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Aims & Scope

Compared to other fields, developments and innovations in the fields of medical, health and life sciences are very fast. In this century, where the human population is rapidly increasing and technology is developing rapidly, health problems are constantly changing and new solutions are constantly being brought to these problems. With the Covid 19 epidemic, it has emerged that a health problem affects all humanity and all areas of life. For this reason, this conference focused on the changes and innovations in the field of Medical, Health and Life Sciences.

The aim of the conference is to bring together researchers and administrators from different countries, and to discuss theoretical and practical issues of Medical, Health and Life Sciences. At the same time, it is aimed to enable the conference participants to share the changes and developments in the field of Medical, Health and Life Sciences with their colleagues.

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Expositions Plants of the Absheron Philharmonic Garden

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Abstract: The article describes the results of research work on the taxonomic structure of ornamental trees, shrubs and herbaceous plants from 34 families, of 45 genera and 55 species. The form for creating expositions, rule they grouping plans in expositions, the use of small architectural forms of the Absheron Philharmonic Garden. It was revealed that these plants adapt well under Absheron conditions are promising and it is recommended at registration of parks, gardens and squares, creation of various expositions. As a result of research work at the Institute of Dendrology of the National Academy of Sciences of Azerbaijan, it was revealed that the local and introduced from local and foreign flora ornamental trees, shrubs and herbaceous plants from 34 families, 45 genera and 55 species studied in the Philharmonic Garden are well adapted to the conditions of Absheron, are promising and are recommended for designing parks, gardens, squares, creating various compositions in Baku.

Keywords: Ornamental Plants, Park, Horticulture, Landscaping, Exposition

Introduction

The study of all multilateral branches of garden and park construction in Azerbaijan is of great importance in the modern era. The issues of protecting our cultural heritage are very relevant. The beauty of Baku is given by its beautiful gardens and parks. Over the past 10 years, 45 new culture and recreation parks have been created in Baku, and 84 have been rebuilt. Modern cities of Azerbaijan are hard to imagine without gardens and parks, green streets and yards. According to sanitary and hygienic standards in large industrial cities, including Baku, the area of green spaces should be 45-50% of the total construction living area or 26-30 m² per person (Agamirov, 1976).

The most beautiful and oldest park in Baku - Philharmonic Garden (Azerbaijani Filarmoniya bagi; former names Governor's Garden, Mikhailovsky Garden, Revolution Garden, Pioneer Garden, Vahid Garden) is located next to the Baku Fortress (Icheri - Sheher). The Philharmonic Garden with an area of 4.6 hectares was founded in 1830 of the 19th century on the initiative of the commandant of the Baku fortress, Colonel Roman von der Hoven, on the basis of private plantations and on the site of private gardens and orchards between the fortress walls. Soil and plants for the garden had to be imported from other places. In 1859, the outer fortress wall was dismantled and the territory of the garden was expanded to Nikolaevskaya and Sadovaya streets. By 1865, the garden received features that corresponded to the public purpose of the territory as a place of rest for the townspeople, due to the planting of ornamental plants, the arrangement of a dance floor and other park facilities. There were about 12,000 trees in the garden. On May 25, 1936, by the decision of the Council of People's Commissars of the Azerbaijan SSR, the Azerbaijan State Philharmonic Society was organized in the building of the Public Assembly.

The Philharmonic Garden is the first green area that appeared on the map of Baku in the mid-30s of the 20th century. This garden, which occupies a relatively small area, has gone through an interesting evolutionary path. At first, the layout of the garden evolved spontaneously. New trees and shrubs were planted, between which an alley ran. As the garden expanded, the assortment of its plants was replenished. As a result of the expansion of the garden at the beginning of the 20th century, its lower and upper parts completely merged, creating a single

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landscape composition. Objects of landscape architecture organically included in this composition: pavilions, gazebos, pools, fountains, which emphasized certain natural areas (Gasanova, 2006).



Figure 1. General view of the Philharmonic Garden

At present, in the landscape architecture of Baku, the Philharmonic Garden occupies a special place for recreation and walks of the population. Initially, the garden was called the Governor's, and then the Mikhailovsky Garden (in honor of the brother of the Russian Emperor Nicholas II - Mikhail). Under Soviet rule, the name of the park was first changed to "Garden of the Revolution", then to "Pioneer Garden". The park was renovated in the 1970s. In 1990, a bust of the poet Aliaga Vakhid was erected in the garden and the garden became known as the "Vakhid Garden". In 2009, the bust of Vakhid was moved to Icheri Sheher, and after the last renovation, the garden became known as the "Garden of the Philharmonic". Starting from 2007, by order of President Ilham Aliyev, repair work was carried out in the park; a fountain designed by the French company Inter Art was built. In the early days, mulberry, elm, pine, acacia and many other plants were planted here. Later, along with local trees, trees from other countries were also brought to the Philharmonic Garden. In the 60s and 70s of the 19th century, the garden expanded significantly, and a few decades later, ornamental trees and shrubs were planted here, a dance floor, a swimming pool, and playgrounds were built. During the reconstruction, rare species of trees were planted - oak, cedar and ash, a new irrigation system, a platform with a variety of ornamental plants, beautiful landscape compositions appeared. It is alleged that during the repair and restoration work in the Philharmonic Garden, an old underground tunnel was also found.

Green spaces, along with improving the ecology of the city, serve as necessary aesthetic elements of the urban environment. The rapid pace of urbanization, the rapid increase in the population, industrial facilities, means of transport, various means of communication require the use of the most advanced and advanced landscaping methods, the effectiveness of which depends on the range of tree and shrub species, lawn grasses, flower annuals and perennials (Margaylik, 1979).

In order to study the taxonomic composition of ornamental trees, shrubs and herbaceous plants in the Apsheiron Philharmonic Garden, the form of creating expositions, the rules for grouping ornamental plants in expositions, the use of small architectural forms, research work was carried out in the laboratory "Landscape Architecture" of the Institute of Dendrology of the National Academy of Sciences of Azerbaijan.

Method

The objects of study are various types and varieties of ornamental trees, shrubs and herbaceous plants. During the research work, various methods were used. The taxonomic composition of ornamental trees, shrubs and herbaceous plants was studied by the method of (Askerov, 2011), the morphological features of vegetative organs by the methods of (Vasilchenko, 1979) and (Serebryakov, 1952), the phenological phases of plant development by the method of (Beideman, 1979), the rules for grouping plants in expositions and using them in landscape architecture according to the method of (Kizima, 2015), (Yeliseyeva, 2016), (Mammadov, 2010).

Results and Discussion

During the research work in the second decade of May 2020, observations were made on the territory of the Philharmonic Garden, herbaria were collected and the taxonomic composition of ornamental trees, shrubs and herbaceous plants from 34 families, 45 genera and 55 species was determined, forms of creating expositions,

grouping rules were studied plants in expositions, the use of small architectural forms. The expositions are created in a regular style - geometric shapes (rectangle, square, circle, rhombus, etc.) and in a landscape or landscape style - original shapes (flower garden, labyrinth, buta, etc.). Small architectural forms enhance the artistic and architectural image of the park ensemble. Evergreen trees and shrubs are mainly planted in the center of the exposition, and flowering herbaceous plants are planted along the edges. Around the recreation areas are flower beds and palm trees, the stone terraces of the garden are covered with climbing plants. A decorative fountain in the center of a large pool with beautiful sculptures improves the microclimate of the garden area. In front of the fortress walls are located mainly coniferous trees and shrubs.



Figure 2. Coniferous trees and shrubs

The beginnings of landscape gardening art date back to the 10th-13th centuries BC. At first, the gardens were purely utilitarian in nature: they consisted of a vegetable garden, an orchard and a vineyard. The layout of the gardens was carried out mainly in a regular style. Inside, the gardens were fenced along the perimeter with hedges (Alekseyev, 2019).



Figure 3. Geometric shapes of expositions in a regular style

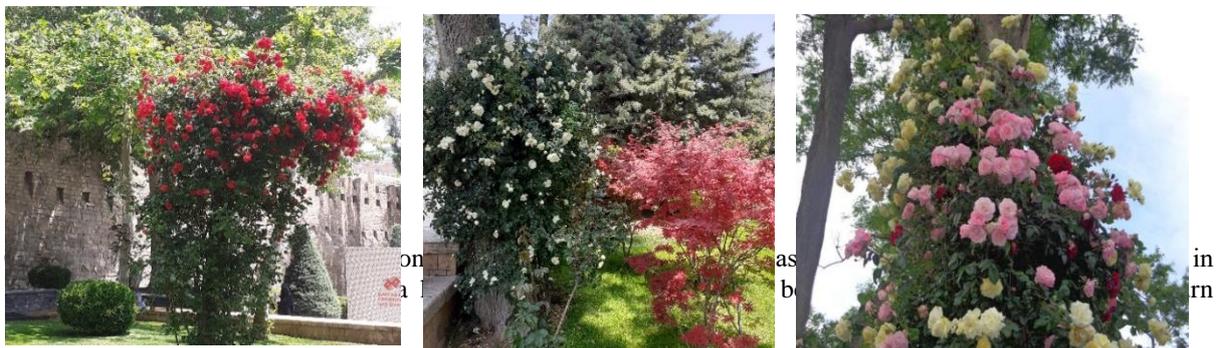


Figure 4. Rose shrubs

consists of secondary compositions, united by a common design and purpose (Vasilyeva, 2018). On the territory of the garden there are rose bushes, mainly brought from Turkey and Italy, which were planted near tree trunks and then attached to them. Scourges of roses wrap around trees, rising to a height of 7-8 meters, which is why from afar they resemble a loach. Such roses can only be found in the Philharmonic Garden.

Today, the formation of the crown of trees of the most complex and exotic forms is very popular - in the form of animals, mushrooms, spirals, etc. Such "living" figures are called topiary (Yeliseyeva, 2016). In the Philharmonic Garden, chrysanthemums planted next to trees bloom in October and do not wither for 2-3 months. The lilies, gardenias and palms blooming in the Philharmonic Garden require special care during the winter months - they are covered or wrapped to protect from the cold. The ailanthus and the mulberry tree, which have been growing here since ancient times, are among the most unpretentious plants in the garden. On the outskirts of the garden, near the road, camellias are planted. They bloom in March and April. The most demanding plant of the Philharmonic Garden is bonsai. If properly cared for, it can live for over 100 years. Khan plane tree is one of the oldest trees in the garden. In addition, there are plants such as holly, fir, elm, holm oak, cedar, magnolia, yucca, oleander, cycad, willow and others.

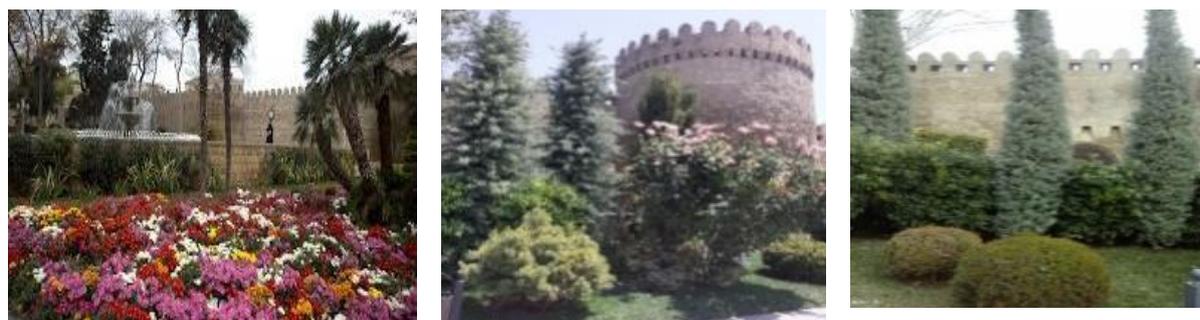


Figure 5. Original forms of expositions in free style

Flower beds bordering lawns help to beautifully arrange the transition of tree and shrub groups to the plane of the lawn or clearing. At the same time, flower beds can include a variety of flowering plants, be monochrome, or generally consist entirely of ornamental foliage plants and small shrubs (Konstantinova, 2018). If you don't have the strength to wait for the results of your work and you want to admire the flower garden right away in the year of planting, you need flyers. These are plants that bloom in the year of sowing. They got their name because they reach the peak of decorativeness in June-September, i.e. summer (Bochkova, 2017).

Table 1. The taxonomic structure and origin some ornamental plants in the Philharmonic Garden

№	Family	Genus	Specie	Homeland
1	Pinaceae Lindl.	Pinus L.	P. eldarica Medw.	Europe, Asia
2	-----	Abies Mill.	A. nordmanniana Spach.	Caucasus, Turkey
3	-----	Cedrus Mill.	C. deodara Laws.	Algiers
4	Pinaceae Lindl.	Picea Dietz.	P. pungens Engelm.	North America
5	Cupressaceae F.W.Neger	Juniperus L.	J. horizontalis Moench.	North America
6	-----	Thuja L.	T.orientalis L.	China, Korea
7	-----	Cupressus L.	C.arizonica Greene	California
8	Rosaceae Juss.	Rosa L.	Golden climber L.	Iran
9	Rosaceae Juss.	Pyracantha Roem.	P.angustifolia Franch.	South China
10	-----	Cydonia Mill.	C.oblonga Mill.	America
11	-----	Prunus L.	P. serrulata Lindl	Japan
12	-----	Photinia Lindl.	P. fraseri Lindl.	New Zealand
13	Oleaceae Lindl.	Olea L.	O.europae L.	Asia, Australia
14	Platanaceae Dumort.	Platanus L.	P. orientalis L.	North America
15	Fagaceae A.Br.	Quercus L.	Q. ilex L.	South Europe
16	Magnoliaceae J.St.Hil.	Magnolia L.	M. grandiflora L.	East Asia
17	Violaceae Batsch.	Viola L.	V. tricolor L.	Europe, Asia
18	Aceraceae Lindl.	Acer L.	A. palmatum Thunb.	North America
19	Punicaceae Horan	Punica L.	P.granatum L.	Asia
20	Elaeagnaceae Lindl.	Elaeagnus L.	E. pungens Thunb.	Japan

With regular planning, straight paths are laid, plantings are made in rows, which, of course, greatly facilitates the care of plants. Trees are placed along the boundaries of the site, retreating, as expected, from the neighboring one by three to four meters (Kizima, 2015). The taxonomic composition and origin of some ornamental plants in the Philharmonic Garden are shown in Table 1.

Walking through the Philharmonic Garden with wonderful music, you get great pleasure in a beautiful setting with unusual plants. In the morning, when there are still very few visitors in the garden, parrots frolic in the fountain and drink water from it. Classical music constantly sounds here and it seems that the plants blooming under its sounds become more tender and fragrant. On the territory of the Philharmonic Garden, when creating compositions, small architectural forms are very skillfully used. These forms include fountains, lanterns, benches, flower pots, sculptures, stairs, pergolas, arches, gazebos. Small architectural forms give even greater beauty to the territory of the garden; make the rest of the population coming here convenient and rational. Particularly interesting in the garden is the white colonnade with a fountain in the center. This magnificent, openwork, almost weightless composition is complemented by white ladders, going down which you involuntarily transport yourself to past centuries, and the sound of music seems to invite you to a ball.



Figure 6. Little architecture forms

Conclusion

As a result of research work at the Institute of Dendrology of the National Academy of Sciences of Azerbaijan, it was revealed that the local and introduced from local and foreign flora ornamental trees, shrubs and herbaceous plants from 34 families, 45 genera and 55 species studied in the Philharmonic Garden are well adapted to the conditions of Absheron, are promising and are recommended for designing parks, gardens, squares, creating various compositions in Baku.

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

Acknowledgements or Notes

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Multiplex Analysis of Animal Species Origins in Feedstuffs and Foodstuffs for the Prevention, Control and Eradication of Transmissible Spongiform Encephalopathies (TSEs) by PCR

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Abstract: Recently, highly strict regulations for the prevention, control, and elimination of transmissible spongiform encephalopathies (TSEs) were put in place by the European Parliament and the Council of the European Union. Furthermore, because of health concerns, there is a greater demand for knowledge about the composition of feeds and foods, particularly pet food and ruminant feed, so determining the species of origin is critical. Therefore, there is a dire need for an advanced technique that should be rapid, specific, and inexpensive. The purpose of this study was to develop an M-PCR (multiplex PCR) assay that could identify TSEs causing origin species concurrently in food and feed products while employing fluorescent dyes that were less expensive than doubly labelled probes. The development and optimization of M-PCR allowed for the analysis of the origin of animal species' DNAs in complicated feed and food matrices. The primers were designed using specific segments of DNA sequences of the targeted species (bovine: 271bp, ovine: 119bp, caprine: 224bp). The optimized M-PCR assay may be a useful tool for confirming the species origin of feedstuffs and commodities subjected to denaturing technologies, according to the assay's results.

Keywords: PCR, Multiplex analysis, species origin identification, Transmissible Spongiform Encephalopathies

Introduction

The neurological condition called as bovine spongiform encephalopathy (BSE), also referred to as mad cow disease, is lethal and untreated in cows. Atypical conduct, difficulty walking, and weight loss are major symptoms. It is a subtype of scrapie in sheep and Creutzfeldt-Jakob disease in humans (Nash et al., 2009; Singeltary, 2016; Singh et al., 2019). The European Food Safety Authority and Regulation (EU) No 1372/2021 adopted measures to limit the presence of processed animal proteins (PAPs) directly or indirectly in ruminant feed in order to reduce the risks of BSE to humans and animals (Föcker et al., 2022; Lourenço et al., 2022).

For the qualitative examination of animal species in feed and food items, some researchers have used traditional gel electrophoresis-based PCR-detection (Safdar, 2013; Safdar & Junejo, 2015, 2016). As an alternative, multiplex PCR is a quick, affordable, and simple method to use DNA for commercial analysis and feed surveillance (Safdar & Junejo, 2015; Safdar et al., 2014a; Safdar et al., 2014b). Consequently, a cutting-edge technology that is quick, precise, and affordable is desperately needed (Safdar & Junejo, 2016). This study's objective was to design a M-PCR (multiplex PCR) assay that could simultaneously identify the species that cause TSEs in food and feed products while using fluorescent dyes that were less expensive than doubly labelled probes.

Methods

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- Selection and peer-review under responsibility of the Organizing Committee of the Conference

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Samples

Reference samples were prepared at the molecular laboratory to optimise simplex and multiplex PCR assays under control conditions. All the requirements were applied as they are used in the commercial samples. 150 samples were collected from the different commercial markets to evaluate our optimised PCR. Samples were collected from January 2022 to February 2022. The collected samples were then immediately transferred to the Molecular lab and stored at +4°C for further investigation.

DNA Extraction

The DNA extraction from both laboratory-prepared and commercial samples was done according to the Qiagen tissue kit (Germany) instructions and the DNA was quantified by the NanoDro 2000 Spectrophotometer (USA). Further studies were conducted on the quality of DNA.

PCR

For the simplex and triplex PCR amplification, a final volume of 25 μ l, 10 pmol of each species' ovine, bovine, and fish primers, and 90 ng of DNA template were used. Amplification was carried out in a Thermocycler BioRad under the following cycling conditions: The 35 cycles were as follows: 94 °C for 30 seconds, 60 °C for 1 minute, 72 °C for 1 minute, and a final 5 minute extension at 72 °C. The initial heat denaturation phase was carried out at 94°C for 10 min. The PCR-amplified products were stained with ethidium bromide (10 ng/ml) for 20 minutes after electrophoresis on a 2 percent agarose gel (Helicon, USA) in 0.5X TBE buffer (Trisbase, Boric acid, NaEDTA) for 50 minutes at 100 V. A camera was used to capture a picture of the agarose gel while it was being seen under UV light (Vilber Lourmat BP 66, France) (Rainbow S6X11DC4P, Traverse City, MI, USA).

Results and Discussion

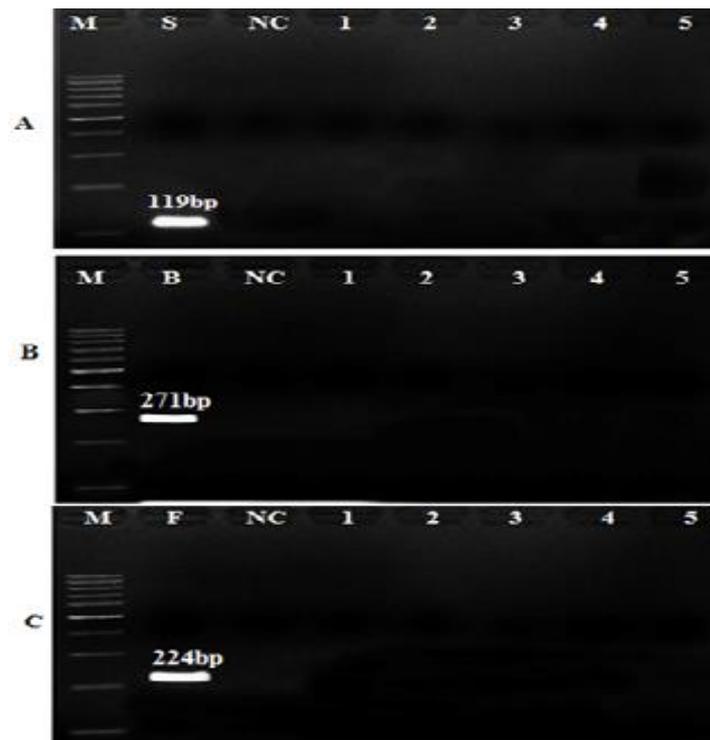


Figure 1. Specificity of primers with respective DNA. M:100bp ladder, S: sheep, B: cow, F: goat, NC: negative control, 1: buffalo, 2: camel, 3: pork, 4: horse, 5: chicken

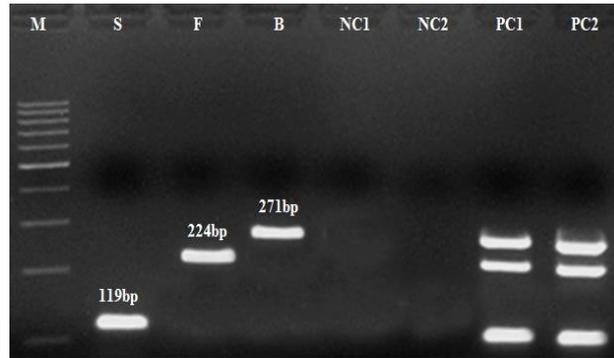


Figure 2. Optimization of triplex PCR M:100bp ladder, S: sheep, B: cow, F: Goat, NC: negative control, PC1: positive control

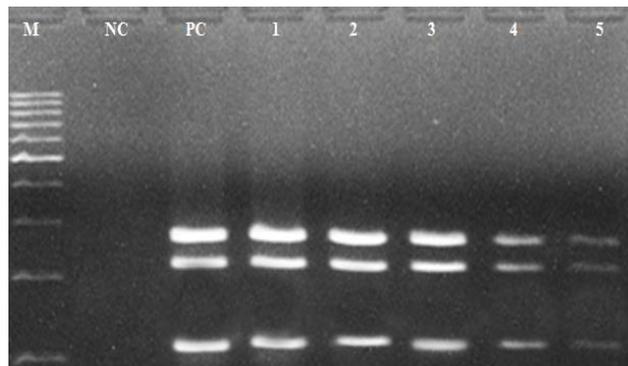


Figure 3. Sensitivity of triplex PCR: M:100bp ladder, NC: negative control, PC: positive control, 1; 5%, 2; 5; 3; 1%, 4; 0.1%, 5; 0.01%

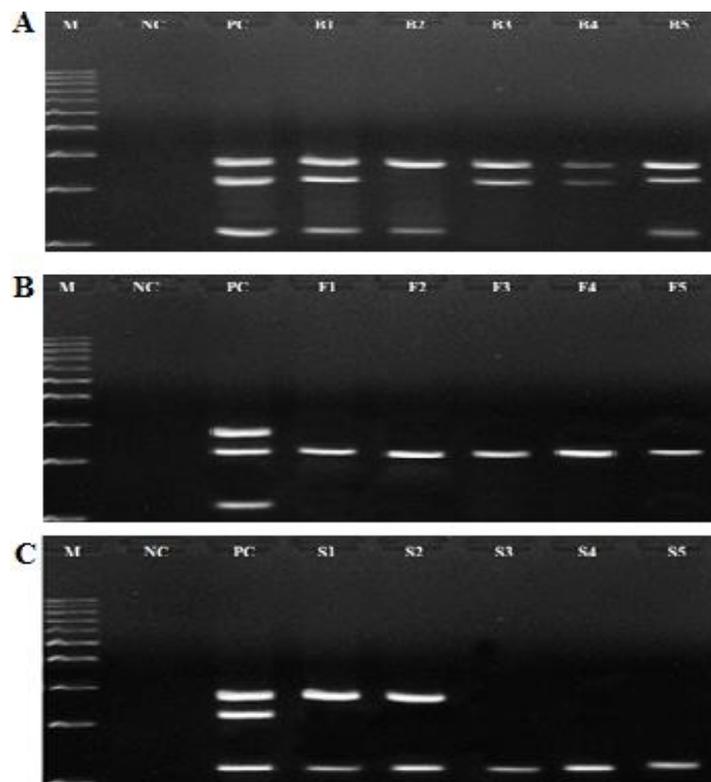


Figure 4. Application of Triplex PCR. M:100bp ladder, NC: negative control, PC: positive control, B1-B5; cow feeds, F1-F5: goat feeds, S1-S5: sheep feeds

The use of the developed method on industrial feed samples is shown in Figure 1-4, which accurately indicates the species present in the commercial feed samples that were supplied. The method revealed that laboratory

prepared samples of cattle, sheep, and goat origin contained exactly the same things that were labelled by us. Similarly, the commercial samples were investigated and found to have the contrary results (Figure.4). Laboratory samples indicated that all samples were appropriately confirmed at 100%. Comparing our results to those in the literature showed that they were about the same or better in terms of specificity, sensitivity, and cost (Denyingyhot et al., 2022; Edwards & Gibbs, 1994; Galal-Khallaf, 2021; Lourenço et al., 2022; Roig et al., 2022; Sangthong et al., 2021; Yanaso et al., 2021; Zhao et al., 2021).

Conclusion

Based upon our results, it has been concluded that this multiplex PCR could detect sources of TSEs related to animal species in foodstuffs and feedstuffs. The assays developed in this study have potential as molecular tools that can be used for rapid and routine detection of animal DNA in feedstuffs simultaneously. It could be used by government institutes to find and identify all of these species in food products at the same time.

Recommendations

This article will lead the scientists to focus on rapid, specific and economical multiplex PCR for identification of TSEs to control and eradicate this.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

Acknowledgements or Notes

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Exploring the Use of *Bacillus Subtilis* to Improve the Growth of *Phaseolus Vulgaris* under Saline Conditions

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Abstract: Soil salinity is a problem that affects many countries, and one of them is the United Arab Emirates. A microorganism that has been known for its salinity resistance mechanisms could be a factor in improving and enhancing agricultural problems. The aim of this study is to explore the use of *Bacillus Subtilis* in agricultural practices and how it can affect growth under saline conditions and guide future studies in this field with the goal of giving better implications and providing more information. *Bacillus Subtilis* was introduced to a plant that cannot tolerate high salinity levels, *Phaseolus Vulgaris*. Three different methods were used in conducting this study: (1) germination of seeds in bacterial broth, (2) inoculation of seeds with bacterial broth, and (3) spreading of bacterial broth on soil samples. This study confirmed that using *Bacillus Subtilis* with *Phaseolus Vulgaris* indeed increases its resistance in saline conditions. Moreover, using this bacterium could be the solution to agricultural problems due to high salinity levels if they were engineered and modified to enhance their resistance tolerance. The recommendations to this study would be to implement it in a controlled field and explore the usage of *Bacillus Subtilis* with different plants and soils as well as to check how other factors, such as temperature, affect the growth of plants in saline conditions while *Bacillus Subtilis* is present in that environment. Another recommendation would be collecting data with different methods and using DNA sequencing to check how *Bacillus Subtilis* affect soils and the microbes that exist in those soils.

Keywords: Soil Salinity, *Bacillus Subtilis*, *Phaseolus Vulgaris*, Agriculture.

Introduction

Agriculture is one of the oldest professions in the human history, and it is the key to obtaining food. There are many subsidiary branches of agriculture like fish farming, bee keeping, animal husbandry, etc. Agriculture in UAE was mainly dependent on fishing during the period between 1970 and 1990s, contributing 4% in total GDP of UAE economy. Lack of proper rain, salinity, high temperature, and sandstorms make things very difficult for agriculture in the UAE and limits the agricultural area. The main farming areas were Diganda in Ras al-khaimah, Falaj al Mulla in umm al Qawain, wadi adhDhayad in Sharjah; total of only 70,000 hectares land was available for agriculture. The severe problem of salinity in the UAE should be tackled to increase agricultural food yield. According to Machado & Serralheiro, (2017) It was estimated that about 20% of irrigated land, producing one-third of the world's food, is salt-affected. In the European Union around 1 hectare are affected due to high salinity levels, this is a major cause of desertification. In Spain, 3% of the 3.5 million hectares of irrigated land is severely affected, markedly reducing its agricultural potential, while another 15% is under serious risk (Machado & Serralheiro, 2017). Salinity both affects soil and plant growth, affecting osmotic pressure and to interference with plant nutrition. High salinity level in soil reduces the ability of plants to retain water, often referred as water-deficit effect. It causes metabolic changes in plant due to ions toxicity and lack of nutrition balance. To counter the problem like salinity of the soil, scientists are working on different methods such as genetically modified plants, genetic engineering, biotic agents like viruses, bacteria, fungi, algae. The biotic agents induce biotic stress in the host by interfering in their metabolism, but sometimes these biotic agents interact to host symbiotically. These microbes are beneficial to the plants such as lichen, mycorrhizae, *Bacillus subtilis*. These organisms also get food, shelter, nutrients in return. *Bacillus subtilis* helps plant to grow in harsh

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saline condition by restricting the uptake of sodium ion by decreasing the passive flow of sodium ion into the stele, since these *Bacillus subtilis* covered the maximum proportion of roots in specifically PGPR-inoculated plants. Another way *Bacillus Subtilis* protects plants against salt is by lowering ROS levels in plants. This protects plants from oxidative stress such as protein oxidation, enzyme inhibition, and poor chlorophyll content. According to Ferria et al (2018), the ability of *Rhodospseudomonas palustris* (strains TN114 and PP803) EPS to adsorb Na cations from aqueous solution is due to an 18 kDa polysaccharide consisting primarily of galacturonic acid (Ferria et al, 2018). This facilitates the potassium uptake in the plants prevents from ions poisoning. The aim of this study is to explore the use of *Bacillus Subtilis* in agricultural practices and how it can affect growth under saline conditions and guide future studies in this field with the goal of giving better implications and providing more information.

Literature Review

Soil Salinity & Agricultural Activities

Soil salinity is a measurement that consists of the concentration of all soluble salts in soil water. Some of the soluble salts are cations such as sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), magnesium (Mg^{2+}); the anions are chloride (Cl^-), carbonate (CO_3^{2-}), sulfate (SO_4^{2-}), bicarbonate (HCO_3^-), and nitrate (NO_3^-). Soil salinity is a problem that is being faced globally, high salinity levels in soil result in land degradation and inhibit plant growth which creates a reduction in crop yield. Hyper saline soils can accommodate boron (B), strontium (Sr), lithium (Li), manganese (Mn), and fluorine (F); those are harmful to certain plants and can reduce their growth and yield rate. This is a serious issue that is being faced in various areas of the globe; it results in agricultural problems and could negatively affect food security around the world. Soil salinity is linked to a variety of difficulties in plants, including ion toxicity, oxidative stress, and osmotic stress (Shahid, S et al., 2018; Yan, K et al., 2013). Increased soil salinity in agricultural activities results in reducing osmotic potential which causes a reduction in turgor in plants and water stress. Salinity sources could be natural, anthropogenic, or both together. When it comes to anthropogenic sources of salinity those can be irrigation with saline water and poor soil management, or soil pollution due to the excessive use of fertilizers (Lopez-Alvarez et al., 2021).

Soil & Soil Salinity in the United Arab Emirates

The soil in the United Arab Emirates is known to be poorly developed, shallow, and rich in gypsum, lime, and salts (Rao et al, 2009). A soil map of the United Arab Emirates has been completed by the Environment Agency – Abu Dhabi; the soil map of Abu Dhabi, which was published in 2009, covers around 84% of the United Arab Emirates. In 2012, EAD published a map for the Northern Emirates, and it made up 11% of the UAE (EAD, 2009; EAD, 2012). Another soil map published in 2005 by Dubai Municipality showed that Dubai makes up 5% of the UAE's soil (Dubai Municipality, 2005).



Figure 1. Soil Map of the United Arab Emirates. Adapted from "Unifying regional soil maps at different scales to generate a national soil map for the United Arab Emirates applying digital soil mapping techniques" by Abdelfattah, M. A., & Pain, C., 2012, *Journal of Maps*, 8(4), 392-405.

Ecosystems in the United Arab Emirates include coasts, islands, mountainous areas, sand deserts, and gravel plains (Boer, 1999). Soil salinity is becoming a major threat to agricultural activities; a study showed that around 11% of farms in Al Ain are classified as “non-saline”, and 89% are affected by high salinity levels. Figure 1., Shows different soil types spread around the United Arab Emirates and they are a total of 15 types; 75% Torripsammets, 5.4% Haplosalids, 0.9% Torriorthents, 0.2% Haplocambids, 0.2% Calcigypsids, 0.1% Petrocalcids, 3.3% of units such as mountains, rock outcrops, miscellaneous units (Abdelfattah, M., 2012).

Saline soils are divided into three categories: (1) saline soils, (2) saline gypsiferous, and (3) saline anhydritic soils. In the United Arab Emirates, these three categories were distributed as sabkhas (a supratidal mudflat with saline minerals accumulating due to the arid climate); sabkhas evaporate, resulting in salt accumulation and reaching agricultural farms where brackish water is used for irrigation, and sabkhas have the highest levels of salinity. The classification of Sabkhas are Salids which are classified further at the level of Aquisalids and Haplosalids (Shahid, S., & Abdelfattah, M. A., 2008).

Plant Growth-Promoting Rhizobacteria

Although bacteria were discovered in late 1600s, their utilization to stimulate the plant and its growth has been exploited time to time. Plant promoting rhizobacteria also abbreviated as (PGPR) come under rhizosphere class of bacteria. They inhabit the soil ecosystem, and they are often found with plant roots, and they are available in high concentrations due to the rhizosphere, which has a high amount of nutrients such as amino acids, sugar, and organic acid molecules; they are crucial elements for bacterial growth and metabolism. Gray and Smith (2005) defined it as follows; The genus is as follow- agro bacterium, Azobacter, Aspergillum, Caulobacter, chromobacterium, Erwinia, micrococcus, pseudomonas, and Serratia belongs to ePGPR (Gray & Smith, 2005). Moreover, Frankia endophytes come under iPGPR they enhance plants development and its growth by using different mechanisms, that are phosphate solubilization siderophore production, fixing the atmospheric nitrogen into the soil and Rhizosphere engineering, quorum sensing signal interference, production of 1-aminocyclopropane-1-carboxylate deaminase, etc. as per the author Hasheem et al (2019) Bacillus subtilis exhibits both a direct and indirect biocontrol mechanism to suppress disease caused by pathogens. The direct mechanism includes the synthesis of many secondary metabolites, hormones, cell-wall-degrading enzymes, and antioxidants that assist the plant in its defense against pathogen attack (Hasheem et al, 2019). The indirect mechanism comprises plant growth promotion and the induction of acquired systemic resistance. Bacillus subtilis can also solubilize soil P, enhance nitrogen fixation, and produce siderophores that promote its growth and suppresses the growth of pathogens (Saxena A et al., 2005). When exposed to constant stressors, rhizobacteria are more likely to tolerate or adapt to those conditions. This results in better plant growth, and it acts as a growth promoter under stressors. When exposed to stressors they produce osmoprotectants such as K⁺, glutamate, proline, ectoine, etc (Grover et al., 2010). Hashem et al (2019) stated that Pseudomonas and Bacillus are predominant genera of PGPR.

