SEPTEMBER 8-10, 2021
BUDVA, MONTENEGRO

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Life Science and Technology

September 8-10 in Budva, MONTENEGRO

ABSTRACTS
&
PROCEEDINGS BOOK

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Dear Readers;

The fourth of ICONST organizations was held in Budva/Montenegro between 8-10 September 2021 with the theme of '*science for sustainable technology*' again. In recent years, weather changes due to climate change have reached a perceptible level for everyone and have become a major concern. For this reason, scientific studies that transform technological progress into a sustainable one is seen as the only solution for humanity's salvation. Here we ask ourselves "which branch of science is responsible for sustainability?". Sustainability science is an interdisciplinary field of study that covers all basic sciences with social, economic, ecological dimensions. If we consider technology as the practical application of scientific knowledge, the task of scientists under these conditions is to design products that consume less energy, require less raw materials, and last longer.

ICONST organizations organize congresses on sustainability issues of three main fields of study at the same time in order to present different perspectives to scientists. This year, 157 papers from 28 different countries presented by scientists in **ICONST Organizations**.

85 papers from 17 countries presented in our **International Conference on Engineering Science and Technology** organized under ICONST organizations. Turkey leads the way with 49% of the participants, followed by Kosovo and Moldova with 8.2%, North Macedonia 4.7%, Algeria, Azerbaijan, Hungary, Italy, Montenegro and Poland 3.5%, Croatia, Czech Republic, Kingdom of Saudi Arabia, Japan, Kyrgyzstan, Portugal and Russia with 1.2%.

57 papers from 13 countries presented in our **International Conference on Life Science and Technology** organized under ICONST organizations. Turkey leads the way with 49% of the participants, followed by Poland with 12.7% and Kosovo 11%, United Kingdom 5.4%, Kazakhstan, USA, Tunisia and Croatia 3.6%, Serbia, Israel, Czech Republic and Montenegro with 1.8%.

Finally, 15 papers from 8 countries presented in our **International Conference on Natural Science and Technology** organized under ICONST organizations. Turkey leads the way with 47% of the participants, followed by Kosovo with 11% and Serbia, Egypt, Bosnia and Herzegovina, Italy, Poland, North Macedonia and Romania with 6%.

As ICONST organizations, we will continue to organize organizations with the value you deserve in order to exchange ideas against the greatest threat facing humanity, to inspire each other and to contribute to science. See you at future events.

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ICONST LST 2021

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Contents

The Effect of Exogenous Copper Sulphate Application on Quality Criteria, Vitamin C, and Total Phenolic Countent in Leek (*Allium porrum* L.)

Özlem Aras Aşcı[1*], Neslihan Nohut Maşlakcı[1], Hüsnü Ünlü[2]

Abstract: Leek (*Allium porrum* L.) with its unique taste and aroma is a member of the Allium genus. Leek is an important plant used in gastronomy and modern food technologies. Despite this importance, there are very few studies in the literature examining the effect of bioactive substances on leeks. In this study, 0, 2, 4, and 8 mg L^{-1} doses of copper sulfate ($CuSO_4$) solution were applied exogenously to the leaves of the leek. The applications was made twice with an interval of 3 weeks after 7 weeks from the planting of seedlings. The leek samples were harvested 4 weeks after the last application. In the study, İnegöl-92 variety was used. In the research, % moisture, dry matter, chlorophyll a, chlorophyll b, total chlorophyll, total phenolic, total sugar, and ascorbic acid (vitamin C) amounts were determined in stem and leaves. In the applications, it was determined that the increase in $CuSO_4$ concentration caused an increase in the total phenolic content of leek. As a result of the increase in the amount of copper applied to the plant, the total phenolic content in the samples varies between 3.987 mg GAE g^{-1} FW and 5.309 mg GAE g^{-1} FW in the leaves. It was determined that the selected dose (4 mg L^{-1} $CuSO_4$) as the optimum amount of application increased the total amount of chlorophyll by 149% compared with the control. In our study, it was found that especially 4 mg L^{-1} $CuSO_4$ application increased the nutritional and vitamin C content of copper in leeks. In conclusion, it shows that $CuSO_4$ can be used in applications to improve the quality of leeks.

Keywords: Leek, Copper sulfate, Total phenolic content, Vitamin C, Quality criteria.

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Functional Diversity Effects Carbon Sequestration in Urban Forestry: Case of İstanbul in Turkey

Nermin BAŞARAN[1*], Hilal ÖZYADIN[2], Engin EROĞLU[3]

Abstract Urban areas are more exposed to the effects of climate change. However, urban forests, encompassing all trees, shrubs, lawns, and other vegetation in cities, provide a variety of ecosystem services such as regulating climate, and soil, water and air quality. Thus, plant diversity plays key role in increasing urban resilience against to climate change. Few studies have examined tree community composition or functional diversity linked with ecosystem services. İstanbul has the highest population and carbon footprint in Turkey. İstanbul has the highest population and carbon footprint in Turkey. Additionally, İstanbul is among the cities with the highest urbanization. However, It has no sufficient urban forestry and not all carbon sequestration capacities of existing urban forests have been calculated. . In this study, we discussed the diversity of plant communities and carbon sequestration in Beyazıt, Sultanahmed, and Üsküdar squares in İstanbul /Turkey. Beyazıt Square has 191 tree, Sultanahmed 384 tree, Üsküdar 108 tree. Species richness analysis shows that the species richness in Sultan Ahmet Square is higher than in other squares. According to the Shannon-Wiener index results, Beyazit Square has the highest heterogeneity. Functional diversity analysis show that Sultanahmed and Beyazıt Square were equal in terms of functional diversity. As a result of, We found that functional diversity and carbon sequestration has highly relationship. Additionally, our model showed also that vegetation richness don't directly effect functional diversity and carbon sequestration capacity at tree level. However, richness effects carbon sequestration at community level.

Keywords: Carbon sequestration, Ecosystem regulation services, Functional diversity, Richness, Urban forestry

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Synthesis and Characterization of New Ionic Liquids With Diboron Trioxide

Nesrin Korkmaz[1*], Hüseyin Akbaş[2]

Abstract: Ionic liquids (ILs) are salt compounds with low melting point, low vapor pressure, high solubility and thermally very stable. ILs, also known as ionic solvents or environmentally friendly solvents, are salts with a high content of ions (99.9%). The uses of ILs, which can be modified in endless combinations, are almost limitless.

Boron is an element in the first row of group 3A in the periodic table. It is not found in elemental form in nature. There are many boron-oxygen compounds called borate due to the high affinity of boron with oxygen. Boron oxide (B_2O_3) and boric acid (H_3BO_3) are the simplest ones among these compounds. Although there are hundreds of minerals containing boron in the world, very few boron minerals have commercial importance. The values of the commercially important boron minerals are directly proportional to the boron oxide in their structure. Boron oxide is the compound with the highest percentage of boron among boron products. Boron oxide has the advantage of low thermal expansion and high refractive index. Boron and boron products are used in many fields from communication tools, defense, textile, agriculture, glass, ceramics, construction and pharmaceutical industry to energy.

In this study, *2-amino-1-butanol (**Abut**), N-methylethanolamine (**N-Mea**), amino-2-propanol (**Apro**), ethanolamine (**Etam**), bis(2-hydroxypropyl)amine (**Bishypa**)* and *N,N,N',N'-tetrakis(2-hydroxyethyl)ethylenediamine* (***N-Theta***) aminalcol-derived ligands and new B_2O_3-containing ILs were synthesized by proton transfer between an equal amount of amino alcohol-derived ligands and B_2O_3. The structure of ILs was confirmed using FT-IR spectroscopy, ^{1}H, ^{13}C-NMR and elemental analysis (CHN) techniques. As a result of this synthesis and characterization, a new boron compound containing B_2O_3 in liquid form at room temperature has been synthesized and an alternative new boron compound that can be used in many different fields from the pharmaceutical industry to energy has been introduced.

Keywords: Ionic liquids, B_2O_3, synthesis, spectroscopy

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Relations between topographic variables and forest ecosystems in Isparta Regional Directorate of Forestry

H. Oğuz ÇOBAN [1, *], Mehmet EKER [1], Hakan DURGUN[2]

Abstract: Physiographic variables, which are a part of the forest ecosystem, influence climate, soil properties and therefore vegetation. The definition of factors such as altitude, aspect, and slope, which are mentioned as location factors, allows the definition of forest ecosystems living on them and their comparison with each other. The aim of this study is to reveal the relations of forest ecosystems in Isparta Regional Directorate of Forestry with topographic variables by using a digital elevation model produced from SRTM data. To achieve digital surface radar data of SRTM (Shuttle Radar Topography Mission) 1″ (~30 x 30 m) cell size was used. The digital surface models produced from the radar data were compared with the models obtained from local topographic maps. SRTM data was processed using the Geographic Information System and related topographic analyzes were made. Vector forest data in geographic database was edited and necessary attribute fields were added. Overlay analysis was performed on the produced topographic layers and forest layer. As a result of querying this data, the relations of forest ecosystems with topographic factors were determined and mapped. According to the results, the altitude in the study area is generally the lowest 72 m and the highest 2784 m. Forest ecosystems distributed between 72-200 meters at the lowest and 2100-2200 meters at the highest. Forests are mostly in the south aspect. However, there is an almost equal distribution in other aspects. Forest ecosystems in the study area are located at an average slope of 20-40%. The relations of topographical variables based on tree species, stand type, stand development age, and crown closure were examined in detail. We would like to emphasize that the results obtained from this study can be a resource for practitioners in forestry studies and that topographic analyzes with 1″ SRTM data can be used for forestry applications, except for studies that require high resolution.

Keywords: SRTM data, GIS, Digital elevation model, Physiographic factors

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''Effects of Sucrose and Brassinosteroid Treatments on Roor Growth and Secondary Metabolite productiob in Root Cultures of *Rubin tinctorum* L.''

Nilgün Göktürk Baydar[1], Özlem Aras Aşcı [2*], Tunhan Demirci[3], Hasan Baydar [4]

Abstract: Rubia tinctorum, is rich in anthraquinones (AQs) having biological activities and dyeing properties. This study was carried out to determine the effect of sucrose and brassinosteroid treatments on root growth and secondary metabolite production in root cultures of R. tinctorum L. In vitro root cultures obtained from internode parts were cultured in plant MS culture medium having altered concentrations of sucrose (3, 4, 5, 6, and 7%) and 24-EBL (0.25, 0.50, 0.75, and 1.00 mg L^{-1}) for 7 days. Afterward, root growth index (RGI), total phenolic content (TPC), purpurine, alizarin, and total AQs contents of adventitious roots were examined. All higher sucrose treatments increased RGI and secondary metabolite accumulation of the roots compared to the standard sucrose concentration (3%). The highest root growth was observed in nutrient media containing 6% sucrose, while the optimum treatment for TPC, purpurine, alizarin, and total AQs contents was 4% sucrose. On the other hand, while the RGI was not significantly affected by 24-EBL treatments, secondary metabolite production increased with 24-EBL treatments compared to controls. It may be concluded that 1.00 mg L^{-1} 24-EBL treatment was the most appropriate application providing the highest total AQs, alizarin, purpurin, and TPC.

Keywords: *Rubia tinctorum* L., sucrose, brassinosteroids, anthraquinones, phenolics.

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Determination Capacity of Air Quality Regulation Services in Urban Forestry: Case of Düzce in Turkey

Nermin BAŞARAN[1*], Melek YILMAZ KAYA[1]

Abstract: Urban air pollution is one of the most visible environmental problems to have accompanied Düzce's urbanization. Urban growth brought severe challenges to society, including environmental degradation, loss of natural habitats and increased human health risks associated with heat, noise, and air pollution in Düzce. Düzce has the highest air pollution in Turkey. However urban forestry influence the local climate and air quality. The amount and type of ecosystem services provided by urban forestry depend on their characteristics. Düzce city is in the shape of a bowl due to its topographic structure. The presence of 3 organized industrial zones in the city and the still use of coal for heating cause pollution to accumulate in this bowl structure. The city has an important status as a protected plain. Agricultural areas in and around the city core serve as ecological spots. The presence of streams and lakes in the basin where it is located is important for the air corridor. The aim of this study is estimate air quality regulation service on the impact and spatial variations of Düzce' s urbanization process. We model current air pollution, changes in urban land cover in Düzce based on large (26,21%) projected increases in the human population by 2040. Then, we mapped air quality regulation services for current and future. As a result of, we found degradation natural ecosystems depend on urbanization effects negatively air quality regulation services. Additionally, our model showed also that the gains achieved by increasing urban forestry areas and vegetation density can be maximized when applied to small sized green spaces.

Keywords: Air quality, Ecosystem regulation services, Urbanization, Urban forestry

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Purslane: A Health-Promoting Medicinal Plant With Multifunctionality

Fadime Eryılmaz Pehlivan[1*]

Abstract Purslane (Portulaca oleracea L.) is a succulent medicinal plant, is grown rapidly, with self-compatible producing large numbers of seeds that have a long survivability, is distributed in temperate and tropical regions world-wide, with a broad physiological adaptability. It is a weed naturally found in lawns, driveways, and fields and edible in many regions of the world. It possesses mucilaginous substances which are of medicinal importance. It is a rich source of potassium followed by magnesium and calcium and possesses the potential to be used as vegetable source of omega-3 fatty acid. It is very good source of alpha-linolenic acid (ALA) and gamma-linolenic acid (LNA) of any green leafy vegetable. It also contains high amounts of alpha-tocopherol and ascorbic acid. As an important drought-tolerant vegetable crop, purslane is also developed as a model system for exploring plant responses to stresses, particularly saline stress, and listed as halophyte in the Haloph database. Although purslane is considered as one of the world's most aggressive weeds in many agroecosystems, it is listed in the World Health Organization as one of the most used medicinal plants, providing biologically active substances and essential compounds for human nutrition.

In this study, purslane seedlings were detected for prolin, total phenolics, peroxidase enzyme activity, DPPH activity and betalain pigment content. Owing to its high antioxidant and radical scavenger properties, it is used in wound-healing, as analgesic, antimicrobial, muscle-relaxant, anti-inflammatory agent. The antioxidant content and nutritional values of purslane are important for human consumption, revealing tremendous nutritional potential and indicating the potential use of this multifunctional medicinal herb for the future.

Keywords: Puslane, medicinal plant, phenolics, antioxidant, multifunctional food

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Assessment of Landscape Potential in terms of Rural Tourism: Göktepe (Karaman) Town Example

Figen Altıner[1*], Abdullah Kelkit[2]

Abstract: People's desire to spend time in natural environments due to reasons such as rapid population growth, intensive working conditions, urbanization, environmental pollution and climatic changes has turned into a physical and mental need. This transformation has brought about developments in rural tourism in recent years. Rural tourism studies have become one of the important rural development tools for the region where it is located, as well as offering different recreational opportunities. However, just like the change and development movements on ecosystems, rural tourism studies should be examined and planned within the framework of conservation-based planning. In order to make sustainable, accurate and qualified planning and spatial analysis, it is necessary to determine the current and future positive and negative features of the area. The purpose of this study is to evaluate the landscape potentials in terms of sustainable rural tourism activities and to put forward the necessary suggestions. Göktepe town, which has strong characteristics in terms of rural tourism potential and is located within the borders of Karaman province, was selected as the research area. Göktepe Town has important resource values such as healing mud beds, rock tombs, natural walking areas, endemic plant species and wildlife. In addition, the fact that the Yörük culture still continues in the region makes the study area one of the priority destinations in terms of rural tourism. Within the scope of the study, meetings were held with the municipality administration and the village headmen of the town regarding the subject and field of work. In addition to the information and documents obtained from these interviews, on-site observations and examinations were made. At the same time, base maps of the natural ecosystem of the town and its immediate surroundings were created with the help of Geographical Information Systems. Within the framework of all the data obtained, the rural tourism potential of Göktepe Town was tried to be determined by SWOT analysis. In the framework of the study, taking into account all these characteristics of the town, the strengths and weaknesses of the area in terms of rural tourism and the opportunities and threats for the future were revealed in detail. In addition, various suggestions have been made in terms of the sustainability of tourism activities, which is one of the important tools of rural development.

Keywords: Rural tourism, geographical information systems, landscape planning, SWOT analysis

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Possibilities of Using Lignocellulosic Residues from Vineyards as an Alternative Material for Wood-Composites on the Example of Wood Plastic Composites Production

Aleksandra Jezo[1*]

Abstract: Lignocellulosic materials being an agricultural waste are easily available and commonly found in large quantities. Maintenance pruning in orchards and vineyards provides a vast amount of lignocellulosic biomass. It has been estimated that five tons of prunings can be obtained from one hectare. Only in the EU in 2015 vines were grown on 3.2 million hectares, and the approximate amount of biomass produced was 16 million tons. Therefore, many research works are carried out on the effective management of agricultural biomass, however research has been focusing mainly on investigating power engineering, particularly energy acquisition. Only a little part of vine pruning waste is used as a source of energy obtained from combustion, while the rest remains unutilized. Nevertheless a significant part of lignocellulosic materials classified as agricultural waste can be also successfully used in other applications.

The object of the following study was to evaluate the utilization of vine pruning waste as an alternative feedstock in wood plastic composites (WPC) production. The possibility of using vine prunings as an alternative feedstock for WPC composites creates new directions for the utilization of this biomass. WPC composites are widely applied in floor panels, terraces, or gardening furniture. In the frame of work were manufactured composites of the high density polyethylene (HDPE) with the varied contributions of vine pruning waste. Preliminary results on the mechanical and physical properties of the composites are encouraging and give grounds for further continuation of the research. The advantages of the investigated product, when applying it into the industry, would be not only reuse of waste biomass but also it could become an answer to raw-material problem. Moreover, the following research provides the field to introduce a more sustainable economy into orchards and wood-industry plants.of leeks.

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Concentration of Heavy Metals in the Hepatopancreas of the Roman Snail (*Helix pomatia L.*) in the city of Mitrovica-Kosovo

Leonora Çarkaj[1], Qerim Selimi[2], Murtezan Ismaili[3], Albana Plakiqi Milaimi[3]

Abstract: The purpose of our study was to monitor the pollution of the environment with heavy metals and the ability of the roman snail (*Helix pomatia*) to accumulate these metals, as well as the possibility of using the roman snail as a biomonitoring organism for metal pollution. For this reason, we have researched in two localities: in Mitrovica (contaminated area with heavy metals, with special emphasis on lead (Pb) derived from the "Trepça" smelter) and in the Vernica (control area 25 kilometers far away from Mitrovica). We were analyzed 22 individuals of roman snail in the Mitrovica and also, 22 in the village of Vernica for the concentration of heavy metals: Lead (Pb), cadmium (Cd), zinc (Zn) and copper (Cu) in the hepatopancreas tissue. The results have shown that the metal concentration was higher in the hepatopancreas of Mitrovica snails (Pb = 37.6 ± 2.1, Cd = 605.2 ± 308, Zn = 51.7 ± 27.8 and Cu = 8.5 ± 6.3) compared to the control group (Pb = 3.7 ± 3.8, Cd = 49.22 ± 25.7, Zn = 3.9. 2.8 and Cu = 7.3 ± 6.8) in the significant degree ($P < 0.001$).

We have found a significant positive correlation between all metals in compare: Pb / Cd ($r = 0.572$; $P < 0.005$); Pb / Cu ($r = 0.758$; $P < 0.001$); Pb / Zn ($r = 0.857$; $P < 0.001$); Cd / Cu ($r = 0.693$; $P < 0.001$); Cd / Zn ($r = 1.00$; $P < 0.001$) and Cu / Zn ($r = 0.685$; $P < 0.001$). In the Mitrovica, the environment is still high polluted with heavy metals and the roman snail can serve as a good animal model for monitoring heavy metal pollution.

Keywords: Roman snail, Hepatopancreas, Heavy metals, Pb, Zn, Cd, Cu.

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Influence of Different Habitat Types on Heavy Metal Content Along Railway Lines

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Abstract: There are many studies on heavy metals in the scientific literature, but relatively few of them relate to surfaces along the railway lines. This is worrying because the network of railway lines is built all over the world, and it passes through cities, settlements, agricultural and natural areas, and represents a significant source of environmental pollution. In order to increase knowledge on this issue, during 2014, in the northwestern Croatia, 60 soil samples were collected along railway lines in six common habitat types (i - habitats without plants, ii - with annual plants, iii - with horsetail, iv - mowed surfaces with dandelion, v - abandoned habitats in succession, vi - stands with goldenrod). The content of 29 chemical elements was determined using a high resolution inductively coupled plasma mass spectrometer (HR-ICP-MS). The results show higher mass concentrations of heavy metals in the habitats i, ii and iii. However, beside the habitat types, elevated concentrations of heavy metals are also affected by the following factors: soil texture, humus content, soil reaction, distance from the tracks, sampling site functionality, topography, and age of railway. The concentrations of the following chemical elements (in relation to the median for European soils and background values) were found to be particularly elevated: As, Cd, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sb, Sn, and Zn.

