa da birçok ortak kuralları vardır ve birbirleriyle çelişmezler. (MI News Network, 2019)

Ortak kurallardan birisi de gemiadamlarının çalışma saatleri üzerinedir. Aşağıdaki gibi zaman sınırlarına ayrılmış olan çalışma saatlerinin ayrıca her zaman **Şekil 2**'deki gibi kayıt altında tutulması istenir.

Dinlenme süresi 7 günlük periyotta 77 saatten az olamaz. Dinlenme süresi 24 saatlik periyotta 10 saatten az olamaz.

24 saatlik periyotta dinlenme süresi ikiden fazla zamana bölünemez.

Dinlenme sürelerinden en az bir tanesi 24 saatlik periyotta 6 saatten az olamaz.

Dinlenme süreleri arasındaki süre 14 saatten fazla olamaz.

Şekil 2: Çalışma Saatleri Kayıt Çizelgesi

ANNEX II

RECORD OF HOURS OF REST

Name of Ship _____   IMO Number _____

Seafarer (full name)_____   Position/Rank_____

Month and Year _____   Watchkeeper ☐ Yes ☐ No

Not to be completed by the seafarer (1)

Please mark periods of rest with an 'X', or using a continuous line or arrow

Hrs\Date	0	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Hours of rest in 24 hour	Comments on any deviations recorded	Hours of rest in any 24 hour period (2)	Hours of rest in any 7 day period (2)

I agree that this record is an accurate reflection of the hours of rest of the seafarer concerned.

Name / Signature of Master or Authorised Person: _____   Signature of Seafarer_____

(1) For completion and use for compliance with the relevant requirements of ILO Convention No. 180 and MLC 2006 in accordance with Isle of Man Ship Registry Regulations
(2) Additional calculations or verifications may be necessary to ensure compliance with the relevant requirements of ILO Convention No. 180 and STCW 1978, as amended.

UYGULANABİLİRLİK

Gemilerde değişik uygulamalar olsa da genel olarak; zabitler seferde 8 saat köprüüstü vardiyası tutar ve üstüne sorumluluğunda olan ekstra işleri yapar. Limanda ise 12 saat yük operasyonu ile ilgilenir. Tayfa ise seyirde 8 saat güvertede çalışır, limanda ise 12 saat yük operasyonu ile ilgilenir. (Smith, Allen and Wadsworth, 2006)

Fakat mevcut iş yükü göz önüne alındığında birçok gemiadamı, hak ettiği biçimde dinlenememektedir. Zaten yoğun olan iş yüküne talim ve eğitimler eklendiği takdirde ise maksimum çalışma süreleri aşılmaktadır. Bu durumda gemiadamları ya eğitim almaktan ya dinlenmekten feragat etmek zorunda kalmaktadır. (Overboard *et al.*) Normal çalışma düzeninde gemiadamlarının vardiyaları belirlenmiştir. Fakat yanaşma ve kalkış manevraları, kumanya ve yakıt ikmalleri, talimler, eğitimler gibi ekstra durumlar olduğunda tüm personel birlikte çalışmak durumundadır. Yukarıdakiler gibi ekstra durumlar, gemiadamlarının dinlenme saatlerine denk geldiklerinde personelin hem kurallar bakımından dinlenme saatlerine uyulamamakta hem de personellerin bedenen yorgunluklarını arttırmaktadır. (Agency, 1999)

Gemiadamları üzerinde TKV tarafından yapılan bir araştırmada gemiadamlarının yaşantısı, gemiye katılmadan 2 hafta önce başlayıp ayrıldıktan 2 hafta sonrasına kadar izlemeye alındı. Araştırma sonucunda gemiadamlarının en büyük sıkıntısının uykusuzluk ve düzensiz uyku saatleri olduğu ortaya çıktı. Araştırma ayrıca zabitlerin mürettebata göre daha az uyuduğunu, uyku kalitelerinin daha düşük olduğunu ve daha fazla stres yaşadıklarını ortaya koydu. Ayrıca uyku kalitesinin ve süresinin azalıp, bünyede hissedilen baskı arttıkça, bunun gemiadamları üzerinde motivasyon eksikliği gibi büyük bir yan etkisi olduğu ortaya çıkmıştır. (Güner, 2000)

Motivasyonun azalması ise kısa yolların tercih edilmesi ve gerekli prosedürlerin dışına çıkılması gibi eğilimlerin artışına neden olmaktadır. Yaşanan gemi kazalarında kök sebep araştırıldığında ise %85 oranla insan hatası ilk sıradadır. (Cordon, Mestre and Walliser, 2015)

Denizcilik sektöründe en çok iş yükü güverte zabitlerine düşmektedir. 18 ay boyunca güverte zabitlerinin çalışma tempoları takip edilmiş ve birçok farklı sebepten dolayı dinlenme saatlerine uyulmadığı görülmüştür. Bu ihlallerin en büyük sebebinin ise iş yüküne karşı personel yetersizliği olduğu ortaya çıkmıştır.

Yapılan araştırmalar sonucunda gemide yer alacak bir 4. güverte zabiti sayesinde çalışma saati ihlallerinin %99,6 oranında azaldığı tespit edilmiştir. Bu durum aynı zamanda sebebi yorgunluk olan çatışma karaya oturma gibi kazaların da önüne geçecektir.(Simkuva *et al.*, 2016)

SONUÇLAR

Denizciler hem tehlikeli hem de yoğun bir iş temposunda çalışmalarına rağmen dinlenmek için yeterli vakit bulamamaktadır. Denizcilerin yorgunluk ve yeterince dinlenememesinden kaynaklı kazalar hem maddi hem manevi olarak çok büyük sonuçlar doğurabilmektedir. Denizcilerin çalışma şartları geliştirilmesi için oluşturulan sözleşmeler problemleri çözememektedir.

ÖNERİLER

Gemilerin çalışma temposuna bağlı olarak minimum personel sayısı arttırılmalıdır. Denizcilerin yaşam şartları iyileştirilmeli ve stres altında çalışmamaları için önlem alınmalıdır. Gemilerde talim, eğitim, çalışma saatleri gibi önem taşıyan konularda kayıtların gerçekçi tutulması sağlanmalıdır. Gemi personelini motive edici uygulamalar teşvik edilmelidir.