Salinity Tolerance Mechanisms of Bacillus Subtilis Bacteria

Salinity in agriculture is a major problem. This causes loss in crop production, low yield of crop, poor harvest etc. Saline conditions negatively affect the dry weight of inoculated and non- inoculated plants. For tackling this situation scientist have been working on different solution this causes reduction in 85 to 95 % in shoot and root. Due to the morphology, biochemistry, and physiology of bacteria bacillus subtilis, it helps in improving the tolerance of plants from soil salinity. Bacillus subtilis restrict the uptake of Na ion in the roots of plants by cutting the flow of sodium passively into the stele, this is maintained by covering the root zones by PGPR-inoculated plants. Further studies also connote, according to the author Ferria et al, (2018) at the highest salinity concentration (200mM) there was an increase in the concentration of proline in treatment without B. subtilis as compared with the presence of Bacillus Subtilis. Its accumulation in plants provides protection against salinity and drought stress. It can be associated with content of water in leaves since there is a strong correlation between water potential in leaves and the concentration of proline (Ferria et al, 2018).

Halophilic Bacteria

High tolerance of plants towards salinity in presence of *bacillus subtilis* allowed the rediscovery of this class of saline resistant bacteria commonly known as Halophiles. They need high concentrations of salt to grow. They are classified into the domain Archaea. They can be characterized under different genus and different species.

According to Grover, M., and Sandhya, V., (2010) some of the examples of halophiles are - Halobacteriaceae, Halobacterium, Halococcus. some genus of diatoms such as Nitzschia, lovenula, comes under halophiles as well." Some basidiomycete fungus, genus name- Wollemi Ichthyophage. Chromohaloceter, Beijerinckii, Tetragenococcus halophilus are some of the examples. Halophiles can withstand up to high saline concentration places like deep sea lagoons etc. This function must be taken into consideration for the future purpose of solving the saline soil problems. A lot can be learned such as the mechanism of saline tolerate, their interaction with humas, uses from these halophiles in our day-to-day life. Halophiles can help in solving the vast problem of UAE agriculture related problems. Taking account of these things we can truly help humankind and pays a great deed to the environment, but we have also investigated all aspects of humans and nature.

Risk Assessment (Human Health Risk, Environmental Risk)

In past few decades humans have been exploiting the nature, by using different means such as extensive use of fertiliser, pesticide, chemicals, in the field. This leads to serious consequences of human health as well as environmental risk. For overcoming these issue's, we must shift our focus to natural resources provided to us by planet earth. According to the Food and Drug Administration (FDA); Bacillus subtilis is classified as GRAS (Generally Regarded as Safe), therefore, it is not a pathogen (Martinez, 2013). It blocks the accumulation of sodium ion by covering the plants roots, this helps in overcoming the serious issue of nutrients toxicity in plants. In agriculture it is widely used as feed additive and animal husbandry since it inflates the digestion of animal fibre and has potential of maintaining intestinal health of ruminants. Recent studies show its self-healing and viscoelastic behaviour. This evidence clearly suggest that Bacillus Subtilis has positive impact on the human health as well as overcoming the environmental risk. This also opens a path of biotic agents in day-to-day usage. According to Hashem et al., (2019) We use the two well established mixture toxicity concepts (Concentration Addition (CA) and Independent Action (IA)) for providing a tiered outline for environmental hazard and risk evaluations of mixes, with an emphasis on general industrial chemicals and the assumption that the "base set" of data (EC50s for algae, crustaceans, and fish) is available (Hashem et al., 2019). Therefore, we can conclude here that Bacillus Subtilis are not harmful to humans, nor are they a risk to the environment.

Method

Bacterial Suspension for Bacillus Subtilis Sample

Luria Bertani broth was prepared, and 20 ml was added to four sterile 50 ml falcon tubes. The metal rod was heated until sterile and used to take bacterial colonies from the prepared spread plates, and then placed in three falcon tubes with the LB broth, while leaving one tube without the B. Sub colony as a control measure. The tubes were sampled and inoculated, and then placed in the shaker for 18 hours at 25°C. Once the cycle in the shaker is finished; checked for contamination in the control tube, and the LB broth was still clear which conclude that the sample was not contaminated. The samples were placed in the centrifuge at 45000 RPM for 4 minutes; the bacterial colonies were at the base while the LB broth was on the top. The media on the top of the sample was poured out and 10 mM MgCl₂ has been diluted in 90 mM distilled water. The MgCl₂ has been prepared using the following method:

$$\begin{aligned} &0.95\text{g of MgCl}_2 \text{ was mixed in } 100 \text{ ml deionized water} \\ &1 \text{ Molar } (0.95 \text{ g}) \times 100 \text{ ml} = 100 \text{ mM MgCl}_2 \end{aligned}$$

The samples have been placed in the centrifuge for a second time and the same steps were repeated for 3 times total.

Methods Used to Introduce Bacillus Subtilis to Phaseolus Vulgaris

Seed germination in B. Subtilis bacterial suspension: Seeds were left to germinate in distilled water unit they start exposing and the outer shell cracks open, once they reach this stage of germination, they were placed in petri dishes and submerged with the B. sub bacterial suspension solution and were kept for a week, and observations were done regularly.

Seed Inoculation with B. Subtilis bacterial suspension: Seeds were left to germinate until the outer shell cracks and expose the roots; using a sterile syringe the roots were gently poked and then submerged with the B. sub bacterial suspension solution and left for a week with regular observations.

Spreading B. subtilis bacterial suspension on soil: The B. sub bacterial suspension was spread on the agricultural soil sample.

Collecting Data on Plant Growth and Analysis

Phenospex trait finder was used to collect data on plant growth in the span of 3 weeks after the germination and potting the seeds in saline soil of different concentrations. From the data collected all the analysis done in the discussion focused on one morphological parameter which is the plant height, and one spectral index which is normalized digital vegetation index “NDVI”. The data from the trait finder was taken and organized in tables and bar graphs.

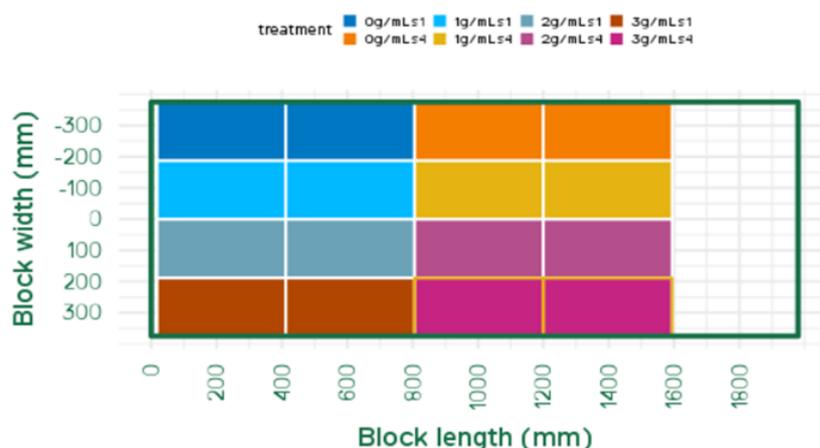


Figure 2. Pots placement on the phenospex based on their % salinity
(Note: S1, S2, S3, and S4 refers to the group number)

Table 1. Shoot height in week 1 of phaseolus vulgaris in different growth conditions with bacillus subtilis

	Treatment	T1 Height (cm)	T2 Height (cm)	Average
Group 1 (Seeds germinated in Bacillus subtilis)	0g/mL	18.97	9.23	14.10
	1g/mL	18.21	17.29	17.75
	2g/mL	-	2.96	2.96
	3g/mL	0.46	15.03	7.74
Group 2 (Seeds inoculated with Bacillus subtilis)	0g/mL	20.58	17.24	18.91
	1g/mL	18.20	17.61	17.91
	2g/mL	17.22	9.23	13.22
	3g/mL	12.84	6.28	9.56
Group 3 (Bacillus Subtilis Spread on Soil)	0g/mL	20.75	21.25	21.00
	1g/mL	17.94	16.64	17.29
	2g/mL	15.17	15.33	15.25
	3g/mL	16.88	17.51	17.20
Group 4 (No Bacillus Subtilis)	0g/mL	18.51	14.75	16.63
	1g/mL	11.53	11.50	11.52
	2g/mL	3.37	9.69	6.53
	3g/mL	6.53	13.36	9.94

Results and Discussion

Shoot Height Growth of Phaseolus Vulgaris in the time span of three weeks after germination

Shoot Height Growth Data Analysis

The shoot height of Phaseolus Vulgaris was taken once a week using the phenospex in the span of 3 weeks. Group 1 refers to the samples which were left to germinate in Bacillus subtilis for a week, group 2 refers to the samples which were germinated and once the roots were visible inoculated in Bacillus subtilis, group 3 refers to the third method used; spreading Bacillus subtilis on the soil directly. The experiment conducted had two trials and the data was collected for each trial, therefore, the data used on graphs was averaged from trial 1 and trial 2.

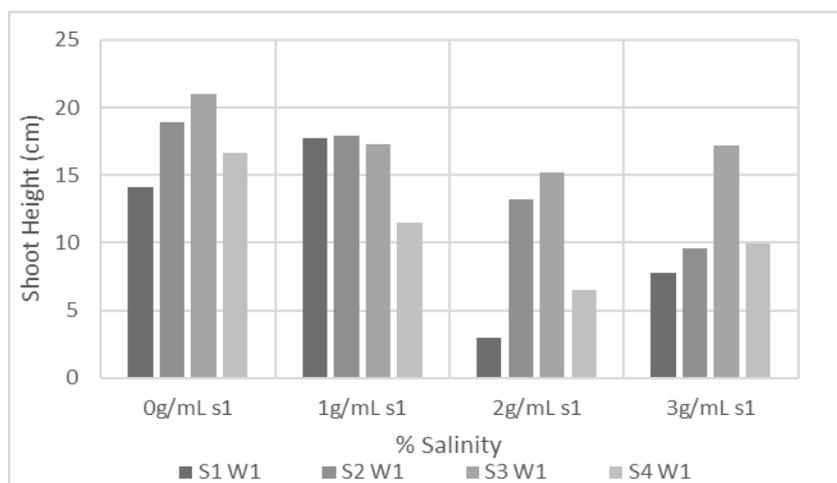


Figure 3. Shoot height growth week 1

Table 1 shows the data obtained from the phenospex for trial 1 and trial 2 in week 1. The data includes all the four groups, and figure (2) is based on the averages for trial 1 and 2. Figure (2) compares different groups in different salinity levels; group 3 had the highest shoot average (21 cm) in 0% salinity, and (17.2 cm) at 3% salinity. While the sample from group 1 had the lowest shoot average (3 cm) at 2% salinity.

Table 2. Shoot height in week 2 of phaseolus vulgaris in different growth conditions with bacillus subtilis

	Treatment	T1 Height (cm)	T2 Height (cm)	Average
Group 1 (Seeds germinated in Bacillus subtilis)	0g/mL	26.31	18.78	22.54
	1g/mL	17.21	17.95	17.58
	2g/mL	-	19.52	19.52
	3g/mL	15.56	3.35	9.46
Group 2 (Seeds inoculated with Bacillus subtilis)	0g/mL	17.79	25.38	21.59
	1g/mL	18.25	20.94	19.59
	2g/mL	16.04	8.43	12.24
	3g/mL	14.81	5.75	10.28
Group 3 (Bacillus Subtilis Spread on Soil)	0g/mL	23.62	24.00	23.81
	1g/mL	17.76	16.18	16.97
	2g/mL	14.52	14.38	14.45
	3g/mL	15.20	10.14	12.67
Group 4 (No Bacillus Subtilis)	0g/mL	19.41	14.55	16.98
	1g/mL	11.66	11.68	11.67
	2g/mL	3.19	9.95	6.57
	3g/mL	6.38	12.75	9.57

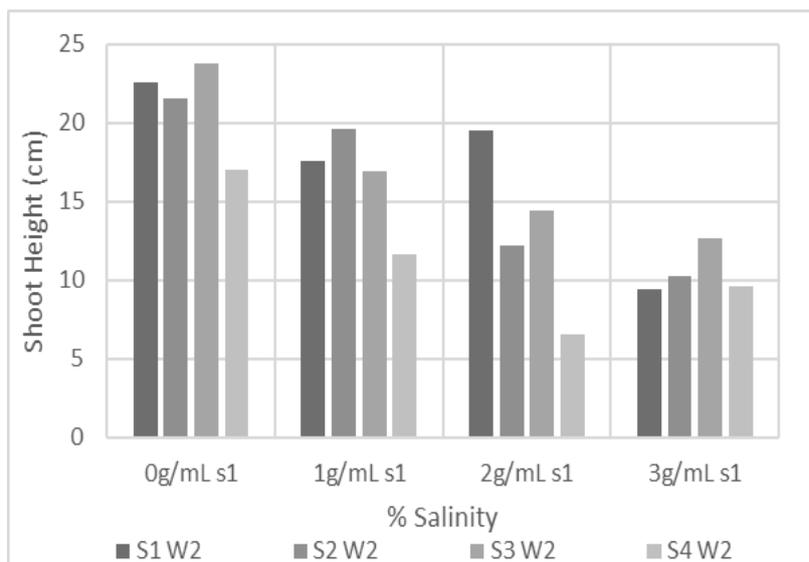


Figure 4. Shoot height growth week 2

Table 2 shows the data obtained from the phenospex for trial 1 and trial 2 in week 2. The data includes all the four groups, and figure (4) is based on the averages for trial 1 and 2. In week 2 we can notice a drastic change in figure (4); there was a sharp surge in the shoot height average for group 1 at 2% salinity (19.5 cm), and at 1% salinity (22.5 cm).

Table 3. Shoot height in week 3 of phaseolus vulgaris in different growth conditions with bacillus subtilis

Treatment	T1 Height (cm)	T2 Height (cm)	Average	
Group 1 (Seeds germinated in Bacillus subtilis)	0g/mL	28.24	22.37	25.30
	1g/mL	15.86	18.19	17.03
	2g/mL	-	19.59	19.59
	3g/mL	12.69	-	12.69
Group 2 (Seeds inoculated with Bacillus subtilis)	0g/mL	26.27	21.07	23.67
	1g/mL	18.41	21.01	19.71
	2g/mL	14.88	8.86	11.87
	3g/mL	8.45	5.33	6.89
Group 3 (Bacillus Subtilis Spread on Soil)	0g/mL	18.86	26.59	22.72
	1g/mL	17.21	14.60	15.91
	2g/mL	15.18	15.95	15.56
	3g/mL	2.78	6.84	4.81
Group 4 (No Bacillus Subtilis)	0g/mL	21.79	13.46	17.62
	1g/mL	10.81	11.77	11.29
	2g/mL	2.15	9.95	6.05
	3g/mL	3.07	7.80	5.43

Table 3 shows the data obtained from the phenospex for trial 1 and trial 2 in week 3. The data includes all the four groups, and figure (2) is based on the averages for trial 1 and 2. In week 3 we can observe that the data obtained from group 2 had the highest averages in all salinity levels except for 1% salinity level. The average for 0% salinity level has reached (25.3 cm), and in 3% salinity the plant was still alive and there was a minimum difference in comparison to week 2.

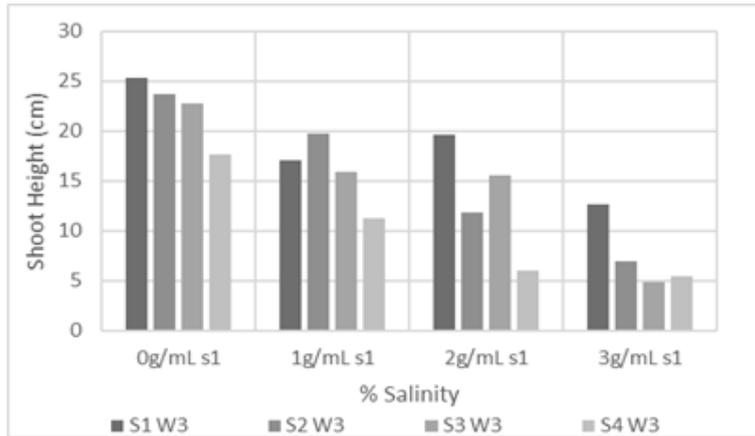


Figure 5. Shoot height growth week 3

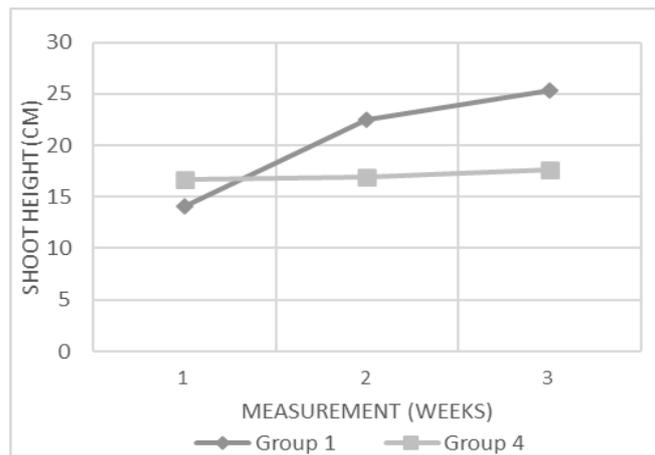


Figure 6. Group 1 & 4 shoot height growth measurement of 3 weeks with 0% salinity.

Figure (6) illustrates the differences between group 1 and group 4 in 0% salinity in a measurement of 3 weeks. When looking into the data and comparing group 1 & 4 in 0% salinity we can notice normal growth for group 4, while group 1 (germinated in B. Sub) we can notice a slightly more elevated growth with more leaf count and flower yield. In image 7, which was taken on week 3, we can notice the difference between group 1 and group 4. However, when looking into this set of data we need to compare it to another set to be able to tell how the bacteria are working and if they are effective in higher salinity levels.

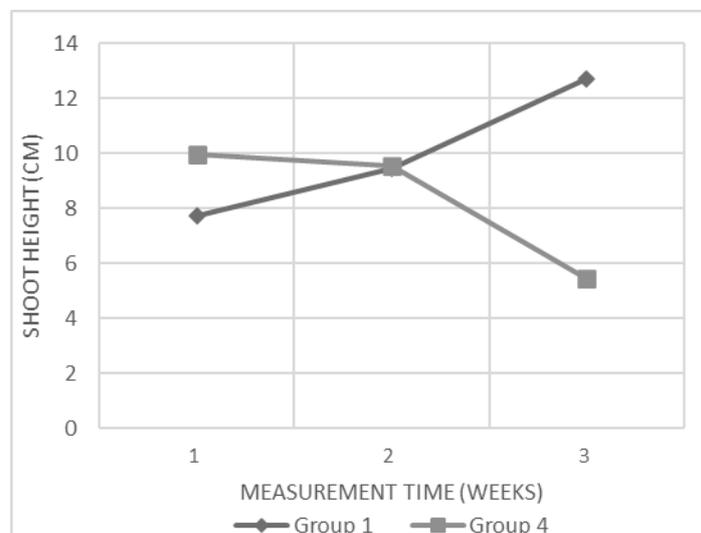


Figure 7. Group 1 & 4 shoot height growth measurement of 3 weeks with 3% salinity.

Figure (7) illustrates the differences between group 1 and group 4 in 3% salinity in a measurement of 3 weeks. When looking into the data from group 1 & 4 in 3% salinity, we can notice a varying difference between the two groups. Unlike the data from 0% salinity, here we can notice an elevation in the data for group 1 which has the bacillus subtilis compared to group 4 which has no b. sub in it; according to Hashem, Tabassum & AbdAlla (2019) the rhizosphere has most nutrients of plants, and bacteria accumulate there for the nutrients, in exchange the bacteria helps the plant by providing protection from abiotic stress due to the bacillus subtilis bio-film which stays on the roots for the long term and protect and stimulates growth.

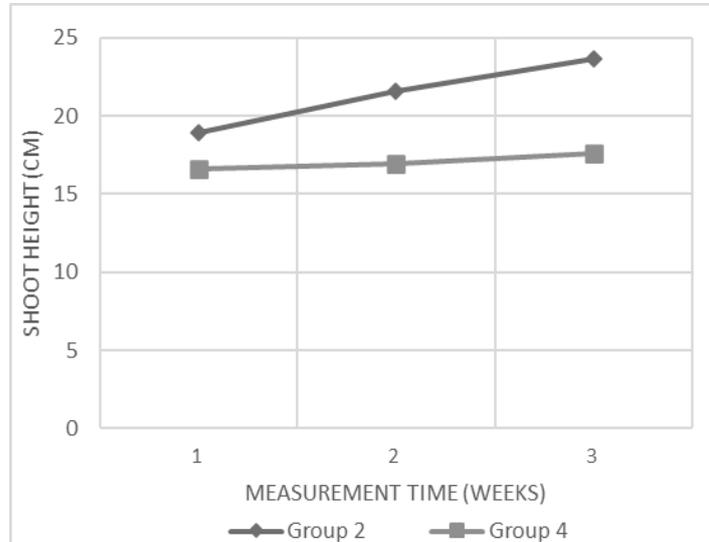


Figure 8. Group 2 & 4 Shoot height growth measurement of 3 weeks with 0% salinity.

The experiment conducted used 3 different methods to introduce *Bacillus subtilis* into *Phaseolus Vulgaris* in saline conditions; the first experiment was germination of seeds in *B. sub* suspension sample, second experiment was inoculation of roots with *B. sub* suspension sample, and the third one was spreading the *B. sub* sample on the soil directly. Figure (8) illustrates the differences between group 2 and group 4 in 0% salinity in a measurement of 3 weeks. When looking into the data and comparing group 2 & 4 in 0% salinity we can notice normal growth for group 4, and group 2 had the same growth level as group 1 in 0% salinity. However, group 1 had more growth compared to group 2.

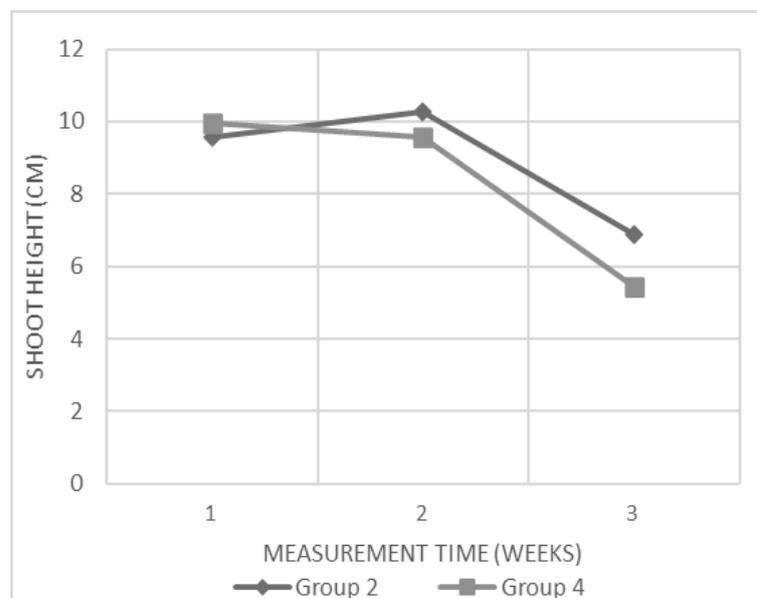


Figure 9. Group 2 & 4 shoot height growth measurement of 3 weeks with 3% salinity.

In contrast when we look at the data in *Figure (9)* for group 2 and 4 in 3% salinity, we can notice a sharp decline in the trendline. Group 2 was inoculated, and the roots were poked to allow *B. sub* to have an entrance to the plant. However, as mentioned above in the section 4.2 the roots showed signs of injury and the sharp increasing in salinity could have added more stress.

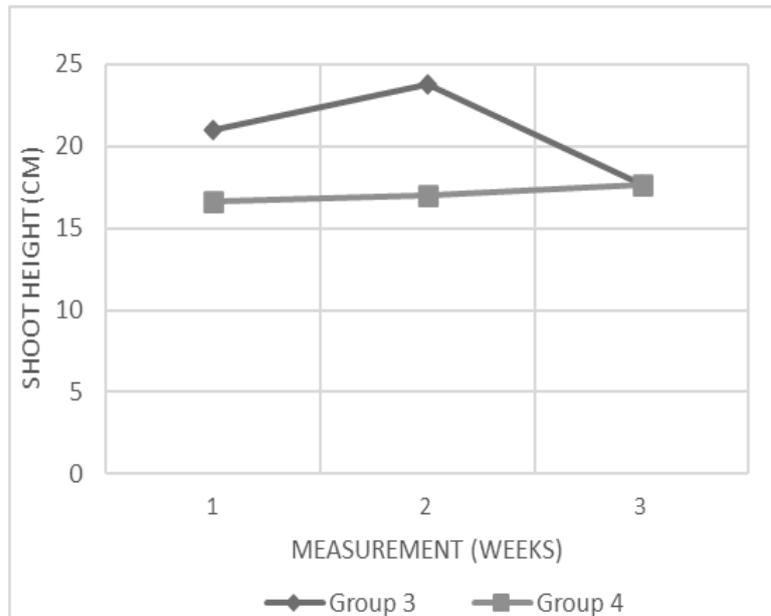


Figure 10. Group 3 & 4 Shoot height growth measurement of 3 weeks with 0% salinity.

Figure (10) illustrates the differences between group 3 and group 4 in 0% salinity in a measurement of 3 weeks. When looking into the data and comparing group 3 & 4 in 0% salinity we can notice normal growth for group 4, and during the first two weeks group 3 was growing at a higher rate and height average, however, in week 3 the height average was the same as group 4 in week 3.

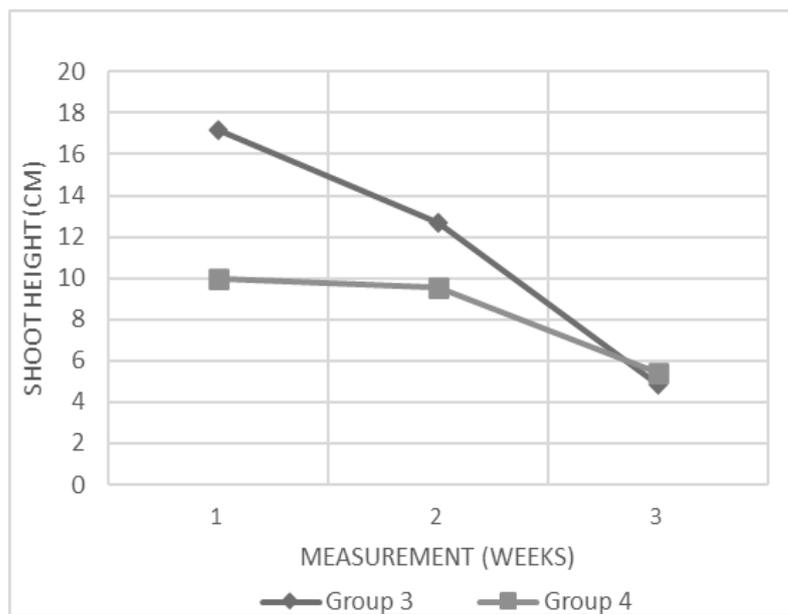


Figure 11. Group 3 & 4 shoot height growth measurement of 3 weeks with 3% salinity.

As shown in *Figure (11)*; group 3 and 4 in 3% salinity data showed a sharp decline in the trendline. Both groups reached a similar average in height in week 3 and both groups started to wilt.

Normalized Difference Vegetation Index (NDVI) Data Analysis

The NDVI index ranges from -1.0 to 1.0. Values below 0.1 indicate bare soil, 0.1 – 0.5 are sparse vegetation, and dense vegetation ranges from 0.6 and above. NDVI is directly related to photosynthetic activity of the vegetation and indirectly related to crop yield and the quality of the environment as habitat for various factors like pests and diseases.

Table 4. NDVI in week 1 of phaseolus vulgaris in different growth conditions with bacillus subtilis

	Treatment	T1 NDVI	T2 NDVI	Average
Group 1 (Seeds germinated in Bacillus subtilis)	0g/mL	0.77	0.76	0.77
	1g/mL	0.75	0.76	0.75
	2g/mL	-	0.42	0.42
	3g/mL	0.51	0.74	0.63
Group 2 (Seeds inoculated with Bacillus subtilis)	0g/mL	0.75	0.79	0.77
	1g/mL	0.80	0.78	0.79
	2g/mL	0.62	0.61	0.62
	3g/mL	0.72	0.63	0.67
Group 3 (Bacillus Subtilis Spread on Soil)	0g/mL	0.71	0.72	0.72
	1g/mL	0.77	0.78	0.77
	2g/mL	0.79	0.78	0.78
	3g/mL	0.61	0.75	0.68
Group 4 (No Bacillus Subtilis)	0g/mL	0.73	0.68	0.71
	1g/mL	0.76	0.74	0.75
	2g/mL	0.67	0.74	0.71
	3g/mL	0.72	0.53	0.63

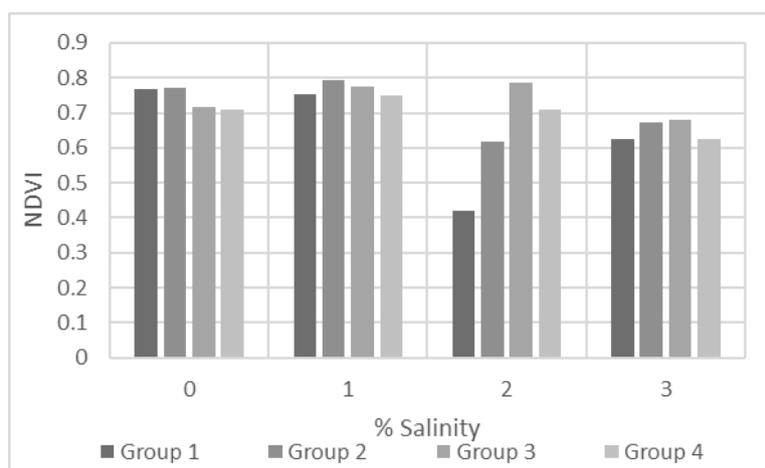


Figure 12. NDVI week 1

Figure (12) shows the NDVI data from week 1 and it includes all 4 groups. Almost all the samples were above 0.6 which indicated a healthy vegetation level, however, the average from group 1 in 2% salinity was less than 0.5 which indicates that the vegetation was sparse. When the NDVI values are low such as the one from group 1 in 2% salinity (0.42) it shows that the plant is stressed.

Table 5. NDVI in week 2 of phaseolus vulgaris in different growth conditions with bacillus subtilis

	Treatment	T1 NDVI	T2 NDVI	Average
Group 1 (Seeds germinated in Bacillus subtilis)	0g/mL	0.70	0.70	0.70
	1g/mL	0.55	0.74	0.65
	2g/mL		0.61	0.61
	3g/mL	0.66	0.37	0.52
Group 2 (Seeds inoculated with Bacillus subtilis)	0g/mL	0.65	0.73	0.69
	1g/mL	0.74	0.71	0.72
	2g/mL	0.53	0.65	0.59
	3g/mL	0.56	0.53	0.55
Group 3 (Bacillus Subtilis Spread on Soil)	0g/mL	0.69	0.64	0.66
	1g/mL	0.70	0.63	0.66
	2g/mL	0.67	0.61	0.64
	3g/mL	0.49	0.55	0.52
Group 4 (No Bacillus Subtilis)	0g/mL	0.69	0.72	0.70
	1g/mL	0.73	0.74	0.73
	2g/mL	0.69	0.74	0.71
	3g/mL	0.70	0.49	0.60

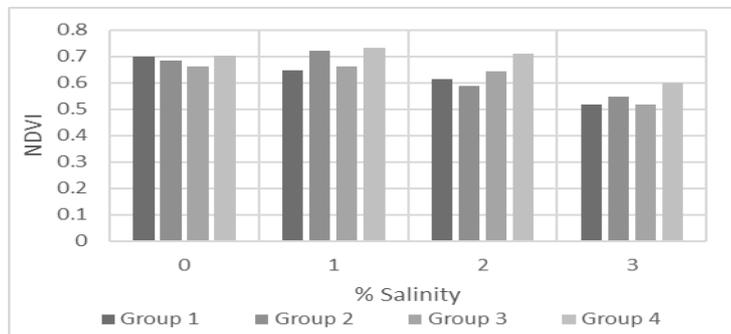


Figure 13. NDVI week 2

Figure (13) shows the NDVI data from week 2 and it includes all 4 groups. Almost all the samples were above 0.6 which indicated a healthy vegetation level; however, the values were lower in all of the four groups at 3% salinity. This shows that the higher the salinity is, and 3% is the highest level in this experiment, the NDVI is lower which indicates that the plant is not as healthy as it should be.

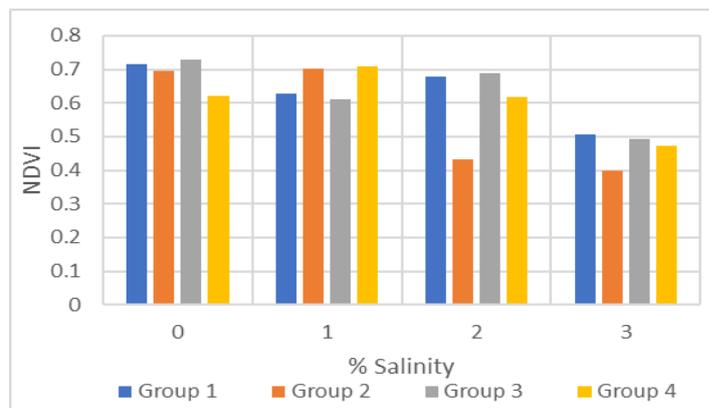


Figure 14. NDVI week 3

Table 6. NDVI in week 3 of phaseolus vulgaris in different growth conditions with bacillus subtilis

	Treatment	T1 NDVI	T2 NDVI	Average
Group 1 (Seeds germinated in Bacillus subtilis)	0g/mL	0.72	0.71	0.71
	1g/mL	0.53	0.73	0.63
	2g/mL		0.68	0.68
	3g/mL	0.50		0.50
Group 2 (Seeds inoculated with Bacillus subtilis)	0g/mL	0.69	0.69	0.69
	1g/mL	0.69	0.71	0.70
	2g/mL	0.49	0.37	0.43
	3g/mL	0.44	0.36	0.40
Group 3 (Bacillus Subtilis Spread on Soil)	0g/mL	0.74	0.71	0.73
	1g/mL	0.71	0.51	0.61
	2g/mL	0.67	0.70	0.69
	3g/mL	0.51	0.48	0.49
Group 4 (No Bacillus Subtilis)	0g/mL	0.69	0.55	0.62
	1g/mL	0.70	0.72	0.71
	2g/mL	0.52	0.72	0.62
	3g/mL	0.50	0.45	0.47

Figure (13) shows the NDVI data from week 2 and it includes all 4 groups. Almost all the samples were above 0.6 which indicated a healthy vegetation level; however, the values were lower in all of the four groups at 3% salinity. This shows that the higher the salinity is, and 3% is the highest level in this experiment, the NDVI is lower which indicates that the plant is not as healthy as it should be.

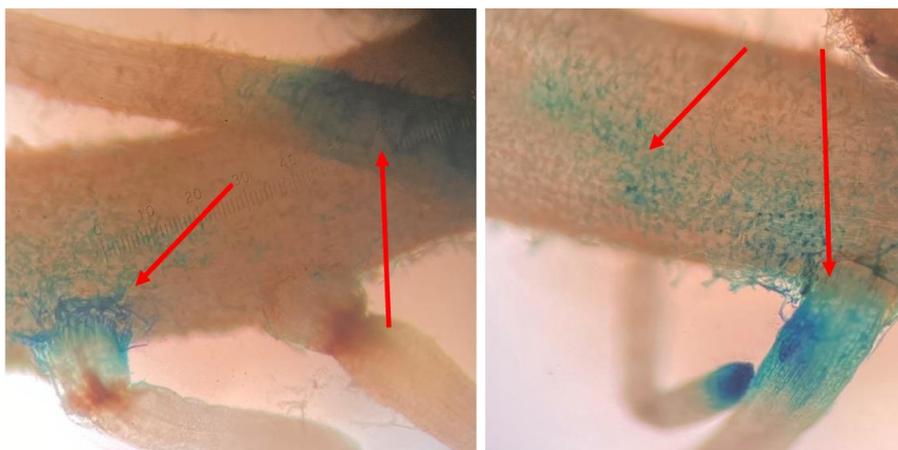


Figure 15. Roots inoculated with b. sub showed signs of arbuscular mycorrhizal fungi

When checking the roots with Bacillus Subtilis under the microscope observations were made and it appeared that some of the roots showed signs of Arbuscular Mycorrhizal (AM) fungi. Based on this observation and some literature review it showed that B. subtilis could lead to AM fungi on plant roots. Literature review stated that B. subtilis had a positive synergism with arbuscular mycorrhizal fungi (Kohler et al., 2007). According to Hashem et al., (2019) the plants which were treated with high salinity levels showed an increase in tannin, ash and lignin content, moreover, the total lipids were reduced in contrast to the control. However, those losses were reduced in the presence of B. subtilis and AM fungi, and they appeared to have improved nutrients absorption in the presence of high salinity levels.