Keywords: heavy metals, railway, habitats, Croatia

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Bacterial Biodiversity in Selected Forest Nurseries

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Abstract: It is believed that most organisms find favourable conditions for living in terrestrial ecosystems, and thus these ecosystems are the places of the most intense accumulation of organic matter. Bacteria are able to colonize all terrestrial and aquatic ecosystems, ranging from places poor in organic compounds to rich environments – oceans, lakes, rivers or soils, they are also present in the air. The aim of this work was to examine the biodiversity of bacteria present in the soil in selected forest nurseries. The soil samples from the forest nurseries were analysed with Illumina sequencing. During the research, OTU (operational taxonomic unit) belonging to the kingdoms of Archaea and Bacteria were described. Additionally, 28-39% of OTUs have not been assigned to any of the above. The percentage share of the first-mentioned kingdom in the three forest nurseries differed between nurseries. In all of the tested forest nurseries bacteria belonging to the following classes were found: Chloracidobacteria, Fimbriimonadia, Leptospirae, Methylacidiphilae, Pedosphaerae, Saprospirae, Spartobacteria, Acidimicrobia, Acidobacteria, Actinobacteria, Alphaproteobacteria, Anaerolineae, Armatimonadia, Bacilli, Bacteroidia, Betaproteobacteria, Chlamydiia, Chloroflexi, Chloroplast, Chthonomonadetes, Clostridia, Cytophagia, Deinococci, Deltaproteobacteria, Elusimicrobia, Endomicrobia, Fibrobacteria, Flavobacteriia, Gammaproteobacteria, Gemmatimonadetes, Holophagae, Ktedonobacteria, Nitrospira, Opitutae, Oscillatoriophycideae, Phycisphaerae, Planctomycetia, Rubrobacteria, Solibacteres, Sphingobacteriia, Spirochaetes, Synechococcophycideae, Thermoleophilia, Thermomicrobia, Verrucomicrobiae. The bacterial communities differed from each other in terms of taxonomic diversity. Bacteria belonging to the clusters Proteobacteria, Acidobacteria, Gemmatimonadetes and Verrucomicrobia predominated in the soils of the studied forest nurseries. The forest situated in Southern Poland, showed the greatest bacterial diversity.

Keywords: bacteria, biodiversity, soil microorganisms, forest nursery

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Future Changes of the Major Forest Tree Species in South Aegean District

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Abstract: The climate crisis is one of the leading problems we have had to face in recent years. Especially the changes in natural ecosystems reveal the dramatic dimension of the climate crisis. Considering the mentioned crisis, distribution modeling of three major forest tree species (*Cedrus libani* A. Rich. (*C. libani*), *Pinus brutia* Ten. (*P. brutia*), and *Pinus nigra* J.F. Arnold (*P. nigra*)) were conducted for the present and the future. In the present study, the South Aegean District, where these species have a significant distribution, was selected as the study area. Presence data were recorded from 115 sample areas for *C. libani*, 582 sample areas for *P. brutia*, and 400 sample areas for *P. nigra*. Climate data were obtained from the WorldClim database for the present and future. The future modeling was carried out for 2100 for the SSP370 and SSP585 scenarios, which were made available within the scope of the IPCC 6th evaluation report. All models were run using the Maxent algorithm. The threshold level of 0.5 was used in the maps obtained for both the present and the future to express these changes concretely. In other words, areas with a predictive value greater than 0.5 were determined as suitable areas.

As a result of the modeling and mapping process, it was observed that there were significant changes in the distribution of target species. AUC values of the models were determined for *C. libani*, *P. brutia*, and *P. nigra* as 0.85, 0.79, and 0.87, respectively. Although 184000 ha is suitable for *C. libani* in present, a decrease of 144000 ha for SSP370 and 127000 ha for SSP585 has been observed. It has also been estimated that there are no suitable areas for SSP370 and SSP585 scenarios for *P. brutia*, which are currently determined as 353000 ha suitable areas. Similarly, no suitable area was predicted for *P. nigra* for both scenarios in 2100.

In this study, only climate variables were used to determine the pure effect of climate change (without other parameters as environmental and edaphic factors) on the distribution of these species. However, it is known that environmental variables also have an effect on the distribution of species. In any case, the results suggested that future climate changes will have an alarming effect on the distributions of these three species.

Keywords: Black pine, climate change, Lebanon cedar, Maxent, Red pine, species distribution modeling.

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Impact of Climate Change on Living Organisms

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Abstract: In this study, the findings of studies that predict climate change risk on living organisms on a global or regional scale were compiled. Climate change has significant impacts on the distribution and productivity of living organisms, biodiversity, population sizes, and health conditions. It is of great importance to be able to predict the future impact dimensions of climate change and to formulate protection strategies. It can be said that the recent temperature increases experienced on a global scale cause changes in the distribution of species. It has been observed that the damages in forests have increased regionally. Aquatic ecosystems and living organisms in aquatic ecosystems can have very clear responses to climate change. Extinctions are likely at some points where biodiversity is heavily affected. In addition, human health and well-being are faced with serious threats in the process of climate change. In summary, the crisis will grow as long as measures are not taken regarding the process. Therefore, we need to take strategic steps to mitigate the effects of climate change. We think that correct modeling and simulation techniques are very important in order to manage the process correctly.

Keywords: Biodiversity, climate scenario, endemic species, extinctions, protected areas, species distribution

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Relationships Between Earthworms and Physical and Chemical Soil Properties in Kütahya-Akdağ Region

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Abstract: Earthworms are key organisms in soil ecology and forest ecosystems. As ecosystem engineers, their activities affects not only the physical, chemical, and biological properties of the soil, but also promotes soil biodiversity, soil fertility. Therefore, they are extremely important creatures for the sustainability of forests and soil health. Although there are many studies on this subject, our knowledges about the relationships between earthworms and soil properties is general informations and still limited. This study was carried out to numerically determine the relationships between earthworms and soil properties and to eliminate the lack of information on this matter, on Kütahya-Akdağ region in 2018. Within the scope of the study, soil samples were taken from 118 sub-sample areas and earthworm inventory was made. Earthworm species, species richness, species diversity, abundance values, presence-absence values, and soil properties were determined for each sample area. The relationships between worm values and soil properties were analyzed by correlation analyzes, Kruskal-Wallis test and Multiple Response Permutation Procedure.

As a result of the analyzes, extremely important relationships were found between earthworm values and bedrocks, elevation, some environmental factors, and the moisture, depth, sand, clay, dust, pH, lime values of the soil. The most important factors affecting the presence and distribution of earthworms in an area were determined as soil moisture content and pH value, respectively.

Conclusions, we need a lot of study to make up for the lack of knowledge about the relationships between earthworms and soil properties and the ecology of earthworms.

Keywords: BİÇEB, Earthworm ecology, Shannon Index, Biodiversity, Species richness

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Industrial Particleboard Design with High Mechanical Resistance Values for Furniture Production

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Abstract: At the beginning of the 2000s, there were developments with new technology in the fabrication of wooden products. As a result of various researches on industrial wood products supported by competent institutions, designs that take wood material production to a new dimension have been realized.

The improvement in its structural properties has been effective in integrating wood into product designs. The fact that it is sustainable in many stages from its acquisition, production, use and recycling has been effective in the prominence of wood material in the fabrication of industrial products.

In this study, pre-treatment of brutian pine particles with alkaline (NaOH) solutions at different concentrations was carried out and it was determined that these pre-treatments improved the mechanical properties of the obtained boards. In addition, as the concentration of the alkali solution was increased in the applied processes, the color darkening was observed on the boards obtained.

The results of the study showed that decorative board products with high mechanical resistance values and different color ranges that can be used in mass furniture production can be obtained when a simple unit is installed in particleboard production and the particles are pre-treated with low-cost alkaline solutions.

Keywords: Industrial Design, Furniture, Mechanical properties, Particleboard.

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A Novel Topical Drug Based on Olive Oil for Full Thickness Wound and Diabetic Ulcers

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Abstract: Despite advances in wound care, impaired wound healing remains a significant clinical problem. The present study was aimed at developing a novel cream based on *Olea europaea* oil (olive oil) and investigating its wound healing effect on mechanical wounds in rats and diabetic ulcers in patients.The topical formulation water-in-oil emulsion-based cream contains olive oil in an amount of about 5% to 16% as active agent. The prepared formulation was subjected to physicochemical assessment and pharmacotechnical characterization. Eighteen rats completing full-thickness excisional skin wounds were randomly divided into three groups topically treated with either a normal saline (control group), the reference drug ("Mebo® ") or the olive oil based cream. The response to treatments was assessed by macroscopic, qualitative and quantitative histopathological analysis. The prepared formulation showed good physicochemical properties. The rheological behaviour of the prepared cream followed non-Newtonian pseudoplastic pattern at different storage temperature. The optimized formulation which is a macroemulsion with uniform size distribution remained stable for 6 months. Skin tolerance studies confirmed the compatibility of the cream with skin. During the experimental trial the cream based on olive oil treated group showed significant improvements over the control and reference groups for both general wound appearance and healing dynamics. On day 11, the olive oil based cream showed a significant decrease in the wound area (final area was equal to 0 cm^2) when compared to the control and reference groups. This increased rate of closure of wounds in rats was associated with increased collagen synthesis. Two clinical *cases* would be presented to show the *clinical* efficacy of the olive oil based cream on diabetic ulcers. Our findings showed that the olive oil based cream could be a promising and innovative therapeutic system as topical healer for the management of acute and diabetic wounds.

Keywords: pharmacotechnical, macroemulsion, Topical Drug.

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The Link Between The Proportion of Smokers and The Level of Education Among the Older Population in Europe

Besarta Taganoviq[1*], Naime Brajshori

Abstract Tobacco control is a primary entry point for achieving the global goal, agreed upon by the World Health Assembly in 2013, of a 25% reduction in premature mortality from non-communicable diseases (NCDs) by 2025. One of the nine voluntary global targets that were also endorsed by the World Health Assembly refers to a 30% relative reduction in prevalence of current tobacco use in persons aged 15+ years by 2025 (World health organization, 2014).Is to investigate if there is any relation between prevalence of smokers and level of education in elderly people in EU.Was used cross-sectional secondary data analysis from the easyShare database. The easyShare includes different information about 21 countries from EU. In this research participated 68231 people were 38497 are females meanwhile 29734 were males.

In a study made in among the Elderly people in Europe, in men, age-adjusted smoking prevalence was highest in elderly with low level of education (16.5%) and lowest in those with a high level of education (8.9%; p for trend = 0.015). From the findings through correlation analyses we found out that there is a moderated relation between level of education and proportion of smokers in elderly people in European countries. According to regression analysis it is found a significant relation between education level and proportion of smokers.

Keywords: Tobacco, global, Europe

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Woody Vegetation Classification with Hierarchical Methods in Kurucuova District

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Abstract: Forests are one of the most important earth resources for humanity. In addition to being a resource that serves a number of purposes, forests are ecosystems that add value to biological diversity with their very different features. Vegetation classification is also important for the protection and sustainability of biological diversity in forest ecosystems. In the study, the classification of woody vegetation in Kurucuova region was made by hierarchical methods. In the study, woody plant species and environmental factors were recorded in the inventory in 70 sampling areas. While cluster analysis and two way indicator species analysis were carried out, presence/ absence values of plant species were used. Multi-response permutation procedures analysis was applied to the results in order to decide which groups to use as a result of the analyzes. According to the results of the analysis was decided to interpret the two-way indicator analysis on the four-group distinction with three indicators. Cedrus libani, Salvia tomentosa, Cistus laurifolius, Phlomis grandiflora, Clinopodium vulgare, Juniperus oxycedrus were identified as discriminating species. Discriminating species were generally distributed at high elevation of the area. As a result of the study, it was determined that the most important variable in the formation of group separations is elevation.

Keywords: Elevation, Kurucuova, Vegetation Classification, Woody Vegetation

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Performance Results of the Prototype Electronic Control System for Micro-granular Fertilizer Units of Single Seed Planters[**]

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Abstract: In recent years, micro-granular fertilizers have been started to be used due to their advantages such as being able to be applied to the seed bed with the seeds, not having a phytotoxic effect, low-dose application, rapid and strong root growth. Unlike granular mineral fertilizers (fertilizer rate: 20-60 kg/da), micro-granular fertilizers are applied at low rates such as 0.6-4 kg/da and have a particle diameter (Ø) between 0.3-1.5 mm. For this reason, conventional fertilizer units cannot be used for micro-granular fertilizers. With the development of micro-granular fertilizer technology, machine manufacturers started to develop units for the application of this new low-rate fertilizer to the field. As in granular fertilization, in these micro-granular application systems, the movement taken from the ground wheel and transferred to the fertilization units with various transmission ratios. These classical systems have many negative aspects, especially about sensitivity. In this study, a prototype micro-granular fertilizer application unit, which works in integration with all units of a single seed planter and that can provide electronic adjustment and control designed and developed. In addition, the performance of this system was determined at 3, 6 and 9 km/h operating speeds with 2.0, 2.5, 3.0, 3.5 ve 4.0 kg/ da application rates. At the operating speed of 3 km/h and with the fertilizer application rate settings of 2.0, 2.5, 3.0, 3.5 and 4.0 kg/da, the measured rates corresponding to the set value entered into the electronic control system interface were 2.04, 2.52, 3.06, 3.60 and 4.06 kg/da, respectively. For 6 km/h operating speed, these results were 2.10, 2.51, 2.99, 3.30 and 3.28 kg/da. Measured rates for 9 km/h operating speed were determined as 2.06 for 2 kg/da setting rate, 2.32 for 2.5 kg/da, 2.34 for 3 kg/da, 2.33 for 3.5 kg/da and 2.23 for 4.0 kg/da setting rates which was adjusted on the system control unit. It was determined that the electronic control system had difficulty in exceeding the limit of 2.50 kg/da application rate especially at higher operation speeds (9 km/h). The MAPE (Mean Absolute Percentage Error) values that made for all speed and fertilizing rates considered within the scope of the research were detected lower than 10%, which was stated as the success limit of the fertilizer systems.

Keywords: Micro-granular fertilizers, electronic control, single seed planters.

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Radioactivity Concentrations of ^{134}Cs, ^{137}Cs and ^{40}K in Some *Morchella* species collected in Turkey

Oğuzhan Kaygusuz[1][*], Kulbanu K. Kabdulkarimova[2]

Abstract: Radioactivity concentrations of ^{134}Cs, ^{137}Cs and ^{40}K in 16 mushroom samples belonging to genus *Morchella* (*M. deliciosa, M. elata, M. esculenta* and *M. tridentina*) of Ascomycota (Morchellaceae: Pezizales) collected from different regions of Turkey have been analyzed between 2013 to 2015. All of *Morchella* specimens are species of edible mushrooms growing wild in Turkey. Analyzes were carried out for fresh, air-dried and freeze-dried mushrooms. The radioactivity concentration ranges of ^{134}Cs, ^{137}Cs and ^{40}K in *Morchella* samples were <10 Bq kg^{-1} wet weight, <10 Bq kg^{-1} dry weight and <10 Bq kg^{-1} dry/frozen weight for ^{134}Cs, <10 Bq kg^{-1} wet weight, <12.3-30.7 Bq kg^{-1} dry weight and <10 Bq kg^{-1} dry/frozen weight for ^{137}Cs, and <953-1568 Bq kg^{-1} wet weight, <706-900 Bq kg^{-1} dry weight and <748-863 Bq kg^{-1} dry/frozen weight for ^{40}K. Bioaccumulation values of radiocesium by *Morchella* were found to be negligible in research area.

Keywords: Edible Mushroom, Effective Dose, Cesium-134, Cesium-137, Potassium-40

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Heavy Metal and Radiation Analysis of Some Medicinal Plants from Kazakhstan

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Abstract: In this study, the determination of heavy metals and radionuclides in *Filipendula ulmaria* (Meadowsweet) and *Helichrysum arenarium* (Sand immortelle) which are medicinal plants (MP) was performed. Due to the fact that medicinal plants can accumulate radionuclides and heavy metals, which negatively affect their quality, the determination of specific activity of gamma-emitting radionuclides (^{40}K, ^{232}Th, ^{226}Ra, ^{137}Cs) and the concentration of toxic metals (As, Cd, Pb) were carried out. The quantitative composition of heavy metals was determined by inductively coupled plasma mass spectrometry (ICP-MS) and inductively coupled plasma atomic emission spectrometry (ICP-AES). It was found that the concentration of radionuclides in medicinal plants does not exceed the minimum significant specific activity (MSSA), and the concentration of cadmium, lead, and arsenic is significantly lower than the normalized indicators. The obtained data on the accumulation of radionuclides and toxic elements in the studied two medicinal plants indicate a favorable situation in the Semipalatinsk region (Kazakhstan).

Keywords: Meadowsweet, Sand immortelle, Mass spectrometry, Atomic emission spectrometry, Gamma-emitting radionuclides, Kazakhstan

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New Locality Records of Gamundia striatula (Agaricomycetes: Agaricales) from forests of Italy and Turkey

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Abstract: *Gamundia striatula*, rather rare species in the family Tricholomataceae, is reported from Veneto region of Vicenza Province (Italy) and Pamukkale district of Denizli Province (Turkey), based on the macro- and micromorphological features, and its identity supported by molecular analysis of the internal transcribed spacer region (nrITS). The specimens were found on a large moss covered wood of *Quercus coccifera* and near *Picea abies* tree. A description of G. striatula is accompanied by illustrations of macro- and micromorphological characters, and a discussion of related taxa is provided.

Keywords: Agaricoid fungi, nrITS, phylogeny, taxonomy, distribution

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Fire Performance of Thermally Modified Wood Impregnated with Clay Nanomaterials.

Ali Ihsan KAYA[1*]

Abstract: Wood is one of the traditional and most widely used construction materials. However, it is thermally degradable and flammable, which posing a serious safety concern in use. In this research, Flammability behavior for cedar (*Cedrus Libani* A. Rich.) wood impregnated with inorganic based clay nanomaterials and thermally at 160, 180 and 210 ºC modified was examined by cone calorimetry, scanning electron microscopy, thermal gravimetric analysis, and Fourier transform infrared spectroscopy. Results revealed that the unique combination of these two processes reduced the total heat release by up to 38%, diminished flame spread by 35%, decreased the average carbon dioxide yield by 15%, lowered the total mass loss by 12%, and significantly slowed the pyrolytic reactions of wood. This research has important implications for the development of valued-added wood products with superior fire safety from relatively low cost timbers, such as *Cedrus Libani* A. Rich.

Keywords: Flammability, Impregnation, Thermally modification, Wood, Nanomaterials

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The Determination of Some Properties of Densified Red Pine Wood

Ömer Ümit Yalçın[1*]

Abstract: The high-performance and environmentally friendly material need are increasing on all scales from small applications in the many industry branches. In this regard, natural wood is a low-cost and abundant material as a structural material for building industry. But the mechanical properties of wood can not satisfy in some applications. In this study, Red pine wood samples were investigated for densification. The densification process involves two part that the partial removal of lignin and hemicellulose from the natural wood and hot pressing. The densified wood thicknes was approximately % 70 reduced compared to test samples. The Thickness Swelling in water (TS, %), Water Absorption (WA, %), Bending Strength (MOR), properties of the boards were examined.

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Holistic Marketing Platform in Development of Eco-Tourism in Montenegro

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Abstract: The paper present theoretical and practical aspects of holistic marketing platform in development of eco-tourism in Montenegro. Focus of the paper is on developing theoretical aspects of holistic marketing platform in development of eco-tourism in Montenegro. The theoretical part of the paper is based on modern literature in the field of holistic marketing approach in tourism. The key hypothesis of the paper is that holistic marketing is platform for development of eco-tourism. In that way, it is important to improve strategies of marketing, in order to raise awareness about ecology to target audiences and to ecological improvement tourism. The special aspect of the paper are strategies of holistic marketing, internal marketing, integrated marketing, relationship marketing and social responsible approach, as base for marketing strategies in tourism. Montenegro is ecological country, with beautiful nature, clear sea, breathless mountains, open heart people, kindness hospitality, wide range of target groups, according to interests, financial opportunity, very deep historical stories, deep tradition, including old music instruments and style of singing that song, specific, excellent gastronomy. Montenegro has slogan for tourism "Wild Beauty", and it is important to send that message by social media, by tourist's experiences, by storytelling, by deep diving into Montenegro culture. In the empirical research the paper will present case studies about implementation of holistic marketing in development of eco-tourism. The empirical research will include results of questionnaire research about perception of eco-tourism in Montenegro. The research in the paper will be qualitative and quantitative. The empirical research will analyze impact of experience marketing, emotional marketing and traditional social marketing strategies in raising awareness about eco-tourism. In the case studies the paper will present good examples of holistic marketing in raising awareness about eco-tourism. The paper present modern marketing models in development of eco-tourism. The paper will analyze impact of social responsible approach and social media on raising awareness about eco-tourism in Montenegro. Presented case studies are: Budva -Theatre City, Montenegro - ecological country, Ada Bojana - Green Tourism, Kotor - Artistically City, Meljine - Healthcare tourism, Igalo - Healthcare tourism, Herceg Novi - Poetry city, Tivat - Yachting Tourism. Porto Montenegro - Luxury tourism, One and Only - Luxury tourism, as well as, places a Montenegro for glamorous camping tourism, for camping tourism, for full connection with nature.