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Mavimasa Sosyal Ağ Adresi Üzerinden Gelen Talep ve Şikayetlerin Makine Öğrenmesi Kullanılarak Kategorize Edilmesi

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ÖZET

Günümüzde tüketiciler ve vatandaşlar ürün ve hizmetlere karşı oluşan memnuniyetsizliklerini bildirmek için öncelikli olarak sosyal medyaya başvurmaktadırlar. Sosyal medya kullanımının yüksek olması sebebiyle kurum ve firmaların sosyal medya üzerinden yapılan talep ve şikayetlerecevap verme süresinin çok kısa olması gerekmektedir. Kullanıcıların memnun olması ancak bu sayede mümkün olabilmektedir. Bu çalışmada, Mavi Masa Twitter adresine (@mavimasa) gelen şikayet ve taleplere en kısa sürede yanıt verilebilmesi için gelen şikayet ve taleplerin makine öğrenmesi yöntemleri kullanılarak otomatik olarak sınıflandırılması amaçlanmıştır.Yapılan deneysel sonuçlarda en yüksek doğruluk oranı %81.46 ile RandomForest yöntemiyle elde edilmiştir.

Anahtar Kelimeler: Makine Öğrenmesi, Şikayet ve Talep Kategorizasyonu, Mavi Masa.

ABSTRACT

Nowadays, consumers and citizens apply primarily to social media to report their dissatisfaction with the products and services. Due to the high use of social media, the time required to respond to complaints andr equests made by the institutions and companies via social media should be very short. It is only possible for users to be satisfied. In this study, it is aimed to classify the complaint sand request scoming from Mavi Masa Twitter address (@mavimasa) automatically by using machine learning methods. The highest accuracy rate was obtained with Random Forest method with 81.46%.

Keywords: Machine Learning, Complaintand Demand Categorization, Mavi Masa.

GİRİŞ

Ürün ve hizmetlerden oluşan memnuniyetsizlik, şirketlerin devamlılığı için çözümlenmesi gereken sorunlardan biridir. Gerektiğinde tüketiciler memnuniyetsizlikle ilgili taleplerinin şirket tarafından karşılanmadığını gerekçe göstererek tazminat davaları açabilmektedir. Tüketiciler, ürün ve hizmtet ile ilgili şikayette bulunduklarında, şirketin şikâyetlerine karşı duyarlı olduğunu ve sorunu çözmeye çalıştıklarını görmeyi beklerler (Van Noort & Willemsen (2012)). Tüketici şikâyetlerine hızlı ve olumlu bir cevap, bir şirketin imajını iyileştirir ve tüketicinin sadakatini artırır (Clark ve diğ. (1992)).

İnsanlar internet ve sosyal medyada daha önce hiç olmadığı kadar zaman harcıyorlar. Sosyal medya kullanan insan sayısı 3 milyarı geçmiş durumda. Büyük sosyal medya kanalları, Facebook ve Twitter, artık müşteri şikayetleri için yaygın olarak kullanılmaktadır (Dekay (2012), Einwiller & Steilen (2015)). Ombudsman Services (Ombudsman Services, (2015)) tarafından yapılan araştırmaya göre, İngiltere'de yapılan şikayetlerin sayısı 2013'ten 2014'e yaklaşık iki katına çıktı ve şikayet edenlerin %31'i sosyal medyayı kullandı.

Araştırmalar, şirketlerin çevrimiçi şikayetlere(sosyal medya) geleneksel olanlardan(yazılı veya eposta) daha fazla tepki verdiklerini göstermektedir (Gulas & Larsen (2012)). Çevrimiçi yanıtları daha hızlı bir şekilde almak, tüketicilerin şirketin algılarını ve şikayet sonrası memnuniyetini olumlu yönde etkilemektedir (Stratuss (2001), Sexton (2015)). Sosyal medya, kamuya açık, hızlı tempolu ve çoğunlukla senkronize olan dinamik bir platform olduğu için, sosyal medyada tepki süresi, şikayet ele alma stratejilerinin önemli boyutlarından biridir.

Kişiler şikayet için resmi mercilere başvurmadan sosyal medya ile sorununu çözmek istiyor. Ayrıca diğer tüketicileri de bu konuda bilgilendirmiş oluyorlar. Bu da sosyal medyanın ne kadar etkili olduğunu göstermektedir. Burada yanıt verme süresinin kullanıcılar üzerinde ne kadar etkili olduğunu göstermektedir. Bu çalışma ile Ankara Büyükşehir Belediyesi şikayet ve talep birimi olarak kurulan Mavi Masa twitter adresine(@mavimasa) gelen talep ve şikayetlere yanıt verme süresini artırmak amacıyla talep ve şikayetlerin makime öğrenmesi kullanılarak otomatik kategorize edildiği bir yöntem önerilmektedir.

LİTERATÜR ARAŞTIRMASI

İstanbulluoğlu (2017) tarafından yapılan bir çalışmada, bazı firmaların Facebook ve Twitter hesapları üç ay boyunca izlenmiş ve şikayetleri yanıtlanan tüketicilere davet gönderilmiştir. Bu, katılımcıların şirket ile görüşmelerini bitirdikten sonra katılımcıların memnuniyetlerini alan bir anket yapmayı amaçlanmıştır. Facebook'ta toplam 1100 davet ve Twitter'da 1250 davet gönderildi. Toplamda 455 katılımcı anketi tamamladı. Kısmen tamamlanan anketler dışında, veri setindeki son anket sayısı 422'dir (Facebook = 222, Twitter = 200). Katılımcıların %33'ü şikayetçi olduktan sonra 1 saat içinde şirketten bir cevap aldıklarını ve sadece yüzde 5,7'sinin 48 saat ve daha sonra aldığını belirtmiştir. Katılımcıların % 57,6'sı sadece bir mesaj almak yerine sosyal medyada bir konuşma yaptığını belirtmiştir. Bir konuşma yapanların sadece % 7,1'i, 1 saat içinde sonuç mesajını aldıklarını belirtirken, % 19.9'u