Discussion

The measurements this study focused on were the germination stage, shoot height, and the normalized difference vegetation index (NDVI). Two of those measurements were taken using the phenospex and the germination stages were measured by observation due to the lack of equipment. The overall data for the shoot height showed that Group 1—using the germination in b. sub method—had the best results when it comes to the shoot height. The highest average in week 3 reached 25.3 cm for 0% salinity and the lowest one was in the 3% salinity which was 12.7 cm. In contrast, group 4 in 0% salinity was 17.6 cm and in 3% salinity it showed a sharp reduction in the shoot height and the average reached 5.4 cm. Moreover, group 2 highest height reached 23.67 cm in 0% salinity and showed the same sharp reduction in 3% salinity which reached 6.88 cm. Group 3 had similar results; 0% salinity height average reached 22.7 cm, and 3% salinity reached 4.8 cm. This part of the data analysis indicates that the best method to introduce b. sub to plants would be germination in the bacterial solution. Next, we have the NDVI data; The NDVI index ranges from -1.0 to 1.0. Values below 0.1 indicate bare soil, 0.1 – 0.5 are sparse vegetation, and dense vegetation ranges from 0.6 and above. The data obtained from this measurement indicated that the higher the salinity is, and 3% is the highest level in this experiment, the NDVI is lower which indicates that the plant is not as healthy as it should be. However, when it comes to the plants with bacteria their NDVI levels were slightly more elevated in contrast to the group without bacteria. The literature review stated that *B. Subtilis* are PGPR's and they have the mechanism to resist abiotic stresses. Therefore, group 1, 2, and 3 had better growth in comparison to group 4 which had no bacteria. According to Shaharouna et al., (2008) Some PGPR include an enzyme called 1-aminocyclopropane-1-carboxylate (ACC)-deaminase, which hydrolyzes ACC (an immediate precursor of ethylene in higher plants) in the roots to ammonia and -ketobutyrate. When these bacteria are present near the root, they significantly reduce ethylene production in roots, promoting root development. Because ethylene production in roots may vary depending on the nutritional condition of the roots and/or rhizosphere, it is extremely likely that the efficacy of PGPR containing ACC-deaminase to boost growth of inoculated plants may vary significantly depending on fertilizer application rates. Moreover, *Bacillus Subtilis* restricts the uptake of Na ions in the roots with cutting the flow of sodium; this happens on the roots that were covered by PGPR's and in this case, *bacillus subtilis*. This study showed that when the roots are covered with *bacillus subtilis* the plant can resist and adapt to high salinity levels and continue growing normally, and in certain cases more than the plants without *bacillus subtilis*. Moreover, when looking into the last set of results obtained and when we look into Image (19) we can notice a growth of AM fungi on the roots. According to Hashem et al., (2019) plants exposed to high salt levels exhibited an increase in tannin, ash, and lignin content, whereas total lipids were decreased in comparison to the control. However, in the presence of *B. subtilis* and AM fungi, those losses were decreased, and they appeared to increase nutrient absorption in the presence of high salt levels.

Conclusion

The aim of this study was to assess the effect of the bacterial inoculation method for saline soils and how it improves crop growth in the middle east, specifically, the United Arab Emirates. As UAE has adverse condition for the agriculture, rain doesn't fall often for the agriculture. It has also severe situation of soil salinity. For overcoming these problems, we must take the help of nature. Nature has also provided solution in form of *bacillus subtilis*. *Bacillus subtilis* comes under genus *bacillus* and in the member of halophytes. Studies show that *bacillus subtilis* helps plant to maintain its proper metabolic actions properly such as respiration, intake, and exchange of gaseous, chlorophyll percentage etc. Studies also suggest that those plants who were kept with bacterium-*bacillus subtilis* vs. without *bacillus subtilis*, it was found that *bacillus subtilis* positive plants were yielded more than those plants without of *bacillus subtilis*. This can help in solving the severe problem of UAE i.e., is agriculture. They have specific biochemistry, morphology, and physiology that allows them to survive in harsh conditions. Since using of these biotic agents we can also plays a vital role in reducing the human health risk as well as environmental risk, and by promoting the biotic agents for agriculture, we can be the pioneer in new methods of farming. According to the author Grover, M., & Sandhya, V., (2010) A wide range of adaptations and mitigation strategies are required to cope with such impacts. Efficient resource management and crop/livestock development for developing superior breeds can assist to some extent overcome abiotic stressors. The use of these microbes in and of themselves can ease stressors in agricultural plants, bringing up a new and rising use in agriculture. These microbes also provide excellent models for understanding the stress tolerance, adaptation, and response (Grover & Sandhya, 2010). This study confirmed that using *Bacillus Subtilis* with *Phaseolus Vulgaris* indeed increases its resistance in saline conditions. the methods which showed the highest yield and had the healthiest set of plants were of group (1); germination of seeds in *Bacillus subtilis*, and group (2); inoculation of seeds with *bacillus subtilis*. These bacteria are plant growth promoting rhizobacteria and halophilic bacteria; they help in promoting growth against abiotic stressors and they grow in high salt

concentrations. Therefore, using this type of bacteria in saline soils could help improve crop yield and enhance agricultural practices. Moreover, using this bacterium could be the solution to agricultural problems due to high salinity levels if they were engineered and modified to enhance their resistance tolerance. The recommendations to this study would be to implement it in a controlled field and explore the usage of *Bacillus Subtilis* with different plants and soils as well as to check how other factors, such as temperature, affect the growth of plants in saline conditions while *Bacillus Subtilis* is present in that environment. Another recommendation would be collecting data with different methods and using DNA sequencing to check how *Bacillus Subtilis* affect soils and the microbes that exist in those soils.

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Suggestions for Overcoming Communication Barriers in Doctor and Patient Communication with Efficient Communication

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Abstract: Having had to desert their countries because of war, which brought political oppression, and lack of life safety, many Syrians became refugees in Turkey for protection and they have struggled with many hardships (Yaylacı and Karakuş, 2015, p. 238). In the beginning, they had lived in shelter camps in the Southern Eastern Anatolian region of Turkey. Later on, many of them started to contribute into the workforce by migrating to the big cities. Today, some of them have even received the Turkish citizenship. Struggling with certain diseases such as tuberculosis, measles, poliomyelitis and leishmania, these Syrians applied to the Turkish hospitals in order to regain their health (Sezen et al., 2018). This paper aims to show the communication problems that are experienced between doctors and patients in the first encounter at hospitals from the perspective of Syrian refugees who have become the latest immigrants by gaining citizenship. It also suggests some solutions in how to overcome these communication barriers during the first interaction experienced with doctors. The research used literature review as the method and the results show that the partnership model, two-way communication, active listening, making empathy and giving feedback are essential elements for effective communication.

Keywords: Doctor, Patient, Barriers, Effective Communication, Immigrants

Introduction

The doctor and patient communication are a significant part of everyday communication. However, some major problems occur between these two parties while communicating. These communication problems lead to patient's dissatisfaction not only from the doctor, but also the treatment in return (Matusitz & Spear, 2014, p.253). It is found out by the researches that 80% medical mistakes made during the treatments are merely resulted from the communication breakdowns occurred between the patients and the doctors, which is quite a high ratio (Chapman University, 2015). In other words, the way the communication is continued between the doctor and the patient influences the consequences of the health activity considerably (Matusitz & Spear, 2014, p.252).

What's more, patients cannot deal with their illnesses due to lack of communication between their doctors and especially when their doctors aren't willing to collaborate (Dalma et al., 2020, p.301). Patients behave as if they understood their doctors' words and they tend to forget quickly what their doctors have said after they leave the hospital room (Network of the National Library of Medicine, 2020). For a long time, in the Turkish public, there was opposition for Syrian refugees to become Turkish citizens and to gain the right to vote in the elections, and many discussions were held that Syrians don't fit into the Turkish society (Yaylacı & Karakuş, 2015, p.244). Thus, Syrian immigrants quite often haven't come across with good manners of their doctors, as well. The doctors either behave arrogantly, and they make them wait a long time, or they just simply don't care (Eleishi, 2014).

For instance, some doctors just stand out during the whole diagnosis instead of sitting down and this makes the patients irritated and then patients tend to stay a shorter amount of time in the room (Dhand, 2017). Instead, the doctors are advised to use affectionate communication and they should show to their patients that they are caring and listening by using supportive behaviors and this way their patients won't be depressed after they leave the

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doctor's office (Hesse & Rauscher, 2019, p.882). According to Singh (2015, p.33), as a human's right, all human beings should be treated with respect, and thus doctors should approach their patients with humility without creating arguments and by making them feel that they are concerned for them.

Thus, lack of communication can be improved with some practical suggestions which will enhance the dialogues and will help to create a bond between the doctor and the patient during the clinical interview. It will also facilitate an environment in which they will shake hands in the end. Thus, this paper aims to discuss how to overcome communication problems during the clinical interview that takes place between the doctors and the Syrian patients by coming up with practical suggestions.

Method

This paper aims to show the communication problems that are experienced between doctors and patients in the first encounter at hospitals from the perspective of Syrian refugees who have become the latest immigrants by gaining citizenship. It also suggests some solutions in how to overcome these communication barriers during the first interaction experienced with doctors. Literature review is used as the method of the research and it addresses the research problem by making a contribution with using relevant previous literature and it creates something new by filling a gap in the issue (Merriam, 2018, p. 71). The researcher used her university library and YouTube in order to reach these sources. First, she chose some keywords and made research on the online catalog and YouTube, and then selected the sources which are related to her research and combined them (Creswell, 2009). Literature review means researching, analyzing, summarizing, evaluating and synthesizing previous sources such as books, articles, and electronic sources such as videos etc., and coming up some conclusions out of them in a critical way (Şimşek, 2012, p.54).

Results and Discussion

Being Competent in “Skilled Communication”

As Giroldi suggests, what is important for doctors is to turn communication skills into “skilled communication”; however, it is found out that doctors cannot become experts in skilled communication in teaching settings during their education; but they can gain it in the clinical environment by practice (Giroldi et al., 2017, p.1264). So, the more patient they encounter, the more competent they become. However, it is found out that diagnosing too many patients during the day lead doctors to burn-out and feel exhausted, and thus they can't make empathy with every patient they meet (Hardee & Platt, 2009, p.17).

Doctors have a hectic and busy schedule, and they experience time pressure during the diagnosis (Okay, 2020, p.109). In the European countries, doctors take care of nearly 40 to 50 patients on average during the day (Dalma et.al., 2020, p.308). Whereas in Turkey, the length for diagnosing patients has been decreased to 5 minutes and doctors have to diagnose nearly 100 patients a day, which is barely enough time for thoroughly understanding the complaints of the patients and giving them consultancy by making empathy (D.W., 2021). This is also explained with the term “high patient load” and it is seen as one of the main obstacles in creating a shared understanding between the doctor and the patient (Claramita et al., 2011, p.75). At this point the doctor should use some effective communication strategies so that she can improve the doctor and patient communication in a better way.

Doctors' Communication Styles

The patient goes to the hospital in order to find a solution to a physical problem such as pain or ache, and the doctor is the person who will soothe this problem (Gireesh, 2021). Nevertheless, the moment the patient enters the room of the doctor, there is a hierarchy because the doctor is the one who has the authority since she has the knowledge to treat the patient (Tran et al., 2020, p.2).

The paternalistic style of communication signifies that the doctor is the one who can give the best decision for the health of the patient and the decisions of the patient regarding her health are disregarded. In other words, there isn't a mutual decision-making. The paternalistic model takes all the responsibilities from the shoulders of the patient; in other words, the patient isn't found responsible from her illness what she needs to do is to be in

contact with her doctor to regain her health (Okay, 2020, p.102). For instance, cancer patients want their doctor to take the main responsibility for the consequences of their treatment (Ong et al., 1995, p.905).

However, what is actually advised in healthcare is the partnership model in which the position of the doctor and the patient is in an equal level, and in which the doctor enables the patient to contribute to the consultation process (Tran et.al., 2020, p.2). This can be also named as shared decision-making. In shared decision-making, the doctor presents many alternative solutions to the patient in which she can choose from and consequently both the patient and the doctor have an agreement on the treatment that will be applied (Okay, 2020, p.106). Shared-decision making enables interaction, a conversation which is two-way, listening each other actively, showing emotion and making empathy (Tran et.al., 2020, p.9).

The First Encounter of the Patient and Doctor Creates the First Impressions

The first meeting of the patient and the doctor has significance because first impressions are formed at this stage (Gireesh, 2021). The patient, who has anxiety, might go to the doctor's office with questions in her head by thinking that whether this doctor will criticize me, whether she will spare enough time for me, and whether I will get along with this doctor or not? (Gordon & Edwards, 2013, p. 74). On the other hand, the doctor has two aims in her head. One of them is to understand where the pain is coming from by motivating the patient to explain, and the other one is that she wants to make sure that the patient is understanding what she is explaining (Ong et al., 1995, p.904).

When the patient meets the doctor, the doctor should make her feel comfortable. The doctor should have a happy face while greeting the patient, she should approach the patient with affection and this will indicate that the doctor is friendly (Eleishi, 2014). She needs to show to the patient that she will take care of her, and then the doctor should give her a couple minutes to talk about her problem in details (Gireesh, 2021). Also, the moment that the patient steps into the doctor's office, the patient needs to fill a form about her hereditary, chronic diseases, allergies, surgeries, so that the doctor can see the whole picture related with the health of the patient (Gordon & Edwards, 2013, p. 75).

During the first contact, the doctor should maintain eye-contact with the patient and she should take notes while the patient is explaining her problem (Gireesh, 2021). The doctor shouldn't be busy with other things while the patient is explaining her problem such as her computer because this will distract the attention of the patient; instead, she should actively listen (Dhand, 2017). The doctor should rephrase what the patient has explained and this way she will show that she is paying attention to what the patient is saying (İlhan, 2018, p.177).

Doctors Should Avoid Medical Terminology

During the diagnosis, the doctor should talk about superficial things such as news, matches or politics in a conversational tone in order to take the patient's anxiety away and she should learn whether she has a companion (Gordan & Edwards, 2013, p. 75). If the Syrian immigrant patient has hear-loss, the doctor shouldn't talk loudly, but she shouldn't talk so slowly either and she needs to make sure that there is no other noise in the room (İlhan, 2018, p. 245). Moreover, the doctor should speak towards the ear which is hearing better and let the patient lipread (Ertekin, 2017, p.104). The doctor can benefit from non-verbal language such as facial expressions, tone of voice and hand gestures in order to explain things (Eleishi, 2014).

The doctors are highly educated whereas the patients such as Syrian immigrants usually come from a lower education background and this makes it difficult for the patients to understand what the doctor is talking about because the doctors usually use the medical terminology in their speech. Being unfamiliar to the medical terminology makes it harder for the patients to grasp the steps that they need to take after they leave the hospital room (Ong et al., 1995, p. 910).

Low Health Literacy is a Major Problem

Also, language barriers and having low health literacy makes it more complex for them to understand which medicines they need to take during the day after the doctor writes the prescription (Erdem et al., 2020, p.225). Due to low health literacy, they can't read the prescription of the medicine bottles, or they can't read the handwriting of their doctors and what's more they may use the medicines wrong (Booth library EIU).

Furthermore, when they reach to a health service, Syrian immigrant patients have a difficult time in reading complex texts and filling out forms due to low health literacy and low language proficiency (Ethiopian Community Development Council, 2015). Being health literate also includes being able to use a computer for health services and being able to read graphs in examination reports and making sense of other visual information such as signs at hospitals, yet Syrian immigrants also lack these skills (umnLibraries, 2022).

Because of low health literacy these patients visit the hospitals quite often, they stay in the hospital long, yet they don't stick to the treatment plans of their doctors completely (Network of the National Library of Medicine, 2021). Health literacy is about comprehending how the health system functions, and navigating through that system by making sense of medical instructions, and understanding the advantages and disadvantages of treatments (University of Arizona Health Sciences, 2021). Low health literacy causes them to stay 2 days longer in the hospital, and to pay 4 times higher healthcare costs (Network of the National Library of Medicine, 2017). If these patients were highly health literate, then they would have 26% less hospitalizations and they would visit the emergency department 18% less (umnLibraries, 2022). So, it will be best for the doctor to simplify her language and to use words that the patients have in their vocabulary while talking with them. It is found out that medical jargons and abbreviations used by the doctors during the conversations lead patients to misinterpret things and thus doctors should use these terms while talking with their colleagues instead (Chapman University, 2015).

Moreover, it is observed that patients who have low education levels are more suitable for paternalistic style of communication whereas patients with a higher education prefer the partnership model (Claramita et al., 2011, p.78). For the immigrant patient, the doctor should use a translator if it is needed and the doctor shouldn't create stereotypes while diagnosing the patient by being prejudiced, instead, the doctor should make empathy (Erdem et al., 2020, p. 225).

Empathy is Key for Effective Communication

Most importantly, the doctor should empathize with the patient by putting herself into the shoes of the patient and she should try to understand what the patient goes through by saying "I understand what you're going through. Let me give you assistance in solving this problem" (Gireesh, 2021). The doctor should prefer asking open ended-questions instead of closed ended questions because this will motivate the patient to reveal herself by describing her ache or pain, instead of saying yes or no (Dhand, 2021).

During the interview, the frame of reference has significance because it is the junction point where true communication happens. People have different codes in their heads, and these includes thoughts, experiences or prejudices and when the two codes which intersect give the same meaning then communication happens and people understand each other.

Nevertheless, researches indicate that doctors usually cut the speeches of patients in a short amount of time by thinking that their patient have already understood what has been told (Dalma et al., 2020, p.307). Doctors let the patients talk only 11 seconds and then interrupt them (Study Finds, 2022). Indeed, if patients can talk uninterruptly they can talk 2 minutes maximumly (Buckman, 2010). Active listening means that doctors don't pretend like as if they were listening, they don't choose the words that are only relative to them, and they don't compare what is said with other patients' words that were previously said (Eroğlu, 2019, p.10).

Negative Diagnosis Brings Ambiguity

In addition, researches show that patients cannot find the courage to ask the right questions at the right time and they prefer to keep their silence instead and this hinders the interaction between the doctor and the patient (Ong et al., 1995, p.908). The doctor should be aware that human beings carry many feelings within such as fear, anxiety, or anger, thus the patient might also give a reaction in return if they experience a negative diagnosis (Dalma et al., 2020, p.308). Learning little about the process of the treatment or the problem usually makes the patients feel depressed because they live in an ambiguity then (Ong et al., 1995, p. 912).

How Communication Breakdowns Occurred

When they came across with their doctors, many Syrians were encountered with prejudices or their doctors didn't pay attention to them because they haven't been welcomed in the society. They came across with angerly attitudes or they were shouted, or they waited a long time before seeing their doctors; what's more wrong procedures and treatments were applied to them due to translation mistakes (Gürbüz & Duğan, 2017, p. 483). Therefore, lack of communication caused longer stays at the hospitals and the increase in hospital expenses. All of these caused Syrian immigrants to experience negative feelings which led to communication breakdowns with their doctors.

Doctors should be competent in communication skills. They should show affection and then persuade them because their patients might not want to do what they are told, they don't want to be separated from their families for a long time, they don't want to be too much vaccinated, they don't want to give blood or they don't want to eat food that they don't like (Gordon & Edwards, 2013, p. 94). Thus, the doctors should be sensitive, and considerate, and they should avoid unnecessary medical procedures and examinations (Singh, 2016, p.34). If the doctor can empathize with the patients by putting herself into their place by understanding the patients' feelings and thoughts correctly and by explaining these to the patient, she will give value to them and this will create mutual trust (İlhan, 2018, p.172).

Doctors Should Motivate the Patients for better Results

When the doctor receives the investigation results of the patient, she should explain her what kind of treatment she will apply and if there are any choices that they can choose from in a simple language that the patient can understand (Gireesh, 2021). If efficient communication can be achieved between the two parties, then doctors can give precise medical diagnosis for the patients and patients trust them more throughout the treatment (Gordon & Edwards, 2013, p. 33).

Once the doctor writes the prescription, she should explain to the patient which medicines she needs to take in sequence and what time of the day (Gireesh, 2021). If the patient has some questions on her head related with the medicines, the doctor should motivate her to ask these questions, and while leaving the doctor should encourage the patient by saying that you'll overcome this illness and she should give the next appointment (Dhand, 2017).

Conclusion

This paper aims to suggest how to overcome communication barriers during the first interaction that patients experience with their doctors. The main problems which cause communication breakdowns are time pressure, using medical terminology, interrupting patient's words without listening them completely and the inability of making empathy. Whereas for patients' low health literacy, not being fluent in the Turkish language and low education levels create major problems. The result of the research shows that active listening, two-way communication, making empathy and giving feedback to the patients are key for effective communication.

The partnership model, two-way communication, active listening, making empathy and giving feedback are essential elements for effective communication. Effective communication helps to receive more positive outcomes from the treatment, it will increase the satisfaction that the patient has from the treatment applied because the patient will better comprehend her health issue, and it will also reduce the costs of the treatment because the patient won't have redundant tests (Ha et al., 2010, p.42).

Doctors should be human-centered instead of problem-centered, they should take the responsibility of their patients by caring for them, by showing affection, and by being kind towards them (Gordon & Edwards, 2013, p. 35). With effective communication, patients who are content from going to their doctor increases, patients don't change their doctor frequently and they continue with the same doctor for a long time (Ertekin, 2017, p.129). So, effective communication eradicates the dissatisfaction experienced in the patient and doctor relationship to a large extent. Thus, the length of diagnosing patients should be increased to 20 minutes so that doctors can thoroughly understand the complaints of their patients, and they can apply shared-decision making through the process which will increase patients' satisfaction from the treatments (D.W., 2021).

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

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Flora and Fauna Conservation in Machakhela National Park Georgia

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Abstract: Biodiversity conservation is the protection and management of biodiversity to obtain resources for sustainable development. The diverse topography and climate has provided conditions to develop a remarkably wide array of landscapes and plant formations. They include two features of plants and plant associations that date back millions of years: the Colchic refugium in the eastern Black Sea basin and the Hyrcanic region on the southern Caspian Sea coast. These “refugia”/refugial forests harbour many locally endemic plants - species that are found nowhere else. They include relict and endemic oaks (such as *Quercus imeretina*, *Q. hartwissiana*), Medvedev’s birch (*Betula medwedewii*), Ungern’s and Smirow’s rhododendrons (*Rhododendron ungerii*, *R. smirnowii*) in the Colchic. Machakhela National Park is located 30 km away from Batumi in the foothills of the Lesser Caucasus. Close to the Turkish border, Machakhela expands the protection of the unique ecosystems of the Colchic forests – rich tropical and sub-tropical habitats (temperate rain forests with peat bogs) which contain unrivaled biodiversity, and are rich in relicts of the tertiary period: Colchic bot box, chestnut, nut, hazel-nut, and bot trees abound. Trails are being developed and since this park has only been recently established, you can still be one of the first to witness its wet beauty. At the same time these unique forests can mostly be classified as temperate rainforests, due to the same principal reasons as for other temperate rainforest regions: relevant slopes of barrier mountains located along coastlines that trap a large portion of the humidity from sea air masses. Montane barriers also contribute to a warm and humid climate that has been present since the late Tertiary and is the primary reason that the Caucasus has acted as a shelter for humid- and warm-requiring (hygrothermophilous) relicts during the ice age.

Keywords: Machakhela. National Park. Biodiversity. Flora. Fauna

Introduction

Georgia, like the whole Caucasus, is one of the 36 "hot spots" of world biodiversity. As a reserve of many endemic, rare and extinct species, it is the richest in its biodiversity not only in the Caucasus, but also in Europe. Adjara, in this respect, is considered to be one of the outstanding regions in the whole Caucasus. Protected areas, including national parks, are a guarantee of sustainable development in Georgia. The main parts of the country's wealth, forest groves, the representatives of terrestrial and aquatic flora and fauna, monuments of historical and cultural heritage and others are protected in these areas. (Gegechkori, 2020).

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Machakhela National Park is located on the territory of the Khelvachauri Municipality of the Autonomous Republic of Adjara and is part of the Protected Areas Agency of the Ministry of Environment and Natural Resources of Georgia. In the north the territory of Machakhela National Park is bordered by the territory of Keda Municipality and Kirnati Forestry of Khelvachauri Forestry Administration. Kirnati Forestry of Khelvachauri Forestry Administration in the west, Turkish state in the east and south. The forest massifs of Machakhela National Park stretch 11 kilometers from the north to the south, and 20 kilometers from the east to the west. The total area of the forest fund of Machakhela National Park is 7327 ha with the afforestation of 2016.

Adjara fauna diversity is represented by 4627 species. 4028 of them belong to invertebrates (15 species are included in the Red List of Georgia), and 599 belong to chordates (66 species are included in the Red List of Georgia). 548 species of plants are distributed on the territory of Machakhela National Park, 55 species of which are endemic, among them 21 from the Caucasus, 3 from Georgia, 25 from Colchis, 4 from Adjara-Lazeti and 2 from Adjara. On the territory of the park, there are 35 coniferous plants (5.5%), 31 shrubs (5.7%), 18 semi-shrubs (3.3%), 19 filices (3.5%) and 445 species of herbaceous plants (81.2%), 278 (50.7%) of which are perennial herbaceous plants, 53- (9.7%) biennial herbs, 90- (16.4%) annual herbs, 19-(3.5%) seasonal herbs, 5-(0.3%) biennials and perennials. Many relict and endemic plants are gathered here: rare and endangered species, 12 species of the "Red List" of Georgia, 52 species of the "Red List" of the Caucasus and 7 species of the IUCN-International Red List. Among the species in the national park, there are Pontic oak (*Quercus pontica*), Medvedev birch (*Betula medwedewii*), Laz iris (*Iris lazica*), Ungern sugar (*Rhododendron ungeri*), Hartwiss oak (*Quercus hartwissiana*) and many other plants. (Nakhutsishvili, 2014)

Method

The purpose of the research is to study the flora and fauna of Machakhela National Park and to assess their current state. The collection of the field data was held on the territory of the park using a weekly route method. We processed the selected sample areas using the releve method. The plant nomenclature is given in the abstract of Flora of Georgia (Gagnidze, 2003), Florist of Georgia Vol. IXIV, (1971-2003), We assigned systematic status to the plant according to the Plant List (www.theplant.list.org).

Observation and description of animals in the research area is carried out using various methods: monitoring and recording methods, camera processing, orthophotos, traps. For example, the population monitoring of the hornbill, Caucasian salamander, brown bear, lynx is carried out with photo traps.

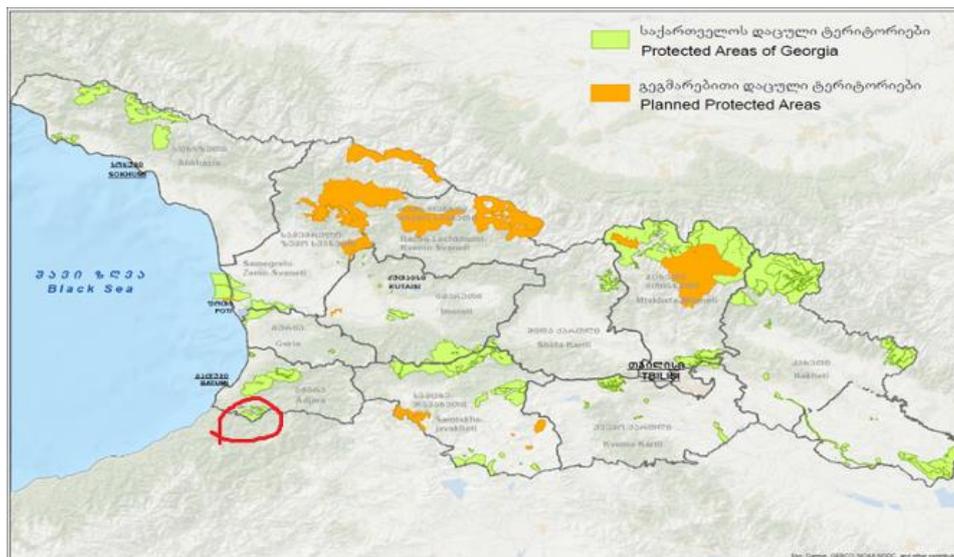


Figure 1. Map of study area

Photo traps are placed in different rangers, the areas of which are determined by the staff of the protection department, in strategic places, mainly where the probability of detecting priority key species is high, as a result of which monitoring is carried out. Also, the monitoring is carried out in a special form developed by the administration, which is filled in daily in the field while recording traces, excrement, den and other specific signs.

While recording traces, excrement, den and other specific signs in the field, monitoring proceeds actively with both photo traps and a camera and direct observation. The number of birds' nests, overgrown hollowed out trees, ant nests and the location of wild animals were recorded using the abovementioned methods.

Results and Discussion

41 species of mammals (3 species are included in the Red List of Georgia), 108 species of birds (8 species are included in the Red List of Georgia), 31 species of fish (1 is included in the Red List of Georgia), 21 species of amphibians and reptiles belong to the list of animal species widespread on the territory of the Forest Foundation of the Machakhela National Park.

During the research process in the research area, 8 harmful insects were identified, which are a necessary component of the biological processes in the forest ecosystems. According to the route-detailed recording method of pathological observations, a list of harmful insects has been determined, which, from the economic and pathological point of view, are of special importance for the present and the nearest future:

1. *Mikiola fagi* Hartig
2. *Cameraria ohridella* Deschka & Dimic
3. *Tischeria complanella* Hb.,
4. *Cerambix cerdo acuminatus* Motsch.,
5. *Lymantria (Ocneria) dispr* L.,
6. *Erannis defoliaria* Clerck.
7. *Agelastica alni* L.
8. *Cydalima perspeqtalis* Walker.

31 species registered in the class of fishes in Machakhela National Park are united in 10 families; 5 species registered in the class of amphibians are united in 3 families; 41 species registered in the class of mammals are united in 13 families;

Species of the red list in Machakhela National Park

- I. Class: Actinopterygii Klein, 1885
Family: Salmonidae Cuvier, 1816
1. Species - *Salmo trutta* Linnaeus, 1758 VU (A1d)
- II. Class: Birds - Aves Linnaeus, 1758
Family: Podicipetidae Latham, 1787
2. Species - *Podiceps grisegena* (Boddaert, 1783) VU (D1)
Family: Ardeidae Leach, 1820
3. Species - *Ciconia nigra* (Linnaeus, 1758) VU (D1)
Family: - Accipitridae Vieillot, 1816
4. Species - *Accipiter brevipes* (Severtzov, 1850) VU (D1)
5. Species - *Aquila clanga* Pallas, 1811 VU (IUCN)
6. Species - *Aquila heliaca* Savigny, 1809 VU (IUCN)
7. Species - *Buteo rufinus* (Cretzschmar, 1826) VU (D1)
8. Species - *Neophron percnopterus* (Linnaeus, 1758) VU (D1)
Family: Falconidae Vigors, 1824
9. Species - *Falco vespertinus* Linnaeus, 1766 EN (D1)
- III. Class: Mammals - Mammalia Linnaeus, 1758
Family: Sciuridae Fischer, 1817
10. Species - *Sciurus anomalus* Gmelin, 1778 VU (A1e)
Family: Mustelidae Fischer, 1817
11. Species - *Lutra lutra* (Linnaeus, 1758) VU (B1(bI))
Family: Ursidae Fischer von Waldheim, 1817
12. Species - *Ursus arctos* Linnaeus, 1758 EN

95% of the territory of Machakhela National Park is covered with forest and impenetrable bushes. Hypsometrically, the forests are distributed as follows:

500-600 m above the sea level: it is represented by mixed broad-leaved Colchian type forests, where the largest part of the park's territory is occupied by forest phytocenoses dominated by alder (*alnus barbata*), also in this zone we find chestnut copse - (*astanea sativa*) and beech forest (*fagus orientalis*) as well as hornbeam (*lat. Carpinus caucasica*) ash-tree (*Fraxinus excelsior*), sumach (*Rhus coriaria*), maple (*Acer campestre*) - chequer (*Sorbus torminalis*) and others.

500-800-1000 (1200 m): chestnut belt. This belt also includes hornbeam, alder, linden - (*tilia causicum*), elder - (*Sambucus nigra*), ash-tree - (*lat. Fraxinus*), elm - (*lat. Ulmus*) spruce - (*lat. picea orientalis*) yew - (*lat. Taxus baccata*), persimmon - (*lat. Diospyros lotus*), locust - (*lat. Robinia pseudoacacia*), pear (*lat. Pyrus caucasica*), goat-willow - (*lat. Salix caprea*), from aspen species - poplar (*lat. Populus euphratica*) (*Populus*) and others.

Undergrowth: Colchian bladder-nut is frequent here - (*Lat. Staphylea colchica*), Colchian box tree - (*Lat. buxus cholchica*), Pontic Rhododendron - (*Lat. Rhododendron ponticum*), azalea - (*Rhododendron luteum*), cherry-laurel - (*laurocerasus officinalis*), spodozol fern - (*Dryopteris oreopteris*), male-fern - (*dryopterix filix-mas*), ivy - (*Hedera pastuchowii*), hart's tongue - (*Phyllitis scolopendrium*), elder - (*Sambucus ebulus*), phytolacca - (*Phytolacca Americana*), field chamomile - (*Leucanthemum-vulgare*), ilex - (*Ilex colchica*), bladder-nut - (*Staphylea*), fig (*Ficus carica*), alder buckthorn - (*Frangula alnus*), apple - (*Malus orientalis*), locust - (*Robinia pseudoacacia*) and others.

The beech belt is represented at 1000-1500 (1800m) above the sea level. This belt consists mainly of eastern beech, hornbeam, and the mixture of other species.

The species of flora included in the red list of Machakhela National Park

№	Species	Verbal basis for the inclusion in the "red list"	The status of safety and condition
1	<i>Castanea sativa</i>	Reduction of the area and the tendency of fragmentation	VU
2	Georgian walnut <i>Juglans regia</i>	Reduction of the area and the tendency of fragmentation	VU
3	<i>Corylus colchica</i>	Small fragmented area	VU
4	<i>Taxus baccata</i>	Small, fragmented area	VU
5	<i>Buxus colchica</i>	Reduction of the area and the tendency of fragmentation	VU
6	<i>Rhododendron ungerii</i>	Small, fragmented area	VU
7	<i>Cerasus silvestris</i>	Small, fragmented area	VU
8	<i>Ulmus glabra</i> Huds	Small, fragmented area	VU
9	Georgian maple (<i>Acer ibericum</i> M. Bieb. ex Willd)	Small, fragmented area	VU
10	<i>Quercus pontica</i>	Small, fragmented area	VU
11	<i>Quercus hartwissiana</i> , <i>Quercus armeniaca</i>	Small, fragmented area	VU
12	<i>Betula medwedewii</i>	Small, fragmented area	VU
13	<i>Staphylea colchica</i>	Small, fragmented area	VU

Conclusion

Thus, the flora and fauna of Machakhela National Park have been studied. According to the data of 2018-2022, 8 species of harmful insects and 201 species of vertebrate animals have been registered, 41 species of which are mammals, 108 species are birds, 31 species are fish, 16 species are reptiles, 5 species are amphibians. 12 species of vertebrate animals are included in the red list of Georgia.