Keywords: Holistic marketing, marketing strategies, experience marketing, eco-tourism.

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The influence of soil solarization on microbiota in selected Polish forest nurseries

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Abstract: Solarization is a hydrothermal soil decontamination process that occurs through passive solar heating. It occurs through a combination of physical, chemical and biological mechanisms. Solarization is used as a substitute for chemicals in a small percentage on a global scale, however, this percentage is constantly increasing, among others due to the fact of reducing the use of toxic chemicals. The solarization process is mainly used in areas where the air temperature is very high in summer, e.g. in India. Plastic film placed on moist soil during high solar insolation, contributes to reducing the occurrence and even complete elimination of pathogens and pests, including fungi, bacteria, nematodes, arthropods and weeds. There is little work done on soil solarization in forest nurseries, its effect on soil-inhabiting microorganisms and changes occurring during its implementation on the structure of the microorganism communities. Forest nurseries are characterized by specific plant breeding that differs from agricultural crops breeding. In Poland forest nurseries have been established on average several dozen years ago, which affects the imbalance between saprotrophic and pathogenic microorganisms in soil.

The purpose of this research was to investigate the impact of soil solarization in Polish climate conditions on soil organisms in three forest nurseries located at different latitudes of the country. The experimental plots in each nursery were flooded with water, and then covered with thick foil. In the soil, before covering it, in three replications, at 3 different depths (5 cm, 15 cm, 30 cm), loggers recording the temperature and humidity of the soil throughout the experiment were placed. Before starting the experiment, soil samples from 5 cm, 15 cm, 30 cm deep were collected from each plot for the DNA isolation. The next samples were taken after 4 weeks, 7, and 11 weeks from the establishment of the experiment. The effect of temperature over the solarization time on occurring organisms was investigated in soil for Fungi, Oomycetes and Bacteria. The experiment allowed to determine the impact of soil solarization on the development of individual groups of microorganisms, including pathogenic and saprotrophic ones at individual soil depths.

Keywords: soil, solarization, forest nursery, microorganisms, microbiota,

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Determination of the Main Climatic and Biotic Stress Factors Affecting *Pinus brutia* Ten. in Denizli (Bozkurt) in Turkey

Refika Ceyda Beram[1]*

Abstract: Urban trees play a crucial role in mitigating urban environmental problems. Decreasing urban tree health can influence critical ecosystem services, such as air quality, temperature moderation, carbon storage, and biodiversity conservation. In general, urban trees are under continuous pressure from climatic and biotic stress factors as well as other environmental problems. The climatic stress factors such as drought increasing the risk of water stress for trees, and therefore, their susceptibility to some pests and pathogens. Recently, drought-related forest declines have been increasing in the Mediterranean basin, and this is not limited to natural forests but has also occurred in urban trees. Drought can affects the tree's health and mortality, also can be viewed as an inciting factor that generates adverse growth conditions and a loss of vitality that can make the trees susceptible to secondary damage factors. These factors could alter the compositional and structural characteristics of urban trees, which in turn could affect ecosystem services. *Pinus brutia* Ten. is the most common and widely distributed coniferous species in Turkey. This species is one of the main species preferred in afforestation studies in the south and west of Turkey for decades due to its ease and success in afforestation. Intense deformation and drying were observed on *P. brutia*, which is mostly used in afforestations in center of the Bozkurt district in Denizli province. The aim of this research is to determine the role of climate, especially drought and biotic stress factors on the health of urban trees and to advise managers on appropriate management strategies and control options for urban trees. Periodic surveys were carried out on *P. brutia* distributed in centre of the district for a period of one year. As a result of the study, insects such as *Dioryctria mendacella* Staudinger (Lepidoptera: Pyralidae), *Marchalina hellenica* Gennadius (Hemiptera: Marchalinidae), *Tomicus destruens* Wollaston (Coleoptera: Scolytidae) and fungal pathogens such as *Porodaedalea pini* (Brot.) Murrill were detected from the survey area. It has been determined that the trees that cannot adapt to the environmental conditions in the survey area weaken, become more susceptible to pests and finally dry out. It is concluded that the selection of the appropriate species will be of great importance both ecologically and economically, taking into account the growing environmental conditions and the presence of biotic stress factors in the afforestation works to be carried out in the district. Given the future effects of climate change on the growth and mortality of urban trees, it is critical for managers to develop adaptive management practices.

Keywords: P. brutia, urban tree, climatic factors, biotic factors, pests, fungi.

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Visualizing Metastatic Degree of Cancer Cells

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Abstract: The majority of cancer related deaths are caused by metastases. The identification of the metastatic potential of cancer cells has great importance for determining the correct treatment. Incorrect diagnosis can lead patients to undergo unnecessary treatments or to be denied necessary treatments. The prognosis for metastasis is currently based primarily on the condition of the adjacent lymph nodes and the morphological classification of the tumor. Such a diagnosis is not immediate and usually requires taking a biopsy from the tumor. Furthermore, in many cases, such as in breast cancer and pancreatic cancer, these predictors are limited or unreliable. In this study, we intend to develop a novel technique that will allow us to visualize cancer cells and describe their metastatic degree based on their infrared spectroscopic properties. This technique would give immediate and real-time diagnosis of the degree of metastasis of the suspicious tissue even without the need for a biopsy and with its help we can offer customized treatment to each patient.

Fourier Transform Infra-Red (FTIR) spectroscopy is a particularly useful tool for studying the structure and chemical composition of molecules such as phospholipids, proteins, nucleic acids, and carbohydrates, and their interactions with surrounding molecules. Specifically, FTIR spectroscopy has been demonstrated to be highly useful in the investigation of biological cells, producing spectroscopic signatures that effectively differentiate between various types of cells. The use of micro-spectroscopy (FTIR microscope) allows the spectral information to be combined with the spatial information so that the tissue can be mapped based on the spectral properties of its cells.

In our previous work, we were able to distinguish between melanoma cells with varying metastatic potential. We have found two complementary lines of evidence that link the cells' metastatic potential to the hydration level of cell membrane. Our method was developed on melanoma cells in culture. In the proposed work we would like to expand these results to other types of cancer cells in culture, as well as to the differentiation between cancer and normal cells. Once we prove that our method is also suitable for other cancer types we will use FTIR microscopy to apply the method to cancerous tissues.

The success of the proposed study will enable the development of a device that performs real-time imaging of cancerous or suspected cancerous tissue and maps the various areas in the tissue according to the degree of metastasis of the tissue cells. Such a device will allow immediate diagnosis and classification of the tissue, will assist in the removal of tumors during surgery and will allow the doctor to tailor the most beneficial treatment to the patient.

Keywords: Fourier Transform Infra-Red, microscopy

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Precision farming in all aspects

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Abstract: Starting from the beginning of industrialization, there have been technological leaps that have revolutionized the concept of industrial production, sometimes called industrial revolutions. With the first industrial revolution, while mechanization took place in the industry, the importance of genetic structures in the yield of animals used in animal production was understood, and selection studies for genetic improvement were started. With the second industrial revolution, while the production was standardized in the industry, the importance of pure breeds in order to increase the yield in animal husbandry, genetic improvement began with the crossing of different breeds or lines. The importance of feed and nutrition is increasingly recognized. The nutrient requirement of farm animals with a single feed It has been understood that the importance of micronutrients such as vitamins and minerals for life and productivity, which can be provided with a mixture of different feed materials, with the third industrial revolution, while electronic control systems and robot technology were put into practice, the period of obtaining hybrids in poultry, production of high-yielding pure breeds and benefiting from them in production began as a result of breeding-specific crossbreeding in animal husbandry. The third industrial revolution has made a great contribution to the technological development, especially in compound feed production, to the use of computers in this context, and to the increase in feed quality. Industrialization has accelerated thanks to improvements in herd management, care and feeding in animal production. Digital transformation has a significant impact on all industries. Manufacturing organizations have begun to accept and even experience the advantages of digital transformation. Most companies understand the need to move towards Industry 4.0. Because, human errors and decisions should not be put at risk as they have a major impact on end product quality and profitability. The applications like milking, feeding and environmental control that need to be done daily in herd management are configured according to the accuracy of the records by using technologic systems which can offer many opportunities to farmers. However, today together with Industry 5.0 unmanned technologies are under development by scientists and researchers for society.

Keywords: PLF, technology, data analysis, animal

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Development and testing of a prototype electronic control system for granular fertilizer units of single seed planters[**]

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Abstract: In plant production, in addition to other cultural factors, the number of plants and the amount of plant nutrients applied to the unit area are the most important factors affecting yield. Mineral granular fertilizers are widely used in agriculture to increase crop production and ensure soil fertility. Today, traditional planter integrated fertilization units which are driven by mechanical power transmission (with chain and gears) are used. However, such units have many negative aspects such as skidding, slipping and jamming, and their adjusting sensitivity of this systems is very limited. In this study, the development and tests of an electronic system that allow stepless adjustment of granular fertilizer application in single seed planters have been carried out. To make the system modular, microcontrollers platform was used for all corrugated roller shells. The system was tested with 3, 6, 9 km/h forward speeds and also under dynamic variable speed conditions of 0-12 km/h to simulate real field conditions. 20, 30, 40, 50 and 60 kg/da application rate were chosen and standard granular fertilizers (15-15-15- NPK) were used in the trials. Measured application rates were 20.03, 21.41, 22.40 and 21.99 kg/da for the 20 kg/da application rate settings of 3, 6, 9 (km/h) and dynamic variable speed conditions, respectively. The others measured application rates were determined as 31.02, 32.23, 32.88 and 32.97 kg/da for 30 kg/da application rate setting and 41.53, 42.11, 43.32 and 42.73 and 51.98, 53.50, 51.79 and 51.38 kg/da respectively for 40 and 50 kg/da application rate settings. For 60 kg/da application rate, these values were also determined as 61.87, 63.98, 59.14 and 62.90 kg/da, respectively. The lowest standard error was determined at 50 kg/da fertilizer rate and the highest standard error was found at 20 kg/da rate. With these results, it was clearly seen that the developed system provides a very successful performance in reaching the adjusted fertilizer application rate on the system interface for all speed conditions. The closeness of the target fertilizer application rate entered in the system control panel to the measured granular fertilizer rate were very close under all operating conditions, and the mean absolute percent error (MAPE) values were very low.

Keywords: Granular fertilizer, electronic control, single seed planters.

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Proteomic Profiling in Multicentric Canine *Lymphoma*

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Abstract: Lymphoma is the most common spontaneous malignant tumor in dogs. As a heterogeneous disease, canine lymphoma represents malignant transformation of lymphocyte subtypes at different stages of development. Different biomarkers of canine lymphoma for diagnosis, prognosis, and therapy monitoring have been of clinical interest for more than a decade. Moreover, canine lymphoma is similar to human non-Hodgkin's lymphoma and represents an excellent model as the most widely investigated tumor both in veterinary and comparative oncology.

This study employed quantitative label-based proteomic and bioinformatic approaches to identify potential serum biomarkers in dogs with lymphoma. Ten dogs with multicentric lymphoma were followed in 3 time points: at the presentation to the Clinic for internal diseases, during the treatment and after the treatment. The results were compared with samples obtained from 10 healthy dogs.

Results summary based on analysis of 378 proteins and four different groups of dogs: 50 proteins were significantly different between the four groups after FDR correction (all FDR < 0.05). In post-hoc tests, 152 proteins were significantly differentially abundant with adjusted P-value (FDR < 0.05) according to the group combinations (10 unique genes). Involved proteins had a role in different biological processes: response to stress, blood coagulation, regulation of biological quality, defence response, adaptive and innate immune response and acute-phase response. Differentially expressed REACTOME pathways are: complement cascade, common pathway of fibrin clot formation, signaling for integrins, innate immune system, thrombin signalling through proteinase activated receptors (PARs), platelet activation, signaling and aggregation, regulation of complement cascade and cell surface interactions at the vascular wall. Overexpressed subunit of fibrinogen - fibrinogen gamma chain isoform X2, different isforms of fibronectin and rearrangement of genes for immunoglobulin are previously connected with human cancers and non-Hodgkin's lymphoma, so they deserve further validation.

Spontaneously occurring malignancies in dogs provide a tool for translational research for human oncology. Complete characterization of canine proteome in lymphoma, as well as biomarker validation with detailed explanation of the role of involved proteins becomes useful for diagnosis and treatment monitoring.

Keywords: proteomics, dog, lymphoma, biomarker.

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Chlamydomonas Reinhardtii Mediated Resistance Against Pseudomonas Syringe Infection in Tobacco is Essentially İndependent of Cytokinins

Roman Sandor[1*]

Abstract: Microalgae are a large and diverse group of microorganisms that play an essential role in agriculture as bio-fertilisers. Microalgae have been shwon to promote faster germination, root growth, and pathogen resistance in plants when applied to the soil. Microalgae can produce auxin, abscisic acid (ABA), ethylene (ET), Cytokinin (CKs) and gibberellins (GAs). CKs are a well-known class of phytohormones essential to plant life, and recent evidence shows that CKs play a role in plant defence responses. This study aimed to see if a CK-producing strain of the microalgae *Chlamydomonas reinhardtii* (Chl) could promote resistance to the pathogenic bacterium *Pseudomonas syringae* in *Nicotiana tabacum*. We have shown a significant reduction of disease symptoms and living bacteria present in the treated leaves.

To further analyse the role of cytokins in biocontrol by Chl we used cytokinin-deficient CRISPR/cas9 Chl mutants. Gene knockouts for the LOG (strains PH145 and PH147) and IPT (strains PH219, PH220, PH221 and PH222) genes were generated, which are involved in the two main CK synthesis pathways. Measurements of endogenous cytokinins in the wt-Chl and the generated mutantshas clearly shown high CK content in the wild type, significant reduction of CKs in the LOG mutants, while the IPT mutants contained only negligible quantities of CKs.

Finally, the novel strains were tested in biocontrol experiments. Surprisingly, we have observed no significant reduction in their mean ability to decrease disease symptoms compared to the wt, which means that cytokinins present in the algae are not the driving force behind the conferred resistance.

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The Effect of Application of Densified Wood in I-beams on Their Bending Properties

Anita Wronka[1], Grzegorz Kowaluk[2*]

Abstract: The wood and wood-based materials gets more popular in the light of low-energetic and/or passive houses and buildings. The structural elements of such constructions, are quite often made of wood connected with wood-based materials, like I-beams. The main load of these elements located horizontally in roofs, ceilings or floors, is bending. In case of wood and wood-based materials, the bending feature is strongly correlated to material density. The goal of research was to evaluate the effect of application of densified wood in I-beams on their bending properties.

Within the scope of research, the characteristic of densified wood has been completed, including density profile measurement and bending strength and modulus of elasticity estimation, in reference to undensified wood. The prepared samples of I-beams, made of densified and undensified wood in flanges and high density fiberboard (HDF) in web, have been tested during static bending. In addition to the basic characteristic of tested samples during bending, the collapse manner of the tested beams has been described.

Keywords: wood, densification, structural material, I-beam, bending, mechanical properties

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Effect of thermomechanical densification of pine wood (Pinus sylvestris L.) on axial force, torque and quality of processing during drilling

Barbara Białowąs[1*]

Abstract: For years, various modifications of wood have been used to improve selected wood properties, such as: hardness, dimensional stability, hygroscopicity and resistance to biological degradation. Among the many available methods of wood modification, can be distinguish: chemical, thermo-hydro-mechanical, biological, with the use of electromagnetic or plasma radiation, and many others.

One of the many available methods of wood modification is thermo-mechanical modification, commonly known as "compaction". Thermo-mechanical treatment of wood is a process of increasing the density of wood using heat and mechanical compression. Wood compaction improves its properties, increases its hardness, resistance to fire, thermal conductivity and reduces abrasion and porosity of the surface and changes its color.

The aim of the study was to determine the effect of thermo-mechanical modification of pine (Pinus sylvestris L.) wood on the axial force and torque during through-drilling as well as to assess the quality of processing of the holes formed. The machining quality was assessed on the basis of the surface roughness (according to Ra index) inside the holes formed. Selected physicomechanical properties of compacted and native wood were examined in the study. As part of the study of wood machinability assessment, an industrial CNC machining center and commonly available through-hole drills were used. During the tests, diagnostic signals of the axial force and torque were recorded.

The results obtained during the research show that the thermo-mechanical modification of wood has a statistically significant influence on the increase of axial force and torque during drilling and also improves surface roughness.

Some of the mentioned tests have been completed within the activity of Student Furniture Research Group and Student Wood Technologists Research Group, Faculty of Wood Technology, Warsaw University of Life Sciences – SGGW.

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Bending Characteristics of Wood I-beams Made With Use of Selected Biopolymers

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Abstract: The popularity of wood and wood-based materials grow, especially when recognized as potential material for construction of module, pre-assembled construction of low energetic or passive buildings. The multi – material elements of such constructions, like I-beams, are produced generally with use of crude oil based resins and glues. It should be highlighted here, that, due to limited capacity resources of that binders, it is necessary to look for new, based on renewable resources. The promising results in wood bonding are available for selected biopolymers, like polylactide (PLA) and polycaprolactone (PCL) and their blends with additional components. Thus, the goal of this research was to characterize the bending properties of wood I-beams made with use of selected biopolymers as a bonding agent.

Within the scope of research, the samples of I-beams have been prepared in laboratory conditions, where the PLA and PCL have been applied in liquid state to bond together the elements of I-beams, like flanges and webs. The prepared samples have been tested under static bending to achieve the bending characteristic. The occurring collapse manner has been also observed to get more information about potential usefulness of above mentioned binders in bended materials.

The presented study have been co-financed by The National Centre for Research and Development under Strategic Research and Development Program „Environment, agriculture and forestry" – BIOSTRATEG agreement No. BIOSTRATEG3/344303/14/NCBR/2018. The Authors wants to acknowledge the Student Furniture Research Group (Koło Naukowe Meblarstwa), Faculty of Wood Technology, Warsaw University of Life Sciences – SGGW, for realization of selected tasks.

Keywords: wood, structural material, I-beam, biopolymer, bending, mechanical properties

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Characteristic of Selected Properties of Biopolymer Blends for Further Application in Wood-based Composites

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Abstract: Currently, in the wood-based panels industry and the scientific community, the research and experiments are conducted to take into account environmental and economic problems by increasing the use of renewable resources and biological origin in the production of wood-based materials, due to the dominance of petroleum products, whose resources are limited. Biocomposites are becoming more interesting and promising alternative to commonly used petropolymers, which have a negative impact on health and the environment throughout their entire life cycle.

The aim of the research was creating biopolymer blends with substances of the nature of compatibilizers and characterizing main properties of biopolymer blends using selected techniques of chemical and thermal analysis. The investigated materials were natural polymers, such as polylactide (PLA) and polycaprolactone (PCL). At the begining, the materials surface energy characterization was conducted, and then testing of blends by differential scanning calorimetry (DSC), thermogravimetry analysis (TGA), termomechanical analysis (TMA) and near infrared radiation (NIR).

The conducted research allowed to determine, i.a. polarity of used biopolymers, improving the interfacial adhesion between the substrate and the biopolymer used as a binder in wood materials, by filling the biopolymers with nanoparticles. We expect that biopolymers used as a binder in wood- based composites technology, modified by nanoparticles, achieve the better mechanical and physical properties compared to pure industrial biopolymers, due to improved adhesion. After testing of above mentioned biopolymer blends, the achieved results in the field of properties of biopolymer blends, can be used to determine the application of these blends in wood-based composites.