son mesajı şikayetçi olduktan sonra 48 saatten fazla sürdüğünü belirtti. Genel olarak, katılımcıların %54'ü tazminat almayı hedeflemiştir ve katılımcıların %46'sı ise kamuoyuna şikayette bulunmayı hedeflemiştir.
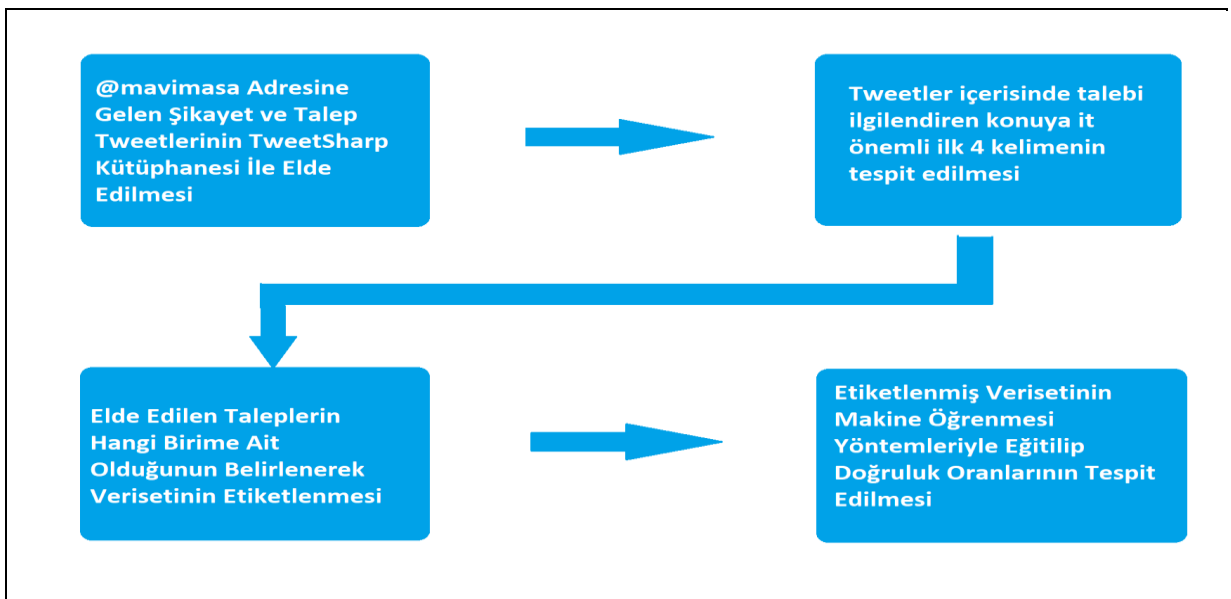
METODOLOJİK ÖZELLİKLER VE SONUÇLAR

Mavi Masa, Ankara halkının Büyükşehir Belediyesi'nin yapmış olduğu hizmetlerle ilgili şikayet ve taleplerinin yönetildiği bir platformdur. 2003 yılında kurulan Mavi Masa ile telefon, sms, yüzyüze görüşme, web sitesi, Whatsapp ve Twitter üzerinden gelen şikayet ve talepler alınarak konu ile ilgilenen birimlere iletilir. İlgili birim konu ile ilgili çalışmasını yaparak şikayet veya talebi gönderene bir geri bildirimde bulunur (Mavi Masa Hakkında, (2018)).

Sosyal medya günümüzde sık kullanılan bir mecra olduğundan kurumların prestijleri açısından kuruma yapılacak herhangi bir talep ve şikayetin hızlı bir şekilde çözülmesi gerekmektedir. Mavi Masa Twitter adresi üzerinden gelen talep ve şikayetler sosyal medya uzmanları tarafından değerlendirilerek ilgili birime iletilmektedir. Ancak burada bazı olumsuzluklar vardır:

- Tüketici şikayetine yanıt verecek uzman personel sayısı,
- Hangi şikayetin hangi birim tarafından çözüleceği,
- Görev paylaşımının nasıl yapılacağı (herkes aynı talebi okuyabilir).

Bu olumsuzluklar hızlı bir yanıt verme süresini olumsuz yönde etkileyecektir. Ayrıca senkronizasyonun sağlanması da diğer bir olumsuzluktur. Bu makalede bu olumsuzlukları gidermek için Şekil 1. de adımları belirtildiği gibi Mavi Masa Twitter adresine gelen tweet'lerin otomatik kategorize edildiği bir yöntem önerilmektedir.

Şekil 1: Sistemin İşleyiş Adımları

@mavimasa Adresine Gelen Şikayet ve Talep Tweetlerinin TweetSharp Kütüphanesi İle Elde Edilmesi

Tweetler içerisinde talebi ilgilendiren konuya it önemli ilk 4 kelimenin tespit edilmesi

Elde Edilen Taleplerin Hangi Birime Ait Olduğunun Belirlenerek Verisetinin Etiketlenmesi

Etiketlenmiş Verisetinin Makine Öğrenmesi Yöntemleriyle Eğitilip Doğruluk Oranlarının Tespit Edilmesi

Kaynak: Yazar

Twitter Verilerinin Elde Edilmesi

Twitter verilerini geliştirdiği API'ler aracılığı ile geliştiriciler ile paylaşmaktadır. Bu çalışmada C# dili ile TweetSharp (Crenna, (2009)) kütüphanesi kullanılarak @mavimasa etiketi kullanan toplam 1000 tweet elde edilmiştir.

Verilerin Temizlenmesi

Toplanan tweet'ler manual olarak incelenmiş, temizlik yapıldıktan sonra şikayet ve talep içeren 234 tweet elde edilmiştir.

Verilerin Etiketlenmesi

Tweet içeriklerinde bulunan sırası önemsenmeden önemli 4 kelime anahtar(keyword) olarak seçilmiş, bunlar şikayet ve talep olarak etiketlenmiş ve son olarak ilgili birimler tespit edilerek verilerin etiketleme işlemi tamamlanmıştır(Tablo 1.). İşlemler manual olarak yapılmıştır.