548 species of plants, united in 108 genera of 30 families, 55 species of which are endemic, including 21 from the Caucasus, 3 from Georgia, 25 from Colchis, 4 from Adjara-Lazeti and 2 from Adjara.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

Acknowledgements or Notes

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Sars-Cov-2 Virus Pathogenicity in Syrian Hamsters at Different Routes of Inoculation

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Abstract: In early December 2019, humanity faced a new problem caused by a coronavirus. An epidemic event capable of causing severe primary viral pneumonia in humans began to develop in the central Chinese province of Hubei. The isolated etiological agent was identified as a member of *Coronaviridae*. Currently, the global pandemic associated with a new coronavirus infection of acute respiratory syndrome type 2 (SARS-CoV-

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2 - Severe acute respiratory syndrome 2) has become a challenge for humanity. In this work, the replicative capacity and pathogenesis of the SARS-CoV-2 virus in hamsters under different infection methods was evaluated. SARS-CoV-2 virus isolates showed effective replication in hamster lungs, leading to pathological lung lesions upon intranasal infection. When infected with this virus, the clinical manifestations of the disease in hamsters were characterized by decreased body temperature and live weight, moistening and ruffling of hair, and frequent stroking of the nasal mirror. In addition, SARS-CoV-2 was detected with higher titers from the group infected intranasally in cell culture from nasal, oral flushes, and lungs compared to other infection methods ($p < 0.05$). Furthermore, the pathological autopsy results showed some pathological changes in the lungs of hamsters infected intranasally. Moreover, airborne transmission was found in the co-maintenance of a healthy hamster with intranasally infected hamster. In conclusion, our work shows that the Syrian hamster model can be used to study SARS-CoV-2 pathogenesis and vaccine testing against type 2 acute respiratory syndrome.

Keywords: SARS-CoV-2; Pathogenicity; Biological model; Syrian hamster

Introduction

The first members of the family *Coronaviridae* were discovered in the first half of the last century (Schalk et al., 1931, Almeida et al., 1968). This virus posed a serious problem in veterinary medicine, but the scientific community did not consider epidemic viruses particularly dangerous. Coronaviruses became a problem in 2002 when SARS-CoV (Severe acute respiratory syndrome-related coronavirus) was detected in the human population (Lvov et al., 2013. Chuchalin et al., 2004, Shchelkanov et al., 2013, WHO, 31 December 2003). The natural reservoir of this virus was bats (Chiroptera, Microchiroptera) (Lvov et al., 2013. Li et al., 2005, Menachery et al., 2015) excreting the virus in saliva, urine, and feces (Shchelkanov et al., 2020). These infect small mammals, widely used as food in Southeast Asian countries (Shchelkanov et al., 2020). The epidemic caused by SARS-CoV had a worldwide case fatality rate of 9.6% (Lvov et al., 2013. Chuchalin et al., 2004, Shchelkanov et al., 2013, WHO, 31 December 2003, Ed. A.G. Chuchalin, 2016).

In early December 2019, humanity faced a new problem caused by the coronavirus. An epidemic event began to develop in the middle Hubei Province of China, causing severe primary viral pneumonia in humans (Ryu et al., 2020). The isolated etiological agent was identified as a member of *Coronaviridae* (Wu et al., 2020). The genome of this agent turned out to be homologous to MERS-CoV (50%), SARS-CoV (79%), and BtRCoV (88%). Subsequently, considering the peculiarities of genome structure, it was given a name of SARS-CoV-2 (severe acute respiratory syndrome 2) (Shchelkanov et al., 2020, CSGICTV, 2020). This virus causes infectious disease COVID-19. Clinical manifestation of the virus is rather wide.

The disease has now spread to all countries worldwide and is a global pandemic with a high fatality rate. The pandemic causes enormous damage to global health and the economy (Li et al., 2020, Wu, Z. et al., 2020, Wu, J. T. et al., 2020). At this time, vaccines against type 2 coronavirus infection are being actively developed worldwide (WHO, 26 January 2021). Preclinical vaccine trials require a suitable biological animal model to provide consistent and reproducible results (Sia et al., 2020). The ideal animal model should reflect the clinical features, viral replication, and pathology observed in humans. The presence and distribution of viral receptors should be the same as in humans. The virus must replicate in selected animal species, and there must be a correlation between the viral titer and disease severity (Bolles et al., 2011).

The method of infection of a biological model is an important factor when studying the pathogenicity of a virus. Considering the tropism of the SARS-Cov-2 virus, which may result in a more accurate elucidation of pathogenesis in a potential biological model. Following a detailed reading of the literature, in this work, we made the decision to use a hamster animal model. Hamsters had been used to study SARS-CoV, and replication maintenance in hamsters with type I coronavirus infection has been reported (Roberts et al., 2008, 2005). Also, earlier studies on SARS-CoV-2 have shown (Sia et al., 2020) that the virus under study can replicate in the lungs of an animal with a high titer.

Method

Isolation of Virus

We used epidemic strain “SARS-CoV-2/KZ_Almaty/04.2020” (GenBank #: MZ379258.1) of COVID-19 virus isolated from clinical specimen deposited in the republican depository of microorganisms’ collection of Research Institute for Biological Safety Problems (RIBSP) of the Ministry of Education and Science of the Republic of Kazakhstan (Patent # 34762). The virus was isolated in Vero cell culture, 4-passage. The virus titer was 4.50 ± 0.08 lg TCID₅₀/ml.

Animal models

The 16 heads of Syrian hamsters were used in the experiment. Before the work, all animals underwent thermometry, after which blood serums were sampled from all animals to determine viral neutralizing antibodies in the organisms against the studied virus, and then they were divided into 4 groups by randomized method: 1) group – (n=4); it is left as a control group. 2) group (intranasal, n=4); The second group was infected by 0.2 ml via nostrils (intranasal route); 3) group (intravenous, n=4); virus suspension was administered to animals intravenously (via a hypoglossal vein) by 0.2 ml. 4) group (subcutaneous, n=4); subcutaneous (s/c) infection of hamsters was carried out by inoculation of a virus suspension in the top of shoulder, using the same doses and volumes of preparations, as at intranasal infection. At infection of hamsters, the virus titer has made $10^{4.50 \pm 0.08}$ TCID₅₀/ml; and it was applied in an integral kind without additional dilution. After challenge, the animals were placed in cages and left in independently ventilated case for keeping animals. The animals were supervised, paying attention on their physiological condition. During the experience on 3, 5, 7, 9, 12 and 14 days after challenge, we carried out with all animals the blood sampling, nasal and oral swabs for virus isolation.

RNA isolation.

RNA was extracted from pathological materials using a QIAamp viral RNA mini kit (QIAGEN, Hilden, Germany) according to the manufacturer’s instructions.

Viral RNA analysis

The following primers and probes were used to amplify the N gene of the SARS-CoV-2 virus: N_Sarbeco_F (cacattggcaccgccaatc), N_Sarbeco_R (gaggaacgagaaggcttg), and N_Sarbeco_P (fam-acttctcaaggaacaacattgccabbq) (Corman et al., 2020). The viral genome was evaluated by quantitative real-time PCR using the Superscript® III Platinum One-Step RT-PCR System with Platinum™ Taq DNA Polymerase System (Invitrogen, USA) according to the manufacturer’s instructions. The reactions were performed in a Rotor-Gene 6000 Series thermal cycler (Qiagen, Germany).

Histological examination

For microscopic analysis, lung tissue samples were taken from all studied animals and fixed in a 10% neutral formalin solution. Tissue pieces were left in formalin overnight at room temperature, then processed according to the standard procedure of histological technique (dehydration, clarification, and compaction). Tissue sections of 4–5 µm thickness were prepared from paraffin blocks using a sled microtome. Histological sections were stained with hematoxylin and eosin for general review.

Virus isolation in cell culture

The prepared 20% suspension of 0.5 ml was applied to the Vero cell culture monolayer after removing the nutrient medium and incubated for 60 min at 37°C. The inoculum was then removed, the monolayer was washed in three shifts with PBS solution, DMEM maintenance medium with fetal blood serum was added, and cultivation was continued at 37°C with daily microscopy of the cell culture monolayer. The presence of the virus was determined by the cytopathogenic effect in the infected cell cultures compared to the control uninfected cell culture.

Statistical processing of experimental data.

All studies were performed with several replications, ensuring reliable results. The results of the study were processed mathematically. The arithmetic means (X) and mean square error (m) were calculated using GraphPad Prism8. The significance of differences between the indicators ($P < 0.05$) was determined using Student's test.

Results and Discussion

Clinical signs at intranasal infection were bright expressed, that demonstrated in the general depression, frequent stroking of a nasal pocket mirror and decrease in temperature at hamsters. As well, the outcome lethality has made 20 % from the general number of hamsters of this group. In research spent by us with hamsters we also tried to define possibility of transfer of the virus from the infected to a healthy hamster by airborne infection.

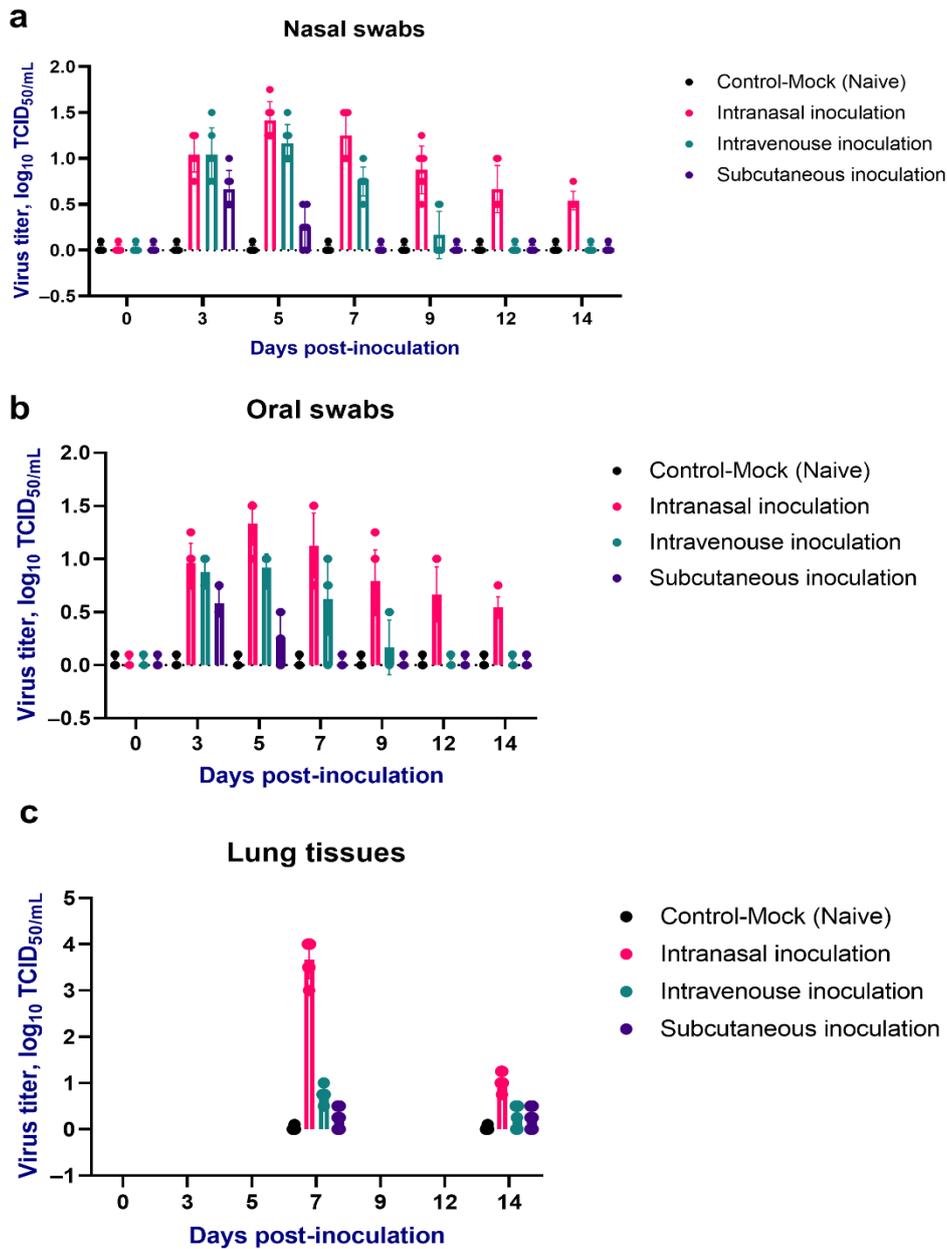


Figure 1. Viruses are released from clinical and pathological materials from hamsters infected with the SARS-CoV-2 virus by different methods. a - nasal washes; b - oral washes; c - lung tissue of infected hamsters. x - no samples were taken. ns - no significant difference; ** - $p \leq 0.002$; **** - $p \leq 0.0001$.

At this, to reveal the infection by the virus, during the joint keeping of the animals, one hamster was placed from the control group to the group infected with intranasal method instead of the dead hamster. In the result of this it was revealed, that the general clinical symptoms were found out in healthy animals, such as appetite loss, frequent stroking of nostrils, an itch, a rash, a diarrhea and temperature decrease. The researches carried out by us on study the mechanism of the virus transfer at the joint maintenance of the non-infected animal together with the infected one have confirmed the results of similar researches of other authors (Lvov et al., 2013). The body temperature control of hamsters demonstrated decrease in temperature in the group infected by the intranasal method. Also because of the shown clinical signs as loss of appetite group of the hamsters infected with intranasal method showed in measurement the constant loss of a body live weight. Group of the infected intravenously hamsters also showed irrelevant decrease in weight of a body (from $P \leq 0.02$ to $P < 0.001$ in comparison with the control group), that can testify of efficiency of infection by the intranasal method. To study the pathogenicity of a virus on internal bodies we made the postmortem opening in which we revealed dot hemorrhages and increase bronchial and well lymph nodes.

The obtained data testify occurrence of pathological changes at intranasal infection. Opening the chest cavity at intravenous inoculation showed an inflammatory process in the lungs. No such pathological changes were observed during subcutaneous inoculation. These pathological changes were confirmed by histological studies. Results of our histologic analysis demonstrated in the intranasally infected group a pathology in the form of alveolar damages, desquamation of atypical pneumocystis. Intensive coloring of microstructures, signs of sharp respiratory distress syndrome were observed. In the infected intravenously group the pathology histologic lung changes were characteristic to damages of an initial exudative phase of a sharp respiratory distress syndrome, changes are insignificant. Cuts of materials taken of the subcutaneous infected group and the control group of the pathology have not been shown.

In our work we, using one of methods of the modern molecular-genetic analysis made PCR on revealing virus RNA in samples of the received experimental animals. PCR in real time at detection virus RNA in samples of nasal and oral swabs showed results with 3 for 14 days, and also in fabrics of lungs selected on the 7th and 14th days. Received PCR results specifies on successful replication of the virus on the given models in experiment.

As well in experiment, we used virus shedding in culture of cells. We carried out the experiences on allocation of a virus from clinical and pathological materials from the experimentally infected animals in the manner of infection in culture of Vero cells. The virus shedding from clinical samples of lungs of hamsters showed at intranasal infection method for 7 days the content of a virus with titer of 3.66 ± 0.41 lg TCID₅₀/ml, the subsequent sample for the 14th day, the analysis revealed the virus already with smaller titer equal to 1.04 ± 0.19 lg TCID₅₀/ml. The intravenously infected hamsters also showed virus shedding in lungs for the 7th day with low titer 0.75 ± 0.15 lg TCID₅₀/ml in comparison with the group, infected by the intranasal method ($p \leq 0.0001$), and for the 14th day, the titer was equal to 0.29 ± 0.24 lg TCID₅₀/ml ($p \leq 0.0001$).

Hamsters from the group infected subcutaneous also showed virus shedding with low titer of 0.25 ± 0.22 lg for the 7th and 14th days. The given value gives the chance to understand better the pathological picture at a special method of infection.

Conclusion

By the results of the researches which we have carried out, it has been established, that hamsters are susceptible to SARS-CoV-2 virus, and have manifested development of a pneumonia similar to the people's one at infection with the given virus. Among three tested methods of infection it is revealed, that intranasal introduction with good probability cause the coronavirus infection in hamsters, than other methods. This, in its turn, confirms that the virus quickly replicates in the respiratory tract cells. Clinical manifestations of the disease were also pronounced in hamsters infected with the intranasal method, at this low mortality among infected hamsters was shown. Airborne transmission of the virus has been proven, when an infected hamster is kept in contact with healthy animals from the control group. The obtained results confirm that hamsters can be useful in creating a biological model for estimation of candidate vaccines for COVID19 coronavirus infection, since the picture of pathogenesis and clinical manifestations in this animal is close to the manifestation of the virus in humans.

Scientific Ethics Declaration

*The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

*The animal study was reviewed and approved by the Committee on the Ethics of Animal Experiments of the Research Institute for Biological safety problems of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan (permit nos. KZ0520/013 and KZ1120/014).

Conflict of Interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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Bioecological Features and Reproduction of *Leucaena Pulverulenta* Benth. in the Conditions of the ABSHERON

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Abstract. The article presents information about the introduction of the species *Leucaena pulverulenta* Benth., belonging to the genus *Leucaena* Benth., in the conditions of Absheron, bioecological features, reproduction, a comprehensive study of growth and development, research work and results. It is important to study the changes that occur at all stages of ontogeny, the study of growth and developmental characteristics of plants under the conditions of introduction, reproductive characteristics such as flowering and fruiting. Methods for assessing the main bioecological characteristics of plants provide obtaining the main bioecological characteristics of the species, its growth and reproduction. The choice of plants for landscaping, along with their biological and ecological characteristics, is closely related to the soil and climatic conditions of the region. For the stability and durability of the planted greenery, it is advisable to use plants that have more valuable decorative properties. When choosing plants for landscaping, it should be borne in mind that they are more decorative, resistant to diseases and pests. *Leucaena pulverulenta* Benth., when analyzing the results of the study in terms of its ecological and biological characteristics, the species has a dry subtropical character, is recognized as drought-resistant, heat-resistant, photophilous and less demanding on the soil. The relatively low and high alkalinity of organic and inorganic substances in the gray-brown soils of the study area has a negative impact on the vegetative and generative organs of plants at certain stages of the seasonal development rhythms of these plants. However, this effect is not decisive in completing the life cycle of the studied plants. Thus, it can be concluded from the research that in the conditions of Absheron plants can fully complete the rhythms of development, which is expedient in terms of their widespread use in the landscaping of the Absheron Peninsula.

Keywords: Bioecological features, Reproduction, Phenology, Morphology, Landscape.

Introduction

Recently, extensive research has been conducted on the protection of biological diversity, increasing the plant gene pool, and the efficient use of natural resources. Along with our natural flora, it is very important to study the cultural dendroflora and enrich it with new species resistant to soil and climatic conditions. To this end, the laboratory of the Institute of Dendrology "Introduction and acclimatization of trees and shrubs" conducts extensive research on the introduction of new species of exotic plants, the study of biological properties, adaptation to environmental factors and application to landscape architecture.

Methods for assessing the main bioecological characteristics of plants provide the main bioecological characteristics of the species, its growth and reproduction. The choice of plants for landscaping, along with their biological and ecological characteristics, is closely related to the soil and climatic conditions of the region. For the durability and longevity of planted greenery, it is advisable to use plants that have more valuable decorative properties. When choosing plants for landscaping, it should be borne in mind that they are more decorative, resistant to disease and pests. *Leucaena pulverulenta* Benth. Bioecological features, generative reproduction, phenology, morphology, perspective of the species in Absheron conditions were studied.

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Material and methods

The research was conducted in 2020-2022 in the experimental areas of the laboratory "Introduction and acclimatization of trees and shrubs" of the Institute of Dendrology of ANAS. The species *Leucaena pulverulenta* Benth., introduced in the Absheron, was obtained by exchange from the Central Botanical Garden of Padua, Italy. Observations of the studied species were carried out every ten days. In the research work - introduction Agamirov et al. (1985). Biological features Sokolov (2014), seed propagation Firsova (1955), morphology of seedlings Serebryakov (1952), bioecological features Iskenderov (1989), growth dynamics was studied based on the methods of Molchanova (1967), morphology of the root system Kolesnikov (1972) and also, literary materials (2022); Plant List (2013) were studied according to the methodologies.

Analysis and Discussion

Leucaena pulverulenta Benth. species of evergreen shrub or tree with gray-brown bark, up to 20 m high. The leaves are bipinnate, up to 30 cm long, consisting of 3-10 pairs of leaflets of the first order, in turn, consisting of 10-20 pairs of soft lanceolate leaflets of the second order. The flowers are collected in rounded inflorescences-heads of a greenish-white color with a diameter of about 2 cm. The fruits are flat straight or slightly crescent-shaped beans up to 20 cm long and 1.5-2 cm wide, pointed at the end. The skin is thin, brown and brittle in ripe beans. Each pod contains up to 16-18 ovoid seeds 6-10 mm in diameter, dark brown when ripe (Sokolov, 2014). Before sowing, all seeds are scarified by scalding their hard shell with very hot water (~80°C). After that, the seeds should be immersed in cold water. They are kept for at least 12 hours in water, and not dried, they are sown in moist soil under glass.

Leucaena pulverulenta Benth. seeds are sown in autumn, indoors and outdoors. 04.10.2020 sown to a depth of 1.5-2.0 cm in a substrate prepared in the form of a mixture of soil, sand and peat (1:1:1) (Firsova, 1955).



Figure 1. *L. pulverulenta* Benth. in autumn. seedlings of the species in open and closed conditions.

When studying the morphological characteristics of the seedlings of seeds sown in autumn in open and closed conditions, it was found that the seedlings of *Leucaena pulverulenta* are surface and have high germination properties observed. Germination yielded 80-83% (06.10.2020). When the seeds of the plant germinate, the upper part of the petals remains inside the seed, thus using the seed as a nutrient, which is used to form a seedling that develops from the embryo. The leaves are bright, oval, the stem is dull, the base is hearty, light green, then darkens. The hypocotyl is white, 1.9-2.0 cm long, and the epocotyledon is 1.5 cm long. The development of the root system begins at the same time as the development of the aboveground part. The life of the leaves lasts 40 days. As the true leaves develop, the edges become ciliated (Serebryakov, 1952).

Seeds sown indoors grow well at a temperature of 19-20°C. The height of the first annual *Leucaena pulverulenta*, sown in closed ground on February 11, 2020, was 19 cm, the length of the main root was 11 cm, the diameter of the root collar was 3 mm, and the length of the lateral roots was 6.5 - 8 cm (Kolesnikov, 1972). The more intensive development of the root system of *Leucaena pulverulenta* is an adaptation to the fact that the plants grow on dry, stony, sunny slopes. As the root system is formed, intensive growth of the surface part of the plant is observed, the root system is pivotal. Such development of plants is favorable for the dry climate of Absheron. By working deep in the root, it uses groundwater in the lower layers more efficiently. It is recommended to transplant the plant no later than 2-3 years. Dynamic development of surface parts is one of the main indicators of plant life.



Figure 2. *L. pulverulenta* Benth. root system

The growth of *Leucaena pulverulenta* begins in the second decade of April and lasts until the end of October. The plant has a vegetation period of about 210 + 7 days. The plant is warm and light-loving, with a height of 2.5 m for 5-6 years, the diameter of the trunk is 14 cm, and the length of the side branches is 85-90 cm. It fruits from 4-5 years. We studied the beginning and recovery period of the development phases of the first annual *Leucaena pulverulenta* in the conditions of Absheron.

Table 1. *Leucaena pulverulenta* Benth. L. I annual development dynamics of the species (2020-2021)

Species	Height (cm)	Annual height development start	Annual height development end.	The process of growth	Annual height increase (cm)
<i>L.pulverulenta</i> Benth.	25 ± 5	23.04.±1	29.10.±3	210±7	19 ± 5

The requirements of *Leucaena pulverulenta* to heat, light, humidity, cold air flow and soil nutrition in the Absheron were studied. The results of the study are given in table 2.

Table 2. *Leucaena pulverulenta* Benth. The main environmental factors affecting the species

Species	Environmental factors				
	thermal	sunbeams	humidity	cold weather	the soil
<i>Leucaena pulverulenta</i> Benth.	+	+	+	-	±

Note: (+) very demanding, (-) slightly demanding, (±) relatively demanding. It is highly demanding on environmental factors during the period of growth, flowering and fruiting, the end of the vegetative period is undemanding (Iskenderov, 1989).

The contribution of *Leucaena pulverulenta* Benth. to the environment is multifaceted. Erosion control and reclamation. The deep root helps break up compacted groundwater layers, thereby improving water infiltration and reducing surface runoff. The brine prevents groundwater from rising to the surface. *Leucaena pulverulenta* growing in contour stripes, helps control erosion on steep slopes, prevents wind damage, and uses the leaves as green manure (2022); Plant List (2013). The plant is used to make quality charcoal, small furniture and paper pulp. Young shoots, young leaves and seeds can be used as vegetables in human nutrition. *Leucaena pulverulenta* is one of the highest quality and delicious forage trees in the tropics.

Conclusion

Leucaena pulverulenta Benth which we studied in Absheron ; has all the developmental phases during the growing season and has great potential for application in landscaping. The growth of *Leucaena pulverulenta* Benth. begins in the second decade of April and lasts until the end of October. The plant has a vegetation period of about 210 + 7 days.

The growth of *Leucaena pulverulenta* Benth begins in the second decade of April and lasts until the end of October. The plant has a vegetation period of about 210 + 7 days. The plant is warm and light-loving, with a

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Novelty of the research: The results of the research showed that although the seeds sown in both conditions (open and closed) give good results, it is more expedient to sow the seeds indoors in autumn. Because cold weather is unfavorable for the development of seeds sown in the open. After three years, the plant can be transplanted to a permanently selected open environment.

Leucena - Leucaena pulverulenta Benth. is often planted for hedges and shade, and to protect soil from erosion. It withstands a short-term drop in temperature to -6 C. It is tolerant of the alternation of rainy and dry seasons, thermophilic, it does not like soils with high acidity and aluminum content. Given the evergreen, long-lived, decorative nature of the plant, it is expedient to use it extensively in landscaping, single and group plantings

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

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Genetic Studies in Acute Myeloid Leukemia

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Abstract: Acute Myeloid Leukemia (AML) is a group of malignant diseases originating from clonal hematopoietic stem cells, with a prevalence of 2-3 per hundred thousand people all over the world every year, and whose incidence has not changed significantly for the last 20 years. This malignant change in hematopoietic cells causes loss of function in these cells and, if untreated, results in death within weeks or months depending on the clinical course. AML is a complex disease that shows heterogeneity as well as phenotypic and recurrent chromosomal aberrations are observed in most of the cases. AML-related translocations generally affect the CBF (corebinding factor), RAR α (retinoic acid receptor alpha) and ETS (E-twentysix) family transcription factors and the HOX (Homeobox) gene family. There are various treatment examples and prognostic approaches as a result of genetic studies in AML. Recently, some molecules and molecular changes thought to be of prognostic and therapeutic importance have been identified and their importance in terms of treatment and prognosis has been investigated. In this study, genetic studies in AML were examined and new approaches and treatment processes in recent years were examined.

Keywords: AML, CRF, RAR α , ETS, HOX

Introduction

Cancer is defined as after uncontrolled cell proliferation after changes in the cell cycle due to environmental or genetic factors and mutations. (Jemal et al., 2009). Leukemia is a malignant disease arising from lymphopoietic or hematopoietic stem cells or precursor cells of the bone marrow. Although the etiology of leukemia, which is a blood disease characterized by the accumulation of neoplastic cells in the bone marrow and other tissues and accumulation in the peripheral blood as a result of pause and clonal proliferation in a specific stage of normal myeloid or lymphoid hematopoiesis, is not known exactly, it can result in death if not treated. (Biondi&McKenna, 2000 ; Lowenberg et al., 2003).

Acute myeloid leukemia (AML) is a hematopoietic stem cell disorder characterized by the cessation of differentiation during the hematopoiesis process, resulting in proliferation of the blast cell population. This malignant change in hematopoietic cells causes loss of function in these cells and, if not treated, results in death within weeks to months depending on the clinical course (Shibley et al., 2009). AML is a complex disease that shows heterogeneity both phenotypically and genotypically, and recurrent chromosomal aberrations are observed in most of the cases. Translocations related to AML generally affect CBF (corebinding factor), RAR α (retinoic acid receptor alpha) and ETS (E-twentysix) family transcription factors and HOX (Homeobox) gene family (Dash et al., 2001).

Some generalizations are made about the molecular biology of leukemias. The first of these; It is the occurrence of chromosomal abnormalities that disrupt or interrupt gene control mechanisms, unlike normal cells in somatic tissues. A genetic defect that occurs at a certain point during normal hematopoiesis results in leukemia of a

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particular line of hematopoietic differentiation. Another generalization made about the molecular biology of leukemias is that leukemias develop from a single cell and proliferate clonal, as is the case with cancers in general. AML'de genetik çalışmalar sonucu çeşitli tedavi örnekleri ve prognostik yaklaşımlar bulunmaktadır. Son zamanlarda prognostik ve terapötik önem taşıdığı düşünülen bazı moleküller ve moleküler değişiklikler belirlenmekte ve bunların tedavisi ve prognoz açısından önemleri araştırılmaktadır (Gale et al., 2003).

Today, the methods applied in the fight against this disease; First of all, our aim is to determine the possible risk factors and genetic factors that play a role in the etiopathogenesis of these patients, and to apply appropriate treatment methods for these factors whose prognostic value is determined.

Etiology of AML

Although there is no risk factor to explain the etiology in all AML patients, many hereditary, acquired and environmental predisposing factors have been identified (Liesveld et al., 2006). Although the development of AML is associated with many risk factors, known risks explain only a small part of the identified cases. These risks include age, hematological diseases, genetic disorders caused by chemicals, viruses and radiation, chemotherapy or having a profession that will affect health, etc. can be counted as (Deschler & Lübbert, 2006).

Mutations in AML

Mutations that play a role in the pathogenesis of AML are generally defined in two subgroups. The first group activates the signal transduction system, resulting in increased proliferation or survival advantage. The second group affects transcriptional coactivation complexes via transcription factors, resulting in decreased differentiation or increased self-renewal capacity.

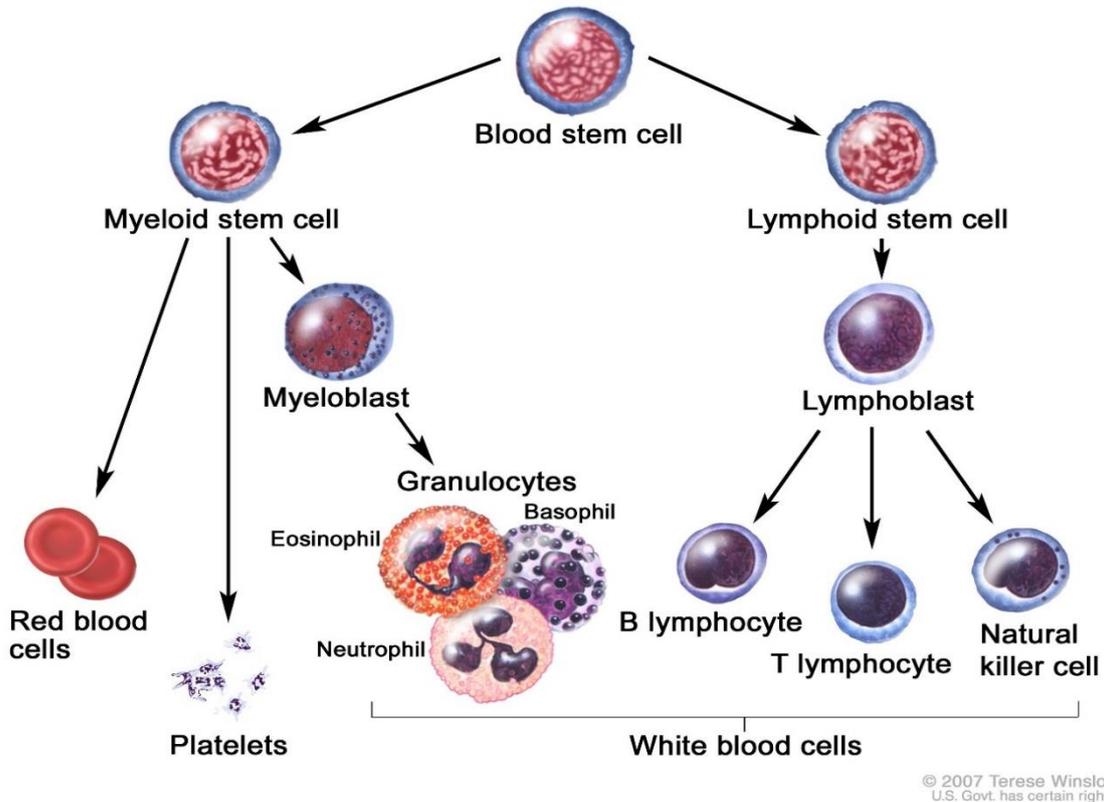


Figure 1. Blood stem cell proliferation

Cytogenetic studies have shown that frequently recurrent chromosomal abnormalities are found in approximately half of leukemias. When the genes affected by these structural chromosomal abnormalities in the form of translocations, inversions and deletions are examined, it has been shown that they play a role in the

development and normal function of the hematopoietic system. In addition to permanent structural changes (mutations) related to these genes, epigenetic changes have also been described.

Prognosis of AML

The response to treatment in AML is determined by various clinical and biological features. Being over 60 years old, poor pre-treatment performance status, AML occurring as a result of previous chemotherapy or a hematological disease such as MDS (Secondary AML), and high leukocyte count ($>20,000/\text{mm}^3$) or high lactate dehydrogenase level are unfavorable prognostic factors. . In addition, "multidrug resistance MDR1 protein" and immunophenotyping studies provide prognostic information, as well as cytogenetic analysis of leukemic cells, important information that is a prognostic indicator is obtained (T.H.D., 2011). When the patient's cytogenetic characteristics or some of the molecular alterations are taken into consideration together with the patient's age, it has been determined that they are suitable parameters that can be used in the follow-up of the disease, the prediction of recurrence, and the selection of appropriate treatment. (Ferrara et al.,2008). Nonrandom (non-random, previously described) clonal chromosomal abnormalities (eg, balanced translocations, inversions, deletions, monosomies, and trisomies) are alterations in leukemic blasts that occur in approximately 55% of adults with AML. These changes have been defined as the most important prognostic factors affecting the realization of complete remission, the determination of the risk of recurrence and the average life span in the past years. (Fröhling et al., 2005).

Conclusion

Cancer is defined as after uncontrolled cell proliferation after changes in the cell cycle due to environmental or genetic factors and mutations. According to the data of the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, CDC); While 12.7 million people worldwide get cancer annually, 6.7 million people die as a result of cancer-related diseases. It is extremely important that the data obtained to investigate the genetic origin of cancer shed light on the clinicians. Acute Myeloid Leukemia (AML) is a group of malignant diseases originating from clonal hematopoietic stem cells, with a prevalence of 2-3 per hundred thousand people all over the world every year, and whose incidence has not changed significantly for the last 20 years. Therefore, identification of mutations in AML is very important for early diagnosis. Therefore, we believe that both mutations and recent genetic studies in this study will be pioneers for clinicians.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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Research of Transport Effects of Heavy Metals in Plants of *Opuntia Vulgaris* Mill and *Rosmarinus Officinalis* L., Grown in the Technogenic Contaminated Soils

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Abstract: In this work, it was carried out the study of transport effect of a number of heavy metals from technogenic contaminated soil to the plants of *Opuntia Vulgaris* Mill and *Rosmarinus officinalis* L. For the conducting research it was selected two sites for each plant from the technogenic contaminated zone in the village of Gala, Absheron Peninsula of Azerbaijan. It was used transportable roentgen-fluorescence XRF spectrometer X Omega Roentgen Fluorescence Spectrometer of Innov-X for the measurement of plants of heavy metals in contaminated soil and plants. Seedlings of these plants were moved from ecologically clean areas to contaminated areas. Before planting, the concentration of a number of heavy metals was measured in the soil at depths of (0-5); (10-15); (15-20) cm. Measurement of concentration of heavy metals in the samples were carried out after 6 month of planting. It was revealed that, there is “Transport effect” of a number of heavy metals from technogenic contaminated soil to the above-mentioned plants. The results of experiment are expressed in the following figures (the concentration of specified heavy metals in soil corresponds to the depth of (0-5) cm). For *Opuntia Vulgaris* Mill – Cd (2,27-1,86); Pb (9,58-5,59); Zn (60,28-46,40); Ni (31,76-22,32); Co (4,60-2,46); Mn (39,76-16,57). For *Rosmarinus officinalis* L. – Cd (2,36-0,92); Pb (9,31-3,38); Zn (58,17-39,90); Ni (29,61-12,75); Co (4,71-1,64); Mn (37,15-16,57) (unit of measuring concentration - mg/kg; in the brackets, in the first place there is concentration in soil, in the second place there is transported concentration in plants taking into account background measurement before planting).