Keywords: biopolymer, blends, DSC, TGA, TMA, thermal analysis, wood-based composite

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Determination of the Effects of Conventional and Reduced Tillage Systems on Weed Density in Dry-Land Wheat Production

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Abstract: The study was carried out in the soil tillage plots which are under long-term period (from 2002) in the Dardanos Crop Production Unit in the last growing season. Conventional tillage system with mouldboard plough, commonly used by local farmers, and two reduced tillage (shallow tillage with rototiller, chisel) systems. The effects of the tillage systems were investigated to determine the weed density in dry-wheat production.According to the results, it was observed that rototiller encouraged the emergence of weeds in the early autumn after wheat seeding according to the rainfall distribution. On the other hand, such an effect was observed in the system in which the mouldboard plough was used, mostly in early spring. Chisel was found to be more stable in terms of weed density in both autumn and spring season during experimental period. Weed diversity per unit area was observed during the period of February and March when the highest populations were observed such as petalless daisy *(Matricaria discoidea)*, Wild Mustard *(Sinapis arvensis)*, vetch *(Vicia sativa L.)*, common glow grass *(Veronica hederifolia)* and pea *(Pisum sativum)*. Among these species, it was observed that the density of petalless daisy and wild mustard per unit area was 47.34 weeds m^{-2} in the conventional system in which the mouldboard plough was used, while the density of the same species was 61.70 weeds m^{-2} in the reduced tillage with chisel system. In the period through April and May, the highest weed diversity was achieved for shepherd's bag *(Capsella bursa-pastoris)*, goose beak *(Corydalis)*, yogurt grass *(Galium aparine)* and wild lettuce *(Lactuca serriola)* varieties. It was determined that the conventional tillage at harvest had the lowest weed density with 3.17 weeds m^{-2} regardless of species, and reduced tillage with chisel had the highest population with 8.37 weeds m^{-2}. Over this period, the tillage system had a significant effect on the weed density.

Keywords: wheat, weed, tillage, dry-farming, soil management.

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++ This paper was produced from some data of the first author's master thesis studies at Canakkale Onsekiz Mart University School of Graduate Studies.

Invasive Species and Their Impact of Forest Ecosystems

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Abstract: Forest ecosystems are subjected to numerous biotic and abiotic stresses as natural components in development processes. Amongst the stresses are native insects and pathogens, drought, storms and fires, each of which affect forests by weakening the trees, or in extreme cases causong mortality. The effects of these stress factors can be observed locally, when extinction of species or significant long-term changes in the forests are not likely. In contrast, alien invasive species (AIS) threaten the ecosystem to which they are inadvertently transferred. Threats of AIS in world forestry are already at alarming levels. Forestry activities, changes in land use, international and national trade, tourism and global climate change are factors contributing to spread and establishment of AIS. While globalisation brings about economic, social, technological, political, cultural integration and cooperation between the countries involved, it also presents increasing risks of the movement of AIS. Introduction of AIS to previously uninvaded areas results in unrecoverable changes to the forest ecosystems and, as establishment in natural communities proceeds, native species face extinction. The impacts of the possible damage posed by AIS are ecological and economic, threatening both the environment and human health. AIS can severely damage biodiversity, structure and functions of invaded ecosystems.

It is notable that more than half of all plant pathogens on the European and Mediterranean Plant Pathology Organisation quarantine list are forest pathogens. Cryphonectria parasitica (chestnut canker*), Ophiostoma novo-ulmi* (Dutch elm disease), *Cronartium ribicola* (white pine blister pine rust), Phytophthora spp. (mainly Phytophthora root rot), Fusarium circinatum (pitch canker), *Hymenoscyphus fraxineus* (ash dieback), *Ceratocystis platani* (canker stain of plane) Dothistroma spetosporum and D. pini (Dothistroma needle blight of pines) and *Cylindrocladium buxicola* (box blight) are striking examples of AIS forest pathogens that are affecting European trees in urban and forest areas. The destructive effects of these pathogens are also well-known in Turkey. In this paper, ongoing epidemics of AIS, and examples of pathogens not yet present in Turkey, but likely to be seen in the near future, threatening Turkish forestry, and the impacts in forest ecosystem are discussed.

Keywords: alien invasive species, forest pathogens, stress factors, Turkish forestry.

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Urban Tree Disease; Canker Stain of Plane and the Possible Threat in Forests

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Abstract: While alley trees, parks and urban forests have many beneficial functions in urban environments they may also support organisms causing tree diseases. Canker stain of plane is caused by the fungal pathogen Ceratocystis platani, which enters host trees through wounds, colonize the inner bark, vascular cambium and sapwood rapidly resulting in tree death. Natural spread from tree to tree occurs via root contact and by spores in rain splash or saw dust over short distances. Terracing machinery may carry infested soil and contaminate healthy areas. Spread over longer distances can occur by trade of infected host plants and Platanus wood. Since the pathogen was introduced to Europe, the disease affected mostly trees in alleys and parks. However, of particular concern was the spread of the disease into the natural stands of P. orientalis in Sicily, and later in Greece. The disease firstly affected Peloponnese but rapidly spread to north-western Greece. The high level of susceptibility of P. orientalis to C. platani has led to devastation of the natural populations of this tree, arguably the most important riparian species in Greece, other Balkan countries and Turkey. In Greece alone, estimates of losses are in the range of tens of thousands of trees. The disease was also reported in Albania, causing significant mortality in natural ecosystems and towns. Spread of the disease into natural stands is problematic as, apart from phytosanitary measures, control methods are not immediately available.

Keywords: Urban tree, fungal pathogens, Ceratocystis platani, canker stain.

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Changing Climate, Changing Pathogens: Threats to Forest Ecosystems Increase with Climate Change

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Abstract: In the past 25 to 30 years, a marked increase has occurred in the numbers of alien invasive pests and pathogens recorded in populated continents of earth, damaging agriculture, horticulture and the wider environment, including forest ecosystems. The reasons for this upsurge are clear: all involve interacting human-driven factors, with, arguably, global trade as the most important component in the complex. This review focuses on increased damage in forest ecosystems by alien invasive pathogens, some of which have led to, or are threatening, near extinction events for several tree species.

Humans seem to have developed a desire to discover what was over the next horizon since they emerged in Southern Africa. Presumably the first migrations were on foot, but crossing rivers and, eventually, large expanses of water led to crafting of simple boats. Shipping evolved slowly, through small craft, the harnessing of wind power with sails, eventually very recently to ships powered by steam then diesel engines. With the development of more efficient shipping came increased abilities to take plants and animals on long journeys. In the past 70 years, shipping efficiency has massively increased through wide-spread adoption of containerisation. The largest container ship now in use is The MSC Gülsen, launched in 2019, which carries nearly 24,000 standardised containers, over 2,000 of which are refrigerated. Each container on a ship could include live plant materials. Each plant could potentially carry cryptic pest or pathogen infestations, which may then be introduced into a previously naïve environment, establishing on plants in the newly invaded area and ultimately leading to major health issues on those plants. Global trade in plants is a very complex system, driven by the need to plant in landscapes and demand for different plants for gardens.

In addition to global trade, climate change is having a major influence on establishment and spread of alien invasive species, affecting pest/pathogen activities and life cycles, host plant physiology and the outcomes of interactions between pests/pathogens and the plants.

Examples of tree pathogens causing wide-spread problems on a global scale currently include many Phytophthora species, Dothistroma needle blight and Fusarium circinatum pitch canker of pines, and Xylella fastidiosa on a wide range of trees, although particularly on olives in the southern Italy. A striking example in recent history was the spread of the Dutch elm disease pathogen, Ophiostoma novo-ulmi, initially in North America, then from the early 1960s in Western Europe. Many other invasive pathogens are causing problems in more localized regions, including Ceratocystis platani, killing Platanus trees in Italy, Switzerland, France, Greece, Albania and Turkey. Other examples include the threat of pine wilt nematode (Bursaphelenchus xylophilus) spread from it's established areas in the Iberian Peninsula, damage to cypress in Mediterranean landscapes caused by Seiridium cardinale, dieback of sweet chestnut (Castanea) caused by the canker pathogen, Cryphonectria parasitica, and, unfortunately, many others.

Climate change appears to be making these issues worse than previously anticipated. To give hope, however, the genetic 'power' in plants is enormous and humans could, given the political will, establish selection and breeding programmes that will ultimately enable us to maintain plantings of trees with far greater tolerance of changing climate and the associated pests and pathogens, whether native or invasive.

Keywords: Climate change, forest ecosystems, forest pathogens, invasive species.

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Hypsometric Modeling of Antalya Watershed in Turkey

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Abstract: The effects of climate change are increasing day by day and have huge effects especially on watershed systems. The frequency and severity of natural disasters will increase significantly with climate change impacts on water and soil resources and changes in temperatures. The hypsometric integral, which is a critical parameter in determining the surface morphometric features of the watershed systems, will contribute to revealing the dynamic hydrological process of the watershed. With this study, the formation processes of the eroded surface forms were taken into account. This established the altitude distribution of the watershed area with the Hypsometric tool using DEM (Digital Elevation Model) data for Antalya watershed, and calculated its erosional cycle, and generated raster data for the watershed by calculating the basic environmental variables of the watershed such as aspect, slope, roughness. In this analysis, the hypsometric integral value was found to be 0.37, which was carried out by considering hypsometric analysis. Based on the hypsometric integral value and the hypsometric curve formed, it was seen that the Antalya watershed was eroded by erosion processes and for the cycle of erosion, it is in the transition from young to mature. As a result of the study, it has been assigned that the Antalya watershed is in balance or at a mature stage.

Keywords: Hypsometric Integral, Hypsometric Curve, Climate Change

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Interconnections of Art and Biology: Towards A New Architecture of the Olive Tree

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Abstract: Studying the concept of bio-art and working in collaboration with scientific partners to achieve a common goal is a process by which the biologist, the chemist, the philosopher, and the artist, come together to reinvent another conception of creation. In fact, Bio-art is distinguished by its power to modify the structure of living beings and their ways of life. It aims (through science and technology) largely to invent and innovate a new aesthetic of nature. It therefore defines itself as one of the varieties and forms of contemporary art. Xavier Lambert underlines in his book entitled: The post-human and the issues of the subject that "Bio-art is a generic term, which designates different artistic activities, targeting their mode of intervention on living things. It is defined as art that uses or in general relates to biotechnology. It's still a very loose term, and it's applied to many art forms that relate in some way to biology, and biotechnology and life" In this sense, we have noticed that it is of utmost importance to dwell for a moment on the concept of biotechnology, which in modern scientific literature is frequently used. This concept designates, through its current sharing, a new field of scientific and technological research and where scientists seek to apply their knowledge of life sciences and particle biology and computer technology and even sometimes nanotechnology in the field. Study of microscopic cells and living things. All this in order to produce new knowledge that would be able to facilitate a good understanding of the mechanisms by which the devices of living beings operate. In this field, the goal of researchers can be summed up in principle to improve the conditions of human life, either by producing new useful living beings, or by modifying certain characteristics already known, or by offering qualitative services, such as the development of some new species ... either by improving food products and harvesting results, or by treating some aspects of environmental pollution with the aim of reducing its dangers and harmful effects.

From this perspective, we can ask the following question: How is bio-artistic creation progressing? And how can we recognize it? Does it have the same meaning in Art and in Science? Can it be considered a scientific discovery or a work of art? We answer these questions from our experience called "biolivart".

Biolivart: Scientific knowledge as an Art

The innovation of Greenyamin organic colors, based on olive kernels, gave us the chance to manipulate living things, but also to intervene in an olive tree field. Our idea is posed in this context, the colors invented, will be mixed in the vessel of the olive tree, we have injected the colors arrived at the level of the xylem towards the stems of the tree so that they rise to reach the top. of the tree, where each color is distinguished by a specific aroma and taste, the taste of strawberries, pineapples, lemons for example

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Our bio-artistic experience is a model, which consists in rediscovering the laws of nature, and in expressing them in an abstract and concise way, in inventing a new aesthetic of nature. Indeed, the Tree, which we will see - once we have gone through all of the previous steps. - is a bonsai olive tree that does not exceed the size of 50 cm, and where you can taste 5 different tastes in the same tree in five different olive fruits. Our goal was also to extend this experience over a whole field that will be a typical model, and in which no one has set foot and which no one has thought of ...We believe that the originality of our biolivart practice is presented by the intentions hidden behind the gestures, the notes use of instrument, colors, techniques, practices ...,to manipulate living things, scientists, for their part, can help them. In turn, take advantage of this bio-artistic contribution shared through this collaboration that I hope in the future will be beneficial to both art and science.

But, the question that remains unanswered for us is: How will the public act with regard to this painting without a palette and this bio-art made in test tubes? How will he welcome the tree with multiple colors and varied tastes?

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Determination of Adductor Pollicis Muscle Thickness in Overweight or Obese Young Women

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Abstract: The Adductor Pollicis Muscle Thickness (APMT) value is the numerical value obtained by measuring the thickness that contains components such as tissue, skin, nerve and adipose tissue by means of a caliper. A new anthropometric measurement technique, APMT, is promising for clinical use in conditions such as obesity and malnutrition. In this study, it is aimed to compare APMT measurement with other anthropometric measurements in overweight-obese and normal weight female individuals.

Healthy female individuals living in Sivas, between the ages of 18-25, overweight-obese and with normal weight were included in the study. APMT measurements were taken from both the right and left hands of the participants. The measurements were repeated twice and the average of the measurements was taken. Body mass index (BMI) was calculated by taking the weight and height measurements of the participants. In addition, other anthropometric measurements such as triceps skinfold thickness, upper middle arm circumference, upper middle arm muscle circumference, upper middle arm area and upper middle arm muscle area were taken.

The study sample was divided into normal weight and overweight-obese groups. A total of 46 individuals were included in the study by including 23 women in the groups. While obese individuals constitute 15.2% of the sample; overweight individuals constitute 34.8%. While APMT-R was 15.37±1.90, APMT-L was 15.04±1.78 mm in individuals with normal weight; APMT-R was 17.10±2.81 and APMT-L was 16.69±22.75 mm in overweight and obese individuals. APMT and APMT index values measured on both the right and left hands were found to be higher in overweight-obese individuals than in individuals with normal weight ($p<0.05$). In the study, it was revealed that APMT and APMT index measured in the right and left hands showed a moderate positive correlation with BMI ($p<0.05$). It was observed that the correlation between APMT thickness and other anthropometric measurements was higher in overweight and obese individuals.

The results obtained from the study show that the increase in weight, muscle and adipose tissue affects APMT values. Anthropometric measurements and APMT values correlate with each other. Therefore, APMT measurement is a feasible method in different age groups and in different clinical situations because it is easy and applicable.

Keywords: Adductor Pollicis Muscle Thickness, Anthropometric Measurements, Muscle Mass, Obesity

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1. Introduction

Nutritional status is an indicator of how much of an individual's physiological nutritional needs are met (Hammond, 2019). Evaluation of healthy and unhealthy individuals in the society in terms of nutrition; Identifying and diagnosing nutritional risks is essential for planning appropriate nutritional interventions. Anthropometric measurements used in the evaluation of nutritional status and determination of body composition are considered by researchers as a very important component (Uyar, 2013).

Anthropometric measurements are important in terms of diagnosing malnutrition and reflecting protein and fat reserves in various parts of the body. Anthropometric measurements are frequently used in clinical practice because of their ease of application and low cost. In general, skeletal muscle mass is measured quickly and easily through anthropometric measurements such as upper middle arm muscle circumference (UMAMC) and upper middle arm muscle area (UMAMA) (Lameu et al. 2004a).

The idea of using the place called "Adductor Pollicis Muscle Thickness" (APMT) between the thumb and forefinger in determining the nutritional status of individuals by taking the measurement alone was first put forward by Lameu et al in 2004. Measurement of APMT; It is in the form of determining the thickness of the whole textural structure together with the skin, subcutaneous adipose tissue, muscle and other components. When determining the place to be measured, it was accepted that the metacarpal bones of the thumb and index fingers formed the two sides of a triangle, and the line to be drawn between the metacarpophalangeal joints at the end of these bones formed the base of the triangle. The bisectors of this imaginary triangle are drawn with a compass and their intersection points are marked. While the individual to be measured was in a sitting position, the measurement was taken with a caliper so that the wrist standing at the tip of the kneecap was 90 degrees to the homolateral lower extremity (Lameu et al.2004b).

The method described above has been accepted as a standard in studies investigating the relationship between APMT and nutritional status (Heymsfield et al. 1982; Lameu et al. 2004a). In the studies, APMT measurement was performed only in the dominant hand (the hand used for daily work or writing). The reason for this is based on the idea that the muscles here, which are used more and more developed, will atrophy faster in the presence of malnutrition (Pereira et al. 2018). Because of these features, the measurement of this thickness has the potential to be used in clinical malnutrition screening by comparing or using other anthropometric measurements (Lew et al. 2016). Various scientific studies have shown that APMT measurement can reflect the total muscle mass in the body (Gonzalez et al. 2010; de Oliveira et al. 2012).

In this study, it is aimed to compare APMT measurement with other anthropometric measurements in overweight-obese and normal weight female individuals. With the results of the study, it is thought that APMT measurement can be used in the clinic and in the evaluation of nutritional status.

2. Material-Method

The study was planned as a cross-sectional study and included between 18-25 years of age, living in Sivas, healthy female individuals with a normal weight and overweight-obese. Anthropometric measurements in the study were carried out by researchers who are specialist dietitians. In this study, APMT measurements of the dominant and non-dominant hands of the participants were taken separately and thus, the bias that could occur depending on the

dominant or non-dominant hand was tried to be prevented. The measurements were repeated twice and the average of the measurements was taken.

The weight measurements of the participants were measured with a digital weighing instrument with an accuracy of ± 0.1 kg. The height measurement was made by means of a portable height meter that can be calibrated (with an accuracy of 20-205 cm±1 mm). The height measurement was recorded standing upright, facing straight ahead, and the upper part of the ears and the outer corner of the eyes were in a line parallel to the plane (Frankfort plane). Body mass index (BMI) was calculated by dividing weight (in kilograms) by the square of height (in meters) (WHO, 2019).

Caliper was used to measure APMT and triceps skinfold thickness (TST). It has the feature of measuring the subcutaneous fat layer of the calipers used with an accuracy of ±0.2 mm. TSK measurement; The distance between the tip of the acromion protrusion of the scapula and the olecranon prominence of the ulna was measured while the elbow was flexed at 90 degrees and the midpoint was marked. The measurement was recorded 1 cm below the marked point with the individual standing upright and the arm hanging freely. Skinfold thickness (ST) values were measured while individuals were standing upright and with their shoulders and arms relaxed. A total of 2 measurements were taken at 2 min intervals to allow the tissue to recover. The ST values to be used in the study were calculated by taking the average of these 2 values (Heyward and Wagner, 2004).

Upper mid-arm circumference (UMAC) measurement was performed using a non-flexible tape measure by marking the midpoint of the distance between the tip of the acromion process of the scapula and the olecranon process of the ulna. Upper middle arm muscle circumference (UMAMC) measurement, UMAC and TST values were found; calculated by means of the formula UMAMC = UMAC -- (π x TST). Upper middle arm area (UMAA); calculated with the formula UMAA = UMAC^2/4π. Upper middle arm muscle area (UMAMA); It has been determined as UMAMA = UMAMC^2/ 4π. Adductor Pollicis Muscle Thickness Index (APMTI); It was obtained by dividing the APMT value measured in millimeters (mm) by the height in meters (m) (Ghorabi et al. 2014).

The data obtained from our study were evaluated with the SPSS 23.0 program. The normality of the data was evaluated with the Mann Whitney U test. Independent sample t test was used for two independent groups in normally distributed data. Normally distributed data are shown as x̄±SD, non-normally distributed data are shown as median. The state, direction and degree of the relationship between continuous variables were analyzed using the Pearson correlation coefficient. $p < 0.05$ was considered statistically significant.

3. Results

The study sample was divided into normal weight and overweight-obese groups. A total of 46 individuals were included in the study by including 23 women in the groups. Obese individuals constitute 15.2% of the sample and overweight individuals constitute 34.8%. The mean weight of the sample was 64.13±12.72 kg, the average height was 1.6±0.48 m, and the mean BMI was 25.02±4.61 kg/m2. When the weight and BMI status of the groups are examined; in the overweight-obese group, mean weight was 72.86±11.87 kg (range: 58.6-103.8 kg), mean BMI was 28.61±3.8 kg/m2 (range: 25.12-38.59 kg/m2); in the normal weight group, the mean weight was 55.41±5.56 kg (range: 46.45-67 kg), and the mean BMI was 21.43±1.47 kg/m2 (range: 18.61-24.46 kg/m2). It was determined that the right hand of all individuals included in the study was dominant.