Tablo 1: Etiketlenmiş örnek veriseti

Tip	1.Kelime	2.Kelime	3.Kelime	4.Kelime	İlgilenen Birim
şikayet	şelale	park	Ateş	Tehlike	ÇevreKoruma
şikayet	kaldırım	Yaya	Yenileme	yürünmüyor	FenIşleri
talep	yatak	engelli	Bağımlı	Belirsiz	SosyalHizmetler
şikayet	durak	havaş	Öncelik	Yok	EGO
talep	servis	havaş	Güzergah	Durak	EGO
talep	dönüşüm	kentsel	Projesi	kaldırım	FenIşleri
şikayet	durak	hat	Otobüs	Dolu	EGO
şikayet	sıfır	hava	Sulama	kamyon	ÇevreKoruma
talep	rögar	kazı	Kırılmış	vidanjör	FenIşleri
şikayet	dilenci	kaldırım	Dolu	Belirsiz	Zabıta
talep	alanı	rekreasyon	Millet	bahçesi	ÇevreKoruma
talep	numara	hat	Otobüs	Zaman	EGO
talep	bozulma	asfalt	Belirsiz	Belirsiz	FenIşleri
şikayet	süresi	seyahat	Uzun	Aştı	Ulaşım
talep	ayak	hayvan	Kırılmış	Belirsiz	SağlıkIsleri
şikayet	aynı	asfalt	Durumda	Belirsiz	FenIşleri
talep	batıkent	metro	yoğunluk	Çözüm	EGO
şikayet	uygunsuz	dolmuş	Park	Belirsiz	EGO
talep	çalışma	kaldırım	Belirsiz	Belirsiz	FenIşleri
şikayet	çukur	asfalt	Araç	tampon	FenIşleri

Kaynak: Yazar

Sonuçlar

Önerilen yöntemde elde edilmiş etiketli veriler C4.5 (Quinlan, (1993)), Random Forest (Liaw & Wiener, (2002)), Naive Bayes (Bayes), Lojistik Regresyon (Cox, (1969)) öğrenme algoritmaları ile ayrı ayrı öğretilerek test edilmiştir. Bu işlem için Weka (Vafopoulos ve diğ. (2005)) kullanılmıştır.

Tablo 2: Veri setinin öğrenme algoritmaları kullanılarak elde edilen test sonuçları

Yöntem	Doğruluk Oranı(%)	TPR	FPR
C4.5	81,03	0,81	0,11
Random Forest	81,46	0,82	0,11
Naive Bayes	77,16	0,77	0,11
Lojistik Regresyon	81,03	0,81	0,07

Kaynak: Yazar

Tablo 2. de kullanılan yöntemlerin doğruluk oranları, Doğru Pozitif Oran(TPR) ve Yanlış Pozitif Oran(FPR) gösterilmektedir. Tablo incelendiğinde en iyi sonuçlar C4.5 ve Lojistik Regresyon algoritmaları ile elde edilmiştir.

SON SÖZLER

Bu çalışmada sosyal medya üzerinden alınan şikayet ve taleplere hızlı bir yanıt verme süresi elde etmek için Mavi Masa twitter adresine(@mavimasa) gelen şikayet ve taleplerin otomatik kataorize edildiği bir yöntem önerilmiştir. @mavimasa etiketiyle toplanan veriler manual olarak kategorize edilmiş ve makine öğrenmesi yöntemleri ile öğretilerek yöntemin başarısı test edilmiştir. Makine öğrenme yöntemleri kullanılarak elde edilen sınıflandırma sonuçları %81'lik bir doğruluk oranı elde etmiştir.

Çalışma daha fazla veri üzerinde uygulandığında daha başarılı sonuçlar elde edebilir. Ayrıca veriler otomatik olarak bir sözlük yardımıyla etiketlenebilir. Gelecek çalışmalarda daha büyük bir veri seti ve kategorize edilecek şikayet ve taleplere ilişkin bir sözlük yardımıyla otomatik etiketleme konuları üzerinde durulacaktır.

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IMO Balast Suyu Yönetimi Sözleşmesinin Gereklilikleri ve Akdeniz Ekosistemindeki Zararlı Türler

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ÖZET[3]

Dünya ticaretinin %90'a yakını deniz yoluyla gerçekleşmektedir. 1 Ocak 2018 itibariyle dünya denizlerinde toplam 1,6 milyar tonaja sahip 90 bin civarı gemi dolaşmaktadır. Gemiler yük işlemleri gereği yük taşıdıkları ambarları ve tankları boş olduğunda balast tanklarına deniz suyu almaktadırlar. Bu deniz suyunu yükleme yapacağı limanda ambarlarına ve tanklarına yük aldığında boşaltmak zorundadırlar. Dünyanın farklı coğrafyalarında çalışan gemiler, farklı denizlerden ve bölgelerden aldıkları bu sular yüzünden gizli bir tehlike barındırmaktadır. O bölgeden aldıkları deniz suyu o bölgeye has deniz canlıları barındırmaktadır. Yükleme limanındaki bölgede dışarı verilen bu su oradaki canlı türleri ve ekosistemi için çok tehlikeli olabilir. Bilim insanları tarafından ilk defa 1903 yılında Kuzey Denizi'nde Asya kökenli fitoplanktonlar görülmüş olup sorunun ele alınması 1970 yılında gerçekleşmiştir. 1980 yılının sonlarında Avustralya ve Kanada Uluslararası Denizcilik Örgütü'nün (IMO) Deniz Çevre Koruma Komitesi'nde sorunla ilgili dikkat çekmiştir. Artan ticaret hacmi ve gemi sayısıyla gemilerin balast suyuyla taşınan işgalci zararlı türlerden etkilenen bölge sayısı giderek artmakta olup ekolojik ve ekonomik olarak büyük tehdit oluşturmaktadır. Bu çalışmada 8 Eylül 2017 yılında yürürlüğe giren Balast Suyu Yönetimi Sözleşmesiyle gemilerin yükleme limanlarına varmadan önce yapması gereken işlemlere ve balast tankındaki suyu zararlı türlerden arındırma yöntemlerine açıklık getirildi. Akdeniz ekosistemindeki zararlı türlerin neler olduğu hakkında bilgi verildi.

Anahtar Kelimeler: Balast Suyu, Ekosistem, Zararlı Türler.