Keywords: *Opuntia Vulgaris* Mill, *Rosmarinus officinalis* L., Heavy metals, Transport effect

Introduction

Phytoremediation is a new technology that uses plants and their associated rhizosphere microorganisms to remove contaminants from technogenic contaminated soils. In recent years this technology has been recognized as a cheap, effective and economically clean technology. But here we must note that, the effectiveness of this technology depends on many factors, for example properties of different soils and plants, physical and chemical processes occurring in soil, microbial properties and bioavailability of metals, the ability of different plant adsorption, accumulate and neutralize metals in technogenic contaminated soils. Despite some advantages, phytoremediation has not yet become commercially available technology. Progress in this area is hampered by lack of understanding of complex interactions in the rhizosphere of plants and mechanism that enable translocation of metals and their accumulation in plants. For further increase of effectiveness of phytoremediation, there is a necessity to improve the knowledge about the processes, such as the presence of pollution, especially rhizosphere layer, absorption of contaminants, translocation, poisoning, degradation and evaporation (Vinita 2007; Pilon-Smits; 2005, & Elizabeth et al., 2006). On the other hand, many research shows that a number of plants have the genetic potential to remove many toxic metals from soil (Lasat, 2002). In (Sawatsky, 1997), it has been studied the movement of water that plays a main role in phytoremediation processes in petroleum contaminated soils. It has been clear from the research that, there is critical soil moisture

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about 20%, but when this indicator is higher than this value sorption processes in oil-polluted soil approaches to similar processes in purified soil. It has been established by researches that there is a critical soil moisture around 20% s, under this value sorption processes in oil-polluted soil approaches to similar processes in the treated soil.

In Pena-Castro et al. (2006), it has been indicated that the presence of petroleum contaminants in soils is a disadvantage for the growth of plants. Here, the main thing is that in these conditions the plant is growing under the stress of inserted organic contaminants. However, there is not much information about the molecular mechanisms underlying at the basis of adaptation to this stress. In this paper we studied the plants, *Cynodon Dactylon* grown under oil stress. Here, toxic concentration of oil was $(5,5 \pm 1,1) \%$.

In Macek et al. (2000), it is discussed the possibility of injection of alien genes into plant genes that can increase the speed of the bioremediation process. Thus it has been studied various aspects of metabolism in plant cells, the role of enzymes involved in the process and interaction with rhizosphere microorganisms, accelerating recovery processes. In (Duruibe et al., 2007), it was studied emerging risks of heavy metals for human health within bio toxic effects. Caney et al. (2005) indicated that subsistence farmers eating rice grain grown on contaminated sites throughout their lifetime are at risk from dietary exposure to cadmium. With greater awareness by the governments and the public of the implications of degraded environment on human and animal health, there has been increasing interest amongst the scientific community in the development of technologies to remediate contaminated sites.

Maize is grown in all parts of the country, though it is grown slightly more in the savannah belt of the country. About 50 species exist and consist of different colors, textures and grain shapes and sizes. White, yellow and red are the most common types. Maize is capable of continuous phytoextraction of metals from contaminated soils by translocating them from roots to shoots (Nascimento et al., 2006). The maize plant has been even shown to accumulate certain heavy metals such as Cd (Kimenyu et al., 2009) and Pb (Pereira et al., 2007) above levels that define metal hyper accumulation. Based on its capability of heavy metal uptake and sensitivity to high metal pollution, Máthé-Gáspár and Anton (Mathe-Gaspar et al., 2005) have grouped maize as an accumulator and a metal tolerant plant especially for Cd and Zn.

On the other hand, in the frame of use in phytoremediation technology of cacti has been attracted much attention as a biological indicator of the environment. The most basic kind of family of cacti is *Opuntia* due to the fact that this plant has no system leaves, it evaporates very small amount of water and this ability allows it to survive in very rigorous environments. The unique properties of the plant of *Opuntia* are that it can collect in their internal organs of water from the environment and this property allows it to act as a biological indicator which determines the degree of deviation from the ecological balance of the environment. With this plant we can determine the degree of purification from contaminants of soil, water and air. At the same time the plant of *Opuntia* has the property of absorbing and neutralizing contaminants (Barrera et al., 2009; Milner, 2004).

There is also particular interest to the plant of *Rosmarinus officinalis* L. for using it in phytoremediation processes. This plant in the natural form is common in Mediterranean countries. There is a bushy evergreen plant with a typical height of 1.5-2 meters. Rosemary is very resistant to drought and salinization of soil. It doesn't withstand low temperatures and frost very much. It doesn't like strong moisture. When cutting branches it acquires the desired shape and retains this form for a long time. Rosemary is rich with essential oils and used in perfumery in producing bakery products. Simultaneously Rosemary is used for strengthening the soil surface and in greenery planting. It is widely used in parks and boulevards of the Absheron Peninsula. (Rosemary et al., 2014; *Oregano*, rosemary extracts promise omega-3 preservation, 2007; Barbut et al., 1985).

Method

For conducting study, it was selected technogenic contaminated zone in the village of Gala, Absheron Peninsula of Azerbaijan. For planting seedlings of *Rosmarinus officinalis* L in this area, it has been selected separate part in size of 10 m × 10 m; as well planting chilik. A separate section in the same size was also selected for *Opuntia Vulgaris* Mill (section №2). The distance between sites was equal to 25-30 meters. Certain parts of our view will allow investigating the effect of transport of heavy metals from technogenic contaminated soil to both plants in more optimal way. On the other hand, in comparison with the size of selected technogenic contaminated area, both sites were selected as close as possible to each other, in order both parts of the soil climatic conditions to be practically the same. It should be noted that, dry climate of moderately warm temperate semi-desert and dry steppe is characterized for the Absheron Peninsula. The total solar radiation is 130-135 kcal

/ cm² per year. The main part of the total radiation (86-90 kcal / cm²) is applied during the warm half of the year. The average annual temperature is 13,5-13,7 °C.

A characteristic feature of the selected area (village Gala, Absheron Peninsula) is that, except technologically-anthropogenic effects on soil, there is contaminated sediments of oilfield wastewater and weak oil pollution. Some characteristics of the soil of the zone are shown in Table 1.

Table 1. Some indicators of contaminated soils

The depth taken from the soil sample (cm)	Hygroscopic moisture (%)	pH	CO ₂ (%)
0-10	2,85	7,9	10,13
10-31	3,78	8,6	9,56
31-51	3,6	8,7	8,54
51-88	3,75	8,6	7,92
88-150	4,01	8,5	7,97

It was seen from table 1 that, the characteristic feature of oil-contaminated soils is also a high pH in the upper soil horizons (8,8-9,4). These high indicators of pH in contaminated sections are not reduced in entire soil profile. Such strong basic conditions are explained by the presence of oil and alkalinity of drilling water, impregnating the whole soil profile. Acidity of pure soil varies within 7,9-8,2.

It is pertinent to note that the mobility of heavy metals in soil and their flow into the plant is very variable and depends on many factors: the type of plant, soil and climatic conditions. The concentration of heavy metals in plants depends on the age of the plants and strongly varies in different organs.

Soil shows its buffering properties, by transferring the water-soluble metal compounds to sparingly soluble form and sparingly soluble to more mobile, e.i. traced convergence of included compounds of elements and their conversion to compounds, characteristic of soil of particular composition and properties. However, the buffering capacity of the soil is not unlimited, and the amount of those compounds in which they enter the soil and then into plants is gradually increased with increasing exogenous concentrations of metal.

In the specific soil and climatic conditions of the region and the presence of certain type of vegetation of availability of heavy metals is determined by the properties of soil, a change that can significantly affect the accumulation of heavy metals in plant products. Heavy metals are the most mobile in the humus-poor acid soils of light granulometric composition with a low capacity of cation exchange and low buffer.

For the measurement of concentration of heavy metals in soil of both sites, locations of two sections were randomly selected (four sections in total). Sections were made up to a depth of 20 cm. With the help of transportable roentgen-fluorescence XRF spectrometer the concentration of heavy metals was measured in the vertical direction of three points: at a depth of 0-5cm; 10-15 cm; 15-20cm. The results of measurement are shown in Table 2 (the data are averaged over two sections of each site).

Table 2. The concentration of heavy metals in soil

Sections Heavy Metals	Concentration (mg/kg)					
	Section № 1 Depth (cm)			Section № 2 Depth (cm)		
	(0-5)	(10-15)	(15-20)	(0-5)	(10-15)	(15-20)
Cd	2,27	1,35	1,12	2,36	1,22	0,97
Pb	9,58	8,12	7,61	9,31	8,07	8,11
Zn	60,28	52,26	50,05	58,17	51,17	49,11
Ni	31,76	28,63	27,54	29,61	28,62	28,08
Co	4,60	5,42	5,53	4,71	5,46	5,62
Mn	39,76	43,65	45,84	37,15	42,37	46,57

* It should be noted that, Cd- includes in I risk group; Pb- includes in II risk group; Zn and Ni include in III risk group; Co and Mn include in the groups of less danger.

10 seeding of *Rosmarinus officinalis* L. and 10 Chilik of *Opuntia Vulgaris* Mill was transferred from ecologically clean areas to these contaminated sites and was planted. The concentration of heavy metals was measured with the help of roentgen-fluorescent spectrometer of XRF samples of plants (plantlets and chilik) before planting them in contaminated areas. Results of control measurements are given in Table 3. Observation

of the plants lasted for 6 months. During this period, the survival of plants was analyzed in technogenic contaminated sites. From planted Chilik of *Opuntia Vulgaris* Mill plant survived only 6 plants (60% survival), but from planted seedlings of the *Rosmarinus officinalis* L. plant survived only 4 (40% survival). This fact demonstrates the relative stability of the *Opuntia Vulgaris* Mill plant to technogenic contaminants in relation to *Rosmarinus officinalis* L. Exactly 6 months after planting, it was measured the concentration of heavy metals of surviving samples of these plants. For this purpose, three samples were taken from 6 surviving *Opuntia Vulgaris* Mill and 3 samples from 4 survivors *Rosmarinus officinalis* L. and the results of measurement of the concentrations of heavy metals were averaged over three samples for each plant. Technology of manufacturing plant samples was as follows: plants were separated neat way from soils with root systems, then the root systems of plants have been thoroughly washed and dried. Then the plants with their roots were grinded and transferred to a separate vessel until homogenous properties (see. Table 3).

Table 3. The concentration of heavy metals in plant samples (mg / kg)

Heavy Metals Plants	The concentration of heavy metals in plant samples (mg / kg)											
	Cd		Pb		Zn		Ni		Co		Mn	
	1	2	1	2	1	2	1	2	1	2	1	2
<i>Opuntia Vulgaris</i> Mill	LOD	,86	LOD	,69	,21	0,61	,37	8,69	,28	,74	,33	7,65
<i>Rosmarinus officinalis</i> L.	LOD	,92	LOD	,38	,36	3,26	,11	7,86	,19	,83	,64	4,21

Note: 1- control measurement; 2-measurement in the samples, after 6 months

Results and Discussion

Observation of planted plants in the technogenic contaminated sites has shown that "survival effect" (resistance to technogenic contaminants in *Opuntia Vulgaris* Mill plants in relation to the *Rosmarinus officinalis* L. plant) is more than 1.5 times. This is explained by the fact that the plant has a catchment *Opuntia* property and very resistant to aridity, high temperature and salinity. This is explained by the fact that the plant of *Opuntia* has a catchment property and it is very resistant to aridity, high temperature and salinity.

The concentration and distribution of selected heavy metals at depth is almost the same for two contaminated sites. This fact is explained by that in order to achieve identity of external influencing factors, two contaminated sites were chosen optimally close to each other (the distance between the two sites is equal to 25-30 m). The optimal distance between two technologically contaminated sites is conditioned by the fact that it is possible to trace the effect of transport of heavy metals from contaminated soil to both plants independently.

As seen from Table 2 the concentration of Cd, Pb, Zn, Ni, Co changed in the direction of decreasing from top to bottom along the vertical direction. Only Mn concentration increased with the increase of depth. Comparative analysis of table 2 and 3 has showed that the effect of transport of Cd which includes in I risk group for *Opuntia Vulgaris* Mill plant was 81, 94%. The effect of transport of heavy metal to the plant is calculated by the following formula:

$$EF_{TR} = \left[\frac{C_{cd}^{Op} - C_{cd}^{(Op)}}{C_{cd}^{(1)}} \right] * 100\% \quad (1)$$

Where EF_{TR} - effect of transport of heavy metals from contaminated soil to the plant measured in percentages;
 $C_{cd}^{(1)}$ - Cd concentration in the contaminated soil measured in units of mg / kg at depth of (0-5 cm).
 $C_{cd}^{(Op)}$ - The concentration of Cd in samples of plants of *Opuntia Vulgaris* Mill after 6 months of planting;
 $C_{o,cd}^{(op)}$ - The concentration of Cd in samples of plants of *Opuntia Vulgaris* Mill before planting the plants (control measurement)

"The effect of transport" for other heavy metals from contaminated soil to both plants has been calculated using the same formula (1). The results of calculations of «the effect of transport» of heavy metal are demonstrated in Table 4.

Table 4. The effect of transport of heavy metals from contaminated soil to plants calculated in percentages (%)

Plant	"The effect of transport" of heavy metals from contaminated soil to plants calculated in percentages (%)					
	Cd	Pb	Zn	Ni	Co	Mn
<i>Opuntia Vulgaris</i> Mill	81,94	58,35	76,97	70,27	53,48	41,68
<i>Rosmarinus officinalis</i> L.	38,98	36,31	68,59	43,06	34,82	44,57

Conclusion

As it is shown in Table 4, "effect of transport" of these heavy metals from technogenic contaminated soil to the plants is expressed more clearly for *Opuntia Vulgaris* Mill than *Rosmarinus officinalis* L. If averaging "effect of transport" for these heavy metals in both plants, it will turn out that observed "effect" is stronger 1,44 times in the plants of *Opuntia Vulgaris* Mill than in the plants of *Rosmarinus officinalis* L. This fact is explained by the physiological characteristics of the plant of *Opuntia*. In this work it was studied the effect of a number of transport of heavy metals from technogenic contaminated soils to plants of *Opuntia Vulgaris* Mill and *Rosmarinus officinalis* L.

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

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Forest Erosion of the Hirkan Talish Mountains, Application of Flora and Erosion Resistant Varieties

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Abstract: In the article information is given about forest erosion in some parts of Hirkan mountainous areas and prevention measures of it. The purpose in investigation is studying the causes of erosion, bioecological characteristics of trees and bushes, effects of climate factors. During the study, the Hirkan plant reservoir, soil types were studied, the consequences of the global ecological erosion processes, the criteria for impact on the plant gene pool were studied, the forest cover was monitored by DJI Phantom 4 DRON from 30-400 m and GPS was used to determine the exact coordinates. There has been a partial thinning in the Talish-Hirkan National Park, and changes were observed in the areas compared to previous years. The reasons for the shrinkage of plant habitats have been identified, and research has been conducted on hazard criteria, biological characteristics, and causes of changes in natural resources in accordance with IUCN version 3.1. Land use in the Talish-Hirkan area has been studied over the years, as well as ways to prevent the growth of erosion. The results of anthropogenic impact, measures taken to maintain the balance, the work done at the state level are reflected in the article. The aim was to choose sustainable species during the ameliorative works in the process of erosion. The use of such species as *Quercus* L., *Fagus* L., *Pinus* L., *Fraxinus* L., *Robinia pseudoacacia*, *Popus* L. and its constituent species in forest regeneration has been considered expedient.

Keywords: Forest, Erosion, Lankaran, Talish, Mountains

Introduction

Compared to other regions of the world, our republic is less forested. Only 10% of the total area is covered with forest. Due to its physical and geographical conditions, Talish region differs significantly from other natural regions of Azerbaijan. This is the only humid subtropical region in the republic. Due to orographic and ecological conditions, the region is usually divided into 2 areas, separate sub-districts - mountain-forest and Lankaran plain. Due to climatic conditions, this region is again divided into two sub-districts: lowland and mountainous. Talish ecological-economic region includes 6 administrative districts: Astara, Lankaran, Masalli,

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Lerik, Yardimli and Jalilabad districts. The total area of the region is 496.0 thousand hectares, including the area used in agriculture is 152.4 thousand hectares (1/3 of the land area) (Amirov, 2003).

A distinctive feature of this region is that from October to May, sufficient rainfall is provided, and in hot weather, drought and low humidity prevail (Amirov, 2003). Talish region has different soils and vegetation. Here the plants are selected in a unique way on the vertical belt.



Figure 1. Consequences of erosion

Its vegetation consists of plants of the third period, preserved in accordance with its past and to this day. From *Parrotia persica* (DC.) C.A.Mey to *Quercus castaneifolia* C.A.Mey. and *Carpinus* L. plain forests move to the lower mountain-forest belt due to the elevation of the land. *Zelkova* Spach., *Albizia julibrissin* Durazz. and *Diospyros kaki* are also mixed. While ascending the mountains, the forests are dominated by *Fagus* L., mostly *Quercus castaneifolia* and *Quercus macranthera* Fisch. Other species also mix with forests: *Acer* L., *Popus* L., *Crataegus* Tourn.ex L., *Mespilus* L. and others. The vegetation of Talish (including forest plants) is reminiscent of a huge natural museum of the republic, and is dominated by relict species. Green treasure of Azerbaijan presents ten classic relict trees that typify the Hyrcanian Forest. The fossil records attest to the fact that the Hircanian Forest is a descendant of forest communities that were widespread throughout the northern hemisphere during the Miocene, a geological era between 23 and 5.3 million years before present but whose range significantly retreated during the climate change that occurred during the Pleistocene (Mammadov, 2007). Despite fluctuations over the first millions of years and a gradual but constant cooling trend, the global climate during the Miocene was notably warmer than today. For this reason, North America and Eurasia were covered well into their northern regions by warm temperate vegetation. The Pleistocene finally brought on another but more distinctive cooling period leading to the ice ages of the final two million years, in which not only the cold but also increasing drought played a key role in forcing back the distribution of the Miocene forest vegetation.

The main characteristic of the world's use of land resources in the last millennium is the increase in arable land due to the growing demand for food. As can be seen from Table 1, the area of land in the world has changed very little within each major region, and the area of forests has decreased.

Table 1. Forest area change over the years

Year	1700	1850	1920	1950	1980	1985	2000
Forest	62	60	57	54	50		
Pasture	68	68	67	67	68		
Plantation	3	5	9	12	15	15	15,4
Total	133	133	133	133	133		

Distinguished by favorable subtropical climate and fertile soil conditions, Lankaran lowland has allowed dense population. Plowed lands make up 11.0% of the total area of the region, and the area under pastures is 15.7%. Irrigated lands cover 12% of agricultural lands. Deforestation has occurred in some areas of the lowland, which is used as a habitat. In these forests, especially in the lowlands, hirkan-relict tree species (chestnut-leaved oak,

ironwood, azat, silk acacia, etc.) have been developed. Deforestation has occurred in some areas of the lowland, which is used as a habitat (Kaper, 1985).

As a result of anthropogenic impacts on nature in the Talysh region, the following changes are not allowed in the ecosystem:

1. Soil erosion develops due to plowing and deforestation. About half of the region's territory is subject to water erosion. 64.4 thousand hectares of them are strongly eroded lands.
2. Contamination of soils with chlorinated pesticides and heavy metals, accumulation of lead, nickel, zinc, etc. is several times more than the world quark.
3. Use of construction industry products, soil pollution (Amirov, 2003).

In different elements and shapes of the relief, the thickness of the soils and their exposure to erosion vary. In the 100 m wide (from Jalilabad to Astara region) forest strip in the lowland, only chestnut-leaved oak, mainly evergreen (cypress) and deciduous (pecan, oak, catalpa, etc.) trees along the main road, village roads and field protection forest strips. was used. Water canals were built from the Khanbulanchay reservoir to irrigate citrus fields. Thus, the natural landscape of the Lankaran lowland has changed radically. Poor soil washing and irrigation erosion are widespread in the south of the country - in Lankaran, in the basin of the Araz River (lowland along the Araz). Due to the low slope of the surface, the erosion process is weak here. In the Arkhangelsk and coastal areas, the slope of the surface is 30 and sometimes 50, so the washing of the soil is severe, and as a result, the formation of ravines is observed. Heavy washing of the soil surface is observed in the upper mountainous part of Lankaran. Eroded soils are rare in the areas close to the Hirkan forests in Talysh province. The physical properties of the soils here are more or less good, there are few stones, so the conditions for afforestation are relatively favorable (Amirov, 2003).

Compared to all other types of soil degradation, the most harmful is soil erosion. It makes the soil inactive in the true sense: it deprives the soil of a fertile upper humus horizon. Sour soils can be neutralized, saline soils can be desalinated, saline soils can be desalinated, and hard soils can be softened. However, it is impossible to restore eroded soil and turn it into non-eroded soil. The main reason for the formation and development of soil erosion is agriculture. Due to human activities, the use of slopes under agricultural crops, intensive grazing of pastures and meadows, destruction of forests, plowing along the slopes intensifies the process of erosion. As a result of the development of the process of surface erosion on the slopes, soil fertility decreases, the productivity of agricultural crops decreases. During the erosion process, the topsoil is sometimes completely washed away. Soil erosion is a major disaster worldwide. Although various measures have been taken to prevent it, no results have been achieved. However, it is easier to prevent the erosion process than to fight it and eliminate its consequences (Zaitsev, 1981).

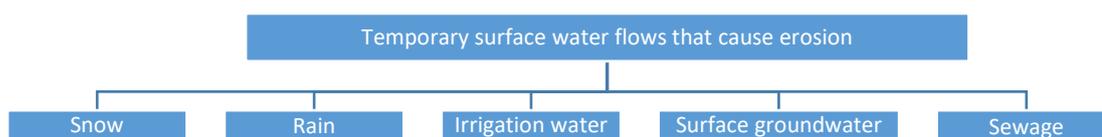


Figure 2. Causes of erosion

Method

Fertile soils from washing in the prevention, minimization of flood, wind and drought protection of arable lands is of exceptional importance to forests. High humidity in the forest is always noticeable. To form the umbrella, trees block the sun's rays and protect it from strong winds. As a result, a favorable living environment for the life of forest plants and animals are raised, under the umbrella of the tree seeds are rapidly developing. Thus, there is a forest ecosystem. Forest ecosystems are closely connected with each other all the components that are included (Beideman, 1960). Discovering fruits and seeds spread by consuming seeds long distances are involved. The development of wood fungi depends on trees. Dried trees, branches and stem decay fungi that affect mineral absorption into the soil helps. The interaction between the various components of the forest for many years formed. Came from a microclimate, there is dense vegetation. Infused with all natural processes of forest self-regulation. The arid climate plays a key role in the forest-meadow landscape structure of the plains.



Figure 3. Erosion Ravines

Table 2. Determination of coefficients distributed in connection with soil erosion

Signs of the soil	Soil name and correction factors			
	Mountain-meadow	Mountain black	Wild mountain-brown	Mountain-gray-brown (chestnut)
Erosion	1	2	3	4
Damaged	1,00	1,00	1,00	1,00
Slightly damaged	0,84	0,82	0,82	0,81
Moderately damaged	0,71	0,68	0,69	0,75
Badly damaged	0,49	0,50	0,53	0,60

Lankaran lowland in the north-east slopes of the mountainous areas in order to prevent the collapse of lands from erosion and degradation processes, corrupt forest restoration and planting new forests urgent problems of the time. The time taken to curb the growth of forests, erosion, severe ecological disasters, erosion processes, expansion, growth of gray areas, mountainous areas, floods and landslides, avalanches, there will be the danger of drying up of springs and rivers. In these areas, particularly in low-lying areas of the few non-wooded forests, protective forests and forest several times the amount of restoration and large-scale studies are being carried out in order to reconstruct. That should be considered to be increasingly limited areas of forests and large-scale logging operations in these areas because decreasing erosion threatens the forest.

Results and Discussion

Deforestation, erosion and collapse of slopes, unsystematic cattle grazing, drought, the cultivation of agricultural crops and natural vegetation areas, and other factors resulted in damages to climate. The above-mentioned factors dramatically affect the vegetation of the area. Reforestation began after 1930 and they were important in increasing forest resources, *Quercus L.*, *Fagus L.*, *Pinus L.*, *Fraxinus L.*, *Robinia pseudoacacia*, *Popus L.* and others played an important role in the cultivation of productive tree species. Without detailing the results of the *Robinia pseudoacacia* growth study, it can be shown that white acacia is a fast-growing species that adapts quickly to the environment and grows well in rocky and dry soils and rocky river valleys that were eroded in the early years. Therefore, it is promising to cultivate plantations for short-term use of this species. *Pinus L.* is a genus that does not require soil fertility, it is drought tolerant. Therefore, it is of great importance in afforestation and landscaping of eroded soils. In Azerbaijan, this problem is very actual, so here the forest areas are so few, the reserve of the soil areas that will be given to the forest production is limited. In our forests, 150 species of feral fruit plants of 1536 species are available. There are thousand tons (walnuts, apples, pears, dogwoods, hawthorn, medlar, hazelnuts, pistachios, dates, blackberries etc.) of feral fruit products in these plants. 30 percent of these fruits have significance as consumption products.

Table 3. Degree of soil erosion in the Talish region

Administrative districts	Total area (hectares)	Not subject to erosion	Weakly eroded	Eroded soils	Strongly eroded soils
Jalilabad	144536	105836	15683	14405	8612
Astara	61643	52963	2850	2540	3290
Lankaran	153941	126721	9525	966	8031
Lerik	135172	67227	24123	14620	19202
Masalli	72097	55610	8340	5332	2815
Yardimli	70622	25385	9441	13290	25506
	638011	433742	69962	69851	64456
	100	67,98	10,92	10,94	10,10

Table 4. The Hirkan plant reservoir taxa

Species:	
Latin	Latin
<i>Malus baccata</i> (L.) Borkh.	<i>Pyrus hyrcana</i> Fed.
<i>Malus orientalis</i> Uglifzk.	<i>Prunus divaricata</i> ledeb.
<i>Malus sylvestris</i> Mill.	<i>Prunus spinosa</i> L.
<i>Malus micromalus</i> Mak.	<i>Ulmus parvifolia</i> Jacq.Schneid.
<i>Mespilus germanica</i> L.	<i>Capparis spinosa</i> L.
<i>Rosa iberica</i> Sieb.	<i>Ligustrum vulgare</i> L.
<i>Rosa canina</i> L.	<i>Fraxinus excelsior</i> L.
<i>Rosa multiflora</i> Thunb.	<i>Fraxinus lanceolata</i> Borkh.
<i>Rosa banksiae</i> R. Br.	<i>Fraxinus ornus</i> L.
<i>Rosa karcagi</i> Sosn.	<i>Fraxinus oxycarpa</i> Willd.
<i>Rosa kazarcanii</i> Sosn.	<i>Syringa vulgaris</i> L.
<i>Rosa spinosissima</i> L.	<i>Rhamnus alaternus</i> L.
<i>Rosa tschatyrdagi</i> Chrshan.	<i>Paliurus spina-christii</i> Mill.
<i>Rosa hraciziana</i> S.Tamamsch	<i>Salix caprea</i> L.
<i>Rubus idaeus</i> L.	<i>Salix babylonica</i> L.
<i>Rubus buschii</i> (Rozan.) Chrshan.	<i>Salix acutifolia</i> Willd.
<i>Rubus caesicus</i> L.	<i>Smilax excelsa</i>
<i>Rubus caucasicus</i> Fojke.	<i>Populus hybrida</i> M. B.
<i>Rubus hyrcanus</i> Juss.	<i>Danae racemosa</i> (L.) Moench.
<i>Rubus odoratus</i> L.	<i>Ruscus hyrcanus</i> G.Woron
<i>Rubus sanguineus</i> Friv.	<i>Sambucus nigra</i>
<i>Sorbus discolor</i> (Maxim.) Hedl.	<i>Acacia dealbata</i> Link.
<i>Pyracantha coccinea</i> M. Roem.	<i>Acacia melanoxylon</i> R. Br.
<i>Pyracantha angustifolia</i> Franch.	<i>Amorpha fruticosa</i> L.
<i>Pyracantha fortuneana</i> (Maxim.) L.	<i>Colutea arborescens</i> L.
<i>Crataegus monogyna</i> Jacq.	<i>Colutea caucasica</i> Boiss. et Huet.
<i>Crataegus nigra</i> Waldst. et Kit.	<i>Colutea orientalis</i> Mill.
<i>Crataegus caucasica</i> C.Koch.	<i>Berberis vulgaris</i> L.
<i>Crataegus kyrtostyla</i> Fingerh.	<i>Catalpa bignonioides</i> Walt.
<i>Crataegus lagenaria</i> Fisch. et Mey.	<i>Pinus kochiana</i> Klotzsch ex C. Koch.
<i>Crataegus orientalis</i> Ball.	<i>Juniperus communis</i> L.
<i>Cydonia oblonga</i> Mill.	<i>Euonymus latifolia</i> (L.) Mill.
<i>Armeniaca vulgaris</i> Lam.	<i>Quercus castaneifolia</i> C.A.Mey.
<i>Cerasus avium</i> (L.) Moench.	<i>Cotinus coggygria</i> Scop.
<i>Cerasus mahaleb</i> (L.) Mill.	<i>Ficus carica</i> L.
<i>Cerasus austera</i> (L.) Roem.	<i>Ficus hyrcana</i> A. Grossh
<i>Cerasus incana</i> (Pall.) Spach.	<i>Acca sellowiana</i> Berg.
<i>Cerasus vulgaris</i> Mill.	<i>Ephedra equisetina</i> Bunge.
<i>Cerasus microcarpa</i> (C.A.Mey) Boiss.	<i>Acer campestre</i> L.
<i>Cotoneaster melanocarpus</i> Load.	<i>Acer laetum</i> C.A.Mey
<i>Cotoneaster nitens</i> Rehd. et Wils.	<i>Alnus subcordata</i> C.A.Mey.
<i>Cotoneaster adpressus</i> Boiss.	<i>Alnus barbata</i> C.A.Mey.
<i>Cotoneaster divaricatus</i> Rehd. et Wils.	<i>Betula papyrifera</i> Marsh.

<i>Caprinus betulus</i> L.	<i>Ricinus communis</i> L.
<i>Carpinus macrocarpa</i> (C.maxima Mill.) H. Winkl.	<i>Philadelphus caucasicus</i> Koehne.
<i>Buxus microphylla</i> Sieb. et Zucc.	<i>Parrotia persica</i> (DC.) C.A. Mey.
<i>Buxus colchica</i> Pojark	<i>Aesculus hippocastanum</i> L.
<i>Buxus sempervirens</i> L.	<i>Platanus orientalis</i> L.
<i>Buxus hyrcana</i> Pojark	<i>Punica granatum</i> L.
<i>Gleditsia caspia</i> Desf.	<i>Solanum aviculare</i> Forst.
<i>Lonicera iberica</i> Bieb.	<i>Lycium chinense</i> Mill.
<i>Lonicera caucasica</i> Pall.	<i>Lycium horridum</i> Thumb.
<i>Celtis caucasica</i> Willd.	<i>Tilia cordata</i> Mill.
<i>Swida sanguinea</i> (Opiz) L.	<i>Tilia caucasica</i> Rupr.
<i>Cornus mas</i> L.	<i>Peganum harmala</i>
<i>Corylus avellana</i> L.	<i>Hydrangea macrophylla</i> DC.
<i>Artemisia abrotanum</i> Bess.	<i>Jasminum revolutum</i> Lindl.
<i>Artemisia arenaria</i> D.C.	<i>Ligustrum japonicum</i> Thunb.
<i>Artemisia dracunculul</i> L.	<i>Ligustrum chinensis</i> Lour.
<i>Artemisia baldhanorum</i> Krasch.	<i>Ligustrum ibota</i> Sieb. et Zucc.
<i>Artemisia vulgaris</i> L.	<i>Ligustrum lucidum</i> Ait.
<i>Santolina chamaecyparissus</i> L.	<i>Ligustrum vulgare</i> L.
<i>Santolina virens</i> Mill.	<i>Pinus pitsunda</i> Steve.
<i>Diospyros lotus</i> L.	<i>Pinus hamata</i> D.Sosn.
<i>Elaeagnus pungens</i> Thunb.	<i>Carya illinoensis</i> L.
<i>Elaeagnus argentea</i> Pursh.	<i>Fagus orientalis</i> Lipsky
<i>Hippophae rhamnoides</i> L.	<i>Juglans nigra</i> L.

Conclusion

Poor soil washing and irrigation erosion are widespread in the south of the country in Lankaran, in the massif. Due to the low slope of the surface of the Lankaran lowland, the erosion process is weak here. In the Caspian Sea and coastal areas, the slope of the surface is 30 and sometimes 50, so the washing of the soil is severe, resulting in the formation of ravines.

Each year more than one million seedlings of various species in these areas are grown. These species of deciduous and coniferous forests in Lankaran grown in areas facing severe ecological disasters. In order to combat soil erosion, a cultivation system is used without turning them, and deep plowing, intermittent plowing, plowing, splitting, etc. are carried out to prevent leaching, which can be used to keep and hold the falling precipitation.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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Obtaining Ozonated Hazelnut Oil and Determination of the Chemical and Physical Properties

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Abstract : Hazelnuts are an extremely important agricultural product in the world. In this study, for the first time, ozonized hazelnut oil was obtained in appropriate optimization and the use area of ozone was combined with an important product such as hazelnuts. For this purpose, natural hazelnut oil was obtained by cold pressing method (55-60 °C) without any refining and temperature exposure in this study. Natural hazelnut oil with hexan was obtained by adding hexan under the condition of natural hazelnut oil (50 °C, 1000 rpm, 24 hours). Ozonization was applied for 110 minutes in the flow of ozone gas at 7-8 flows. The physical and chemical properties of 5 different oil samples were determined in total. As a result, in parallel with the ozonization process; density, viscosity, peroxide value, moisture content increased, while iodine value naturally decreased. The fracture index, on the other hand, was almost no different. In parallel with the ozonization process, the concentration of vitamin E and insatiable fattyacids was also observed to decrease. In order for the shelf life to be long, extra vitamin E should be added to prevent the formation of radicals in ozone oil contents; storage conditions were found to be 4°C or lower.

Keywords: Ozonation process, Peroxide value, Iodine value, Vitamin E

Introduction

Hazelnut is the homeland of Anatolia, the first in the world hazelnut production and trade of Turkey was started. Turkey last 5 years 70% of world hazelnut production 'has a share. Subsequently, as the most important region in the world hazelnut production in Italy, it has come to America and Spain. Approximately 534 000 tonnes of annual production of 136,000 million tons, with exports of our country and provides income for 400 thousand million US dollars (Özdemir&Akıncı, 2004). Very similar to the chemical composition of olive oil (Zabaras & Gordon 2004) in hazelnut oil consumption is increasing in recent years. Hazelnut oil has a high amount (82-84%) comprises oleic acid. (López-Diez et al., 2003). Subsequently, linoleic (9-11%), palmitic (4%), stearic acid (1.5 to 2.3%) to come. The food in the house, hazelnut oil, for frying and salad are used instead of other vegetable oils (Alasalvar et al.,2003).

Ozone (O₃), was discovered in 19th century as inorganic gas which consist of three oxygen atoms (Paulesu et al., 1991). In the early 1950's, the United States began using ozonated oil as a disinfectant in wound cleanup. The ozone's solubility in water is 10 times higher than oxygen , dissolves rapidly in pure water and reacts instantly with organic and inorganic molecules dissolved in biological fluids (Lezcano et al., 2000 and Pai et al., 2004). Plants applying ozonated oils and obtaining one of the most commonly performed method of ozone treatment is easy. The most widely used at this point ozonated oil is olive oil. Ozonated olive oil is antiseptic and

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regenerative properties, thanks to the ozonide formation of acting more on long-term biological substances, the ozone solution is much more active (Uysal 2014).