Table 1 shows the mean and standard deviation values of the TST, UMAC, UMAMC, UMAA, UMAMA, right and left hands of the individuals' APMT and APMT index, and the lowest and highest values of anthropometric measurements according to the groups. A statistically significant difference was found between APMT, APMT index and other anthropometric measurements between overweight-obese and normal-weight individuals.

Table 1: Adductor Pollicis Muscle Thickness and Other Anthropometric Measurements of Individuals by Group

Anthropometric Measurements	Normal Weight Group		Overweight-Obese Group		Test Statistics p
	x̄±SD	Min-Max	x̄±SD	Min-Max	
APMT (mm-right hand)	15.37±1.90	11.60-18.90	17.10±2.81	12.20-22.70	0.019**
APMT (mm-left hand)	15.04±1.78	11.30-18.10	16.69±22.75	12.30-21.15	0.020**
APMİ(mm/m²-right hand)	9.58±1.24	6.99-11.96	10.73±1.74	7.87-14.04	0.013**
APMİ (mm/m²-left hand)	9.37±1.13	6.81-11.76	10.46±1.69	7.69-13.78	0.012**
TST (cm)	1.54±0.33	0.92-2.27	2.47±0.47	1.54-3.20	0.001*
UMAC (cm)	24.13±1.48	21.00-27.00	29.59±33.16	25.40-36.00	0.001*
UMAMC (cm)	19.27±1.15	17.67-22.18	21.81±2.47	17.93-27.68	0.001*
UMAA (cm²)	46.52±5.69	35.11-58.04	70.48±15.42	51.37-103.18	0.001*
UMAMA (cm²)	29.67±3.65	24.87-39.17	38.34±8.89	25.59-61.00	0.001*

* p <0.01, ** p <0.05

In the study, when the correlation relationship between BMI and APMT, APMT index was examined; It has been revealed that there is a positive correlation between BMI and right hand APMT mean r=0.608 (p=0.001), and left hand APMT mean r=0.550 (p=0.001). A positive correlation was found between the mean of the right hand APMT index, r=0.592 (p=0.001) and the mean of the left-hand APMT index, r=0.549 (p=0.001).

When the relationship between APMT and other anthropometric measurements of normal-weight individuals is examined; APMT and APMT index measured in the right and left hands were found to be positively correlated with each other (p<0.01). While APMT and APMT index measured from the right hand were not found to be associated with TST, UMAC, UMAMC, UMAA and UMAMA (p>0.05); it was found that APMT measured on the left hand showed a positive correlation with UMAC, UMAMC, UMAA and UMAMA (p<0.05). On the other hand, it was revealed that the APMT index measured on the left hand showed a positive correlation only with UMAMC (p<0.05). It was determined that TST, which is one of the other anthropometric measurements taken from individuals with normal weight, showed a positive correlation with UMAC and UMAMC (p<0.01). The correlation relationship between APMT and other anthropometric measurements of normal-weight individuals is shown in Table 2.

Table 2. Correlation Relationship Between Adductor Pollicis Muscle Thickness and Other Anthropometric Measurements of Normal Weight Individuals

	APMT-R (mm)	APMT-L (mm)	APMİ-R (mm/m²)	APMİ-L (mm/m²)	TST (cm)	UMAC (cm)	UMAMC (cm)	UMAA (cm²)	UMAMA (cm²)
APMT-R (mm)	-	r=0.867 p=0.001*	r=0.972 p=0.001*	r=0.866 p=0.001*	r= -0.118 p=0.592	r=0.201 p=0.357	r=0.366 p=0.086	r=0.196 p=0.370	r=0.350 p=0.102
APMT-L (mm)	r=0.867 p=0.001*	-	r=0.820 p=0.001*	r=0.965 p=0.001*	r=0.106 p=0.630	r=0.451 p=0.031**	r=0.482 p=0.020**	r=0.452 p=0.030**	r=0.474 p=0.022**
APMİ-R	r=0.972	r=0.820	-	r=0.881	r= -0.204	r=0.095	r=0.307	r=0.087	r=0.288

(mm/m²)	p=0.001*	p=0.001*		p=0.001*	p=0.352	p=0.668	p=0.154	p=0.693	p=0.182
APMİ-L (mm/m²)	r=0.866 p=0.001*	r=0.965 p=0.001*	r=0.881 p=0.001*	-	r=0.002 p=0.992	r=0.330 p=0.124	r=0.421 p=0.045**	r=0.328 p=0.126	r=0.410 p=0.052
TST (cm)	r= -0.118 p=0.592	r=0.106 p=0.630	r= -0.204 p=0.352	r=0.002 p=0.992	-	r=0.632 p=0.001*	r= -0.103 p=0.640	r=0.614 p=0.002*	r= -0.094 p=0.668
UMAC (cm)	r=0.201 p=0.357	r=0.451 p=0.031**	r=0.095 p=0.668	r=0.330 p=0.124	r=0.632 p=0.001*	-	r=0.706 p=0.001*	r=0.999 p=0.001*	r=0.712 p=0.001*
UMAMC (cm)	r=0.366 p=0.086	r=0.482 p=0.020**	r=0.307 p=0.154	r=0.421 p=0.045	r= -0.103 p=0.640	r=0.706 p=0.001*	-	r=0.721 p=0.001*	r=0.999 p=0.001*
UMAA (cm²)	r=0.196 p=0.370	r=0.452 p=0.030**	r=0.087 p=0.693	r=0.328 p=0.126	r=0.614 p=0.002*	r=0.999 p=0.001*	r=0.721 p=0.001*	-	r=0.728 p=0.001*
UMAMA (cm²)	r=0.350 p=0.102	r=0.474 p=0.022**	r=0.288 p=0.182	r=0.410 p=0.052	r= -0.094 p=0.668	r=0.712 p=0.001*	r=0.999 p=0.001*	r=0.728 p=0.001*	-

* p <0.01, ** p <0.05

When the relationship between APMT and other anthropometric measurements of overweight and obese individuals was examined; APMT and APMT index measured in the right and left hands were found to be positively correlated with each other (p<0.01). While APMT and APMT index measured on the right hand were found to be positively correlated with TST, UMAC, UMAMC, UMAA and UMAMA (p<0.05); it was found that the APMT and APMT index measured on the left hand showed a positive correlation with TST, UMAC, and UMAA (p<0.05). It was determined that TST, which is one of the other anthropometric measurements taken from overweight and obese individuals, showed a positive correlation with UMAC and UMAA (p<0.01). The correlation relationship between APMT and other anthropometric measurements of overweight and obese individuals is shown in Table 3.

Table 3. Correlation Relationship between Adductor Pollicis Muscle Thickness and Other Anthropometric Measurements of Overweight and Obese Individuals

	APMT-R (mm)	APMT-L (mm)	APMİ-R (mm/m²)	APMİ-L (mm/m²)	TST (cm)	UMAC (cm)	UMAMC (cm)	UMAA (cm²)	UMAMA (cm²)
APMT-R (mm)	-	r=0.084 p=0.001*	r=0.980 p=0.001*	r=0.895 p=0.001*	r=0.520 p=0.011**	r=0.673 p=0.001*	r=0.545 p=0.007*	r=0.669 p=0.001*	r=0.547 p=0.007*
APMT-L (mm)	r=0.084 p=0.001*	-	r=0.847 p=0.001*	r=0.981 p=0.001*	r=0.497 p=0.016**	r=0.528 p=0.010**	r=0.375 p=0.078	r=0.521 p=0.011**	r=0.361 p=0.090
APMİ-R (mm/m²)	r=0.980 p=0.001*	r=0.847 p=0.001*	-	r=0.887 p=0.001*	r=0.436 p=0.038**	r=0.631 p=0.001*	r=0.542 p=0.007*	r=0.629 p=0.001*	r=0.545 p=0.007*
APMİ-L (mm/m²)	r=0.895 p=0.001	r=0.981 p=0.001*	r=0.887 p=0.001*	-	r=0.425 p=0.043**	r=0.500 p=0.015**	r=0.383 p=0.072	r=0.495 p=0.016**	r=0.370 p=0.083
TST (cm)	r=0.520 p=0.011**	r=0.497 p=0.016**	r=0.436 p=0.038**	r=0.425 p=0.043**	-	r=0.646 p=0.001*	r=0.222 p=0.309	r=0.639 p=0.001*	r=0.231 p=0.289
UMAC (cm)	r=0.673 p=0.001*	r=0.528 p=0.010**	r=0.631 p=0.001*	r=0.500 p=0.015**	r=0.646 p=0.001*	-	r=0.887 p=0.001*	r=0.999 p=0.001*	r=0.890 p=0.001*
UMAMC (cm)	r=0.545 p=0.007*	r=0.375 p=0.078	r=0.542 p=0.007*	r=0.383 p=0.072	r=0.222 p=0.309	r=0.887 p=0.001*	-	r=0.891 p=0.001*	r=0.998 p=0.001*
UMAA (cm²)	r=0.669 p=0.001*	r=0.521 p=0.011**	r=0.629 p=0.001*	r=0.495 p=0.016**	r=0.639 p=0.001*	r=0.999 p=0.001*	r=0.891 p=0.001*	-	r=0.895 p=0.001*
UMAMA (cm²)	r=0.547 p=0.007*	r=0.361 p=0.090	r=0.545 p=0.007*	r=0.370 p=0.083	r=0.231 p=0.289	r=0.890 p=0.001*	r=0.998 p=0.001*	r=0.895 p=0.001*	-

* p <0.01, ** p <0.05

4. Discussion and Conclusion

Assessment of nutritional status is an important table showing the ratio of meeting the physiological nutrient needs of individuals and reflecting the health status of the individual. One of the important methods used in the assessment of nutritional status is anthropometric measurements (Hammond, 2019). The APMT value is a numerical value obtained by measuring the layer containing components such as tissue, skin, nerve and adipose tissue through the caliper. This thickness contains minimal adipose tissue. This distinctive feature makes APMT the only place in the body that can be directly measured by caliper as a muscle component. Anthropometric measurements are frequently used in the clinic due to their practical application, low cost and advantages such as being an invasive technique (Lameu et al. 2004b). A new anthropometric measurement technique, APMT, is promising for clinical use in conditions such as obesity and malnutrition. In the study, APMT measurement, which can be detected easily and quickly, the measurements can be easily repeated, and the cost is relatively lower than other anthropometric measurement methods, was used. APMT values were compared in overweight and obese and normal weight young women.

In this study, APMT-R was 15.37±1.90 mm and APMT-L was 15.04±1.78 mm in individuals with normal weight; APMT-R was 17.10±2.81 mm and APMT-L was 16.69±22.75 mm in overweight and obese individuals. In the findings obtained from the study, APMT and APMT index values measured in both the right and left hands are higher in overweight-obese individuals than in individuals with normal weight. In another recent study, it was shown that APMT value is higher in obese individuals. In the study, it was shown that APMT value was 17.6±3.1 mm in women with normal weight, 19.9±2.9 mm in overweight women and 22.9±3.8 mm in obese women (Bielemann et al. 2016). In another study in which women were the sample, the mean BMI was found to be 27.1±6.2 kg/m^2 and the mean APMT was 14.0±3.6 mm (Barreiro et al. 2018). In a study involving adolescents aged 14-19 years, APMT measurement in women was found to be 18.0 mm (de Lima Pereira et al. 2021). In another study, APKT measurement in the dominant hand of women aged 18-29 was found to be 19.4±3.10 mm (Gonzalez et al. 2010). The findings of our study are similar to the results of other studies. According to the results of the study, weight gain leads to an increase in APMT.

In this study, it was revealed that the APMT and APMT index measured in the right and left hands showed a moderate positive correlation with BMI. In a study that included both women and men, APMT was found to be moderately correlated with lean mass and lean mass index (Bielemann et al. 2016). In another study that included post-menopausal and young women, it was found that APMT showed a positive correlation with lean mass (Barreiro et al. 2018). In a study of adolescents, in women, APMT measurement showed moderate correlation with lean mass, lean mass index, and body fat mass. However, no correlation was found between BMI and APMT (de Lima Pereira et al. 2021). In a study involving healthy adults, it was found that APMT measured on both hands and weight and BMI correlated (Gonzalez et al. 2010). In a study conducted with elderly individuals, it was revealed that there is a weak correlation between BMI and APMT. In the study, the mean BMI was found to be 26.93± 5.75 kg/m^2 (de Seabra Trevisan et al. 2021). In another study, right and left-handed APMT and anthropometric measurements of individuals with anorexia nervosa were performed before and after treatment. Parallel to the increase in weight and BMI in individuals after treatment, there was an increase in APMT in both the right and left hands (Soto-Célix et al. 2019). The results obtained from our study show parallelism with the results of other studies. Increases in body muscle and fat mass affect APMT.

Anthropometric measurements and APMT measurements show correlation with each other. Therefore, APMT measurement can be applied in different age groups and in different clinical situations because it is easy and applicable. APMT measurement emerges as a new anthropometric measurement in the prediction of both obesity and malnutrition. There is a need to reveal new studies by measuring APMT in different age groups and clinical situations.

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İstanbul İli Orman Alanlarındaki Zamansal Değişimlerin Belirlenmesi /
Determination of Temporal Changes in Forest Areas of Istanbul Province

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Özet: Orman ekosistemlerindeki değişimlerin belirlenmesi, izlenmesi ve değerlendirilmesi sürdürülebilir planlama ve yönetim için oldukça ciddi bir görevdir. Değişimlerin büyüklüğü ve değişimin yönü hakkında elde edilen veriler uygulamacılar için önemli bir karar desteği sunar. Bu çalışmada İstanbul ilinin orman alanlarındaki zamansal değişimlerin belirlenmesi amaçlanmıştır. Çalışma alanı, İstanbul Orman Bölge Müdürlüğü operasyon alanı içindeki İstanbul il sınırlarını kapsamaktadır. Çalışma alanının büyüklüğü yaklaşık 500 bin hektardır. Bu alanda Çatalca, İstanbul, Bahçeköy, Kanlıca ve Şile Orman İşletme Müdürlükleri bulunmaktadır. Orman alanlarındaki değişimlerin belirlenmesi için 2000, 2006, 2012 ve 2018 yıllarına ait CORINE (Coordination of information on the Environment) arazi örtüsü verileri kullanılmıştır. Ayrıca 2003-2004, 2012-2013 tarihli orman amenajman plan verilerinden de yararlanılmıştır. Çok zamanlı arazi örtüsü verileri Coğrafi Bilgi Sistemi yazılımı olan ArcGIS ortamında üretilen bir coğrafi veri tabanına aktarılmış ve düzenlenmiştir. CBS overlay analizi yapılarak değişim haritaları üretilmiştir. Değişim katmanlarına ait tablo verilerden değişim matrisleri türetilmiştir. Değişim matrislerinden yıllar arasındaki değişimlerin büyüklüğü ve değişimin yönü belirlenmiştir. Çalışmada yapay yüzeyler, tarım alanları, orman alanları, sulak alanlar ve su kütlesi olmak üzere 5 temel arazi örtüsü sınıfındaki değişimler ortaya konulmuştur. Ayrıca, orman alanı sınıfındaki verilerin değişimleri detaylı olarak tespit edilmiştir. İstanbul ilinde 2000-2018 yılları arasında ana arazi örtüsü sınıflarındaki değişimler incelendiğinde, arazi örtüsü değişimlerinin yaklaşık 24000 hektar ile en çok orman arazi örtüsü sınıfında meydana geldiği anlaşılmaktadır. Bu dönemde ormanlık alanlar %8.7 oranında azalmıştır. Orman alanlarındaki bu değişimlerin %4.22'sinin yerleşim alanları, %4.45'inin tarım alanları yönünde olduğu görülmüştür. Orman değişim verileri, ormanların planlanması ve yönetimi için değerlidir. Bu nedenle bölge koşullarına uygun, ormanlardaki artım ve büyüme dengesini bozmayacak, sürdürülebilir bir orman ekosistemi planlamasının önemli olduğunu düşünüyoruz.

Anahtar Kelimeler: Orman değişimi, CBS, CORINE, Değişim belirleme teknikleri

Abstract: Determining, monitoring, and evaluating changes in forest ecosystems is a very serious task for sustainable planning and management of forests. The data obtained about the size and the direction of the changes provide important decision support for the practitioners. In this study, it is aimed to determine the temporal changes in the forest areas of Istanbul province. The study area covers the provincial borders of Istanbul within the operation area of

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Istanbul Regional Directorate of Forestry. This area composed of Çatalca, İstanbul, Bahçeköy, Kanlıca and Şile Forest District Directorates and extend over an area of 500 thousand hectares. CORINE (Coordination of information on the Environment) land cover data for the years 2000, 2006, 2012 and 2018 were used to determine the forest changes. In addition, forest management plan data of 2003-2004, 2012-2013 were also used. Multi-temporal land cover data was transferred to a geographic database produced in ArcGIS, a Geographical Information System software, and edited. Change maps were produced by performing GIS overlay analysis. The change matrices were derived from the tabular data of the change layers. The size and the direction of the changes between the years were determined from these matrices. In the study, changes in 5 main land cover classes have been revealed: artificial surfaces, agricultural areas, forest areas, wetlands, and water areas. In addition, changes in forest areas have been analyzed in detail. When the changes in the main land cover classes in the province of Istanbul between the years 2000-2018 are examined, it is understood that the land cover changes occurred mostly in the forest land cover class about 24000 hectares. During this period, forest areas decreased by 8.7 %. It has been observed that 4.22% of these changes in forest areas were in the direction of settlement areas and 4.45 of agricultural areas. Forest change data is valuable for the planning and managing of forests. Thus, we think that it is important to plan a sustainable forest ecosystem that is suitable for the conditions of the region and will not disturb the increment and growth balance in the forests.

Keywords: Forest change, GIS, CORINE, Change detection techniques.

1.Giriş

Ormanlar dünyadaki yaşamın temelini oluşturan ekosistemlerdir (Zelenaia, 2019). Orman ekosistemleri yiyecek, yakıt ve odun kaynağıdır. Bunun yanı sıra toprağı koruma, iklim ve su rejimini düzenlenme, sel/taşkın ve erozyon kontrolü, gen ve biyolojik çeşitliliği koruma, yaban hayatının sürekliliğini sağlama gibi fonksiyonları bulunmaktadır. Ormanlar iç içe yaşadığı toplumun kültürel ve sosyal değerlerini barındıran ve bu ögelerin nesilden nesile aktarılmasını sağlayan bir platformdur. Orman alanları rekreasyon ve ekoturizm merkezleri olarak doğa ve insan yaşamı arasında güçlü bir bağ kurmaktadır.

İnsan yaşamında vazgeçilmez bir yeri olan ormanların mutlaka korunması gereklidir. Ancak toplumun orman ürünlerine olan ihtiyaçlarının karşılanması da gereklidir. Bu karşılıklı faydalanma sürecinin dengeli ve sürdürülebilir olması iyi bir planlamayı gerekli kılar. Bu planlar dahilinde, doğayla uyumlu olarak ve ekosistem dengesi bozulmadan ormanların işletilmesine özen gösterilmelidir. Aksi halde kaybedilen ormanların yerine yeni ormanlar kuramazsak orman ekosistemindeki yaşam döngüsü bozulur ve geri dönüşü olmayan bir çölleşmeyle karşı karşıya kalınabilir. Bu nedenle orman alanlarının izlenmesi ve orman alanlarında yaşanan değişimlerin belirlenmesi en önemli çalışma konularından biridir.

Ormancılıkta teknolojinin kullanımı özellikle Coğrafi Bilgi Sistemleri ve Uzaktan Algılama teknolojileri plan yapıcı ve uygulamacılara önemli bir karar desteği sunmaktadır. Coğrafi Bilgi Sistemi (CBS) bir coğrafi veri tabanında konumsal verilerin sayısal halde işlenmesine, sorgulanmasına ve analizine olanak tanır (Erdin, 1988). Orman ekosistem verilerinin konumsal analizi, orman varlığının ve orman alanlarındaki değişimlerin belirlenmesi çalışmalarında sıklıkla kullanılmaktadır (Erdin vd., 1998; Koç, 2001; Yener ve Koç, 2002; Koç, 2006, Ün, 2006; Yener ve Koç, 2006). Uzaktan algılama yöntemleri ile elde edilmiş uydu verileri ve hava fotoğrafları da (Hajek, 2007; Lillesand vd., 2014) ormancılık çalışmaları için güçlü bir veri kaynağıdır. CBS ve uzaktan algılama verilerinin bütünleşik kullanımı, değişim belirlemede

güncel veriye kolay erişimi sağladığı gibi analiz süreçlerinin de hızlandırılmasına yardımcı olur (Çoban, 2006).