ABSTRACT

Nearly 90% of the world trade is carried out by sea. As of 1st January, 2018, around 90 thousand ships with a total capacity of 1.6 billion tonnes are traveling around the world. Due to the cargo operations, the vessels are receiving sea water from the ballast tanks when their hatches or tanks are empty. They have to unload the seawater at the port where they will load their hatches or tanks. Ships which are operating in different geographies of the world have a hidden danger because of the water they receive from different seas and regions. The sea water that they receive from the region contains species which belong to that region. This water which pump out in the area of the loading port can be very dangerous for the species and ecosystem in there. Scientists have seen Asian origin phytoplankton in the North Sea for the first time in 1903 and but the problem was reviewed in 1970. In late 1980, Australia and Canada made attention to Maritime and Environmental Protection Committee of the International Maritime Organization (IMO) relevant with invasive species. With the increasing trade volume and the number of ships, the number of areas which is affected by the invasive species carried by the ballast water of the ships is increasing and they pose a great threat ecologically and economically. In this study, the Ballast Water Management Convention, which came into force on September 8, 2017, clarified the procedures to be taken by the ships before reaching the loading ports and the methods of removing the harmful species from water in the ballast tank. Information about the harmful species in the Mediterranean ecosystem was given.

Keywords: Ballast Water, Ecosystem, Harmful Species.

GİRİŞ

Dünya ticaretinin %90'a yakını deniz yoluyla yani gemilerle yapılmaktadır (un.org). 1 Ocak 2018 tarihi itibariyle dünyada toplam 1,6 milyar tonaja sahip 90 bin civarı gemi dolaşmaktadır (unctad.org). Dünyanın her noktasının günümüz teknolojisiyle ulaşılabilir olması sebebiyle dünya üzerindeki her bölgenin, gemilerin balast tanklarıyla getirdiği sulardaki mikroorganizma tehdidi altında olduğu gerçeğiyle karşı karşıyayız. Gemi sayısının da fazla olmasından dolayı dünya denizlerindeki değişen mikroorganizma sayısı ve yer değiştirme süresi kısalmaktadır.

Balast suyunun ortaya çıkışından bahsetmek gerekirse çelik gövdeli gemilerin piyasaya sürülmesinden bu yana, denizdeki gemileri dengede tutmak için balast olarak su kullanılmıştır. Balast suyu, yolculuk boyunca güvenli çalışma koşullarını sağlamak için gemilerdeki tanklara pompalanır. Bu uygulama, tekne üzerindeki stresi azaltıp, yüzdürme dengesine yani stabiliteye katkı sağlar. İtme ve manevra kabiliyetini arttırır. Çeşitli kargo yük seviyelerinde yakıt ve su tüketimi nedeniyle ağırlık değişikliklerini telafi eder (imo.org).

Balast suyu güvenli ve verimli modern deniz taşımacılığı operasyonları için gerekli olsa da, gemilerin balast suyunda taşınan çok sayıda deniz türü nedeniyle ciddi ekolojik, ekonomik ve sağlık sorunları doğabilir. Bunlar arasında bakteri, mikrop, küçük omurgasızlar, yumurta, kist ve çeşitli türlerin larvaları bulunmaktadır. Tanklarda taşınan türler, ev sahibi ortamda üreyici bir popülasyon oluşturmak için hayatta kalabilir, istilacı, rekabet eden yerli türler haline gelmektedir. Bilim adamları, ilk kez 1903 yılında Kuzey Denizinde Asya fitoplankton alglerinden Odontella'nın (Biddulphia sinensis) kitlesel bir şekilde ortaya çıkışından sonra yabancı bir türün girişinin işaretlerinin farkına vardı. Ancak, 1970'lere kadar bilim topluluğu sorunu ayrıntılı bir şekilde incelemeye başlamadı. 1980'lerin sonlarında, Kanada ve Avustralya istilacı türlerle ilgili belirli problemler yaşayan ülkeler arasındaydı ve endişelerini IMO'nun Deniz Çevre Koruma Komitesi'nin (MEPC) dikkatine sundular (imo.org).

Gemilerin balast suyundaki istilacı türlerin sorunu büyük ölçüde, son birkaç on yıldaki artmış ticaret ve trafik hacminden kaynaklanmaktadır. Deniz ticaretindeki hacimler artmaya devam ettiğinden, sorun henüz tam olarak pik noktasına ulaşmamış olabilir. Fakat dünyanın birçok bölgesindeki etkileri yıkıcı olmuştur. Nicel veriler, biyo-istilaların oranının endişe verici bir oranda artmaya devam ettiğini ve her zaman yeni alanların işgal edildiğini göstermektedir. İstilacı türlerin yayılması dünyanın ekolojik ve ekonomik refahı için en büyük tehditlerden biri olarak kabul edilmektedir. Bu türler biyolojik çeşitliliğe ve dayandığımız dünyanın değerli doğal zenginliklerine büyük zararlar vermektedir. Doğrudan ve dolaylı olarak sağlığa etkileri giderek daha ciddi bir hal almakta ve çevreye verilen zarar genellikle geri dönülmez noktaya gelmektedir (imo.org).

IMO BALAST SUYU SÖZLEŞMESİ

İstilacı türlerin gemiler tarafından taşınmasını önlemek ve istilalara zamanında etkili bir yanıtı koordine etmek, hükümetler, ekonomik alanda faaliyet gösteren sektörler, sivil

toplum kuruluşları ve uluslararası anlaşma kuruluşları arasında işbirliği gerektirir; Birleşmiş Milletler Deniz Hukuku Sözleşmesi (Madde 196), belirli bir yere deniz ortamındaki önemli ve zararlı değişikliklere neden olabilecek yabancı veya yeni türlerin kasıtlı veya kazara sokulması dahil, deniz ortamının kirlenmesini önlemek, azaltmak ve kontrol etmek için birlikte çalışmalarını gerektiren çerçeveyi sunmaktadır. IMO, istilacı su türlerinin (IAS) taşınma yoluyla yer değiştirmesine konusuna önderlik ederek uluslararası çabanın önünde olmuştur. 1991 yılında MEPC, istenmeyen su organizmalarının ve patojenlerinin gemilerin balast suyundan ve tortu deşarjlarından getirilmesinin önlenmesine yönelik Uluslararası Kuralları kabul etti (karar MEPC.50 (31)); 1992 yılında Rio de Janeiro'da düzenlenen Birleşmiş Milletler Çevre ve Kalkınma Konferansı (UNCED) konuyu uluslararası bir sorun olarak kabul etti (imo.org).