Ozonated olive oil leaves the active oxygen penetrates the tissue thereby increases the blood flow in this area, activates metabolic processes, accelerates the granulation and epithelialization in pathological region. Ozone (O_3), which provide pure oxygen needs of the tissues and cells, is the most effective substance in nature that destroys germs and toxins. Ozonated olive oil and cream helps to soothe rapidly absorbed in the regions where the waist and knee pain. When applied to the face and neck tissue by stimulating the cells expand, it helps to remove wrinkles. Ozone treatment and biological activity of fat made in many academic studies available. (Bocci et al., 2009 and Valacchi et al., 2005)

For this purpose, in this study, ozonized hazelnut oil was obtained from hazelnut oil, as is the case with ozonated olive oil, which has a great use in the medical-cosmetic field and still has an important place in ozone treatments that continue to increase. In order to make a comparison, the same processes were applied to the natural hazelnut oil obtained by cold pressing in a similar way to olive oil without any refining and exposure to heat. Obtained ozonated oils; Physical and chemical analyzes were carried out.

MATERIAL AND METHODS

The Experimental Oils

For ozonation process, refined hazelnut oil, unrefined cold-pressed (50-60°C in press), hazelnut oil and by extraction (hexane, 50 ° C 'at 1000 rpm, 24 hours) was obtained un refined hazelnut oil. Natural hazelnut oils obtained from cold press were ozonated for 7-8 flow rates for 110 minutes and ozonated hazelnut oils were obtained under optimum conditions.

Physical Analyzes

Properties such as density, viscosity, refractive index and percent moisture content of ozonated hazelnut oil were studied as physical analyses. All of the samples physicial analysis results are shown as Table 1.

Table 1. Physical analysis results of samples

Samples	Density (g/ml,25 °C)	Viscosity (cpt,25 °C)	Refractive index(nD,20 °C)	% Humidity (105 °C)
3	0,914	65,00	1,470350	0,11
4	0,919	86,25	1,470270	0,38
1	0,916	86,88	1,469230	0,71
2	0,925	92,0	1,477132	1,35
5	0,917	64,50	1,468880	0,20

Samples were given to a syringe Anton Paar DMA 38 instrument. About three minutes until the point where the density of the fixed values were recorded of the totally 5 samples. Density measurement process 25 ° C were performed. Anton Paar Abbemut 350 insrument for determined of refractive index. Temperature 25 ° C stabilized in the system.

Brook field viscometer with small sample adapter using spindle No. 21, made 3 min. 30 sec. 6 measured at 80 rpm, on 6 Average results and measured viscosity with 30 ml volume for the samples. Mettler Toledo Halogen Moisture analyzer was used by meausrement of humidty. 105°C temperature setting device, the timer is set to 2 minutes. The sample pan is placed in a balanced way to put the sample into the device. After the device is reset balance added up to about one gram sample pan and spread on the analysis starts. The obtained value is stored in 2 minutes.

Chemical Analysis

For the chemical characterization of ozonated hazelnut oil, 2 different chemical analyzes that should be evaluated in oil samples were carried out. The measurement of both peroxide and iodine values was carried out with a different procedure and titrimetric method. Peroxide and iodine values are as shown in Table 2.

Table 2. Hazelnut oil values of peroxide and iodine

Samples	Peroxide Value (mEqO ₂ /kg)	Iodine Value
3	3.67	85,13
4	58.89	52,52
1	168,70	68,81
2	301,78	53,94
5	22.58	63,18

Conclusion

Ozonated oils obtained by different routes at different times in the same conditions, the samples were obtained. The obtained oil with of ozonized; physical and chemical were analyzed. As a result of ozonation, the double bonded fatty acids in the oil content were broken down. As can be seen from the values shown in Table 1, ozonation of double bonds significantly increased the density and increased the viscosity accordingly. While the density of refined, unozonated hazelnut oil was 0.914, the highest density value was found to be 0.925 in hexane ozonated hazelnut oil. While the viscosity of refined hazelnut oil was determined as 65.00, the highest viscosity value was recorded as 92 in ozonated hazelnut oil with boiler. Peroxide formation increased due to the active oxygen that occurred with ozonation, and the peroxide value was determined at very high levels as shown in Table 2. The most important value showing that ozonation has taken place is iodine. As shown in Table 2, the iodine value of all ozonated samples decreased. At the same time, the decrease in the iodine value indicates that the number of double bonds decreases.

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Phenology and Application of *Maclura Aurantiaca* Nutt Species in Absheron Conditions

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Abstract: Phenological observations at different phases of vegetation on the species *Maclura aurantiaca* Nutt. introduced in Absheron and cultivated in cultural conditions (beginning of new shoots, budding phase (beginning, end), flowering phase (beginning, mass, end), fruit and maturation), the directions of use of the species were studied. The species *Maclura aurantiaca* Nutt., belonging to the genus *Maclura*, which has a multifaceted economic significance, decorative features and resistance to environmental factors, is widely used in the protection of greenery (laying fences and protective forest strips) in the dry subtropical climate of Absheron. The fruits of mackerel are rich in alkaloids, glucosides, morin, rutin, flavonoids containing quercetin, sugar, pectin, protein, fat, resinous substances, organic acids, vitamin C. Vitamin C was also found in the leaves. In folk medicine, an ointment is prepared from the fruits of the orange macula for therapeutic purposes and is used in the treatment of some diseases (gout, salt diseases, rheumatic pains, ankylosis). The infusion of the fruit as a tea is used in hypertension, and the juice is used in various skin diseases.

Keywords: *Maclura aurantiaca* nutt., Absheron, Fruit, Juice, Phenology, Application

Introduction

In today's world, environmental protection is a pressing issue. Therefore, along with the development of the economy, raising the socio-cultural level of the population, the protection and rehabilitation of nature is always in the focus of the state. In solving such issues, it is important to improve the environment of residential areas and industrial enterprises, to build new recreation areas. In carrying out landscaping works, evergreen and deciduous trees and shrubs are widely used in accordance with local soil and climatic conditions, attracting attention with their decorative and exotic beauty. One of such plants is *Maclura aurantica* Nutt., which has a special place in the flora of Azerbaijan.

Named after the American naturalist Maclure, *Maclura* is known as a monkey apple, monkey bread. On the other hand, according to legend, when Adam wanted to eat this fruit, it remained in his throat, and therefore it was called "Adam's apple". The fruit is sometimes called a poisonous orange because it looks like an orange (Ibadli et al., 2009).

The fruits of mackerel are rich in alkaloids, glucosides, morin, rutin, flavonoids containing quercetin, sugar, pectin, protein, fat, resinous substances, organic acids, vitamin C (Gasimov et al., 2014). Vitamin C was also found in the leaves. In folk medicine, an ointment is prepared from the fruits of the orange macula for therapeutic purposes and is used in the treatment of some diseases (gout, salt diseases, rheumatic pains, ankylosis). The infusion of the fruit as a tea is used in hypertension, and the juice is used in various skin diseases. According to some sources, ointments made from the fruit have a good effect in the treatment of

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malignant tumors. The juice, fruits and seeds of mackerel have a bitter taste. However, in some cases it is used as food (leaves as food for silkworms). It is a long-lived, powerful plant that produces more oxygen. It can be considered a valuable dye plant.

It contains alkaloids, glycosites, sugars, organic acids, resinous substances, etc. is rich. Fruits are rich in vitamin C. It is widely used in folk medicine, orange mackerel has anti-carcinogenic and sclerotic effects, strengthens the immune system, cardiovascular system, relieves fatigue, has a beneficial effect on the liver and spleen. The leaves of these species are used for medicinal purposes. It is considered suitable for collecting and using the leaves when the diameter of the fruits on the tree is 5-6 cm. For treatment, the leaves of the species are collected, washed and chopped and pour water soaked in glass at a temperature of 60°C and keep for about 10-15 days. Then the leaves and water are taken in a ratio of 5: 1. The resulting solution is mixed with water in a ratio of 1: 2 and used. This solution is used for treatment of rheumatism, radiculitis, knee, back, bone, muscle, etc. used in pain. In addition, it is used externally for skin diseases - dermatitis, eczema, skin ulcers and wounds.

In folk medicine, an extract is made from the fruits of *Maclura aurantiaca* Nutt. for therapeutic purposes. To prepare the ore, clean, non-rotten fruits of the plant are collected and dried for 10-15 days in a dark, ventilated room at a temperature of 25-30°C. After drying, it is cut into 1-2 cm thick pieces, collected in a glass jar, 95% alcohol is poured on it, the lid is tightly closed and stored for 8-10 months. The resulting thickened, yellow solution is mixed with water in a ratio of 1: 2. The ore prepared by this method can be used in the treatment of diseases such as hypertension, joint diseases (salinity), fibroids, polyarthritis, mastopathy, gout, vascular occlusion, cerebral hemorrhage, etc.

The main goal is to study the possibility of using the species *Maclura aurantiaca* Nutt., belonging to the genus *Maclura*, which has a multidisciplinary economic significance, decorative features and durability of environmental factors in the protection of greenery in the dry subtropical climate of Absheron. The purpose of the study: to study the phenology and application of the species *Maclura aurantiaca* Nutt..

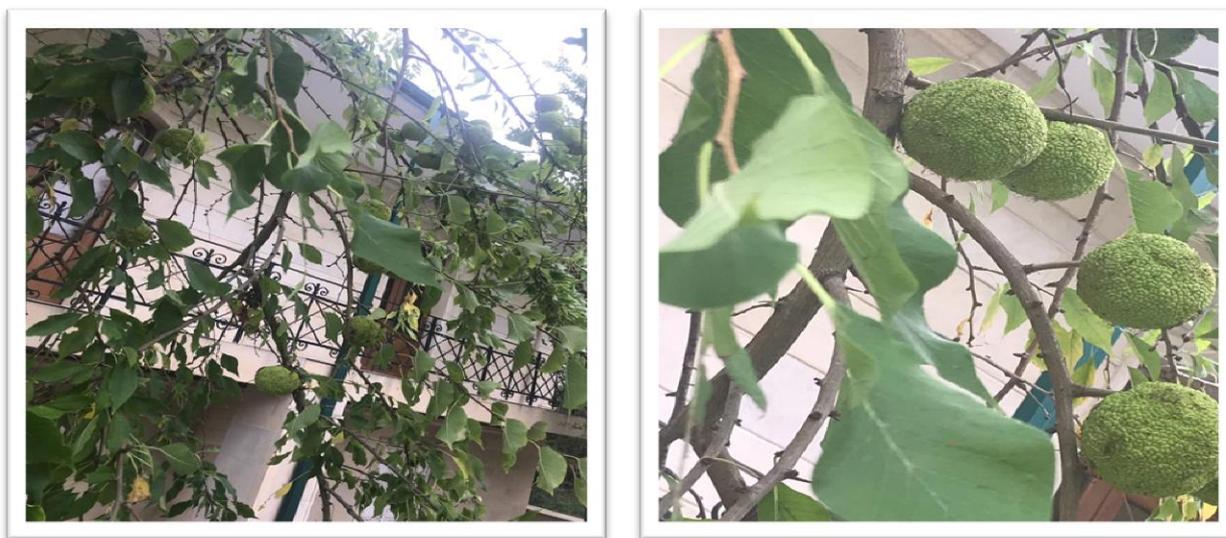


Figure 1. General view of *Maclura aurantiaca* Nutt

Method

The research was conducted in the experimental field of the Institute of Dendrology on the species Orange macula (*Maclura aurantiaca* Nutt.). In our study, the taxonomic composition of the orange mackerel species was referred to A. Engler-Prantl and the APG IV (Angiosperm Phylogeny Group IV) systems adopted in 2016. Phenological observations on the species under study were studied with reference to standard methods used in botanical gardens (Methods of phenological observations in botanical gardens of the USSR, 1979). During the observations, the beginning of the formation of new shoots, the phase of budding (beginning, end), the phase of flowering (beginning, mass, end), the formation and ripening of fruits, the end of vegetation were recorded. The revised scale of Iskandarov (1993) was used to determine the perspective of introduction of the studied species in cultural conditions.

Results and Discussion

Maclura aurantiaca Nutt. is a tree belonging to the genus *Moraceae Gaudich*, growing up to 15-20 m in height. Sometimes it is found in the form of a bush 2-3 m high. It is a dicotyledonous plant. Its population zone is North America, China. The orange mackerel was brought to Azerbaijan from Europe. It is widespread in Absheron and many regions of the republic, especially in the Kur-Araz plain. Its body is dark gray and has shallow cracks. Its umbrella is densely branched, spherical, growing up to 1 m. The leaves are arranged in a spiral on a branch, 5-10 cm long and 3.5 cm wide, the tip is scaly. In most cases, the shape of the leaf is ovate, and sometimes semicircular, scissor-shaped. The leaves are grayish-green on the upper side, covered with small hairs.

Flowering occurs in June-July. The stamens are greenish, in the form of earrings or balloons, and are located in a group of cluster flowers. The flowers also look like mulberry flowers and have a mulberry-like appearance between the leaves. The fruits ripen in October-November, weigh 300-400 grams, are located on the flower axis, golden-yellow, 10-15 cm in diameter, spherical. It is propagated by seeds, rootstocks, cuttings and pollinated by insects and wind.



Figure 2. Appearance of fruits and seeds of *Maclura aurantiaca* nutt. species

Phenological observations were made on the studied species at different phases of vegetation and the obtained indicators are reflected in Table 1.

Table 1. Phases of development of *Maclura aurantiaca* nutt. at different times of vegetation

Species	Budding	Flowering		Seed ripening	Vegetation period	The growth of the plant
		Beginning	Ending			
<i>Maclura aurantiaca</i> Nutt.	10.05.2021	20.05.2021	05.06.2021	25.09.2021	200-220	15-20

Phenological observations of the *Maclura aurantiaca* Nutt. species show that the vegetation period of this species in Absheron conditions lasts 200-220 days. Thus, in the open field, the budding phase lasts in May, the flowering phase lasts from May to June, and the fruit formation phase lasts from June to September. The fruits ripen in late September, after which a period of relative calm in their growth and development begins. It is a very powerful plant that produces oxygen. It is resistant to drought, cold, wind. It grows best in fertile soils. It lives up to 100 years. The fruits and leaves are very decorative in appearance and can be shaped well when pruned. It is used in the construction of fences and protective forest strips.

Conclusion

Maclura aurantiaca Nutt. is a very strong, long-lived plant. The composition of the fruits of this species is very rich, which allows it to be used in medicine for medicinal purposes. When branched, the tree can be shaped well. It is a valuable dye plant. As a result of scientific research, it became clear that the orange mackle type develops normally when provided with agro-technical care in the conditions of Absheron. Therefore, it is expedient to widely use the species *Maclura aurantiaca* Nutt., belonging to the genus *Maclura*, which has important economic diversity, decorative features and resistance to environmental factors, in the protection of greenery (laying fences and protective forest strips) in the dry subtropical climate of Absheron.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

Acknowledgements or Notes

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Biomorphological Properties, Phytochemical Composition and Medical Importance of the *Ocimum*.

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Abstract: At the Absheron Experimental Station (Bina settlement) of the Fruit and Tea Research Institute of the Ministry of Agriculture of the Republic of Azerbaijan, *Ocimum basilicum* L. - ordinary basil species belonging to the family *Lamiaceae* Lindl. were collected in accordance with standards in the laboratory. The biomorphological features of the species were studied, the phytochemical composition of the plants, the possibilities of its use in folk and scientific medicine were given a detailed explanation. *Ocimum basilicum* L. - solvents of different basil leaves and stems of ordinary basil were extracted by hexane and ethanol and their spectra were recorded by Hitachi U-2900 UV-VIS spectrophotometer. According to the results of the analysis, the leaves and stems of the species contain essential oil α -pinene, β pinene, carene 3, α -terpinene, 1.8 sieno 1 (eucalyptol), μ terpinene, terpinolen, cyclohexanone 5-m-2 (1-me) -cis, linaool, cariophyllen, terpinene-4-ol, citronellol, N, N di methyi acetamide, α -terpineol, camphene, myrtenol, nerol, geraniol, camphor, α -terpenilacetate, heranyl oleate, neril acetate, citron heranyl tiglate substances.

Keywords: *Alpha terpineol, Camphene, Camphor, Caryophyllene, Myrtenol*

Introduction

At the Absheron Experimental Station (Bina settlement) of the Fruit and Tea Research Institute of the Ministry of Agriculture of the Republic of Azerbaijan, *Ocimum basilicum* L. - ordinary basil species belonging to the family *Lamiaceae* Lindl. were collected in accordance with standards in the laboratory. The biomorphological features of the species were studied, the phytochemical composition, the possibilities of its use in folk and scientific medicine, its distribution in the world and in Azerbaijan were given a detailed explanation. Solvents of ordinary basil leaves and stems of different polarity were extracted by hexane and ethanol for 3 hours and their spectra were recorded by Hitachi U-2900 UV-VIS spectrophotometer. The main purpose of the study was to detect biologically active substances in *Ocimum basilicum* L. - common basil species.

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As for its use, it should be noted that basil leaf tea is used to strengthen the heart, increase the activity of the stomach and appetite. It improves metabolism in the body, it eliminates inflammation of the kidneys and urinary tract, it is very useful against bloating and it also revitalizes the skin and it has a soothing effect. Due to its sedative effect, it is used against neuroses, neurocirculatory dystonia, arterial hypertension and in the regulation of male sexual activity. In folk medicine, it is prescribed for tuberculosis, and in scientific medicine for stroke, convulsions, asthenia, gynecological diseases, flatulence, and skin rashes. Infusions and teas have a diuretic effect. The extract is used in the expulsion of nematodes and cestodes during helminthiasis, in the dyeing of wool and silk. In obstetric and gynecological practice, amenorrhea is useful as a diuretic in postpartum women. It is used as a spice in marinating vegetables and mushrooms. Essential oils are used in the perfumery, perfumed soap, cologne and eau de toilette, and the leaves are used in cooking to make sausages and surrogate teas. The extract of the leaves and flowers is useful for the treatment of malignant tumors, and they are used for making ointment against eczema. It has been shown that the antibacterial activity of lactic acid affects the interaction of bacteria. It dyes the wool orange-red. The fruits are useful for shortness of breath, vomiting and hiccups. The oil from the seeds is used in the varnish and painting industry.

Ocimum basilicum L., rich in microelements, is used as a vegetable among some peoples. This vegetable plant is used regularly in the spring, summer and autumn, as well as other vegetable crops. This plant is grown and is used in an indoor greenhouse during winter season. There is a difference in the chemical composition of *Ocimum basilicum* L. products grown in the greenhouse and *Ocimum basilicum* L. products grown in the open environment. To eliminate this difference, we obtained natural oil from this plant grown in the open field. Based on the latest results of our research, we recommend using this oil in the fall and winter by sprinkling 5-7 drops of pure oil on vegetables when using vegetables for eating.

Method

Solvents of different polarities prepared from its leaves and stems to detect biologically active substances in ordinary basil species were extracted for 3 hours by hexane and ethanol and their spectra were recorded by Hitachi U-2900 UV-VIS spectrophotometer. At the same time, the obtained oil analyzes were performed on "Crystal" 2000 M gas chromatography. Biomorphological features, phytochemical composition and perspectives of the use of ordinary basil plant were analyzed in detail.

In most countries of the world, basil is now grown from seed. The body is quadrangular, 20-60 cm high, the leaves are stalked, ovate, the edges are sparsely toothed, weakly hairy, the cup is 5 mm long, the fruits are bell-shaped, 12 mm long, the edges are short-haired, the hair is coarse. The flower crown is 6-8 mm, whitish-pink, the lower lip is intact and the upper lip is fringed (Alakbarov, 2014, 2017). Nuts are 2 mm, dotted. It blooms in August-September and bears fruit in September-October. Its homeland is Ceylon. This plant has been used in medicine and cuisine for more than 5,000 years.

In ancient times, people on the shores of the Mediterranean considered it a "king's fragrant plant". The word basil is of Arabic origin and means "beautiful smell". The Latin name of the plant means "fragrance worthy of kings". In ancient Rome, there was a belief that basil was revived when eaten, and in India, it was considered a sacred plant. Despite the fact that there are several types of basil, only ordinary types of basil are grown in our country. Ordinary basil has a fragrant and spicy property, reminiscent of cloves due to its pleasant smell. Basil is used both separately and in combination with other herbs and spices. Due to its aroma, it is not exposed to heat and is added to both hot and cold dishes. Dried basil keeps freshness in closed containers for 3-6 months, and fresh basil in the refrigerator for up to a week (Mehdieva, 2011 ; Alakbarov, 2014).

At the Absheron Experimental Station of the Fruit and Tea Research Institute of the Ministry of Agriculture of the Republic of Azerbaijan (Bina settlement), *Ocimum basilicum* L., a type of basil belonging to the genus *Ocimum* L., was grown and dried in accordance with standards in the collected laboratory conditions (Figure 1). The biomorphological features of the species have been studied, the phytochemical composition of the plant, the possibilities of its use in folk and scientific medicine have been given a detailed explanation (Sadiqov, 2011; Mehdiyeva, 2011).

Phytochemical composition: essential oil contains α -pinen, sienol (eucalyptol), μ terpinen, terpinolene, β pinen, carene 3, α -terpinen, linalool, caryophyllene, neryl acetate, geraniol, camphor and other substances (Ibadullaeva et al., 2014).



Figure 1. *Ocimum basilicum* L.

Results and Discussion

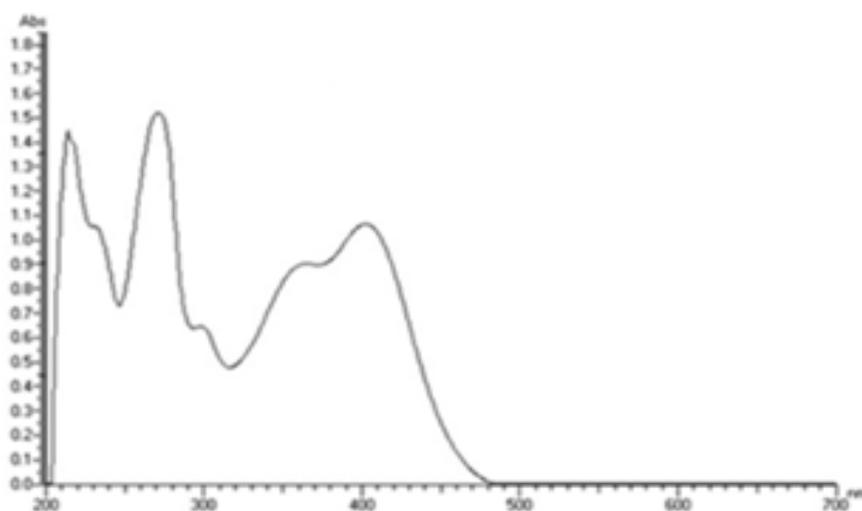
Basil is very important for health. The liquid extract made from the leaves of the plant increases the amount of prothrombin in the blood and accelerates blood clotting. In folk medicine, tea brewed from the fruits of basil is considered a natural remedy for chest pains caused by colds. The tea of basil leaves is drunk to strengthen the heart, and the infusion is drunk to increase the activity and appetite of the stomach. It improves metabolism in the body, eliminates inflammation of the kidneys and urinary tract, it has a positive anti-inflammatory effect. It also revitalizes the skin and has a calming effect. Due to its sedative effect, it is used in neuroses, neurocirculatory dystonia, arterial hypertension and in the regulation of male sexual activity. In folk medicine, it is prescribed for tuberculosis, and in scientific medicine for stroke, convulsions, asthenia, gynecological diseases, flatulence, and skin rashes. Its infusions and teas have a diuretic effect. The extract is used in the expulsion of nematodes and cestodes during helminthiasis, in the dyeing of wool and silk. It is used as an official medicinal plant in Austria, Denmark, Norway, Poland, the Czech Republic, Slovakia and France. In scientific medicine, the essence is a cough medicine, increases intestinal peristalsis, baths are antiseptic and it is general body strengthening. In practical medicine, in the complex treatment of diuretics, sedatives, anticonvulsants against malignant neoplasms, cholecystitis, dyskinesia, urticaria, enterocolitis, acute and chronic bronchitis, gargling, angina, gingivitis, skin diseases, diathesis, neurodermatitis, eczema, vitiligo disease, positive effects are determined during its use. It is useful in obstetric and gynecological practice as amenorrhea, dehydration, used in homoeopathy and hysteria. In Indian folk medicine, balms and ointments are prescribed for neuralgia, rheumatism, paralysis, paresis, dental and ear diseases. The infusion experimentally lowers blood pressure. It is used in veterinary medicine for intestinal atony, gastric and intestinal spasms in animals. It is used as a spice in marinating vegetables and mushrooms. Essential oils are used in the perfumery, perfumed soap, cologne and eau de toilette, and the leaves are used in cooking to make sausages and surrogate teas. The extract of the leaves and flowers is useful in the treatment of malignant tumors, and the ointment is useful in eczema. It has been shown that the antibacterial activity of lactic acid affects the interaction of bacteria. It dyes the wool orange-red. The fruits are very useful for shortness of breath, vomiting and hiccups. The oil from the seeds is used in the varnish and paint industry. The nectar yield as a honey plant is 100 kg/ha. The natural dry productivity of the surface mass is 10.8-135 g / m². It is an ornamental plant (Flora of Azerbaijan, 1957; Alakbarov, 2015). Ordinary basil was collected and dried by the standard method, the extract was prepared and analyzed.

The collected plant samples were dried using standard methods and prepared for laboratory research. Solvents of different polarities were extracted with hexane and ethanol for 3 hours and their spectra were recorded using a Hitachi U-2900 UV-VIS spectrophotometer, while other analyzes were performed on “Crystal 2000 M” gas chromatography. Results of the analysis are given in the Table 1. The detailed analyses are given in Figure. 3, Figure. 4.

Table 1. Chromatography results of *Ocimum basilicum* L.

Time, min	Component found	Area, %
8, 702	α-pinen	0,903%
9,441	β pinen	0,050%
9,721	carene 3	0,059%
10,265	α-terpinen	0,395%
10,425	1,8 dienol (eucalyptol)	1,387%
11,072	μ terpinen	0,313%
13,089	terpinolene	0,142%
13,883	cyclohexanone 5-m-2 (1-m e)-cis	0,153%
14,157	linalool	18,033%
14,589	caryophyllene	0,038%
15,037	terpinen-4-ol,	2,439%
15,303	citronellol	0,276%
15,645	N,N dimethylacetamide	0,764%
16,163	α- terpineol	1,664%
16,331	kamfen	0,559%
16,427	myrtenol	0,069%
16, 597	nerol	2,165%
16,737	geraniol	0,500%
17,009	camphor	0,138%
17,681	α- terpenilasetat	0,189%
18,186	heranyl oleate	0,045%
19,719	neril asetat	0,091%
20,843	geranyl tiglata	46,853%

Spectra of substances of ethanol extract from the leaves and stems of ordinary basil species were recorded at a wavelength of 200-700 nm by means of a Hitachi U-2900 UV-VIS spectrophotometer. Spectra obtained at 210-240 nm wavelengths were found to be characteristic of flavanols, 300-390 nm wavelengths for flavonoids, and 420-480 nm wavelengths for carotenoid pigments (Figure.2).



04.10.2021 Etanol+HCL
Ocimum basilicum L. - Adi reyhan

Figure 2. *Ocimum basilicum* L. - UV spectrum of ethanol extract

According to the results of the analysis of “Crystal” 2000 M gas chromatography, the essential oil contains 0.903% α -pinene, 0.050% β pinene, 0.059% carene 3, 0.395% α -terpine, 1.387% 1.8 sienol (eucalyptol), 0.313% μ terpine. , 0.142% terpinolen, 0.153% cyclohexanone 5-m-2 (1-me) -cis, 18.033% linaool, 0.038 cariophyllen, 2.439% terpinen-4-ol, 0.276% citronellol, 0.764% N, N di methyi acetamide, 1. % alpha terpineol, 0.559% camphene, 0.069% myrtenol, 2.165% nerol, 0.500% geraniol, 0.138% camphor, 0.189% alpha-terpene acetate, 0.045% heranyl oleate, 0.091% neryl acetate, 0.060% citronyll tiglata, 46%.

Отчет хроматограммы

Паспорт хроматограммы

Проект: _____
 Название метода: _____
 Дата и время: _____
 Анализ.Хроматограмма: _____
 Оператор: _____

попаме
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 05.10.2021 15:24:32
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Колонка:
 Проба: _____
 Метод расчета: _____
 Объем, мкл: _____
 Разведение: _____
 Источник: _____

гаулап
 Абсолютная градуировка
 1
 1

Расчет по компонентам

Время, мин	Компонент	Группа	Площадь	Высота	Площадь, %	Концентрация	Ед. концентрации	Детектор
8.061								
8.702	alfa-Pinen		809.784	216.850	0.903			ПИД-1
9.441	beta-Pinen		150.598	51.684	0.168			ПИД-1
9.721	Carene-3		44.518	9.585	0.050			ПИД-1
10.059			52.672	18.317	0.059			ПИД-1
10.265	alfa-Terpinen		19.324	7.640	0.022			ПИД-1
10.425	1,8-Cineol (Evcalıptol)		353.936	117.601	0.395			ПИД-1
10.671			1243.487	401.586	1.387			ПИД-1
10.747			292.277	99.669	0.326			ПИД-1
11.072	gamma-Terpinen		120.460	40.402	0.134			ПИД-1
11.200			281.061	93.533	0.313			ПИД-1
12.473			47.295	17.004	0.053			ПИД-1
12.804			8.391	3.963	0.009			ПИД-1
12.901			29.475	10.950	0.033			ПИД-1
13.089	Terpinolen		17.858	7.359	0.020			ПИД-1
13.311			127.379	39.580	0.142			ПИД-1
13.441			301.418	62.296	0.336			ПИД-1
13.595			67.891	23.196	0.076			ПИД-1
13.883	Cyclohexanone 5-m-2(1-m e)-cis		155.900	52.300	0.174			ПИД-1
14.157	linaool		136.999	40.354	0.153			ПИД-1
14.265			16169.566	4381.939	18.033			ПИД-1
14.409			105.674	31.970	0.118			ПИД-1
14.589	Cariophyllene		579.087	140.996	0.646			ПИД-1
14.700			33.700	11.919	0.038			ПИД-1
14.700			30.131	11.721	0.034			ПИД-1
14.919			3274.357	844.897	3.652			ПИД-1
15.037	Terpinen-4-ol		2187.408	637.608	2.439			ПИД-1
15.127			3326.626	885.384	3.710			ПИД-1
15.303	Citronellol		247.135	64.662	0.276			ПИД-1
15.415			50.052	16.579	0.056			ПИД-1
15.645	N,N di methyl acetamid		684.799	239.194	0.764			ПИД-1
15.763			29.616	9.873	0.033			ПИД-1
15.987			1372.702	417.410	1.531			ПИД-1
16.163	alfa-terpineol		1492.334	434.937	1.664			ПИД-1
16.331	kamfen		501.499	137.466	0.559			ПИД-1
16.427	mirtenol		62.242	20.425	0.069			ПИД-1
16.597	Nerol		1940.840	501.803	2.165			ПИД-1
16.737	geraniol		448.412	97.105	0.500			ПИД-1
17.009	camphor		123.702	41.666	0.138			ПИД-1
17.131			1806.473	549.424	2.015			ПИД-1
17.461			25.068	9.679	0.028			ПИД-1
17.661	alfa-Terpenilacetat		169.130	54.635	0.189			ПИД-1
17.877			18.945	7.700	0.021			ПИД-1
17.953			93.463	31.067	0.104			ПИД-1
18.186	Geranyl Oleate		40.270	12.298	0.045			ПИД-1
18.677			14.864	5.415	0.017			ПИД-1
19.179			53.209	17.262	0.059			ПИД-1
19.295			3988.888	1056.136	4.449			ПИД-1
19.719	neril acetat		81.740	21.501	0.091			ПИД-1
19.847			167.797	47.931	0.187			ПИД-1
19.924	citronellyl tiglata		53.932	17.065	0.060			ПИД-1
20.569			541.078	124.924	0.603			ПИД-1
20.843	Geranyl tiglata		42011.081	7617.792	46.853			ПИД-1
21.209			280.414	78.924	0.313			ПИД-1
21.407			32.785	10.522	0.037			ПИД-1
21.700			2668.539	714.717	2.976			ПИД-1
21.877			8.887	3.578	0.010			ПИД-1

Figure 3. Detailed analysis of “Crystal 2000 M” gas chromatography results

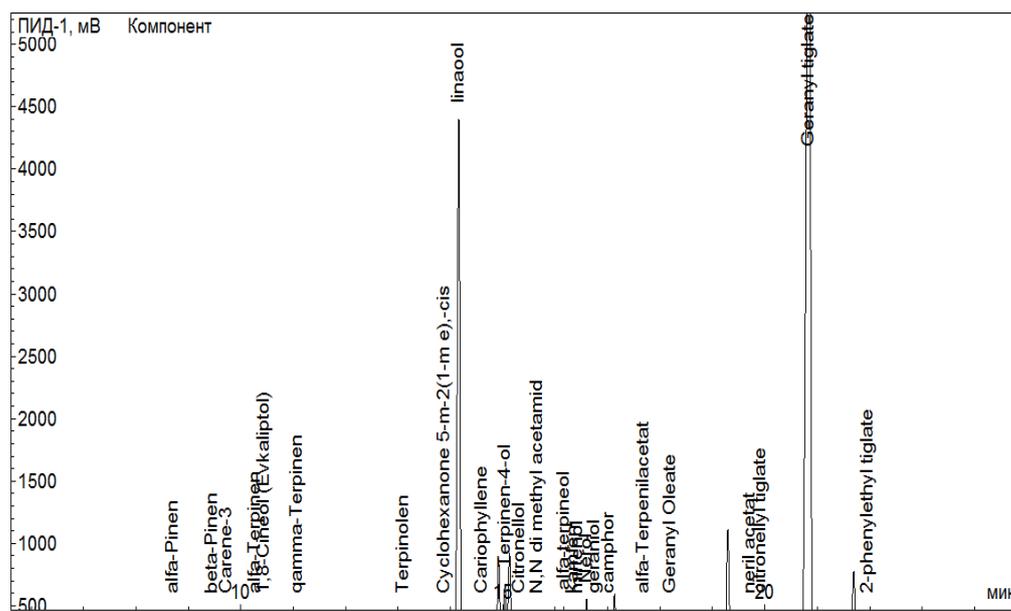


Figure 4. *Ocimum basilicum* L. - Chromatography of ordinary basil oil

Conclusion

Based on the results of the analysis, the spectra of ethanol extract of the leaves and stems of *Ocimum basilicum* L. were taken at a wavelength of 200-700 nm using a Hitachi U-2900 UV-VIS spectrophotometer. The spectra obtained at 210-240 nm were found to be characteristic of flavanols, 300-390 nm at flavonoids, and 420-480 nm at carotenoid pigments. According to the results of the analysis of “Crystal” 2000 M gas chromatography, 0.903% α -pinene, 0.050% β pinene, 0.059% carene 3, 0.395% α -terpinene, 1.387% 1.8 sienol (eucalyptol), 0.313% μ containing essential oil terpene, 0.142% terpinolene, 0.153% cyclohexanone 5-m-2 (1-me) -cis, 18.033% linaool, 0.038 cariophyllene, 2.439% terpinene-4-ol, 0.276% citronellol, 0.764% N, N di methyi acet 1.664% α -terpineol, 0.559% camphene, 0.069% myrtenol, 2.165% nerol, 0.500% geraniol, 0.138% camphor, 0.189% alpha-terpenilacetate, 0.045% heranyl oleate, 0.091% neryl acetate, 0.060% citranyl, 0.060% citronellyl tiglate substances were found. As for its use, it should be noted that basil leaf tea is used to strengthen the heart, increase the activity of the stomach and appetite. It improves metabolism in the body, it eliminates inflammation of the kidneys and urinary tract, it is very useful against bloating and it also revitalizes the skin and it has a soothing effect. Due to its sedative effect, it is used against neuroses, neurocirculatory dystonia, arterial hypertension and in the regulation of male sexual activity.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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Crohn's Disease – Disease for Immunologists, Proctologists, Gastroenterologists or Rheumatologists?