Orman alanlarındaki değişimlerin belirlenmesi çalışmalarında farklı değişim belirleme yöntemleri kullanılabilmektedir (Lu vd., 2004). CBS tek başına değişim belirlemede kullanılabildiği gibi (Şahin, 2014; Çoban ve Gündoğdu, 2020; Kaptan, 2021) uzaktan algılamayla birlikte de kullanılabilmektedir (Çoban ve Koç, 2008; Çoban vd., 2010). Değişiklik tespiti, uzaktan algılama verilerinin önemli bir uygulamasıdır (Sunar, 1998). Orman alanlarındaki zamansal değişimlerin büyüklüğü ve yönü belirlenirken bu değişimlerin nedenlerinin irdelenmesi ormanlara yapılan müdahalelerin sonuçlarının izlenmesine olanak tanımaktadır.

Bu çalışmada, 2000-2018 yılları arasında İstanbul ilindeki orman örtüsünde meydana gelen değişimin yönü ve büyüklüğü araştırılmıştır. İstanbul ilinin nüfusu Avrupa ve dünyadaki pek çok ülkenin nüfusundan fazladır. Asya ve Avrupa kıtalarını birbirine bağlayan İstanbul Boğazı'nı da içine alan bu bölgedeki ormanların çok çeşitli fonksiyonları olduğunu söylemek mümkündür. Öncelikle bu orman alanları, kalabalık nüfus için temiz bir nefes alma, dinlenme ve eğlenme alanı olmaktadır. Ancak nüfusun bu boyutlara ulaşmış olması, insanların ormanlar üzerindeki olumsuz etkilerini artırmakta ve illegal kullanımlar nedeniyle orman alanları yoğun baskı altında kalmaktadır. İstanbul ili ormanlarındaki değişimlerin belirlenmesi ile elde edilen verilere göre, bu ormanların sürdürülebilirlik prensiplerine uygun bir şekilde planlanması konusunda hassas davranılmasının ve orman alanlarını ilgilendiren eylemlerde ekosistem dengesinin korunmasına özen gösterilmesinin gerekliliği vurgulanmıştır.

2.Materyal ve Yöntem

2.1.Materyal

Çalışma alanı İstanbul Orman Bölge Müdürlüğünün sorumluluk sahası içinde kalan İstanbul il sınırlarıdır. Bu alan yaklaşık 500 bin hektar büyüklüğünde olup, Çatalca Orman İşletme Müdürlüğü, İstanbul Orman İşletme Müdürlüğü, Bahçeköy Orman İşletme Müdürlüğü, Kanlıca Orman İşletme Müdürlüğü ve Şile Orman İşletme Müdürlüğü sınırlarını kapsamaktadır (Şekil 1).

İstanbul ili orman alanlarındaki değişimlerin belirlenmesi için 2000, 2006, 2012 ve 2018 yıllarına ait CORINE (Coordination of information on the Environment) arazi örtüsü verileri kullanılmıştır. Ayrıca İstanbul iline ait 2003-2004, 2012-2013 tarihli orman amenajman plan verilerinden de yararlanılmıştır. CORINE Avrupa Birliği tarafından mekânsal veri alt yapısının oluşturulmasına yönelik bir coğrafi veri tabanı üretimi projesidir. Bu projede Avrupa Birliği ile koordineli ülkelerde, arazideki çevresel değişimlerin belirlenmesi, doğal kaynakların rasyonel biçimde yönetilmesi ve çevre ile ilgili politikaların oluşturulması için standart bir veri tabanının oluşturulması amaçlanmıştır (Copernicus, 2021). Bu veriler, Avrupa Çevre Ajansı (AÇA) tarafından belirlenen arazi örtüsü/kullanımı sınıflandırmasına göre uydu görüntüleri üzerinden bilgisayar destekli görsel yorumlama metodu ile üretilmektedir. CORINE arazi örtüsü tipleri yapay yüzeyler, tarım alanları, ormanlar, sulak alanlar ve su kütleleri olmak üzere 5 temel sınıf ve bunlara bağlı alt sınıflar şeklinde tanımlanmıştır (CLC, 2021).

Şekil 1. Çalışma alanının konumu

Çalışma alanında 238 bin hektar orman alanı mevcut olup bunun 31 bin hektarı ibreli, 198 bin hektarı geniş yapraklı ve 9 bin hektarı da ibreli ve geniş yapraklı karışık ormanlardır (Çizelge 1). Akkemik (2020), Türkiye'deki 11.000'den fazla bitki türünün %25'inin İstanbul'da bulunduğunu belirtmiştir. Orman alanlarındaki ağaç türlerine baktığımızda karaçam, fıstık çamı, kızılçam, sahil çamı, sedir, meşe, gürgen, dişbudak, kayın, kestane gibi türlerin ağırlıkta olduğunu görüyoruz (İOAP, 2013). İstanbul bölgesindeki biyolojik çeşitlilik bitki türü zenginliği yanında büyük bir fauna zenginliğini de barındırmaktadır. Türkiye'nin 469 kuş türünden 301'i İstanbul'da (Boyla ve Arslan, 2008), bunun da 160'ı İstanbul Belgrad Ormanı'nda görülmüştür (Ertan ve Arslangündoğdu, 2013). Türkiye'nin 405 kelebek türünden 125'i, 149 memeli hayvanından 38'i ve 157 kurbağa ve sürüngeninden 35'i İstanbul Ormanları'ndadır (Aslangündoğdu, 2014).

Çizelge 1. Çalışma alanındaki arazi örtüsü tipleri ve orman varlığı [a] (hektar)

İşletme müdürlüğü	Orman alanı[b]	Tarım alanı	Yerleşim alanı	Su alanı	Diğer alanlar	Toplam
Bahçeköy	11943.5	1076.3	2349.2	80.1	991.7	16440.8
Çatalca	109567.6	112872.8	26132.1	6518.4	880.9	255971.8
İstanbul	25829.9	17511.9	34693.1	3886.4	1622.2	83543.6
Kanlıca	44492.6	14570.4	40217.2	2236.3	6671.5	108187.9
Şile	63397.8	11785.8	2497.1	707.1	0.0	78387.8
Toplam	255231.3	157817.3	105888.7	13428.3	10166.3	542531.9

[a] Çizelgedeki değerler 2013 yılı orman amenajman planından elde edilmiştir; [b] OT simgesi ile tanımlanan orman toprakları orman alanı olarak değerlendirilmiştir.

Çalışma alanındaki orman işletme müdürlüklerinin arazi örtüsü tiplerine bakıldığında Bahçeköy ve Şile'de sırasıyla genel alanın %73'ü ve %81'inin orman alanı olduğu

anlaşılmaktadır. Çatalca, Kanlıca ve İstanbul işletmelerinde ise sırasıyla %43, %41 ve %31 oranında daha düşük oranlarda orman alanlarının bulunduğu görülmektedir.

2.2.Yöntem

Çalışma alanı içerisinde arazi örtüsü ve kullanımının belirlenmesi için 2000, 2006, 2012 ve 2018 yıllarına ait CORINE verileri temel alınmıştır. CORINE veri katmanları CBS yazılımı olan ArcGIS yazılımında işlenmiştir. Bu verilerden çalışma alanını ilgilendiren bölüm kesilerek ayrılmıştır. Çalışma alanına ait CORINE katmanlarına projeksiyon dönüşümü yapılarak bütün veri setine "UTM (Universal Transverse Mercator) European Datum 1950 (Avrupa Datumu-ED50) 35. zone kuzey" koordinat sistemi atanmıştır.

Veri setindeki katmanların grafik kontrollerinin yapılması için poligon veri tipi için topolojik kurallar denetlenmiş ve verilerde topolojik bir hatanın bulunmadığı anlaşılmıştır. Verilerdeki öznitelik tablolarına orman arazi örtüsü sınıfını tanımlayan yeni bir alan eklenmiştir. Böylece orman alanlarına ait öznitelik verileri ibreli orman, geniş yapraklı orman, karışık orman, maki ve otsu bitki alanları olarak dört sınıfa ayrılarak yeniden kodlanmıştır.

Veri setindeki katmanlar, overlay (bindirme) analizinin altında bulunan intersection (kesiştirme) analiz aracı ile kesiştirilerek yeni bir katman elde edilmiştir. Bu yeni birleştirilmiş katman, arazi örtüsü değişimlerinin hesaplanacağı değişim katmandır. Bu yöntemde, uzaktan algılama verilerinin yorumlanması sonucunda elde edilmiş poligonsal vektör verilerden CBS teknikleri ile değişim matrisleri oluşturularak değişim belirleme işlemi gerçekleştirilmiştir.

İstanbul il sınırları baz alınarak oluşturulan bu değişim katmanında sırasıyla 2000-2006, 2006-2012, 2012-2018 ve 2000-2018 yılları arasında arazi örtüsündeki değişimler hesaplanmıştır. Değişim katmanının öznitelik verileri Excel formatına dönüştürülerek, değişim matrisleri üretilmiştir. Değişim matrisleri, alansal ve konusal değişimin yönünü ve büyüklüğünü ortaya koymuştur. Değişimlerin yönü ve büyüklüğünün yanında değişim haritaları da üretilerek bu değişimler konumsal olarak da incelenmiştir.

3.Tartışma ve Sonuç

İstanbul ilinin arazi örtüsü ve özellikle orman alanlarındaki değişimler, 18 yıllık (2000-2018) bir zaman dilimi için hesaplanmıştır. CORINE sistemine göre yapılan arazi sınıflandırılması analizine göre orman alanları en çok değişime uğrayan arazi örtüsü tipidir (Şekil 2).
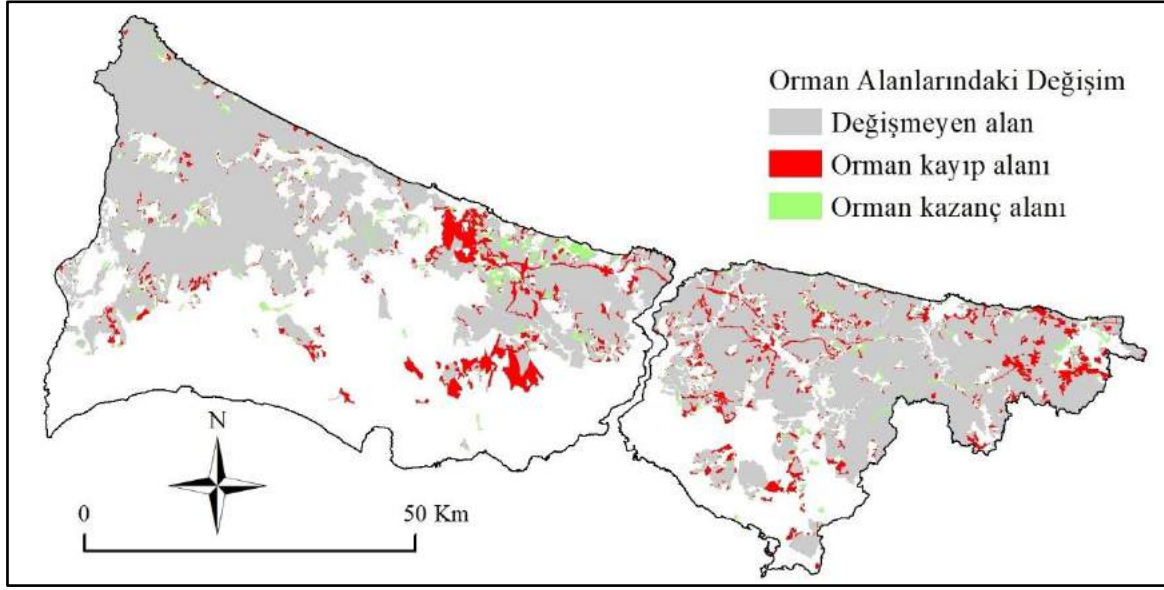
Şekil 2. İstanbul ili orman alanlarında 2000-2018 dönemindeki değişimler

2000 yılında genel alanın %18,7'si yapay yüzeyler, %28,9'u tarım alanı, %49,8'i orman ve %2.6'sı su alanı iken, 2018 yılında yapay yüzeylerin oranı %22,7'ye, tarım alanları ise %29,2'ye yükselmiş, orman alanlarının oranı %45,5'e ve su alanları da %2,4'e düşmüştür.

Zaman serileri incelendiğinde çalışma alanındaki ormanlarda, 2000 yılından 2006 yılına kadar 14309,9 hektar ile %5,3 (Çizelge 2), 2006 yılından 2012 yılına kadar 1574,8 hektar ile %0,6 (Çizelge 3), 2012 yılından 2018 yılına kadar 7761,4 hektar ile %3 (Çizelge 4), 2000 yılından 2018 yılına kadar 23646,1 hektar ile %8,7 (Çizelge 5) oranında azalma olduğu belirlenmiştir.

Çizelge 2. 2000-2006 yılları arasındaki arazi örtüsü değişimleri

| | Arazi tipi | 2006 yılı | | | | | 2000 yılı toplam (A) (ha) | Değişim (B-A) | |
		Yapay yüzey (ha)	Tarım alanı (ha)	Orman alanı (ha)	Sulak alan (ha)	Su kütlesi (ha)		ha	%
2000 yılı	Yapay yüzey	92588,6	5277,8	3687,2	16,5	309,1	101879,1	7665,8	7,5
	Tarım alanı	10551,3	142106,7	4608,1	53,6	70,9	157390,6	6334,5	4,0
	Orman alanı	6268,1	16211,3	248589,7	60,4	264,5	271394,0	-14309,9	-5,3
	Sulak alan	0,0	83,2	83,7	140,5	92,5	399,9	-114,3	-28,6
	Su kütlesi	137,0	46,1	115,4	14,6	13057,4	13370,5	424,0	3,2
	2006 yılı toplam (B)	109544,9	163725,0	257084,1	285,6	13794,5	544434,1		

Çizelge 3. 2006-2012 yılları arasındaki arazi örtüsü değişimleri

Arazi tipi	2012 yılı					2006 yılı toplam (A) (ha)	Değişim (B-A)	
	Yapay yüzey (ha)	Tarım alanı (ha)	Orman alanı (ha)	Sulak alan (ha)	Su kütlesi (ha)		ha	%
2006 yılı								
Yapay yüzey	103754,8	2651,4	2700,6	25,8	412,2	109544,9	2473,7	2,3
Tarım alanı	5618,1	156120,2	1881,2	3,4	102,1	163725,0	-1310,4	-0,8
Orman alanı	2509,1	3573,8	250676,9	10,7	313,7	257084,1	-1574,8	-0,6
Sulak alan	0,8	1,4	2,5	273,3	7,7	285,6	464,3	162,6
Su kütlesi	135,7	67,8	248,1	436,7	12906,0	13794,5	-52,8	-0,4
2012 yılı toplam (B)	112018,6	162414,7	255509,3	749,9	13741,7	544434,1		

Çizelge 4. 2012-2018 yılları arasındaki arazi örtüsü değişimleri

Arazi tipi	2018 yılı					2012 yılı toplam (A) (ha)	Değişim (B-A)	
	Yapay yüzey (ha)	Tarım alanı (ha)	Orman alanı (ha)	Sulak alan (ha)	Su kütlesi (ha)		ha	%
2012 yılı								
Yapay yüzey	111328,4	44,0	646,2		0,0	112018,6	11615,7	10,4
Tarım alanı	3662,2	158695,1	57,4		0,0	162414,7	-3391,3	-2,1
Orman alanı	8345,8	236,5	246927,1		0,0	255509,3	-7761,4	-3,0
Sulak alan				749,9		749,9	0,0	0,0
Su kütlesi	297,9	47,8	117,3		13278,7	13741,7	-463,0	-3,4
2018 yılı toplam (B)	123634,2	159023,4	247747,9	749,9	13278,7	544434,1		

Çizelge 5. 2000-2018 yılları arasındaki arazi örtüsü değişimleri

Arazi tipi	2018 yılı					2000 yılı toplam (A) (ha)	Değişim (B-A)	
	Yapay yüzey (ha)	Tarım alanı (ha)	Orman alanı (ha)	Sulak alan (ha)	Su kütlesi (ha)		ha	%
2000 yılı								
Yapay yüzey	91278,2	5358,5	4721,2	40,9	480,3	101879,1	21755,1	21,4
Tarım alanı	15804,1	136769,5	4603,4	65,6	148,0	157390,6	1632,8	1,0
Orman alanı	16173,5	16668,2	238009,6	68,3	474,4	271394,0	-23646,1	-8,7
Sulak alan	1,0	82,2	75,4	133,8	107,5	399,9	349,9	87,5
Su kütlesi	377,4	145,0	338,4	441,2	12068,5	13370,5	-91,8	-0,7
2018 yılı toplam (B)	123634,2	159023,4	247747,9	749,9	13278,7	544434,1		

Sarıyılmaz (2017) İstanbul ili Sazlıdere havzası sınırlarında 2000-2012 yılları arasındaki CORINE verilerini kullanarak yaptığı araştırmada, bu zaman aralığında geçen sürede su varlığı ve tarım alanları sınıflarının hemen hemen değişmeden kaldığını belirtmiştir. İstanbul ilinin genelindeki arazi örtüsü değişimleri incelendiğinde 2000-2018 dönemi için bu arazilerde görülen çok küçük değişimlerin bu bulguyu desteklemektedir. Bu dönemde orman kayıpları 2000-2006 yılları arasında 14310 hektarla en yüksek seviyededir. Bu kayıpların 2018 yılına kadar sürekli olarak devam ettiği anlaşılmaktadır. Bunun aksine yerleşim yerlerinin de içinde bulunduğu yapay alanların sürekli büyüdüğü görülmektedir.

Orman alanlarındaki değişimler detaylı olarak incelendiğinde, İstanbul'daki üçüncü havalimanı inşaat alanı, bunu destekleyen üçüncü köprü ve bağlantılı otoyolların neden olduğu orman kayıpları dikkat çekmektedir (Şekil 3; Çizelge 6).
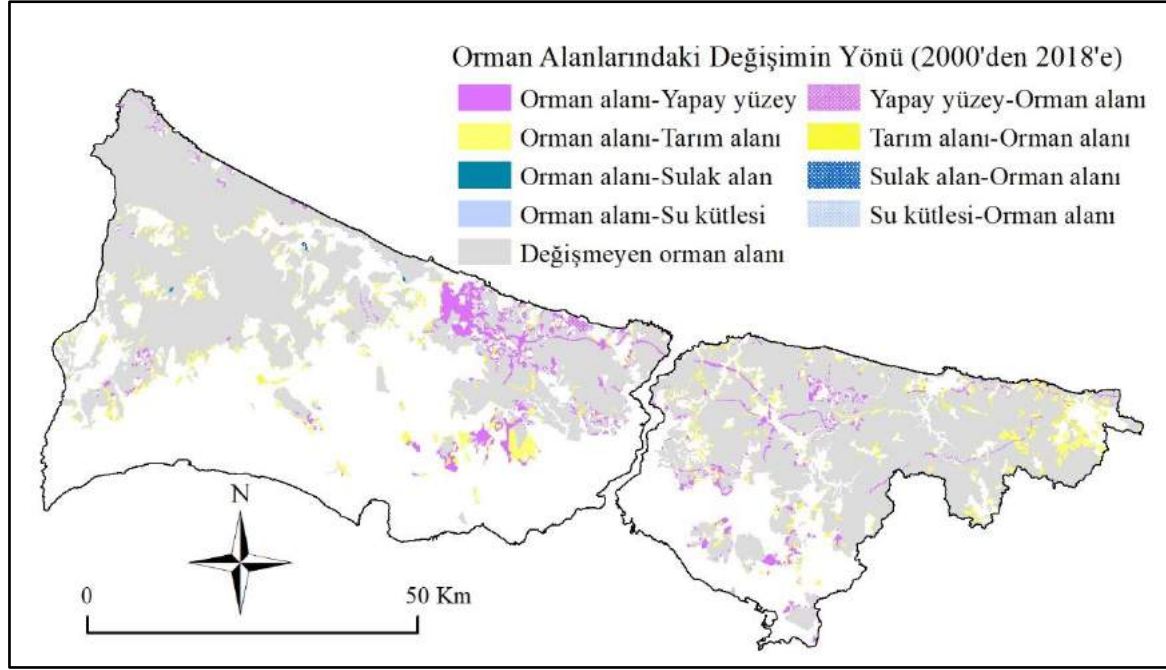
Şekil 3. Orman alanlarında 2000'den 2018'e kadar olan değişimlerin yönü ve konumu

Çizelge 6. 2000-2018 yılları arasında orman alanlarındaki değişimler

Arazi tipi	2018									Değişim (B-A)	
	Yapay yüzey (ha)	Tarım alanı (ha)	Sulak alan (ha)	Su kütlesi (ha)	Geniş yapraklı ormanlar (ha)	İbreli ormanlar (ha)	Karışık ormanlar (ha)	Maki ve otsu bitkiler (ha)	2000 yılı toplam (A) (ha)	(ha)	%
Yapay yüzey	91278,2	5358,5	40,9	480,3	978,3	198,9	225,2	3318,8	101879,1		
Tarım alanı	15804,1	136769,5	65,6	148,0	2447,2	135,2	265,4	1755,6	157390,6		
Sulak alan	1,0	82,2	133,8	107,5	1,6	73,8			399,9		
Su kütlesi	377,4	145,0	441,2	12068,5	146,2	39,2	48,5	104,5	13370,5		
Geniş yapraklı ormanlar	5918,9	6122,9	5,2	202,1	152606,3	551,9	1721,0	5461,2	172589,6	6986,4	4,1
İbreli ormanlar	1439,5	350,5	3,2	19,8	456,7	4944,4	2606,2	1882,4	11702,6	-523,6	-4,5
Karışık ormanlar	2414,5	2085,2	0,0	117,7	8691,8	4129,7	18615,2	5011,4	41065,7	-16880,4	-41,1
Maki ve otsu bitkiler	6400,6	8109,6	59,9	134,8	14248,0	1105,9	703,8	15273,6	46036,1	-13228,4	-28,7
2018 yılı toplam (B)	123634,2	159023,4	749,9	13278,7	179576,0	11179,0	24185,2	32807,6	544434,1		

(2000 sol kenar etiketi)

Çalışma alanındaki ormanların %64'ünü geniş yapraklı ormanlar, %4'ünü ibreli ormanlar, %15'ini karışık ormanlar ve %17'sini de maki ve otsu bitki alanları oluşturmaktadır. 2000-2018 döneminde geniş yapraklı ormanlar %4 oranında büyürken, ibreli ormanlar %4,5, karışık ormanlar %41, maki ve otsu bitki alanları %29 oranında küçülmüştür. Karışık orman ile maki ve otsu bitki sınıflarındaki arazi örtüsünün iyi korunamadığı ve bu alanların ciddi oranda yerleşim ve tarım alanlarına dönüşerek kaybedildiği söylenebilir. Bu bölgeye komşu Tekirdağ ilindeki arazi özelliklerini CORINE sistemine göre tahsis edilmiş verilerinden yararlanarak inceleyen Sarı ve Özşahin (2016) de 2000-2015 yılları arasında en belirgin değişimlerin yerleşim yerlerinde meydana geldiğini belirtmiştir. Uzaktan algılama verilerinin kullanıldığı, CBS tabanlı bir izleme ve tahmin çalışması yapmak, sürdürülebilir planlamaların oluşturulmasında faydalı olabilir (Karabulut vd., 2006). Ancak bu konuda CORINE sisteminde üretilen verinin doğruluğunu (Ateşoğlu, 2016) artırmak ve daha detaylı verilerin ve bilgilerin elde edilmesini sağlamak için daha küçük ölçekli verilerin işlenmesi ve sisteme bir alt seviye daha eklenmesi mümkün olabilir.