Kasım 1993'te IMO Meclisi, Deniz Çevre Koruma Komitesi'nden ve Deniz Emniyeti Komitesi'nden, uluslararası olarak uygulanabilir, yasal olarak bağlayıcı hükümler geliştirmek amacıyla bu Kılavuzları gözden geçirme altında tutmasını talep eden 1991 Kılavuzuna dayanan A.774 (18) sayılı kararı kabul etmiştir. Örgüt, uluslararası bir anlaşmanın geliştirilmesine yönelik çalışmalarını sürdürürken, Kasım 1997'de, A.868 sayılı Kararı kabul etti. Zararlı su organizmalarının ve patojenlerinin taşınmasını en aza indirmek için gemilerin balast suyunun kontrolü ve yönetimi için kılavuzlar, Üye Devletleri, istilacı su türleri konusunda bu yeni kuralları kullanmaya davet etmektedir. IMO Üye Devletleri arasında 14 yıldan uzun süren karmaşık müzakerelerin ardından, Uluslararası Balast Suyu ve Sedimentlerin Kontrolü ve Yönetimi Konvansiyonu (BWM Sözleşmesi) 13 Şubat 2004 tarihinde Londra'daki IMO Genel Merkezi'nde düzenlenen Diplomatik Konferansta oy birliği ile kabul edildi. Konferansın açılış konuşmasında IMO Genel Sekreteri, yeni Konvansiyonun gelecek nesiller için deniz ortamının korunmasına yönelik önemli bir adım teşkil edeceğini belirtti. "Çocuklarımıza ve onların çocuklarına karşı olan görevimizi abarttığımız söylenemez. Eminim ki hepimiz onların temiz, üretken, güvenli ve emniyetli denizleri olan bir dünyayı miras almalarını diliyoruz. Bu konferansın sonucu, giderek daha ciddi bir hal alan tehditten kurtulmamızı sağlayacaktır." dedi (imo.org).

Sözleşme, gemilerin balast suyu yönetim planı uygulamalarını gerektirmektedir. Gemiler bir balast suyu kayıt defteri taşımalıdır ve balast suyu yönetim prosedürlerini belirli bir standarda göre yerine getirmelidir. Sözleşmeye taraf olanlara, sözleşmede belirtilen kriterlere ve IMO yönergelerine tabi olan ek önlem alma seçeneği sunulur. Sözleşmenin bazı maddeleri ve düzenlemeleri, Örgüt ve Konferans'ın 1 no'lu kararına atıfta bulunur. IMO bu kılavuzları acil olarak geliştirmeye, yürürlüğe girmeden önce uygulanabilir kılmaya ve en kısa zamanda kabul edilmeleri için davet edilmiştir. Sözleşmenin, küresel ve tek tip olarak uygulanmasını kolaylaştırmak amacı taşınmıştır. MEPC, Nisan 2004'teki elli birinci oturumunda, Konferans Kararı 1'de listelenen BWM Sözleşmesinin düzgün uygulanması için kılavuzlar ve prosedürlerin geliştirilmesi için bir program onayladı; Program, Temmuz 2005'te MEPC'nin elli üçüncü oturumunda, son olarak Ekim 2008'de MEPC.173 (58) sayılı kararla kabul edilen 14 set Kılavuzun geliştirilmesi ve kabul edilmesi amacıyla genişletilmiştir (imo.org). Sözleşmenin yürürlüğe girmesi için, 12 ay sonra yürürlüğe gireceği ticari gemi tonajının% 35'ini temsil eden asgari 30 Devlet tarafından onaylanması

gerekiyordu. 8 Eylül 2016'da Finlandiya'nın sözleşmeyi imzalamasıyla, sözleşmeye taraf olan devlet sayısı 52'ye yükselmiş olup ve dünya gemi tonajının % 35.14 oranına getirmiştir. Bu sayede, 8 Eylül 2017'de sözleşmenin yürürlüğe girme tarihinin uygulanabilirliği gerçekleşmiştir. Finlandiya'dan bu yana, bir dizi devlet anlaşmayı onaylamaya devam etmiş ve Kasım 2018'e kadar toplam 78 devlet sözleşmeye taraf olmuş ve dünya ticaret tonajının % 77,19'unu temsil etmiştir (wikipedia).

Sözleşme geliştirme sürecinde, balast suyu yönetimi için uygun standartları yaygın hale getirmek için önemli çabalar sarf edilmiştir. Bunlar balast suyu değişim standardı ve balast suyu performans standardıdır. Balast suyu değişimini gerçekleştiren gemiler, balast suyunun hacimsel olarak %95 değişimini yapacaktır. Balast suyu yönetim sistemi (BWMS) kullanan gemiler hacim birimi başına kararlaştırılan organizma sayısına dayanan bir performans standardına uymalıdır. BWM Sözleşmesinin D-3 Yönetmeliği, Sözleşmeye uymak için kullanılan balast suyu yönetim sistemlerinin, balast suyu yönetim sistemlerinin onaylanmasına ilişkin Rehber İlkeleri dikkate alarak İdare tarafından onaylanmasını gerektirir (G8). Kılavuzlar (G8) 2016 yılında revize edilmiş ve MEPC 72 (Nisan 2018) tarafından kabul edilen ve Ekim 2019'da yürürlüğe giren balast suyu yönetim sistemlerinin (BWMS Kodunun) onaylanması için zorunlu bir kod'a dönüştürülmüştür (imo.org).