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Abstract: Crohn's Disease (CD) most commonly affects the terminal portion of the small intestine and the large intestine. CD can also affect any other part of the gastrointestinal tract, from mouth to anus. Inflammation of the intestines is usually not continuous, areas inflammation (foci of inflamed bowel) interspersed with normal areas intestines (segmental lesion). Depending on the severity of the inflammation the inner layer of the intestinal wall (mucosa) may turn red (erythematous) and swollen (edematous) with ulcers of different sizes and shapes (aphthae's, superficial, deep, longitudinal), and the mucous membrane can have the appearance of a "cobblestone pavement". These lesions extend throughout the thickness intestinal wall and can lead to complications such as stenosis of the intestinal lumen and / or germination in other organs (penetration), resulting in abscesses (infiltration of intestinal contents into the abdominal cavity) or fistulas (channels that connect the intestinal cavity with the skin or neighboring organs, for example, the bladder, or with other intestinal loops and through which they enters the contents of the intestine). In addition, in a significant number of patients, CD can affect various parts of the body outside the digestive tract, usually the skin, joints, and eyes. These extra-intestinal manifestations may also occur before the development of typical intestinal symptoms of CD (see below), and sometimes they cause more anxiety and more difficult to treat than intestinal symptoms.

Keywords: Crohn's disease, Inflammation, Manifestation, Treatment.

Introduction

Regional or granulomatous ileitis is a chronic bowel disease (Crohn's disease) that covers all the layers of the intestinal wall (transmural lesions), and sometimes spreads to the mesentery, regional lymph nodes affecting both the small and large intestines, but most often localized in the terminal section of a thin guts (regional, terminal ileitis). These diseases can be accompanied by damage to the peripheral joints, spine, or joints and spine. The clinical manifestations of the joint syndrome in both processes are the same. It is important to note that the course of ankylosing spondylitis (AS) varies greatly from person to person. So too can the onset of symptoms. Although symptoms usually start to appear in late adolescence or early adulthood (ages 17 to 45), symptoms can occur in children or much later in life.

The most common early symptoms of AS are frequent pain and stiffness in the lower back and buttocks, which comes on gradually over the course of a few weeks or months. At first, discomfort may only be felt on one side, or alternate sides. (Danoy P, et al., 2010; Burton PR, et al., 2007). The pain is usually dull and diffuse, rather than localized. This pain and stiffness is usually worse in the mornings and during the night, but may be improved by a warm shower or light exercise.

Note that AS can present differently at onset in some people. This tends to be the case in women more than men. Quoting Dr. Elaine Adams, "Women often present in a little more atypical fashion so it's even harder to

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make the diagnosis in women." For example, we have heard anecdotally from some women with AS that their symptoms started in the neck rather than in the lower back. (Mielants H, et al., 1995; Thjodleifsson B, et al., 2007).

Varying levels of fatigue may also result from the inflammation caused by AS. The body must expend energy to deal with the inflammation, thus causing fatigue. Also, mild to moderate anemia, which may also result from the inflammation, can contribute to an overall feeling of tiredness.

Chronic inflammatory arthritis, a hallmark of several inflammatory rheumatic diseases, and inflammatory bowel disease are both life-long conditions, with substantial morbidity and even mortality. These diseases are highly prevalent—for example, chronic arthritis has a frequency of approximately 2%–3% within a given population. Interestingly, the co-existence of gut and joint inflammation was found to be prominent in spondyloarthritis, a family of interrelated rheumatologic diseases. (Jacques P, Elewaut D., 2008).

Number of typical clinical and genetic characteristics, including peripheral arthritis (particularly of lower limb joints) as well as inflammation of the axial skeleton (e.g., spine). Moreover, different forms of may also affect other organs, such as the skin (psoriasis) or the eye (anterior uveitis), demonstrating the systemic nature of these diseases. Various subtypes have been described based upon clinical features, but any two may share important characteristics. (Burton PR, et. all., 2007).

The prototypical disorder of the family is Ankylosing spondylitis (AS), which is characterized by prominent inflammation of the axial skeleton (spine, sacroiliac joints), although other joints may also be affected. Other diseases include infection-triggered reactive arthritis, some forms of juvenile idiopathic arthritis, arthritis in association with inflammatory bowel diseases (IBD), and some forms of psoriatic arthritis.

Regional or granulomatous ileitis is a chronic bowel disease (Crohn's disease) that covers all the layers of the intestinal wall (transmural lesions), and sometimes spreads to the mesentery, regional lymph nodes affecting both the small and large intestines, but most often localized in the terminal section of a thin guts (regional, terminal ileitis).

These diseases can be accompanied by damage to the peripheral joints, spine, or joints and spine. The clinical manifestations of the joint syndrome in both processes are the same. The pathogenesis of the intestinal process and joint damage has not been fully established, but it is believed that many mechanisms participate in it, and in particular, toxic, immune, autoimmune. In the blood of patients, antibodies to the cells of the intestinal mucosa, lymphocytotoxin antibodies, circulating immune complexes, in which, possibly, antigenic components of intestinal microbes, etc., are also present.

In Crohn's disease, articular manifestations usually occur in childhood and adolescence. The development of peripheral arthritis in these diseases is usually not associated with the carriage of the histocompatibility antigen B27. Ankylosing spondylitis is more common in men than in women (3: 1). This disease usually develops in people who have HLA B27. Articular changes with regional ileitis occur more often in patients with other extraintestinal manifestations of the processes - with ulcers of the oral mucosa, exacerbate erythema nodosum, gangrenous pyoderma.

Method

In Crohn's disease, articular manifestations usually occur in childhood and adolescence. The development of peripheral arthritis in these diseases is usually not associated with the carriage of the histocompatibility antigen B27. Ankylosing spondylitis is more common in men than in women (3: 1). (Braun J, Sieper J., 2007).

This disease usually develops in people who have HLA B27. One particularly interesting aspect of the paper is the elucidation of a strong association with genes implicated in the Th17 pathway, a lymphocyte subset that has gathered much attention lately because of its prominent role in a variety of immune-mediated inflammatory disorders, including psoriasis and CD. While the association of AS with the receptor for IL-23, which is implicated in the expansion and survival of Th17 cells, has been previously reported, Danoy and co-workers provide two additional links to the Th17 pathway.

Firstly, they report a clear association with STAT-3, which is, amongst other things, implicated in IL-23R signal transduction. In addition, an association with the p40 subunit shared between IL-12 and IL-23 was revealed. It is intriguing that so many genes predispose to AS. The functional significance of these associations is, however, presently unclear.

For example, some of the IL-23R single nucleotide polymorphisms associated with AS may confer either protection or susceptibility to the disease. Nevertheless, more than 30 years after the discovery of HLA-B27 as a strong heritability factor for AS, further evidence points to an important genetic susceptibility for adaptive immunity shared with CD.

Results and Discussion

Crohn's disease (CD) (regional enteritis, granulomatous ileitis) is an inflammatory disease involving all layers of the intestinal wall in the process; characterized by intermittent (segmental) nature of the lesion of various sections of the gastrointestinal tract. It is characterized by diarrhea mixed with mucus and blood, abdominal pain (often in the right iliac region), weight loss, and fever. In the clinical picture are characteristic: bleeding from the rectum, rapid bowel movement, tenesmus; abdominal pain is less intense than with Crohn's disease, localized most often in the left iliac region. (Orchard, Holt, & Bradbury, 2009).

With these intestinal pathologies, damage to the joints of the lower extremities is most characteristic. As a rule, there is an acute onset of the joint syndrome in the form of monoarthritis with damage to the knee or ankle joint on one side. After several days, symmetrically involved knee, ankle, shoulder, elbow joints, the defeat of small joints is less characteristic. In CD, joint syndrome can manifest itself with migratory arthralgia, as well as erosive arthritis and joint deformity. (Sulima.& Sulyma, 2020).

Crohn's disease is associated with a type of rheumatologic disease known as seronegative spondyloarthropathy. This group of diseases is characterized by inflammation of one or more joints (arthritis) or muscle inserts (Enthesitis). Arthritis in Crohn's disease can be divided into two types.

The first type affects the greater weight of the supporting joints, such as the knee (the most common), hips, shoulders, wrists, or elbows. The second type symmetrically includes five or more small joints of the arms and legs. Arthritis may also include the spine, leading to ankylosing spondylitis if the entire spine is involved, or simply sacroiliitis if only the sacroiliac joint is involved. Symptoms of arthritis include painful, warm, swollen, stiff joints, and loss of joint mobility or function.

Conclusion

Diagnosis of extraintestinal manifestations of Crohn's disease still requires significant efforts by a immunologist, gastroenterologist, rheumatologist and proctologist to effectively treat patients with these problems.

Recommendations

It is recommended to use the available data in the diagnostic program in patients with complications in Crohn's disease.

Scientific Ethics Declaration

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Tomato Powdery Mildew *Oidium Lycopersicum* C.M. in a Greenhouse

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Abstract: This article is about spread of tomato powdery mildew (*Oidium lycopersicum* Cooke et Massee), features, microscopy analysis of pathogen, damage degree. It informs about specific changes and new specialized race in the morphological features of pathogen. It informs about perspective biological and chemical preparations (Qamair, Alrin-B, Kvadris, Strobi, Bayleton, and Topaz) tested in disease control.

Keywords: Greenhouse, Tomato, Disease, *Oidium lycopersicum*, Biological control

Introduction

The vast majority of the population engaged in agriculture prefers only chemical control, as they have little information about the new achievements of plant protection science, advanced protection means and methods. This increases the volume of use of toxic chemicals. Compared to 1986-1988, in 2009-2020, the number of pesticides used in outdoor potato and tomato production increased from 2-4 to 6-8, and against pests from 2-3 to 7-9. When additional feeding fertilizers and soil fungicides are added, the number of sprayings with chemicals during the season to protect against diseases and pests reaches 12 in potato fields and 20 in tomato production. This situation leads to the pollution of the environment and the soil, and the residual amount of pesticides in the produced products is much higher than the allowed norm. In such a case, phytosanitary dangerous products multiply in markets and sales centers (Aghayev, 2012).

Potatoes, tomatoes, eggplants and peppers, which constitute the main part of human food in daily life, are cultivated with various agrotechnical methods in agriculture, so they are infected with viruses, bacteria, fungi, parasitic and non-infectious diseases (caused by nutritional deficiency, climatic factors, anthropogenic effects). Such diseases have a strong impact on productivity and cause a lot of damage to producers, and cause various pathological conditions in consumers.

In recent years, the greenhouse vegetable growing is expanded still more against the background of developing of agrarian reforms. Transportation and application of modern technologies to Azerbaijan and increasing of productivity of tomato and its marketable quality had caused changing of composition of diseases and pests and wide spread of individual pathogens. So, the phytosanitary analysis of Absheron Peninsula in last twenty years shows that wide spreading of powdery mildew (*Oidium lycopersici* Cooke et Masse) and phytopathogenic fungi (*Cladosporium fulvum* Cooke) lead to problems in the greenhouse site. Firstly, Powdery mildew on tomato in Azerbaijan was remarked by S.Abdullaev and V.Belousova (1989). In spite of different data about pathogen, it was identified by T.Tereshenkova. In her researches about fungi and specified it as *Oidium lycopersici* Cooke et Massee However, in the last 25 years, the diversity of tomato plant variety composition, cultivation technology,

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the change in the species composition of diseases on it, the introduction of new subspecies and races into the republic have resulted in its mass distribution, adapting to local conditions. In the existing conditions, it is necessary to clarify the species composition of diseases, to study newly unstudied and currently causing high crop losses, and to prepare integrated measures to combat them.

Species composition of disease vectors of tomato (*Solanum lycopersicum* L.), potato (*Solanum tuberosum* L.), eggplant (*Solanum melongena* L.) and pepper (*Capsicum annum* L.) belonging to the *Solanaceae* family in the territory of the Republic of Azerbaijan during 2001-2020 expeditions were held 3 times a year in Absheron, Jalilabad, Lankaran, Masalli Khachmaz and Shamkir regions for clarification. Pathological cases observed on the above-ground organs and root system of plants cultivated in open fields and greenhouse areas were recorded and visualized with photographs.

At this time, the symptoms of the samples collected from the fields were specified. Damaged organs were fixed, and the available materials were determined by systematic microscopy and laboratory analysis to be the causative agents of the disease mentioned below. These agents were registered by us for the first time in Azerbaijan. The vectors of this disease entered the country in different ways and spread in a limited area. Detailed information on the distribution area of pathogens has been published.

Newly registered disease agents spreading in a limited area in the territory of the Republic of Azerbaijan:

1. Striped mosaic / Potato virus X
2. Wart mosaic - Tobacco Etch. Virus (TEV)
3. Wrinkled mosaic / Alfalfa mosaic virus (AMV)
4. Potato leafroll virus (PLRV)
5. Stem bacteriosis / *Pseudomonas corrugata* (Roberts and Scarlett).
6. Bacterial spotting-Xanthomonas sp.
7. Root rot / *Phytophthora* sp.
8. Powdery mildew / *Oidium lycopersici* (Cooke and Masee)
9. Brown spot - *Cladosporium fulvum* Cooke. (*Passalora fulva* (Cook) U.Br. & Cro.)
10. Stem rot / *Didymella lycopersici* (Klebahn)
11. Red spot / *Stemphylium botryosum* f.sp. lycopersici (Wa, Neeg.)
12. Red spot / *Stemphylium solani* (G.F. Weber)
13. Gray and brown spot / *Stemphylium* sp.
14. Linear rot in fruits / *Geotrichum candidum* (Link)
15. Throat and trunk rot - *Sclerotinia rolfsii* (*Athelia rolfsii*) (Curzi) C.C. Tu & K.)
16. Soft rot in fruits - *Rhizopus* sp.

The role of environmental factors in the prevention of powdery mildew is great. If the planting scheme is not followed correctly, if the inter-plant and inter-row spacings are close, the aeration-aeration balance is disturbed, and conditions for the development of pathogens are created as humid air remains continuously in the dense parts of the plants. The temperature and humidity balance should be normal. Cool, dewy and foggy evenings, the condition created after evening watering in the covered area, the relative humidity increase is one of the main conditions that cause the disease. Therefore, watering should be done in the morning. The air-aeration conditions are improved by timely cleaning of the leaves in contact with the ground and the lower layers. It should be controlled that the nutritional environment and the macro and microelements in the soil are normal. Before each planting, the soil should be analyzed and the missing nutrients should be brought to the normal level. The composition of irrigation water is also of great importance. When acidic or alkaline water is used for irrigation, the metabolism of the tomato plant is disturbed and the overall durability decreases, the plant becomes weak. Weak plants are more susceptible to powdery mildew.

Method

Disease occurs mostly in Absheron Peninsula of Azerbaijan. At first, on the tomato grown in the greenhouse appear white-grey little covers on the down layer leaves. *O. lycopersicum* covers all leaf surface under favorable conditions. The disease is spread in most of polyethylene-covered greenhouses in Absheron Peninsula. Progression of the disease on the tomato leaves of model plants continues from first observation till quantity of vegetation. Conidia and carriers of conidia of pathogen have been studied properly by the systematic microscopy of taken samples. Conidia have egg-shaped, elliptic and cylindrical forms (pic. 1).

Results and Discussion



Figure 1. The carriers of conidiums' micelles are short, septas are observed. Fledgling elliptic conidiums are elliptic form with sharp head.



Figure 2. This sign was found by us first and was made visual

The main reason of spreading of disease in 2014 is development of new pathogenic race specialized on tomato. Dynamic of disease on seedlings of tomato for Durinta have been studied until the end of vegetation period in the polyethylene covered greenhouse condition. Pathogen continues its development until the end of the vegetation (pic 2). Referring to the results from the registrations it was found that 20-32 °C temperature and 55-85 % relative humidity had been favourable for optimal development of *O. lycopersicum*. As can be seen from the result the condition like that exists in all greenhouses. If the pathogen has resources, its spread is inevitable. During the disease period, power mildew spreads and as the result the leaves turn yellow, their parenchima turn yellowish-brown, if there is a lot humidity begin deformation of leaves, turgor disappears and occurs early leaf fall. Contaminating fruit with the disease is not observed. In spite of it the stalk, receptacle and sepal are infected. In addition, you can see powdery mildew on the tomato growing in open conditions, but it has not economic importance. In summer period, after foggy and drizzly on the weather appears dew, as the result of it the disease spreads too quickly. if in the sowing area the aeration among the plants is very little and the agrotechnical conditions aren't met, the infection kills down leaves. The disease spreads on leaves of middle layer quickly under favorable conditions, which leads to aging, and leaf falling. *Oidium lycopersicum* Coke et Mass. besides tomato infects other sweet and bitter plants, wild nightshade and other weeds. N.Pidoplichko (1977) considered that ascigerous form of *Levellula taurica* Arnaud is indicated as Yachevsky (2).

First, *L. taurica* is observed with light-green and yellow patches on the leaves. It covers the surface of the leaf as powdery coating under favorable conditions. Whitish-grey coating are conidia and micelles of pathogen. Conidia spread intensively by wind, raindrops, irrigating water drops and mist. In mass spread years the leaves of tomato fall, fruits are little, as the result of intensive sun streams can be observed the burns on the fruit. Conidia can migrate to the far distance by mist and wind. It can spread in large range climate conditions. It develops intensively in 13-32°C temperature 50-85% relative humidity.

Measures: First, to control biological and chemical measures developed by *Oidium lycopersicum* or *Levellula taurica* against diseases must be identified the pathogen.

After determination of presence of pathogen must be used, the biological preparation received from its natural antagonist for fighting against it. In 2012-2014, it was studied and tested the applied schedule of the preparations as Gampir (*Bacillus subtilis*, ştam M22 VİZR) and Alrin-B (*Bacillus subtilis* strains B-10 VIZR) against *Oidium lycopersicum*.

When Gamair was applied the titre was ¹¹ KYO/gr. From the tests, carried out on efficiency of influence to development and spread of disease under different expenses, the results showed that the biological efficiency of preparation was by 68% in 0,3 kg/ha variant. During the application process the titre of Alrin was 10¹¹KYO/gr. Alrin-B had been applied during fruit ripening time of the first and second flower clusters of tomato and efficiency was by 65% in 0,2 kg/ha application rate.

Sharing of Alrin-B and Gamarin was effective by 72% in 0,2 +0,2kg/ha application rate. Based on the results, use of Gamair and Alrin-B is promising in green food production, so there were no pesticide remains in the ripening period (1).

In years, when powdery mildew was common on tomato for fighting against it and rational organisation it is useful for 85-90% of applying 0,3-0,5 kg/ha of Strobi (krezoksin-metil), 0,4-0,6 litr/ha of Kvadris SK (Azoksistrobin) 20 days before yield collecting. If these preparations are absent, they can be changed with Topaz (Penkonazol) and Bayleten (Triadimefon).

Ecological factors play key role in fight against Powdery Mildew. If sowing scheme is broken, the space between plants and rows is close aeration balance is disturbed, because of damp air persists among dense part of plants continuously it is suitable for developing of pests. Temperature and damp balance must meet to quota. Main reasons of disease emergence are cool, dewy and foggy evenings, and in the greenhouse is increasing of relative humidity after evening watering. Therefore watering must be carried out in the morning. The aeration will be better, if the leaves closer to the ground and understory will be cleaned in time. the macro and microelements in the ground must be under control. Before each sowing, the ground must be analyzed and the food elements must be reached to normal level. Irrigation water also plays an important role. The metabolism of tomato plant is interrupted and common sustainability decreases, the plant gets weak, if during the irrigation it is used water with sour or alkali reaction, also hard water and as the result, the weak plants are infected with powdery mildew rapidly.

Scientific Ethics Declaration

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Medical Geology as a New Field of Study in Medical Sociology

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Abstract: Geography and the geological structure of a region are among the most important factors that determine inhabitants' health and disease. From this aspect, geological structure of a country also shapes the basic needs of people such as water, food, respiration, and shelter. Geological factors like rocks, elements, mines, minerals contact people directly or indirectly, so health and disease conditions may vary according to different geographical regions. Medical geology, as a branch of science, examines positive or negative effects of the geological environment on the health of people, animals, and plants. It tries to determine the interaction between the geographical factors on health and disease. Moreover, the air surrounding us, the water we drink, the soil we step on, the food we eat, and even the wood, brick, and metal-like things around us greatly affect our health. Medical geology provides "vital" knowledge about the etiology of diseases by examining the factors in the living area. Therefore, interdisciplinary studies should be carried out between medical geology and other related disciplines to solve the problems associated with geology that negatively affect human health. The limited number of research, which have been started to be carried out on the axis of geology in Turkey for about fifteen years and dealing with the relationship between geological structure and health and disease, are not sufficient in terms of the accumulation of medical geology literature. In this study, the subject of medical geology, which has not been studied sufficiently in the field of medical sociology in Turkey, will be discussed and it will be tried to contribute to the literature by drawing attention to the subject of medical geology.

Keywords: Medical geology, Public health, Preventive medicine, Medical sociology

Introduction

Health: It is a concept that meets the basic social needs of people from the past to the present, such as family, education, economy, politics and religion, and is also closely related to these social institutions. The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Piyal, 2011). This definition emphasizes that physical, mental, and social factors are important in determining health, and that these three factors complement each other. On the other hand, when looking at health epistemology, it is seen that "social factors", which are accepted as one of the basic parameters, are mostly ignored.

Modern medicine has both changed the meaning attributed to the concepts of health and disease and provided the rapid transformation of health systems. These transformations have also changed the way societies view health institutions. Until recently, health and disease topics were generally associated with key concepts such as hospital, doctor, nurse, medicine and first aid cabinet. However, today, health and disease has transformed into a health system shaped around new concepts such as healthy foods, organic foods, vitamin drugs, alternative medicine, health clubs, sports, aerobics, walking, diet, weight loss, aesthetics, therapy, psychological counseling, and health checks (Kasapoğlu, 1999). In addition, studies dealing with many macro and micro issues in the field of medicine and sociology of health have revealed that social factors are very important in the construction of health and disease. Among these studies, the following issues can be counted: Urbanization, malnutrition, stress, water and air pollution, insufficient infrastructure, access to health services, low number of

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health workers, changes in social institutions such as family, religion, economy, unhealthy working conditions, and habits of leisure times, sleep times, social policy inadequacies of governments.

In this study, the subject of medical geology, which is a fairly new subject for the fields of health sciences and health sociology, will be discussed in the theoretical framework. It is because medical geology has become an important social determinant of health and disease in today's societies. In other words, the geological structure has a direct or indirect effect on many of our needs, from our nutrition to the water we drink, from our clothes to the materials we use (Can, 2019). Medical geology aims to examine the extent to which these materials affect human and animal health. In this context, in this study, it will be tried to draw attention to the conceptual discussions on this field by including some medical geology research made in Turkey. In addition, through some examples, it will be emphasized how the geological structures and the materials obtained from these structures negatively affect the health and disease of the society. In fact, this study aims to bring the subject of medical geology, as an important social factor determining health and disease, to the attention of both health and social sciences and policy-making relevant government institutions.

An Important Factor Determining Health: Medical Geology

One of the most important factors determining health and disease is the geological structure of the geography where societies live on. Thus, the geological structure of the region also shapes the basic needs of people such as water, food, respiration, and shelter. Geological factors such as rocks, elements, mines, minerals directly or indirectly come into contact with people, so health and disease conditions may vary according to different geographical regions. Medical geology is a branch of science that examines the positive or negative effects of the geological environment on the health of human, animals, and plants in a territory. At the same time, medical geology tries to determine the interaction between geographical factors, health, and disease. It is a great shortcoming that studies dealing with this interaction, both in the field of medicine and in the field of sociology of health, have not been conducted in a significant way. The limited number of studies, which have been started to be conducted on the axis of geology in Turkey for about fifteen years, dealing with the geological structure and health/disease relationship, are not sufficient in terms of the accumulation of medical geology literature. It is because these studies are carried out by a limited number of scientists in Turkey. Scientists who have research in this field are names such as Eşref Atabey, Simge Varol, Orhan Kavak. However, geological examination of the geographies or places where societies live on will enable the detection of many diseases and also the prevention of these diseases (Can, 2019). On the other hand, the positive contributions of medical geology research to public health will greatly support the public health policies of governments.

The science of geology, which tried to explain the formation stages of the earth until the 20th century, continued its existence as a science that sought and searched mines in the following periods. However, since the recent period, the study areas of geology have also changed. Today, the science of geology has begun to deal not only with the structure of the lands, but also with the problems of the environment in which people live. One of these problems is the field of "health" (Kavak et al., 2003) because the air surrounding people, the water they drink, the soil they step on, the food they consume, and even the materials such as wood, brick, and metal around them, directly or indirectly affect people's health positively or negatively (Nasr, 2006). Therefore, medical geology provides "vital" knowledge about the etiology of diseases by examining these factors in the living spaces of societies. Interdisciplinary studies between health and geology sciences have created a new field of study called "medical geology" (Kavak et al., 2003). Medical geology is a science that examines the deficiency or excess of various minerals and elements on the earth, the transport, deformation and amount of organic components, and their good or bad effects on human, animal, and plant health. In addition, medical geology is a new science that deals with the problems between natural geological factors and human and animal health, and the effects of ordinary environmental factors in the geographical distribution of these problems (cited in Varol et al., 2009, p. 45). In other words, medical geology examines the effects of geological factors on people's health and diseases and the distribution of these effects according to geographical areas and helps in the differential diagnosis of various diseases (Kavak et al., 2003).

In recent years, medical geology units that serve health scientists under the coordination of geological engineers have begun to be established within some research hospitals in Turkey (Kavak et al., 2003). With the help of these units, Turkey's medical geology was mapped, and it was determined in which regions and cities various minerals and elements that threaten human health are located. In addition, research was carried out on diseases caused by some elements and a risk analysis report was prepared. If needed, some settlements were evacuated, and the local people were informed about the diseases caused by the mentioned minerals or elements.

Medical Geology as a Subject of Medical Sociology

Interdisciplinary studies should be carried out between medical geology and other related disciplines to solve the problems that adversely affect human health and are associated with geology. These studies should include topics such as the geological structure of the regions, drinking water quality, soil quality, water pollution, soil pollution and worker health (Kavak et al., 2003). For example, groundwater, which is one of the study subjects of medical geology, has a great importance in terms of health and disease. It is because water contains important ions that can be transferred to the human body. These ions are calcium, magnesium, sodium, potassium, chlorine, sulfate, carbonate, bicarbonate. The mixing of these ions with the groundwater at different levels by interacting with the geological elements can cause some diseases. Calcium ion can be given as an example for this situation. When the calcium rate exceeds 1000 mg/l in water, it causes atherosclerosis and kidney stones (Varol et al., 2008). In addition, depending on the amount and interaction process of some elements in water, if the limit values are exceeded, it can have a toxic effect. This is also true for elements such as arsenic, cadmium, chromium, lead, mercury, barium, nitrate, fluoride, radioactive materials, ammonium, and chloride (Varol et al., 2008). The following findings have been reached regarding the rate of presence of some elements in water: endemic goiter or hypothyroidism in regions with low iodine content, dental and skeletal diseases in regions with high fluoride content, and Alzheimer's disease in regions with high manganese content. In addition, if the other elements in the water are lower or higher than the values that should be found, the following diseases are seen: Cadmium element causes deterioration in kidney functions, lung and prostate cancer, mercury causes severe damage to nervous system, kidney and brain, nickel causes asthma, nose and throat cancer and allergic skin reactions (Varol et al., 2008).

When the human body is examined, it has been stated that it contains more than forty trace elements and nine of them (iron, zinc, copper, manganese, cobalt, chromium, selenium, molybdenum, iodine) are necessary for human health to be maximum (Kavak et al., 2003). It is because the waters at different depths of the underground are in constant contact with the rocks of different composition in their location. Depending on the degree of solubility of these rocks in water, more or less dissolved matter mixes with groundwater. It is necessary to know the physical, chemical, and bacteriological properties of water, which is of vital importance for people to live healthy and maintain their lives, the standard properties of water should not exceed certain limits in accordance with the purposes of use, and especially drinking water should be free from microorganisms that can cause disease and harmful effects (Varol et al., 2008).

Excessive or low intake of these elements together with drinking water may cause the formation of several diseases. As a result of research, various health problems occur due to deficiencies of various elements in the human body. Due to copper deficiency, defective melanin production (the pigment that gives the skin its color), defective keratinization (skin hardening), cardiac hypertrophy (heart enlargement), demyelination (lack of nerve sheath) and anemia can be seen. Due to zinc deficiency, anorexia (a special type of loss of appetite), parakeratosis/hyperkeratosis (excessive thickening of the skin) may occur. It has been found that tooth decay is increased in children younger than 12 years old due to the lack of fluoride in water. In fact, fluoride, which is found in drinking water at a rate of 1 mg/l, protects the teeth from decay. If the fluoride ratio is higher, it can be harmful to the teeth. Iodine deficiency in soil and drinking water causes endemic goiter as the primary factor. The prevalence of cardiovascular diseases, on the other hand, is in a negative correlation with drinking water hardness (Kavak et al., 2003).

Medical Geology and Health-Disease Relationship

One of the basic study subjects of medical geology is the elements. When the elements are used disproportionately, they can cause significant harm to human health. Mineral and mineral powders that such as asbestos, erionite, crystal quartz, silicosis, pumice, perlite, diatomite, volcanic ash, siderosis, talc dust and talcosis, beryl and berylliosis, manganous, aluminosis, baritosis, anthracosis, mica, chromite, olivine, corundum, vermiculite, and kaolin cause many diseases, especially cancer (Atabey, 2016). These minerals, which are used in all areas of life, are substances that are inhaled, touched, and then cause diseases without being aware of it.

Asbestos, which is one of the minerals that medical geology works on, and that people use in many areas in daily life, affects human health negatively. Asbestos is a natural mineral that affects human health in various ways. There is a close relationship between exposure to asbestos and some types of cancer, especially mesothelioma (lung membrane cancer) because asbestos is used extensively in many areas of life, especially in the paper and textile industry (Kavak et al., 2003). In addition, asbestos has been frequently used as a waterproof material on the roofs of houses in rural areas, as a filling material used in road construction, and as a

substance used in plastering and whitewashing of houses. In fact, asbestos is used extensively in industry. The reason why asbestos is widely used in industry is that it is resistant to pressure, heat, acids and has a high strength. Asbestos is widely used in roofing, cement products, cement pressure pipes, sewer pipes, flowerpots, insulating and fireproofing sheets, rugs and fabrics, upholstery, tablecloths, hair dryers, washing and toasters, refrigerators and vacuum cleaners, brake pads of automobiles and motorcycles and many other tools and equipment (Atabey, 2016). On the other hand, according to the provision published in the Official Gazette on January 25, 2013, in Turkey, the extraction, processing, sale and import of all types of asbestos, the production and processing of asbestos products or products with added asbestos have become prohibited (Atabey, 2016). This provision is a very important decision taken in the name of public health in terms of medical geology.

In addition to asbestos, erionite minerals also affect health negatively. In regions where erionite minerals are concentrated, especially around Nevşehir, lung cancer cases are more common than in other regions (Atabey, 2007). Undoubtedly, besides asbestos and erionite minerals, many mines and minerals directly affect our health. However, since evaluating the effects of these minerals would exceed the limits of this study, it will be tried to describe the geology-health/disease relationship by giving only a few examples. The effect of erionite minerals can be expressed as follows through the examples of some mines or minerals found in Kütahya, Konya, Eskişehir, Uşak and Isparta.

The most well-known among these examples is the boron reserve in the vicinity of Kütahya Emet and the effect of this boron operation. There are high levels of boron, arsenic, sulfur, and strontium in the tuffs, tuffite, limestones and clays that make up the geology of this region. The waters used were brought to the Emet district center from an arsenic-rich geological unit for years. In another village very close to the boron deposit, drinking water is still obtained from arsenic-rich rocks, and skin disorders (keratosis) on the palms of the hands and soles of the feet have been observed in the villagers. Another example is the water leaking from an abandoned mining operation in Konya Sızma, mixing with the surface and ground waters, causing iron, copper, arsenic, mercury, and sulfate pollution (Varol, 2010). Heavy metal pollution has caused extraordinary animal deaths in the region and problems such as deafness and blindness among the villagers. The most common example in medical geology studies is the effect of fluorine in drinking water. It has been determined that the high level of fluorine in drinking water because of the interaction of volcanic rocks with rock-water has negative effects on human health. Kızılcaören village of Beylikova district of Eskişehir, Güllü village of Eşme district of Uşak, the Center of Isparta and the surrounding of Tendürek volcano are the regions with high fluorine content. For example, the stained structure on the teeth, which is common in Isparta province, is caused by the fluorine in the water. In addition, recent studies on fluoride have proven that apart from stains on teeth, this element also causes cardiovascular and endocrinological diseases (Varol, 2010).

Discussion and Conclusion

It is seen that studies on medical geology have started to be carried out since the early 2000's in Turkey. These studies, in which the effects of rocks, mines and minerals on human health are discussed, also deal with elements such as asbestos, erionite, boron, fluorine, chlorine, iron, zinc, copper, manganese, cobalt, chromium, selenium, molybdenum. However, human life, especially with the development of technology, has caused many mines or minerals used in daily life to enter our lives. In other words, medical geology should also investigate new mines or minerals that have a negative impact on human health, apart from the mines and minerals mentioned above. Moreover, metals and stones such as iron, cement, lime, gypsum, marble, granite, which are used extensively in the construction of the houses we live in, as well as tools and equipment such as pots and pans used in kitchens affect human health negatively. In addition, synthetic and petro-chemical products such as polyester, acrylic, nylon, fiber, caustic, soda, acetic acid, which are used in clothes, carpets, and upholstery, are also objects to be studied. In addition, electronic devices such as refrigerators, washing machines and dishwashers, televisions and hair dryers used in homes and workplaces should be researched in terms of medical geology in terms of their harmful effects such as the radiation they emit to the environment. In particular, petroleum and petroleum products, which are a basic substance used in human life, from clothes to the bottle of water we drink, should be included in these studies because plastic and similar products obtained from petroleum and petroleum products are used as "indispensable" objects in the daily lives of societies.

As a result, it is useful to make the following suggestions that may contribute to the medical geology literature and research in Turkey:

- With the establishment of Medical Geology Research Centers within universities, the number of scientific studies and research in this field can be increased.

- By developing a software for research hospitals, the disease and regional concentration of the patients who applied to the hospital can be recorded.
- Whether there is any correlation between the geographical region and the diseases can be determined by the statistical information obtained by the software.
- When signs of disease originating from rocks, mines and minerals are detected in areas where people live, necessary health interventions can be performed.
- Inspection of vital necessities such as drinking water, food, clothing, petroleum products and electrical equipment in terms of medical geology can be provided.
- Studies can be increased about chemical products such as cement, lime, ceramics, paint, used in the construction of the places we live in, to contain any element harmful to human health.

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

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Ecological Bases of Use of Organic Waste As Fertilizers

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Abstract: Based on the conducted studies, it is established that in Azerbaijan there is a large amount of unused organic waste that accumulate polluting the environment. These wastes can be processed and used as organic fertilizers. The waste contains a large amount of organic matter and mineral nutrients that improve the fertility of soils and the yield of agricultural plants (Artyushin et al., 1984). Works on chemicalization and land reclamation are carried out on an unprecedented scale. At the same time, environmental protection and the rational use of natural resources are becoming increasingly important for the environment. The food program developed in accordance with the decision to develop the country's agriculture provides for the full and rational use of all the resources of organic fertilizers available in our republic with a total volume of their production in 2017 of about 30 million tons. Preserving a deficit-free balance of humus in the soil, increasing its fertility and increasing the yield and quality of agricultural plants with the intensification of agriculture will require the expansion of production and the use of not only all types of animal husbandry and poultry farming and peat, but also the mobilization of other sources of organic matter. Among them, an important place should be given to household, agricultural and industrial waste, waste from the biochemical and woodworking industries, etc. The full and efficient use of all resources of organic fertilizers simultaneously solves a number of economic tasks: obtaining maximum yields while maintaining and increasing soil fertility, protecting the environment from pollution by waste and waste from industry, public utilities, animal husbandry and crop production (Zamanov et al., 1990).

Keywords: Organic waste, Ecology, Compost, Environment, Soils.