Bu çalışmadan elde edilen bulgulara göre, İstanbul ilinde 2000-2018 döneminde orman alanları sürekli azalmıştır. Bu nedenle, orman alanlarına yönelik planlamalarda daha hassas olunması, özellikle karışık orman yapılarının korunması, maki ve otsu bitki alanlarının uygun geniş yapraklı ve ibreli türlerle kapalı orman formlarına dönüştürülmesi ve orman ekosistemlerinin dengesini bozmayacak işler dışında hiçbir müdahaleye izin verilmemesi konularında çok dikkatli davranılmasının gerekliliğini vurguluyoruz.

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Comparıson of Growth Rate of Black Lockust (*Robinia pseudoacacia* L.) on Productıve and Margınal Cultıvated Lands For Sustanable Agroforestry Systems.

Mirvjena Kortoci (Kellezi) [1], Ylli Kortoci [*1]

Abstract: *Robinia pseudoacacia* is considered as a multipurpose tree because of its great adaptability to face environmental stresses and restore degraded sites, its valuable wood, easy propagation, excellent coppicing potential especially for high yield biomass production, high seedling survival etc. This tree represents an interesting perspective in ecological engineering, agroforestry and urban forest, for this reason understanding its growth dynamics falls within the criteria of forest and peri-urban sustainability. The effects of soil condition on the survival and growth of Robinia pseudoacacia planted on degraded and cultivated land, respectively in Monte Romano site and Azienda Agraria didattico-sperimentale "Nello Lupori" site, in Italy, have been studied in a field transplant experiment using the analysis of variance. Cultivated land showed higher survival rate because of the better soil, topography and climatic conditions. Height and diameter growth responded differently to soil conditions and monitoring period. Mean height and diameter increases were higher in cultivated land. A significant difference in height has been found between initial and final period in cultivated land.

This study is considered important because the selected specie can help improving the soil conditions of selected site so in the future this area can be reforested with valuable wood species. This has to be taken in consideration especially for Albania when illegal logging has created a strong decrease of forest surface associated with soil erosion phenomenon, over flooding, over using of the forest for firewood to fulfill the people demand especially in rural areas. In addition, as the honey production is one important agroforestry aspect and the flowers of Robinia pseudoacacia are known for the production of good quality honey and can be used as medicinal plants.

Keywords: saplings; survival; height; diameter; initial period; final period.

1. Introduction The agricultural land is being used for food crops especially those used for wood energy production very often (Re´dei et al. 2011). The lack of highly productive native species with timber or growth characteristics suited to plantation forestry, bring to the use of exotic species such as black locust as it can easily be established on certain sites, has better growth rates than native species, and possesses broader physiological adaptability with regard to site conditions (Keresztesi 1988; Re´dei et al. 2008).

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Black locust (*Robinia pseudoacacia* L.) is considered a promising plantation species for production of timber and biofuel, and its growth pattern has been analyzed in many countries (Keresztesi 1983; Papanastasis et al. 1998; Rédei 2002; Gruenewald et al. 2007; Aravanopoulos 2010; Böhm et al. a, b; Annighofer et al. 2012; Rédei et al. 2012). Due to its potential to produce large amounts of biomass yields even under unfavorable growth conditions, this tree species is especially suitable for marginal sites (Böhm et al. 2011). Other important attributes of Black locust are its rapid growth and low concurrence rate by weeds. It is also highly resistant to fungi and pests, resistant to air pollution as well as low and high temperatures. Black locust is characterized by a vigorous sprouting of stump and root cuttings (Re'dei et al. 2008, 2011). In particular, its root symbiosis with *Rhizonium* bacteria gives it a nitrogen fixing ability. Therefore, this species can help to improve soil chemical properties and fertility (Bolat et al. 2016; Papaioannou et al. 2016). On the other hand, this particular feature can cause an unwanted and long-lasting shift in vegetation composition toward nitrogen-rich and species-poor plant communities (Kowarik 2010). According to this the presence of this species should be carefully monitored around nature reserves and fragile landscapes in nutrient-poor and dry locations, as it has a great harmful potential (Enescu and Danescu 2013). Black locust is a multi-purpose crop, which can be grown for both quality timber and biomass, as well as for honey production. The cultivation to obtain high quality timber is possible only on sites with adequate moisture and drainage conditions, whilst biomass production as both firewood or woodchips, is allowed also on lower quality soils (Re'dei et al. 2008, 2011).

According to this, the main objective of this study was to compare the survival rate and growth of black locust saplings planted in two areas with different soil conditions, with particular reference in evaluating the possibility of cultivation on marginal lands. In Black locust energy stands established by coppicing, the quantity of biomass is lower and the length of rotation is highly influenced by the irregular diameter distribution (Re´dei et al. 2011). The cultivation of black locust into cultivated or degraded land could stimulate rural economies, counteracting to negative impacts of farm and land abandonment, or supporting the restoration of degraded land which results in improved biodiversity values.

2. Material ve Method

Study sites

There are nearly 377,186 ha of black locust in Italy (Monteverdi et al. 2016). Study area is located in Viterbo region, composed by two sites. The first one, Azienda Agraria didattico-sperimentale "Nello Lupori", referred as cultivated land (hereafter abbreviated as site CL), and the second one, in Monte Romano municipality, referred as degraded cultivated land (hereafter abbreviated as site DL), both part of Tuscia University (Table 1). These sites are located at a distance of 22.7 km from each other.

The sites have different elevations. The first site is located in a lower elevation than the second one with a difference of 50. Regarding the slope the first site is located almost in a flat area whereas the second has a considerable slope percentage. Both areas face South-West. The temperatures are slightly higher in the second site but this site is characterized by lower annual precipitations.

Climatic and topographic description of the two sites can be found in following Table 1.

Table 1: Description of studied sites.

Site	Latitude (N)	Longitude (E)	Elevation (m)	Slope (%)	Aspect	Mean annual temperature (ºC)	Total annual precipitation (mm)
CL	42°25'10"N	12°04'39"E	290	2.4	SW	14.4	726
DL	42°15'39"N	11°54'13"E	340	20.9	SW	15.1	680

Climatic data were obtained from https://it.climate-data.org

Experimental design

The "Nello Lupori" educational-experimental farm (CL) is located in Viterbo, in Riello area, 500 meters from the Department of Agriculture and it covers about 30 hectares. It is mainly used for agricultural and forestry experimental purposes. The soil is principally volcanic and only towards the coast is represented by clay deposits. This lithological formation, over time, has allowed the development in vast areas of the soil characteristics mostly brownish and rich in nutrients such as potassium oxide, phosphorus anhydride and calcium oxide. These soil characteristics have made possible the use of this land for crops plantation year after year.

The Monte Romano experimental area (DL) has been used previously for agriculture but it was a non-profit area, therefore it became property of Tuscia University for research purposes. It has been cultivated several times with different exotic species, many of them not succeeded. The soil is flysch clayey with low permeability. The water flow is clearly influenced by runoffs that determine a strongly impulsive regime with flood episodes. The clay flysch marl soils are characterized by predominantly lower clayey portion, and in high calcareous and calcareous-marl-clayey soils with lot of stones. In this context the soils that are found, are rich in skeleton, with variable thicknesses according to the slope and consisting of alternations of thin horizons with more developed layers of brown calcareous type. The nutritive elements are quite scarce, especially the content of assimilable phosphorus anhydride is unsatisfactory. Moreover, they are poor in potassium oxide.

Robinia pseudoacacia saplings, kindly granted by the nursery of C.F.S. of Pieve S. Stefano, were used in both plantation sites. They were all extracted in the same time, from the same area and they had the same age. Saplings were randomly selected when planted in both areas without any criteria about height and diameter. No previous interventions like plowing, fertilization, mechanic or chemical intervention for weeds control were made for terrain preparation. Manual drill has been used to open the holes for saplings plantations. Plantation scheme used in both cases were 1x1 m. A total of 45 saplings have been planted in the CL and 72 saplings in DL.

Measurements and statistical analysis

Sapling height and basal diameter were measured immediately after planting in middle April 2007 (initial) and in first fortnight of December 2007 (final) in both areas in order to compare the growth between the plantation period and the end of growth oned. Saplings death was also noticed.

G–test of independence was used to see whether the distribution of one variable at the initial phase and final phase are different in cultivated area and degraded cultivated area. In the same way the same test was used to conclude about the distribution of each variable between both study areas in the initial and final phase. One-way analysis of variance (ANOVAs) procedures

were used to compare the growth rate in height and diameter in cultivated land and degraded cultivated land. Linear regression analysis of relationships between height and basal diameter of saplings planted on cultivated (CL) and degraded cultivated (DL) land was performed too.

3. Results

Saplings survival at the end of growth period highly differed between sites. Highest mortality occurred at DL where 16 saplings died, whereas at CL only 3. Survival percentage of planted saplings was therefore 93% in CL and 78% DL.
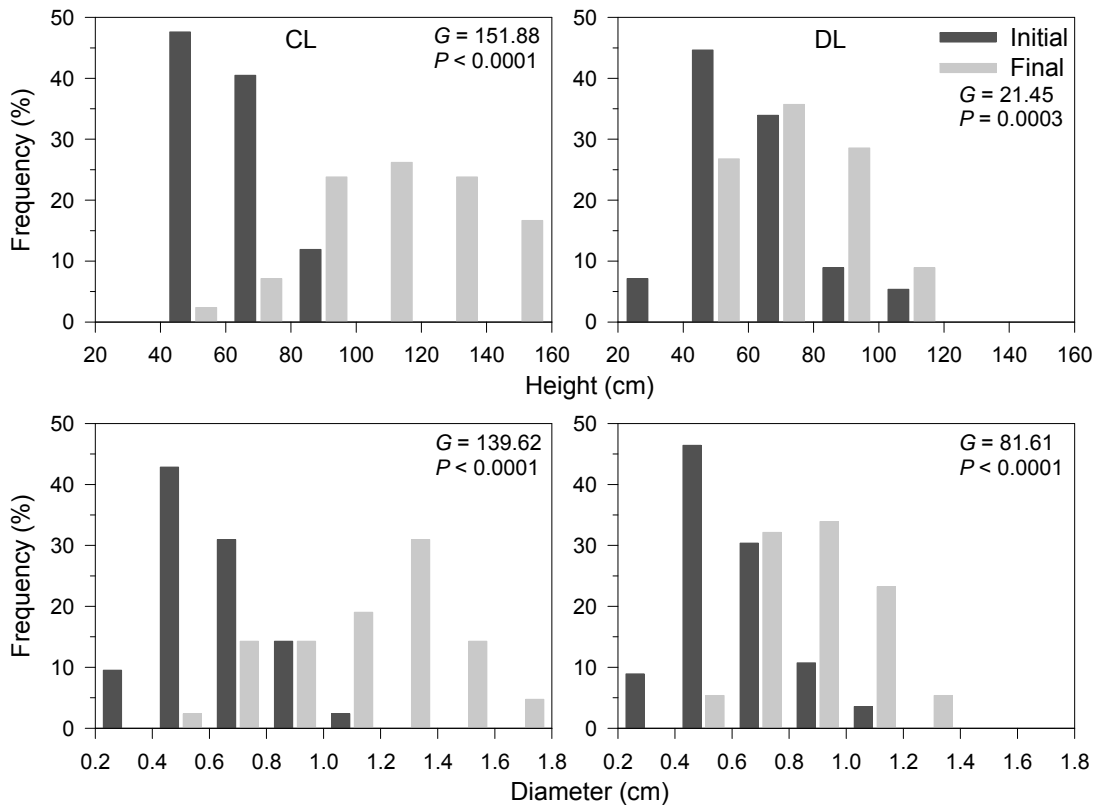
Figure 1: Distribution of height and diameter for each site. The distributions were compared among the two measurement periods using *G*-tests values and related significance levels (*P*).

The distribution of heights and diameters values in the initial period is characterized by an asymmetry to the lower heights in both the surfaces, while at the end of the period it follows the normal distribution (Fig. 1). There are statistically significant differences on both surfaces between the two periods, which is more pronounced in the case of cultivated land.
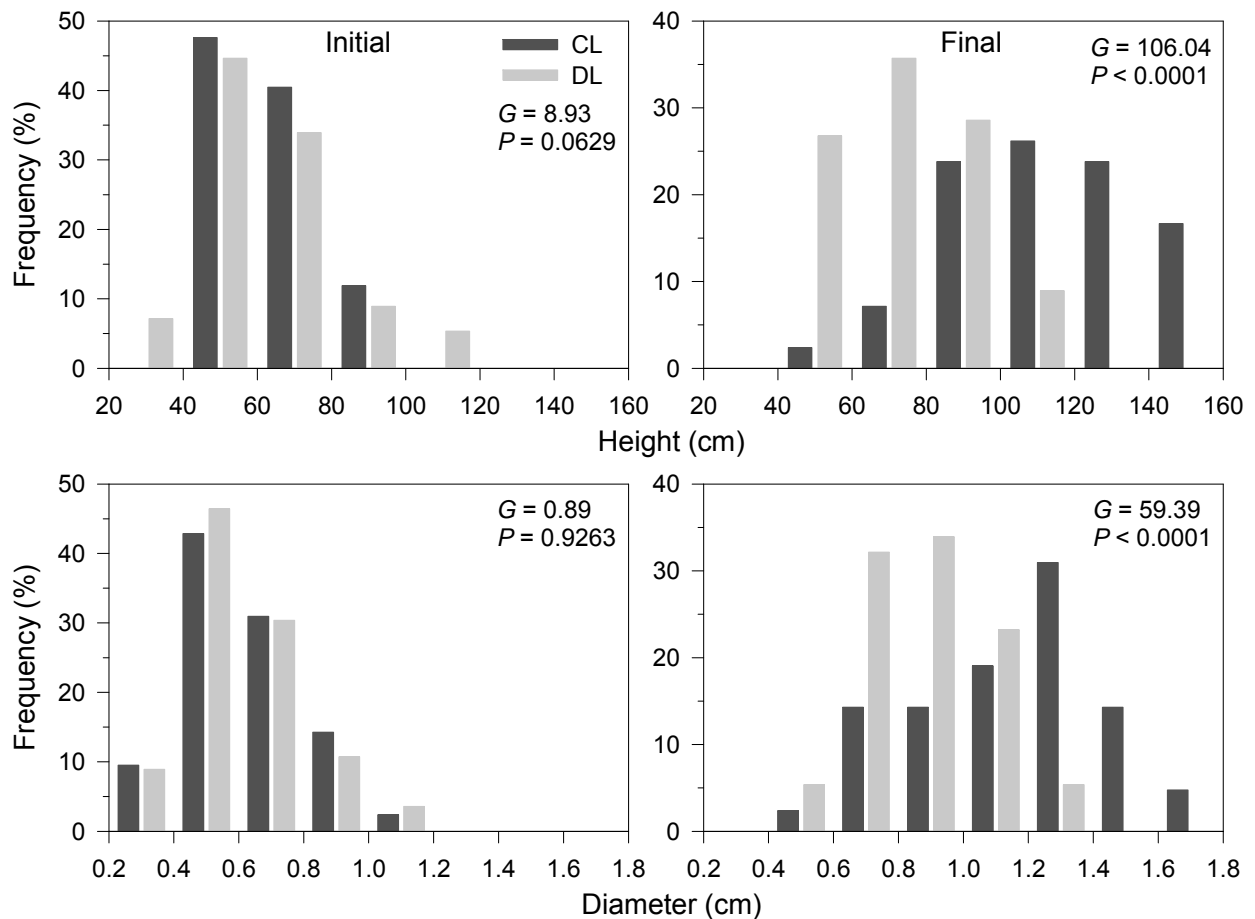
Figure 2: Distribution of height and diameter for each measurement period. The distributions were compared among the two studied sites using *G*-tests values and related significance levels (*P*).

Heights and diameters distributions in the initial period resulted to be quite similar for both surfaces, while the final period is characterized by higher values on the cultivated surface (Fig. 2). Consequently, the comparisons between the distributions of heights and diameters reveal no significant changes in the initial period between the two surfaces, while in the final period the differences are statistically significant for both variables taken into account.
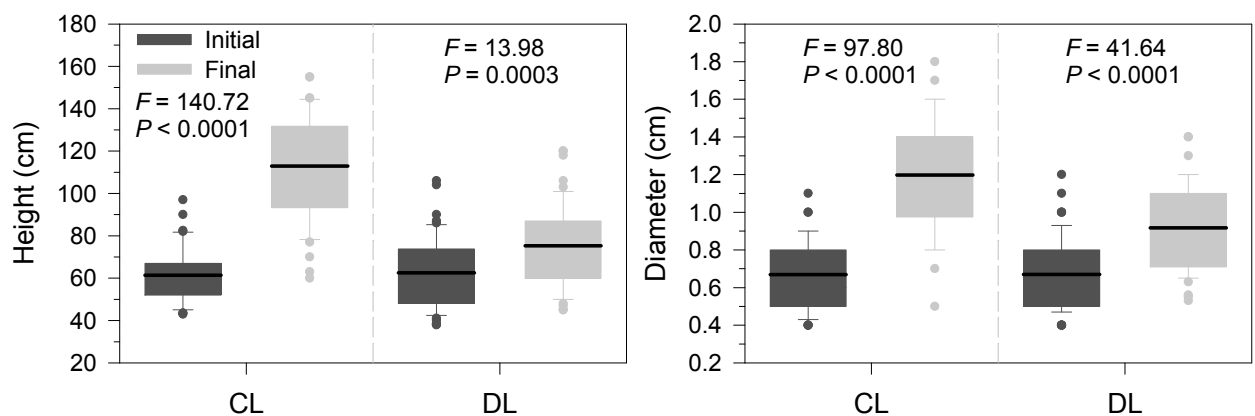
Figure 3: Variability of height and diameter for each studied site. Statistical parameters (*F*; *P*, significance level) comparing initial (dark grey box plots) and final (grey box plots) measuring period within sites are shown. Black horizontal line in box plots corresponds to mean values.