Sözleşme uyarınca, gemilerin, uygulama zaman çizelgesine göre, D1 veya D2 standartlarına uymaları zorunludur. D1 standardı, gemilerin balast suyu değişimini gerçekleştirmelerini gerektirir ve değiştirilmesi gereken suyun hacmini belirler. Bu standart, alınan deşarj suyunun son limandan yeni deniz suyuyla değiştirilmesini içerir; kıyıdan en az 200 deniz mili uzakta gerçekleşmesi gerekir. D2 standardı daha katıdır ve onaylı bir balast suyu arıtma sisteminin kullanılmasını gerektirir. Sistem, deniz yolu taşımacılığının çevresel etkilerini en aza indirgemek için işlemden sonra sadece küçük canlı organizma seviyelerinin suda kalmasını sağlamalıdır. Sözleşme yürürlüğe girdikten sonra 8 Eylül 2017'den itibaren D2 standardının kurulması ve bunlara uyması için yeni gemiler olacaktır. Aşamalı uygulama programına tabi olan mevcut gemiler, (gemi sertifikalarının yenilenmesine bağlı olarak) 8 Eylül 2024 tarihine kadar potansiyel olarak sahipti ve bu süre zarfında tüm gemiler D2 standardına uyması gerekmektedir. Aynı zamanda, 5. maddede bir gemi balast tankının temizlenmesi veya onarımı yapıldığında, limanların sedimanlar için yeterli alım tesislerine sahip olması gerektiği için, limanların onaylanmış kıyı kabul tesislerinde balast boşaltması da mümkündür. Tesisler güvenli bertaraf düzenlemeleri, depolama ve arıtma ekipmanı, güvenli ve uygun bağlama ile acil durum düzenlemelerini ve gemilere bağlantı için gerekli redüktörleri(indirgeyicileri) içermelidir. Bazı gemiler, belirli koşullara ve bayrak devleti tarafından verilen uygun izne göre sözleşmeye uymaktan muaf tutulabilir. Bunlar arasında sınırlı bir bölgede ticaret yapan gemiler, yelkenli tekneler ve balıkçı gemileri dahil olmak üzere küçük gemiler, sadece bir kıyıda faaliyet gösteren gemiler ve ayrıca FPSO(Yüzer Üretim Depolama Boşaltma Birimi)'lar vardır (wikipedia.com).

AKDENİZ EKOSİSTEMİNDEKİ ZARARLI TÜRLER

Avrupa, Afrika ve Asya arasında bir kavşakta yer alan, yarı kapalı bir deniz olan Akdeniz, dünya okyanuslarının yüzölçümünün sadece % 0,82'sini oluşturmaktadır (Bianchi CN. *et al.*, 2000). Dünyadaki en derin (ortalama 1460 m) ve en büyük (2969.000 km2) kapalı deniz kabul edilmektedir. Uzaydan doğudan batıya 3800 km ve kuzeyden güneye 800 km uzanan dar bir göle benzemektedir (Coll M. *et al.*, 2010). Akdeniz, dünya okyanuslarının küçük bir kısmını temsil etse de, alışılmadık derecede zengin ve çeşitli bir biyota barındırmaktadır (Bianchi CN *et al.*, 2000). Dünyanın deniz biyo çeşitliliğinin % 4-18'ini temsil eden yaklaşık 17.000 türe ev sahipliği yapar (Coll M. et al., 2010).

Akdeniz'deki yeni katılımların tahmini sürekli güncellenmektedir. 1000 tür kadar yüksek olabilir. Akdeniz'deki yabancı türlerin çoğu Hint Okyanusu (% 16) ve Kızıldeniz (%

12)   ve Hint - Pasifik (% 41) kökenlidir (Coll M. et al., 2010). Yabancı türlerin sayısı, Deniz Stratejisi Çerçeve Direktifi (Marine Strategy Framework) kapsamında tanımlanan Akdeniz alt bölgeleri (Doğu, Batı, Orta ve Adriyatik Denizi) arasında farklılık göstermektedir. Yabancı türlerin çoğunluğu Doğu alt bölgesinde, Batı ve Orta alt bölgelerinde ve Adriyatik Denizi'nde daha az sayıda kayıt vardır (Zenetos A. *et al.*,2012). Süveyş Kanalı'nın, Akdeniz'e deniz canlı katılımının ana kaynağı olduğu düşünülmektedir. Aslında Süveyş Kanalı,

Akdeniz'e giren tüm egzotik deniz türlerinin % 53'ünden sorumlu olmuştur. % 11 orana sahip bazı türler başlangıçta Süveyş Kanalı'ndan girmiştir ancak daha sonra havzada gemiler tarafından dağılmıştır. Süveyş Kanalı 2015 yılında deniz yoluyla taşımacılığının artışından dolayı genişletilmiştir. Bu olayın Akdeniz deniz ekosistemleri üzerinde güçlü bir etkisi olması beklenmektedir (Galil B. *et al.*, 2015).

Yeni deniz türlerinin Türkiye'deki boğazlar üzerinden girme oranları, özellikle Cebelitarık Boğazı ve Süveyş Kanalı ile karşılaştırıldığında ihmal edilebilir boyutlardadır. Deniz taşımacılığına bağlı tehditler, örneğin, balast suları, balast tankları, gemi çapaları ve boyalarıdır. Gemilerin çoğunluğu Kuzey Atlantik limanlarından gelse de, Kuzey Atlantik türleri havzaya giren yabancı biyotanın sadece% 14'ünü temsil ederken,% 50'si Hint ve Hint-Batı Pasifik kökenlidir. Muhtemelen, bu iki bölge ile Akdeniz arasındaki tuzluluk ve sıcaklık farkları veya benzerliklerinden kaynaklanmaktadır. Açık deniz petrol ve gaz araştırmaları için araştırma gemileri ve platformları da yabancı türlerin yayılmasına katkıda bulunabilmektedir (Relini O. *et al.*, 1979).

Balast suyu ile yeri değiştiği için dünya çapında türlere zarar veren örneklerden bahsedecek olursak:

- ABD'de zebra midyesi Dreissena Polymorpha ve Asyalı istiridye Potamocorbula Amurensis (Griffiths, D.W. *et al.*, 1991);

- Karadeniz ve Azak Denizi'ndeki tarak reçeli (Mnemiopsis Leidyi) (Shunshkina, E.A. *et al.*,1990);

- Toksik Dinoflagellat (Gymnodinium Catenatum) ve kuzey Pasifik deniz kıyısı (Asterias amurenisis) Avustralya'da(marine.csiro).