Introduction

On the basis of the conducted studies, it was established that in Azerbaijan there are a large number of unused resources that need to develop a scientifically based technology for the use of industrial, domestic and agricultural waste, which remain inactive and in many places pollute the environment and degrade the environment (Dre, 1976). These wastes include: urban household waste - 500,000 tons, tops and remains of agricultural plants - 720,000 tons, litter and litter of forest plantations and landscaping of residential areas - 180,000 tons, waste from industrial processing of agricultural products and chemical plants - 320,000 tons, salts of mineral and thermal waters and sewage sludge 100,000 tons, waste and waste from tea and vineyards - 117,000 tons, sewage and sewage sludge - 100,000 tons, sowing green manure crops - 20,000 tons. Of all public and private farms of various types of manure and bird droppings - 19 million tons annually. The analyzes found that the above tops, agricultural and industrial wastes contain about 170,000 tons of nitrogen, 77,000 tons of phosphorus, 220,000 tons of potassium, about 6 million tons of organic matter and 5 million tons of other ash elements, a significant amount of microelements and beneficial microorganisms. Therefore, on the basis of these wastes, a technology has been developed for the preparation of new types of organic fertilizers, which create an opportunity to increase the amount of organic fertilizers applied to the soil in the republic, increase soil fertility and the yield and quality of crops. Complete decomposition of compost, depending on the material used, occurs within 4-12 months. Finished products contain: 4.8% N, 1.0% P₂O₅, 1.5% exchangeable K₂O, 60% organic matter, 30% ash elements and a certain amount of trace elements. It is recommended to use 10-30 t/ha of compost for crops of corn, tobacco, cotton, cereals, vineyards and vegetables. After the introduction of compost

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for the main plowing in the crop rotation under irrigation conditions in the second and third years, its efficiency does not decrease.

Material and Methods

The composition of the new organic fertilizer (compost) includes: Waste taken for mixing in % Annual stocks in the republic in tons Manure 20 19000000 Industrial processing waste agricultural products 10 320000 Municipal household waste 15 500000 Agricultural waste 10 720000 Ash and lime 3 40000 Forest litter 10 180000 Bird droppings 10 115000 Simple superphosphate and ammonium sulfate 2 Dry residue of sewage 10 500000 Sediment of river and lake waters (sapropel) 10 500000 New organic fertilizers (composts) are prepared directly in the field, at the places of their application. Compost heaps should be laid in places protected from winds and not flooded with rain, melt and irrigation water. For this purpose, they dig trenches 3 meters wide and 0.5 m deep, the length is arbitrary. For good air penetration into the compost and faster decomposition of waste, the height of the pile should not exceed 1-1.5 m. Composts are prepared in layers and at any time of the year. Before laying the compost in a pre-dug trench with a layer of 10-15 cm, humus soil is laid or covered with a strong plastic film. Then, in layers of 20-30 cm, various wastes intended for composting are laid. When laying the dry material, it is well moistened with slurry or homogenized manure, other liquid waste suitable for soil application, or water. If the composted material does not contain lime, then carbonate or burnt lime, lime tuff, dolomite flour are added to each layer in the amount of 2-3% by weight of the composted material. Instead of lime, you can use furnace ash, which is a special addition to the compost. Ash can be increased up to 10% of the weight of the compostable material. Ash is especially valuable because it contains a large amount of phosphorus and potassium. Each layer of compost is covered with earth or humus 5-6 cm thick, another layer not thinner than 10 cm is applied on top. It is desirable to mix the compost after 1-2 months. If the material decomposes slowly, the compost should be mixed again after 1-2 months. For proper maturation of compost, it is important to maintain normal humidity in it: the optimal moisture content of materials during composting is 50-60%. Therefore, when drying, the pile must be moistened. On the third and fourth days after laying the stack, the temperature in it rises to 60-70°C, which causes the death of helminth eggs and a number of other pathogens of infectious diseases. Compost maturation occurs within 4-12 months depending on the material. When the compost becomes uniform and takes on a dark color, it is suitable for fertilizing the fields. The terms of decomposition, the place of manufacture and determination of the readiness of the compost for use by the biological method are being studied.

Results and Discussions

It has been established that when composting urban household waste with manure, bird droppings and adding KOMU and DDV, the temperature increased to 70-80°C after 2-4 weeks and decreased after turning the compost. In the process of compost maturation, the content of carbon (C), the ratio of carbohydrate to nitrogen (C:N), and the content of cellulose and hemicellulose decreased in its composition. The content of total nitrogen, ash, and lignin increased. After 5 months, the content of all elements of the compost became stable. To determine the main indicators, samples were taken in all samples, the ratio C:N, the content of total nitrogen and the ratio of carbon to reducing sugars were determined. The C:N ratio in the compost was determined based on the ash content and total nitrogen content according to Kjeldahl in the compost according to the formula: where a is the ash content (in % of dry matter); $100 - a$ - content of organic matter in %; $e-a$ - the content of total nitrogen in the compost (in% of absolutely dry weight). Composts were considered ready when the C:N ratio in its composition was below 20, the nitrogen content in the dried material was 2%, the ratio of carbon (C) in the composition of reducing sugars was below 35% to total carbon. The cation exchange capacity was below 60 meq. per 100 g of compost. In order to determine the readiness (ripening) of a new organic fertilizer for use, a biological method was used for the first time, where the seeds of individual agricultural plants are grown in a solution of this fertilizer and the readiness of the fertilizer for application to the soil is established. New organic fertilizers (composts) "Absheron, Zakataly, Nakhichevan, Lankaran, Ganja, Mugan-Salyany, Cuba-Khachmaz, Shirvan-Karabakh." The compositions were developed, the compositions were determined, the effectiveness and the contained nutrients, as well as their effectiveness for various agricultural crops, were studied (Popov, 1988; Pokrovskaya, 1991). Since 2000, new types of organic fertilizers (composts) have been introduced under the main agricultural crops in the republic. The compost was introduced under corn and tobacco in the Zakatala region on an area of 200 hectares. From the use of this fertilizer at the rate of 10 t/ha, the yield of corn cob increased - 10 centners per hectare, dry tobacco leaf - 4.0 centners per hectare, compared with the control. Compost "Absheron" was used at the rate of 10 t/ha for a vineyard, where the yield of grapes increased by 15 centners/ha, and the sugar content of berries also increased by 3.6%. Also, compost was used on an area of 100

hectares for corn in two farms of the Zagatala region, where the economic efficiency was from 82 to 110 manats. Compost "Lenkoran" was used on an area of 200 hectares, in the Lankaran region at the rate of 10 t/ha; the increase in the yield of green tea leaves averaged 250-300 kg/ha, or the economic effect - 250-300 manats per hectare.

Conclusion

New types of organic fertilizers were also introduced in the subtropical region of 100 ha at the rate of 100 t/ha, where an additional green tea leaf yield of 265 kg/ha or 250 man/ha of additional cash income per hectare was obtained. Compost "Mughan" at the rate of 10 t/ha was used for cotton in the Neftchala region, where the yield of cotton increased by 3.2 q/ha, the economic efficiency was 192 man/ha. The use of waste polluting the environment improves the environment and makes it possible to increase soil fertility, as well as increase the yield of agricultural plants.

Scientific Ethics Declaration

The author declares that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the author.

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Antioxidant Activity and Total Phenolic Properties of Teleme Made with Different Milks

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Abstract: Teleme is an Anatolian shepherd's food, which is a coagulated dairy product made by dripping the milk of freshly plucked raw figs into raw milk. It is also called as teleme cheese or teleme yoghurt. It is an important and forgotten food alternative to nutritious yogurt and milk, which has been known in Anatolian geography for centuries and can be made practically. In this study, antioxidant activity and total phenolic substance values of teleme obtained from three different milks, which are ancient but less known today, were determined. For this purpose, wasteleme made by using fig milk from 3 different milks, sheep, goat and cow milk. Total Phenolic Substance (TPS), Antioxidant Activity (AA), Total Antioxidant Levels (TAL) and Total Oxidant Levels (TOL) analyzes of the extracts of fresh and freeze-dried powdered curds with water, 80% methanol and 100% methanol were performed. Among the fresh curd extracts prepared with different solvents, the highest total phenolic content was found in curd prepared with sheep's milk and extracted with 80% methanol (4,879±0.043 mg GAE (Gallic acid) /g dry weight), the lowest value was also sheep milk. It was determined in curd prepared with water and extracted with water (0.787±0.030 mg GAE/g dry weight). In powder curd products, the highest and lowest total phenolic contents are in curd prepared with sheep milk and extracted with water (2.161±0.033 mg GAE/g dry weight) and curd prepared with sheep milk and extracted with 100% methanol, respectively. (0.680±0.070 mg GAE/g dry weight) was determined. The highest antioxidant activity value was found in fresh curd prepared with sheep's milk extracted with 100% methanol and (6,832±0.029 mg trolox/g dry weight) and powdered curd prepared with goat's milk (1.697±0.006 mg trolox/g) dry weight, respectively. detected. While the total antioxidant values were found to be good in all samples, the oxidant values were detected at low levels. As a result, we believe that curd can be considered as a functional food with very good values in terms of antioxidant values as well as being nutritious.

Keywords: Teleme, TPS, AA, TAL, TOL, GAE

Introduction

Teleme is a very ancient food that has been traditionally produced and consumed by shepherds as a meal while herding sheep in the mountains for centuries. There is very little information in the literature about the biological effectiveness of the content of teleme, which many people are unaware of. Curd is defined as a coagulated dairy product in few scientific texts. Namely, it is possible to use plant-based fig milk as an alternative to various enzyme-structured compounds of animal origin used for curdling milk in cheese making. In cheese technology, enzymes obtained from animal, vegetable and microbial sources are used in the enzymatic coagulation of milk. Coagulant enzymes obtained from different sources and made ready for use are called 'rennet'. Enzymes, also referred to as 'coagulating enzyme' or 'rennet', are all acid proteases. (Fox et al., 2000). Plant-derived coagulant enzymes (papain, bromelin, ricin, ficin, etc.) are obtained from certain parts of plants such as roots, stems, seeds, flowers, leaves, using different extraction methods. These are known as plant-based rennet (vegetable/plant rennet). The coagulation stage is very important in the production and maturation of

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cheeses obtained by using these coagulants, and proteolysis affects the textural and sensory properties of cheese (Amira et al., 2017).

The herbal coagulant used in curd is *Ficus carica* (incir) milk. Although the use of herbal coagulants dates back to ancient times, their use is limited until now due to their high proteolytic activities, except for a few varieties. It is mostly used as a herbal coagulant for figs, golden berries, curd grass, kenger, especially for small consumption purposes. It is even reported that fig milk is impregnated with cotton cloths and frozen and used in making curd in winter. Extracted from the fig tree, ficin is the first plant-derived enzyme used in cheese making and is known to cause bitterness in cheeses due to its high proteolytic activity (Mazorra-Manzano et al., 2013; Shah et al., 2014; Lomolino et al., 2015). Component analysis, gastronomic analysis and biological activity of curd have never been studied before. Therefore, in this study, some biological activity determinations of curd obtained from different milks were evaluated by using fig milk as a coagulating herbal factor.

Materials and Methods

Materials

Sheep and cow's milk was procured from Gaziantep Durantaş village. Figs (kerik) were collected from the same village in August 2021 Turkey, Gaziantep.

Methods

The milk of sheep, goats and cows was dripping from the branch without waiting. After waiting for about 10-15 minutes, the coagulated milk became curd 15 minutes later. The curds were stored in glass jars and brought to the laboratory.

Drying Procedure

Three different milk Teleme cheeses were placed at -24 °C for 24 h, and then, frozen samples were transferred to a freeze dryer (FreeZone 6 Labconco, USA) which was operated at 0.250 mbar and -50 °C for 24 h. At the end of the drying, the obtained dried Teleme cheeses were ground with a coffee grinder (Kiwi KSPG-4811, Turkey).

Analysis

Moisture Content (MC)

The moisture content of the Teleme cheeses and powders was determined using an infrared moisture analyzer (Daihan Scientific MA10, Korea) at 102 °C, where the correlation with the oven method was 0.99.

Antioxidant Activity and Total Phenolic Content (TPC)

Three different solvents were used in the extraction process. Powders and Teleme cheeses (2 g) were extracted with 20 mL of water, 20 mL of 80% methanol and 20 mL of 100% methanol. The mixtures were incubated for 2 h at room temperature in a shaking incubator (Mikrotest MSC-30, Turkey) to extract the bioactive compounds. The mixtures were then centrifuged (PCE Instruments CFE100, Germany) at 6000 rpm for 10 min, and the supernatants were collected.

TPC was determined by the Folin-Ciocalteu colorimetric method (Elmas et al., 2019). Absorbance was compared with a standard curve (Gallic acid, 0–10 mg), and results were expressed as mg gallic acid equivalent per gram dry matter (mg GAE/g dry matter). Antioxidant activity of extract of powders was analyzed using DPPH (2,2- difenil- 1- pikrilhidrazil) method (Baysanet al., 2019). Measurements of DPPH were determined by spectrophotometric method (Soif Optical Instruments V-5000H, Turkey). Antioxidant activity was expressed as µmol Trolox equivalent per g dry matter (mg troloks/g dry matter)

Table 1. Phenolic and antioxidant levels of samples

Sample	Solvent	Total Phenolic Content (mg GAE/g dry matter)	Antioxidant activity (mg troloks/g dry matter)	TAL (mmol/L)	TOL (mmol/L)
Cow Milk Fresh Teleme	Water	1.429±0.041	5.433±0.106	0.683	29.32
Sheep Milk Fresh Teleme	Water	0.787±0.030	3.215±0.075	0.772	20.66
Goat Milk Fresh Teleme	Water	1.521±0.111	3.706±0.165	0.547	23.50
Cow Milk Teleme Powder	Water	0.850±0.039	0.343±0.006	1.144	14.58
Sheep Milk Teleme Powder	Water	2.161±0.033	0.531±0.012	0.905	25.55
Goat Milk Teleme Powder	Water	1.235±0.017	0.548±0.006	0.826	22.44
Cow Milk Fresh Teleme	100% MeOH	1.808±0.016	6.089±0.121	0.966	18.48
Sheep Milk Fresh Teleme	100% MeOH	0.890±0.032	6.832±0.029	0.620	25.68
Goat Milk Fresh Teleme	100% MeOH	1.941±0.203	6.475±0.031	0.558	35.99
Cow Milk Teleme Powder	100% MeOH	1.001±0.068	1.679±0.006	0.708	24.16
Sheep Milk Teleme Powder	100% MeOH	0.680±0.070	1.656±0.026	0.603	22.77
Goat Milk Teleme Powder	100% MeOH	1.272±0.042	1.697±0.006	0.779	26.87
Cow Milk Fresh Teleme	80% MeOH	3.422±0.201	6.819±0.023	0.793	19.43
Sheep Milk Fresh Teleme	80% MeOH	4.879±0.043	4.362±0.605	0.848	20.86
Goat Milk Fresh Teleme	80% MeOH	2.644±0.016	5.503±0.085	0.773	26.57
Cow Milk Teleme Powder	80% MeOH	1.296±0.088	1.530±0.045	0.985	26.61
Sheep Milk Teleme Powder	80% MeOH	0.786±0.003	1.537±0.045	0.705	26.41
Goat Milk Teleme Powder	80% MeOH	1.470±0.008	1.551±0.009	1.057	45.81

Among the fresh curd extracts prepared with different solvents, the highest total phenolic substance content was determined in curd prepared with sheep's milk and extracted with 80% methanol (4.879±0.043 mg GAE (Gallic acid) /g dry weight), while the lowest value was determined in curd prepared with sheep's milk and extracted with water (0.787±0.030 mg GAE/g dry weight). In powder curd products, the highest and lowest total phenolic substance contents were determined in curd prepared with sheep's milk and extracted with water (2,161±0.033 mg GAE/g dry weight) and curd prepared with sheep's milk and extracted with 100% methanol (0.680±0.070 mg GAE/g dry weight). The highest antioxidant activity value was found in fresh curd (6,832±0.029 mg trolox/g dry weight) prepared with sheep's milk extracted with 100% methanol and powder curd prepared with goat's

milk (1,697±0.006 mg trolox/g), respectively. Total antioxidant values were found to be good in all samples, while oxidant values were found to be low.

Conclusion

Milk coagulation is one of the main reactions of cheese production. The first and most commonly used rennet for this purpose are coagulants of animal origin. The worldwide increase in cheese production has led to the inadequacy of animal rennet, and studies have been carried out for suitable rennet substitutions for a long time, and with the developments in recombinant DNA technology, the lack of resources has partially ceased to be a problem. However, ethical issues and religious restrictions related to the use of animal-derived rennetin, as well as the fact that the products obtained with this enzyme are not suitable for vegetarian eating habits, have increased the interest in plant-based coagulants (6). Herbal coagulants have been used in cheese production since ancient times and increase the variety of products. In this context, plant-based coagulating enzymes have been preferred to be used in cheese and new dairy products in recent years, and fig milk is a good kaogulant in this context. With this study, some bioactive components of the curd obtained by coagulating with fig milk have been evaluated and we think that it should be considered as an alternative nutrient. We believe that by making much more detailed analyzes, an ancient product can be used as an innovative nutrient.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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Diseases of Tomato in the Conditions of Azerbaijan

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Abstract: According to research 2001-2018 in Absheron, Lankaran-Astara and Guba- Khachmas regions dynamics and spread of major malware disease progressed. Among the most harmful diseases, as *Phytophthora infestans* (M.) de Bary, *Phytophthora SP.*, *Alternaria solani* Sor. *Alternaria alternata*, aggressive species from the genera of *Fusarium* and *Verticillium*, *Pseudomonas sp.* causing wilt of seedlings, fruit rot of different origin, mosaic and leaf curling caused by viruses, gall nematodes (*Meloidogine incoqnita*, *M. arenarea*).

Keywords: Tomato, Diseases, *Phytophthora infestans*, *Alternaria solani*, Tabasco etch. virus, PotatoX virus

Introduction

The continuous supply of food and vegetable products to the population is an integral part of our food security. In this field, the creation and application of new technologies based on national agricultural traditions is one of the current problems of the day. Thus, plant protection products imported without control and applied without regulation, as well as an unprofessional approach to production, the species composition of diseases and pests that damage farmland have changed, and harmful species have spread (Aghayev, 2018).

Tomato (from the Italian word pomo-d'oro-golden apple) is a plant genus from the *Aubergine* family. They are annual or perennial (in the tropics) grasses and semi-shrubs. His homeland is South America. Wild species are found in Peru, Ecuador and Chile. The tomato genus is divided into three species: common tomato (*Lycopersicon esculentum*), Peruvian tomato (*L. peruvianum*) and hairy tomato (*L. hirsutum*). There are 3 subspecies of common tomato, more than 2000 varieties and forms. Contains 4.5-8.1% dry matter, including 50% soluble sugars, 3.5-8.5% organic acids, sodium, potassium, calcium, iron, phosphorus, ascorbic acid, acetyl-salicylic acid, B1, B2, PP provitamin, carotenoids, etc. there is The fruit ripens in 80-140 days. Tomato is a heat-loving plant. At temperatures below 15°C, the plant usually does not flower. Relatively resistant to drought. It is considered optimal that the soil moisture requirement is 75-80%, and the average humidity of the surrounding air is 65-70%. Tomatoes can be grown in most fertile soils. Since tomato is a heat-loving plant, it is mainly cultivated in the central and southern regions. The structure and composition of the soil has an important role in the normal development of plants and resistance to diseases. The tomato plant grows better in light soils with a neutral reaction, rich in humus. Nitrogen, phosphorus, potassium requirements are in the ratio of 1:0.2:0.5. Therefore, phosphorus and potassium, and then nitrogen fertilizer should be applied before transplanting the seedlings to the field. When growing tomatoes in peat, when feeding them with minerals, the ratio of macro and micronutrients in 1 liter of feeding solution should be as follows (mg/l): N-281, P-43, K-392, Ca-176, Mg-64, Sh-36, Fe -1.8, Mn-0.9, Cu-0.1, Zn-0.1, B-0.2, Mo-0.02, Y, Cr, Co-0.01 [26]. Ca-1 mg/l, Mg-0.5 mg/l, HCO₃⁻³ mg/l in 1 liter of irrigation water should have pH=5.8-6 (Aliyev,1998; Hidayatov & Eyyubov, 2001).

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The vast majority of the population engaged in agriculture prefers only chemical control, as they have little information about the new achievements of plant protection science, advanced protection means and methods. This increases the volume of use of toxic chemicals. Compared to 1986-1988, in 2009-2015, the number of pesticides used in open-field potato and tomato production increased from 2-4 to 6-8, and against pests from 2-3 to 7-9. When additional feeding fertilizers and soil fungicides are added, the number of sprayings with chemicals during the season to protect against diseases and pests reaches 12 in potato fields and 20 in tomato production. This situation leads to the pollution of the environment and the soil, and the residual amount of pesticides in the produced products is much higher than the allowed norm. In this case, phytosanitary-threatening products multiply in markets and sales centers (Aghayev, 2018).

In the current conditions, the development and implementation of ecologically clean and phytosanitary control measures for agricultural producers is of national and strategic importance. Considering the effects of pesticides on the human body (this is a problem that is studied at the international level and distinguished by its relevance), the production of agricultural products that meet phytosanitary standards is of particular importance in raising a healthy generation in Azerbaijan.

Potatoes, tomatoes, eggplants and peppers that are used on a daily basis are among the products that are most contaminated with agrochemicals and pesticides, and are considered more dangerous for the body due to their wide acceptance. In recent years, new aggressive disease agents on these plants (*Phytophthora*, *Alternaria*, *Botrytis*, *Sclerotinia*, *Didimella* and other fungi, some bacteria, viroids, mycoplasmas belonging to the genera *Pseudomonas*, *Eriwina*) have entered the republic, and specialized races and mutants have been created in the existing strains to the agricultural fields. causes serious damage and crop loss (Eyyubov, 1996, 1997).

The species composition of the diseases of plants belonging to the Solanaceae family and the spread of the main harmful species in Azerbaijan were studied in 2001-2020 by route observations conducted in potato, tomato, pepper and eggplant fields in Lankaran-Astara, Jalilabad, Bilasuvar, Absheron and Guba-Khachmaz regions. The analysis of diseased materials collected from the fields was performed in the Phytopathology laboratory of the Absheron Experimental Station of the AzET Institute of Plant Protection, and in the mycology laboratory of the Institute of Microbiology of the Azerbaijan National Academy of Sciences.

Method

In the conditions of Azerbaijan, different determination methods were used to determine the diseases of SSAB. Changes in external signs of plants are based on visual observation methods. After the visible changes were registered, symptoms were recorded, diseased materials were collected and pathogens belonging to bacteria, Chromista, Fungi were analyzed by systematic microscopy, cultivation in a moist chamber, removal to a clean environment, re-infection with the inoculum of the pathogen, and analysis of viruses by enzyme immunoassay (IFA) methods. done and appointed. In the determination of viruses, enzyme immunoassay is the most widespread and most accurate method based on serological methods. The enzyme immunoassay method is based on the use of antibodies registered (tagged) with enzymes (59).

If the analysis of the materials studied by the primary microscopy methods did not yield the desired result in the determination of the pathogen, the samples prepared at 12, 24, 36, 48 and 72 hours of the diseased materials placed in the moist chamber were re-examined and analyzed under the microscope. During the study and determination of diseases caused by *Alternaria* *Phytophthora*, *Uncinula* fungi, *Pseudomonas*, *Erwinia* bacteria, the methods of comparative analysis of the symptoms caused by the pathogen in a clean environment, the symptoms caused by the pathogen in the food environment, the microscopy of the pathogen in stained samples and the repeated artificial infection methods were used. . Artificial inoculation was carried out during the period of seedling, bushing, initial flower ball and crop maturity. It was carried out by the methods of spraying with a culture solution of the pathogen's clean environment, brushing with a brush, and introducing inoculum from the injury site.

Artificial infection with fungi belonging to the genera *Fusarium*, *Verticillium*, *Rhysoktonia*, *Pythium* of soil origin was carried out by mixing the culture solution of the pathogen with the substrate and injecting the inoculum into the damaged areas of the rhizomes. The obtained results were compared with the literature on designation and diseases were determined (Pidoplicko,1977; Vlasov, 1992; Peresykin, 2009).

Route observations and disease registration were performed 3 times during the season: on seedlings, plants up to the flowering phase, fertile plants, and harvested crop. The analysis and determination of the main harmful

diseases, including root and tuber diseases, was carried out on the basis of the analysis of the materials provided by the producers for diagnosis, as well as on the samples taken at the end of the vegetation and the sorting of the seedlings. Registration and observations were performed on the basis of visual measurement and calculation methods. In the field and in the laboratory, the signs of diseased organs were visualized by recording spots, covering, pycnidia, sclerosia, decay, wilting, drying, swelling, cracks, necrosis, chlorosis and other signs caused by the pathogen on the plant (Aghayev, 2018).

In open conditions, the spread of the main diseases of PB (PBBX) Phytophthorosis, Alternaria, Fusarium, Hill rot and others in separate regions and in the region, the intensity of the spread (degree of development) was determined. The role of predecessor plants, crop rotation system, soil structure irrigation norms and irrigation schemes, sowing or planting times, changes in groundwater level depending on the source of irrigation water in the spread of diseases was studied based on visual observations and analysis of data collected from producers.

Comparative calculation methods of healthy plants and diseased plants were used in the study of the spread of the main diseases that cause wilting, drying, burning, root rots in PB (273). During visual observations, the status of disease infection of 10 plants included in the registration was evaluated. 10-20 samples were selected in a diagonal direction, covering the planting area. The samples were numbered and the results obtained from all the samples were summed up and the average number was obtained. The total number of plants in the samples was calculated by comparing healthy and disease-infected plants using the general spread formula:

$$Y = \frac{n}{N} \times 100 \quad (1)$$

Here,

Prevalence of Y-disease, in %;

number of wilted or dried plants in n-sample, in numbers;

Total number of N-registered plants, in numbers:

The average result of the results obtained from the stations covering the region

$$P_o = \frac{\sum SP}{S} \quad (2)$$

Here,

P_o- the average prevalence of the disease in the area, in %;

∑SP- the sum of products of disease prevalence of areas;

Total size of S-viewed fields.

The average prevalence level of the calculated disease in the area and region was determined [272].

Spotting, coating, wounds, pycnid growths, etc. on the plant. during the registration of diseases manifested by symptoms, the intensity of the infection, which expresses the general prevalence and the degree of development of the disease, was studied. At this time, the level of development of diseases observed with the mentioned symptoms was evaluated on a 4-point scale:

0 honey-healthy plants;

1 honey-disease symptoms up to 10% of plant organs;

2 points-up to 10-25%;

3 points - up to 25-50%;

4 points - covers more than 50% of its surface.

During evaluation, each leaf area was examined in compound leaves. The formula for the intensity of disease spread was used:

$$\dot{i} = \frac{\Sigma(r \cdot b) \times 100}{n \cdot a} \quad (3)$$

Here,

I-disease spread intensity, in %;

r-disease infection score;

b-number of plants infected with suitable honey, numbers;

∑ r·b) - total number of suitable honey yield of infected plants;

The total number of cases viewed in the n-sample, number;

a-highest score;

100 -% conversion factor.

Results and Discussion

Table 1. The frequency and spread levels of noticed diseases on tomato plant (*Solanum lycopersicum L.*) in Azerbaijan (2001-2018)

No 1	Disease 2	Spread in Azerbaijan 3	Spread level 4
1.	Non- infection diseases		
1.1.	Apical rot of tomatoes	Absheron, Xachmas, Xyzy, Masalli, Shamakhi	++
1.2.	Tomato cracking	In covered areas	+
1.3.	Thermal burn	Absheron and Mughan	++
1.4.	Salt stress	Absheron, Masalli, Jalilabad regions	+
1.	Nutrient elements deficiency	In all regions	++
2.	Infection diseases		
2.1.	Viral diseases		
2.1.1.	Wrinkled curl	Absheron, Masalli, Khachmaz, Shabran	+
2.1.2.	Potato calico virus <i>Alfa mozaik virus</i>	Open and covered areas	+
2.1.3.	Spot mosaic <i>Cucumber mosaic virus</i>	Absheron and south regions	+
2.1.4.	Potato mottle <i>PotatoX virus</i> and <i>Tomato mozaik virus</i>	Absheron, in north and south regions	+
2.1.5.	Tobacco mosaic virus <i>Tobacco Etch. Virus</i>	Absheron, in covered area	+
2.1.6.	Tomato mosaic <i>Tomato mosaic virus</i>	Absheron, in covered area	+
2.1.7.	<i>Potato Y virus</i>	Absheron, Lankaran-Astara, Guba-Khachmaz regions, open and covered areas	+
2.2.	Mycoplasma Stolbur <i>Solanum micoplasma</i>	Absheron region, open and covered areas	+
2.3.	Bacterial diseases		
2.3.1.	Black spot <i>Pseudomonas siringae pv. tomato</i> Van Hall.	Lankaran, Astara, Masalli, Khachmaz and etc.	+
2.3.2.	Bacterial cancer <i>Clavibacter michiganensis subsp. michiganensis</i> (Smith) Davis	Absheron region, open and covered conditions	++
2.3.3.	Bacterial fading <i>Ralstonia solanasearum</i> (Smith) <i>Yabuuchi et al.</i>	Guba-Khachmas region, open area	+
2.3.4.	Stem bacteriose <i>Pseudomonas corrugata Roberts and Scarlett</i>	Absheron, covered area	+
2.4.	Diseases for <i>Chromista</i> family		
2.4.1.	Potato blight. <i>Phytophthora infestans</i> (Mont.) de Bary.	In all regions of Azerbaijan	+++
2.4.2.	Black shank <i>Phytophthora nicotianae</i> (<i>parasitica</i>) Breda de Haan.	Absheron, Lankaran-Astara, open and covered areas	++
2.4.3.	<i>Phytophthora sp.</i>	In seedlings in Absheron, Lankaran-Astara	+
2.4.3	Seedling root rot <i>Pythium debaryanum</i> Hesse.	Guba-Khachmaz and Lankaran, in the seedlings	++
2.5.	Fungi diseases		
2.5.1.	Powdery mildew Tomato <i>Oidium lycopersicum</i> Cooke et Mass. <i>Levellula taurica</i> (G. Arna.)	Open and covered areas in Absheron	++
2.5.3.	Septoria- <i>Septoria lycopersici</i> Speg.	Open and covered areas in all regions	++
2.5.4.	Fusarium wilt <i>Fus. Oxysporum f.sp. Lycopersici</i> Shlecht.	Open and covered areas in all regions	++

2.5.5.	<i>Fusarium solani</i> f. sp. <i>radicus lycopersici</i> Jarvis & Shoemaker.	Open and covered areas in Lankaran-Astara and Guba-Khachmaz	+
2.5.6.	<i>Fusarium solani</i> Mart.	Open and covered areas in all regions	++
2.5.7.	Stem rot with <i>Didymella lycopersici</i> Kleb.	In covered areas in Absheron	+
2.5.8.	<i>Alternaria alternaria solani</i> Sor., <i>A.alternata</i> f.sp. <i>lycopersici</i> , <i>A.alternata</i>	Open and covered areas in all regions	++ +
2.5.9.	Verticillium wilt of potato <i>Verticillium lycopersici</i> Pit. et. P., <i>Verticillium albo-atrum</i> Rein. et B.; Smith	mughan, Shirvan lowland, Shirvan lowland and Mil-Garabagh lowland	++
2.5.10	Grey and brown spotting <i>Stemphylium solani</i> Web., <i>St. Botryosum</i> f.sp. <i>lycopersici</i> , <i>Stemphylium</i> sp.	Open area in Jaliabad, Bilasuvar, Absheron	++
2.5.11	White rot <i>Sclerotinia sclerotiorum</i> (Lib.) De Bary	Open and covered areas in Lankaran-Astara and Guba-Khachmaz	+
2.5.12	Anthracoze in fruit <i>Colletotrichum coccodes</i> Wallr.	Open and covered areas in Jaliabad, Bilasuvar, Sabirabad	+
2.5.13	Southern blight <i>Athelia rolfsii</i> Curzi. (<i>Sclerotinia rolfsii</i>)	Covered areas in Absheron	+
2.5.14	Brown patches <i>Rhysoctonia solani</i> Kuhn.	Covered areas in Absheron	+
2.5.15	Black bread mold <i>Rhizopus</i> sp.	Open and covered areas in Bilasuvar and Sabirabad	+
2.5.16	Geotrichosis <i>Geotrichum candidum</i> Link	Covered areas in Absheron	+

During 2001-2018 the diseases registered on route observations held by us in Azerbaijan, observations in nurseries and analyses presented by manufacturers have been determined. The registered diseases have been determined on standard methods (1, 2, 3, 4) and divided into 2 groups:

1. Diseases, occurring to the impact of non-infection or physiological processes functional imbalance, dietary deficiency and ecological factors.
2. Diseases, occurred due to parasitic, infectious or different nematodes, viruses, bacterias, micoplasma and fungi species.

During the race observations, it was found out that in the open area the mass spread pathogen infectors and epiphytotic diseases are more frequent both ground, and aboveground organs (5). Among the diseases, three varieties of *Phytophthora* genus of *Chromista* widespread in Absheron and Guba-Khachmaz regions. Two varieties of early blight genus of Fungi family, three varieties of *Fusarium* genus, and two varieties of *verticillium* genus infect the plants more than other fungi. According to the results of the research, the following diseases on the tomato plant was noticed (*Solanum lycopersicum* L.) (Table 1).

As seen from the table, the diseases on Ph. infestans, early blight, (fungi for *Phytophthora*, *Pythium*, *Fusarium*, bacteria *Pseudomonas* sp.), the viruses making different root rots of different origins, mosaics and disformities in tomato widespread in Azerbaijan. The results on disease spreading show that the diseases as *Phytophthora* infestans, early blight, *Fusarium* wilt widespread and specialized on plants. The spread of these diseases on tomato plant develop loss of crops for 30-40% in Absheron, Lankaran-Astara and Guba-Khachmas regions of Azerbaijan. Degree distribution dynamics for disease spreading in the regions has been investigated by our scientists and found that the following diseases develop loss of crops and infect the tomato plants (table 2). During 2001-2018 the dynamics and change of the spread area of three different race of *Phytophthora* infestans was different in TP (tomato plant). However, Ph. infestans (Mont) de Bary was distributed in both of three region in 2001 it was observed in Guba-Khachmaz and Lankaran-Astara with great force in comparison with Absheron region. So in Lankaran-Astara region spread of disease was 44,6%, spread intensity was 16, 4%, in Absheron 32,4%, intensity 7,2%, in Guba-Khachmas region 48,4%, intensity was 21,6%. *Phy.parasitica* Dastur. was not observed in Lankaran-Astara region in 2001, in Guba-Khachmaz region its intensity was 5,8%. In 2008-2018 spread dynamics of *Ph.parasitica* was 29 and 31% and intensity was 9,8-14,6%. According to the data, 2001-2018 years, the dynamic of *Phytophthora* infestans, fungi of the genus *Alternaria*, *Botritis*, *Sclerotinia*, *Didimella*, the bacterium *Pseudomonas* sp., viruses PoMV, ToMV increases.

Table 2. Distribution of major diseases of tomato in Azerbaijan in open area

Disease	Distribution degree of diseases for years, %								
	Lankaran-Astara			Absheron Peninsula			Guba-Khachmas		
	2001	2008	2018	2001	2008	2018	2001	2008	2018
Phytophthora <i>Phy. Infenstans</i> (M/) de Bary.	44,6	50,6	66,5	44,0	48,4	52,5	48,4	52,5	88,0
<i>Phy.parasitica</i> Dastur	--	31,2	38,8	--	--	14,6	18,5	29,0	31,7
<i>Phytophthora spp.</i>	--	22,1	48,9	--	34,8	25,3	--	76,2	46,8
Blight	32,0	41,2	37,1	37,3	58,2	54,6	32,6	38,2	42,8
Vascular wilt and Fusarium	26,5	38,0	42,4	27,7	29,2	22,5	24,6	26,2	18,9
Powdery mildew	--	--	--	22,6	24,6	42,6	--	--	--
Head rot	18,1	20	24,0	48,6	22,4	24,0	18,8	17,5	24,6
Bacterial stem rot	--	11,9	26,7	--	28,9	34,0	--	--	--
Mosaic viral diseases	--	23,6	41,7	22,4	45,8	52,7	--	--	28,7

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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