Yabancı türler, bundan tam beş yüzyıl önce Akdeniz'de gemilerin okyanuslararası seferlere başlamasından itibaren taşınmaya başlamıştır (ciesm.org). Akdeniz'deki biyo-istilanın yüksek sayıda taşımacılık güzergahı olması ve yerel bozunma sebebiyle arttığı öngörülmektedir (Flagella M.. *et al.*, 2005). Geçtiğimiz yarım yüzyıl boyunca, Akdeniz'de deniz taşımacılığı büyük ölçüde genişledi. 1985 ve 2001 yılları arasında Akdeniz limanlarında yüklenen ve boşaltılan kargo hacminde % 77'lik artış kaydedildi. Bugün, tahmini bir rakam verilmek istenirse 200.000 adet ticari gemi Akdeniz'i geçmektedir ve uluslararası deniz yoluyla taşınan hacmin yaklaşık % 30'u Akdeniz'deki 300 limanda işlem görmektedir. Bu rakamların önümüzdeki 20 yıl içinde üç veya dört kat artması bekleniyor (Dobler, J. P. et al.,2002).

Deniz istilalarının aynı zamanda ekonomik ve insan sağlığı üzerinde etkileri olmaktadır. Avrupa'daki, ekonomik etkilerinden söz etmek gerekirse yerel olmayan karasal ve su türlerinin yılda en az 12,5 milyar avro ile 20 milyar avro arasında etkisinin olduğu tahmin edilmektedir. Sadece su türlerinin bölgeye 2,2 milyar avro zararının olduğu öngörülmektedir (Kettunen *et al.*, 2009).

Akdeniz kıyılarında 200'den fazla yabancı deniz yumuşakçaları kayıt altındadır. Çoğunun Hint-Batı Pasifik kökenli ve Süveyş Kanalı'ndan Akdeniz'e giriş yaptığına inanılmaktadır (Zenetos *et al.*, 2012). Başlangıçta belirgin bir göç yolu takibi yapmaktadırlar. İsrail'in Akdeniz kıyısı boyunca kuzeye doğru ilerleyip Türkiye ve Güney Kıbrıs'a ve Ege Denizi'ne girmeden önce batıya doğru Malta ve İtalya'ya doğru ilerlemektedirler. Gemilerin balast tankında taşınması yardımı ile yumuşakça istilası birçok Akdeniz kıyısında, özellikle koylar ve haliçlerde görülmektedir. Örneğin Asya kökenli midye Arcuatula (Musculista) Senhousia, ekolojik olarak Akdeniz'de küresel istilacı olarak kabul edilmektedir (Otero M. *et al.*, 2013).

Denizyolu taşımacılığıyla yaygın istilacı algler Caulerpa Taxifolia ve Caulerpa Racemosa var. Sylindracea Akdeniz'e yayıldı. Bunda gemiler, balıkçı gemilerinin ve özel teknelerin payı vardır. Bazı Kızıldeniz kökenli istilacı midyelerden Brachidontes gemiler yoluyla batıda Sicilya'ya kadar yayıldı. Ek olarak, denizyolu ticaret yolları sayesinde Akdeniz biyota, ithal ettiği gibi ihracatını da sağlamıştır: Hint – Batı Pasifik kökenli yengeç Charybdis hellerii 1920'lerden bu yana doğu Akdeniz'de balast tanklarında Latin Amerika'ya taşınmıştır (Otero M. *et al.*, 2013).

İstilacı deniz türlerinin kara listesi ise aşağıdaki gibidir;

• Yosunlar: 1. Acrothamnion preissii, 2. Asparagopsis armata, 3. Asparagopsis taxiformis, 4. Caulerpa racemosa var. Cylindracea, 5. Caulerpa taxifolia, 6. Codium fragile sp. Fragile, 7. Lophocladia lallemandii, 8. Stypopodium schimperii, 9. Womersleyella setacea

• Kapalı Tohumlular: 10. Halophila stipulacea

• Süngerimsi canlı familyası: 11. Oculina patagonica, 12. Rhopilema nomadica

• Yumuşakçalar: 13. Aplysia dactylomela, 14. Arcuatula (Musculista) senhousia, 15. Brachidontes pharaonis, 16. Bursatella leachii, 17. Chama pacifica, 18. Crassostrea gigas, 19. Crepidula fornicata, 20. Limnoperna (Xenostrobus) securis, 21. Pinctada imbricata radiata,

• 22. Rapana venosa, 23. Spondylus spinosus, 24. Venerupis (Ruditapes) philippinarum

• Deniz kabukluları: 25. Marsupenaeus japonicus, 26. Metapenaeus monoceros, 27. Metapenaeus stebbingi, 28. Percnon gibbesi

• Ascidians: 29. Herdmania momus, 30. Microcosmus squamiger

• Ktenofor: 31. Mnemiopsis leidyi

• Balıklar: 32. Alepes djedaba, 33. Apogonichthyoides pharaonis, 34. Atherinomorus forskalii, 35. Fistularia commersonii, 36. Lagocephalus sceleratus, 36. Lagocephalus spadiceus, 36. Lagocephalus suezensis, 37. Nemipterus randalli, 38. Parexocoetus mento, 39. Pempheris vanicolensis, 40. Plotosus lineatus, 41. Sargocentron rubrum, 42. Saurida undosquamis, 43. Siganus luridus, 44. Siganus rivulatus, 45. Stephanolepis diaspros, 46. Upeneus molluccensis, 47. Upeneus pori

SONUÇLAR

Artan ticaret hacmi ve gemi sayısına bağlı olarak balast tankı yoluyla taşınan canlı sayısı da artmaktadır. Balast Suyu Yönetimi Sözleşmesi sayesinde sorunla mücadele başlamış ve gemilere yaptırımlar getirilerek sorunun geri döndürülemez boyuta ulaşmadan müdahale etme şansı getirmiştir. Bu sayede çevre tahribatının azaltılacağı ya da tamamen önleneceği ümit edilmektedir. Akdeniz ekosisteminin istilacı türlerden kurtarılması hem kıyı ülkelerine maddi açıdan hem de turizm açısından katkı sağlayacaktır. Sorun dünya çapında ele alındığı için sözleşmeye taraf olmayan ülkeler de baskılara dayanamayarak çözüme katkı sunması düşünülmektedir.

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