Mean height and diameter increases were highest for cultivated land and lowest for degraded cultivated land and height showed the highest percentage increase. There is a significant difference in height between initial and final period in cultivated land, while in degraded land there is no significant difference in height between two periods. Considering the diameter, the difference is significant in both ground typologies between both periods of cultivation. (Fig.3).

Table 2: Mean (± SE) values of height and diameter (at the initial and final measuring period as well as the increase between periods) for each site and their statistical parameters (*F*; *P*, significance level).

	Height				Diameter			
	Initial	Final (cm)	Increase	%	Initial	Final (cm)	Increase	%
CL	61.5 ±	112.9 ±	51.5 ± 3.41	87.2 ±	0.67 ±	1.20 ±	0.53 ± 0.04	84.6 ±
DL	62.5 ±	75.3 ± 2.61	12.8 ± 1.22	21.7 ±	0.67 ±	0.92 ±	0.25 ± 0.02	41.6 ±
F	0.1256	**70.52**	**139.65**	**106.78**	0.0003	**29.02**	**52.01**	**28.37**
P	0.7238	**< 0.0001**	**< 0.0001**	**< 0.0001**	0.9874	**< 0.0001**	**< 0.0001**	**< 0.0001**

There is no significant difference in height and diameter between cultivated land and degraded land in initial period, while the difference of this variables is significant in final period between both sites. The difference of increase and increase percentage for height and diameter is also significant between both ground typologies (Table 2).
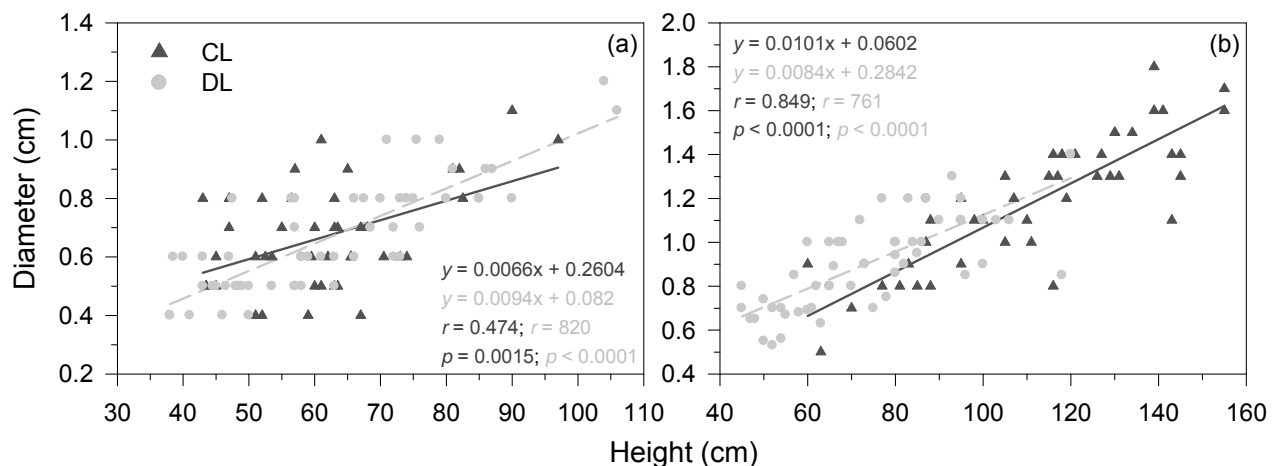
Figure 4: Relationships between height and basal diameter of Robinia pseudoacacia saplings planted on cultivated (CL) and degraded cultivated (DL) land. Data represented in plot (a) were measured in middle April 2007 (initial) and in plot (b) in first fortnight of December 2007 (final). Linear regression equation, correlation coefficient and the level of significance are shown for each case.

Regression analysis revealed different relationships of height with diameter between cultivated and degraded cultivated land, showing stronger correlation at the degraded cultivated land at the initial period and at the cultivated land at the final period (Fig. 4).

4. Discussion and Conclusions

Discussion

Re´dei et al. 2011 reports not to be reasonable the plantation harvesting in the first three years because the mean annual increment is higher with the passing of time.

According (Re´dei et al. 2011) the height growth of black locust peaks within the first five years. The diameter growth in the first decade. On the other hand, in this study, diameter increase percentage in cultivated land is lower than height increase percentage in the same soil typology while diameter increase percentage in degraded land is higher than height increase percentage in the same soil typology. The results suggest that low soil quality can significantly impair seedling growth on a degraded hillside.

Heights and diameters distributions in the initial period resulted to be quite similar for both surfaces considering the same provenience of seedlings from the nursery. The final period is characterized by higher values on the cultivated surface because of the adaption with the good terrain conditions.

About seedlings mortality Re´dei et al. 2011 reports a seedling mortality about one-third at age 7 and 8. This percentage grows to nearly 50% while age passes to 12-13 years.

Conclusıons

The higher seedling survival in cultivated land shows that soil conditions affect this characteristic.

Most seedling mortality occurred in the dry season as a consequence of no post nursery care of planted seedlings. Precautions during seedling transportation and transplantation were effective in minimizing transplantation loss.

Height and diameter increase and increase percentage are higher in cultivated land then in degraded land letting us know that soil conditions affect also this.

This study was limited, but early survival and growth are the keys to successful panorama of Robinia pseudoacacia uses in different sites for a multiple purpose.

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Sustainable Eco-Printing on Natural Materials

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Abstract: Recently, concepts such as sustainable fashion, ecological printing (eco-print), natural dyes, green environment and environmentally friendly designs have gained importance. Ecological printing is a printing method that is used to transfer natural colors and shapes of plants, flowers, leaves, barks etc. to the surface of materials such as fabric, special paper, leather. Patterning the fabric surface with completely natural materials can be done with the help of various mordants which are substances that fix the dyestuff to the substrate, improving color tone and fastness properties. The part of the plant used, the dyeing process, the quality of the water, the pH balance, the mordant and the fabric used, all affect the results of the applied eco-printing. Unpredictable and surprising results, patterns, colors and visual effects are possible with ecological printing. In this study, ecological printing on natural materials such as silk, cotton and leather mordanted with alum sulfate was investigated. The evaluation of the results showed that patterns, colors and shapes are transferred more clearly on protein-based materials. Eco print technique gives an opportunity to designers or realisers to exhibit their unlimited creativity and imagination.

Keywords: Ecological printing, Plants, Natural fibers, Cotton, Silk, Leather

1. Introduction

Nature is always a source of inspiration for human beings. The shapes and colors of various plants, flowers and the leaves of various trees are still tried to be reflected in textile products. Besides, since ancient times, natural dyestuffs of vegetable, animal or mineral origin have been widely used to color textile materials.

The use of natural dyes and renewable natural resources such as plants in coloring or patterning is a very interesting method in the textile and fashion industry, both in terms of its environmentally friendly aspect and in terms of obtaining aesthetically and artistically unique print designs. All over the world, there are intensive researches on the revival of natural dyes, their widespread use and finding new sources (Erdem İşmal, 2019; Samata, 2020; Salauddin et al., 2021).

Recently, concepts such as sustainable fashion, ecological printing (eco-print), natural dyes, green environment and environmentally friendly designs have gained importance (Can and

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Oyman, 2017; Bilir, 2018). As an alternative patterning method quite different from the classical printing techniques applied in industry and artistic works, the technique of creating patterns on the fabric by directly using parts of plants/trees such as flowers, leaves, branches and seeds is called "ecological printing" (eco print) (Özen and Erdem İşmal, 2021). This printing method, discovered by India Flint, is the process of coloring textile surfaces with plant materials in completely natural ways. In eco printing, a vivid, clear and sometimes three-dimensional patterns transfer of nature is carried out on the surface of natural materials such as paper, fabric or leather (Çolak et al., 2020). Thanks to this technique, plants can be used as natural templates to obtain interesting and surprising textures, traces, shapes and color tones on the material surface.

There has been an increase in consumers' interest in ecological products in recent years. In order to meet the increasing demand, it is important to choose the material and to determine the plants to be used in printing, and to make beautiful and resistant designs (Özel and Özkan Tağı, 2019). As a result of the literature review, it has been seen that there are not enough experimental studies on patterning by directly contacting various parts of the plants on natural materials. In this study, it is aimed to obtain the best color and eco printing effects on natural materials such as silk, cotton fabric and leather. For this purpose, an ecological and sustainable approach has been displayed by choosing a method that consumes less water and energy, environmentally friendly materials, harmless mordants, renewable and natural dyestuff resources.

2. Materials and Method
2.1. Materials
%100 Cotton (woven) and silk fabrics were used in this study. Chromium tanned leather in crust state was provided from local tannery. Metal based mordants as copper sulfate ($CuSO_4.5H_2O$), iron sulfate ($FeSO_4.7H_2O$) and potassium aluminum sulfate ($KAl(SO_4)_2.12H_2O$) were used in the mordanting processes. The ecoprint applied fabrics were wrapped in nylon.

2.2. Method
Preparation of natural materials
Preferred orientation to nature can be achieved by using natural dyeing and natural printing methods as well as natural materials such as wool, silk, cotton, linen etc. One of the important points in the eco-print process for a homogenous dyeing and printing process is to remove the process residues that may prevent penetration of dyes on the textile material. Since some finishing processes are usually performed to improve fabric properties while cotton is woven at the factory, the finishing matters must be completely removed before eco-printing. This will affect the penetration of the natural dye from the plants into the fabric, consequently the patterns will not be clear (Çolak et al., 2021). Taking these issues into account, the fabrics were washed with soap or detergent and prepared for eco-printing.

Mordanting process
Mordants help the dyes to bind to the fibers by acting as a chemical bridge between the natural dye and the fiber. The mordanting process increases the affinity between the dye and the textile surface, so that more vivid colors, better dyeing fastness and wider color spectrums can be obtained (Shahid, 2013; İşmal and Yıldırım, 2019). Oeko-Tex Standard 100 mentions that natural dye mordants as aluminum and iron salts are non-toxic (Oeko-Tex Standard 100, 2017). After washing the silk and cotton fabrics were mordanted with potassium aluminum

sulfate (Fig. 1). The chromium tanned leather was mordanted with potassium aluminum sulfate.

Figure 1. Mordanting of cotton and silk fabrics

Eco-printing applications

The eco-printing was performed with the use of the following plants: walnut leaves, plane leaves, pine leaves, yellow and red gerbera flowers, sardinia, osteospermum and ivy.

The plants placed on the silk fabric were mordanted with ferrous sulfate, and the plants placed on the cotton fabric were mordanted with copper sulfate. The plants on chromium tanned leather were mordanted with ferrous sulfate (Fig. 2). The mordanted plants were placed on natural materials, then the materials were rolled with a piece of branch, wrapped tightly with nylon and tied with a rope. The packaged samples were placed in a large pot with boiled water for 1 hour (Fig. 3). After one hour, the packages were removed from water and cooled, then they were opened and cleaned from the plant remnants on them, the unbound mordants were washed out by rinsing with cold water. The fabrics were ironed after drying.
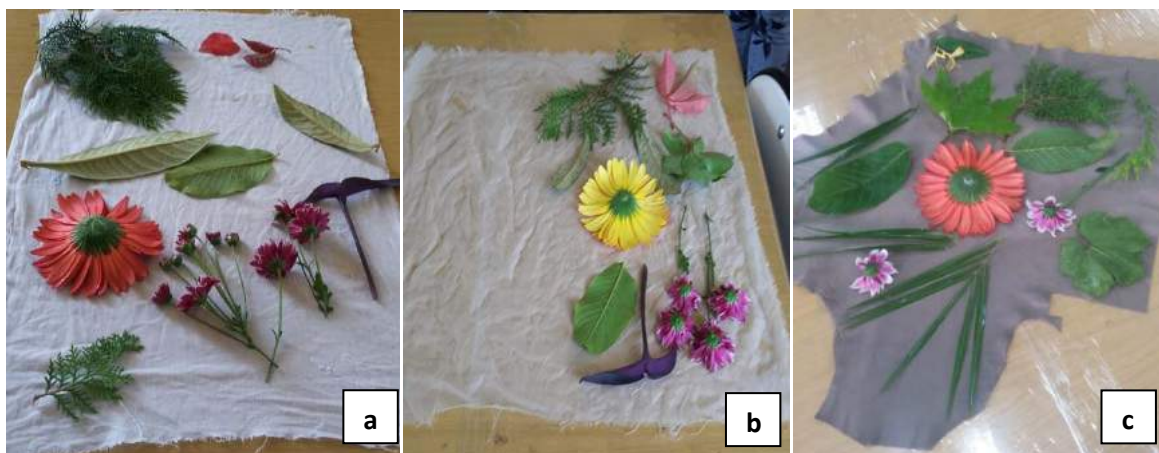
Figure 2. Eco printing applications on cotton (a), silk (b) and leather (c)

Figure 3. Packages in hot water

3. Results and Discussion

Ecological printing results

The visual evaluation of the ecological printing performed on the natural materials as cotton, silk and leather are given below (Fig. 4). The cotton blanket was used on the cotton fabric and the obtained results are also shown in Figure 4. When ecological prints are examined, it has been determined that the patterns, shapes and colors of the used plants are formed on the natural materials. The dyes of the plants are colored them and local prints are created. Each of the patterns obtained on the natural materials is unique and distinctive, ensuring that the designs are original.
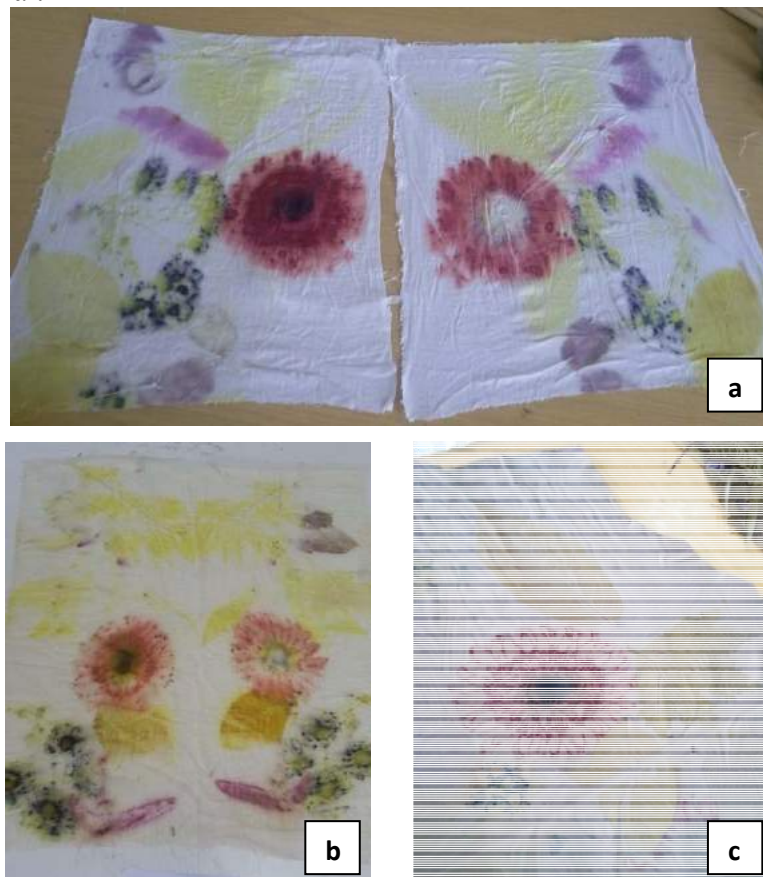
Figure 4. Eco printing results on cotton (a), silk (b) and leather (c)

It has been determined that flower and petal forms on the protein-based silk fabric and leather are clearer and better, than those on the cotton fabric. It is thought that the amino groups of leather and silk are proper to react with the dyestuffs consisting in the plants to form a compound. The selected plants were also found to be important. It has been observed that some plants appear very well with some colors and patterns, while others appear slightly cloudy (Çolak et al., 2020). This issue might be due to the different color shades provided by using different mordants. Application of ecological printing technique is expected to bring a different and an ecological alternative to new designs. The ecological and toxicological problems caused by synthetic dyestuffs can also be solved to some extent.

4. Conclusions

In this study, natural materials such as leather, silk and cotton fabrics were successfully brought into contact with leaves and flowers, and different pattern effects with color tones were obtained on these materials with an environmentally friendly application. The fact that tap water and harmless mordants are utilized and plants are used in the eco-printing method

makes this method environmentally friendly. Eco dyeing and eco printing methods that do not affect the balance of nature and do not harm human health allow usage of the designs produced with natural materials in the production of clothing and decorative products. In addition, distinctive and unique results, patterns, colors and visual effects which are possible with ecological printing provides endless creative power to designers or artists.

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Repercussions of The Covıd-19 Pandemıc on The Sustaınabılıty Of Tourısm in Montenegro

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Abstract: Tourism is an important factor in the world industry, which generates large economic, socio-cultural and environmental benefits for destinations. Developed tourist destinations within the tourist product offer well-built infrastructure, receptive factors, tourist activities and marketing strategies according to target groups. Pandemic COVID-19 crisis causes enormous losses for tourist industry, especially for the destinations which depend on that sector. Montenegro has the largest drop in GDP in the region, which have severe consequences on the economy. Precondition for preserving tourism during the pandemic is the allocation of state aid to the tourism sector which the Government has adopted through several aid packages. Due to the fact that Montenegro is mainly dependent on an airline accessibility, pandemic has caused severe repercussions when it comes to destination access. In comparison to neighbouring country Croatia, which has a developed road infrastructure and good tourist attendance in 2020, it is very important to communicate with target emitting markets about the traffic accessibility of the destination. The use of digital marketing should be mostly focused on the maximum exploitation of the targeted markets. Solutions should also be reflected in the development of other resources, such as renewable energy and agriculture, and cluster connection agriculture with tourism.

Keywords: COVID-19, repercussions, tourism, destination, tourism impacts

1. Introduction

In the first half of 2020, the entire world was hit by the COVID-19 pandemic. On a global scale, all countries have introduced strict lockdown measures, closing all business activities and restricting population movements, to prevent the spread of the virus and protect the vulnerable part of the population. This resulted in limited economic activity and caused a financial crisis on a global scale. Every country has felt the consequences of the crisis, both developed and developing countries, globally GDP has fallen sharply.

Especially pandemic has caused incalculable economic consequences for all destinations that depend on and base their economy on tourism, since tourist movements were restricted. Tourism dependent economies experienced a multiple decline in GDP, which caused a financial collapse in the revenues.

In order to reduce the negative consequences on the economy, the Governments have helped, with special economic measures, economy and vulnerable population. Economic crisis

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countermeasures have saved a large number of employees and helped companies to avoid bankruptcy, due to closed business activities.

2. Tourist destination development

Tourist destination is a spatial unit of the tourist offer that is oriented towards the tourist market. The destination has receptive, communicative and attractive factors, i.e. accommodation and food facilities, infrastructure, cultural-historical, natural and entertainment attractions, which all together form a destination product. The goal of each destination is to create a competitive destination product that will attract and meet the needs of target tourists (Županović & Zečević, 2019, p. 256-257).

In the process of creating a destination product, it is necessary to analyze the following aspects (Galičić & Laškarin, 2016, p. 187):
- Natural and social attractions that will encourage tourists to visit the destination
- Receptive facilities that offer accommodation and food and beverage services
- Developed local and international infrastructure
- Package arrangements that will attract tourists
- Activities in the destination
- Marketing and coordination activities aimed at tourists

The main reason for drawing tourists to a particular destination are attractions. The destination offer must be based on natural beauties, cultural and historical monuments, local culture, good tourist infrastructure and entertainment (Bartoluci, 2013, p. 162).

The quality of the destination product is made up of receptive factors, i.e. accommodation capacities that must be diverse in order to satisfy all types of tourists. Hotel facilities, as the basic accommodation, are the starting point for the development of a competitive tourist destination (Moutinho, 2000, p. 57).

Tourists must be able to reach the destination, so there needs to be an effective infrastructure put in place. According to Vujović-Cvijanović et al. (2012), „The development of traffic contributes to the mass people movement and the development of tourism, especially the construction of modern roads and airports" (p. 134). Infrastructure development and access to local transportation is the foundation and basis for the tourism development, which directly affects the growth of tourist traffic and attendance.

3. Tourism impacts

Tourism is a branch of the economy with a global impact, where hundreds of millions of tourists decide to travel internationally and domestically every year. The tourism industry directly employs tens of millions of workers, and indirectly employs many more. Host destinations receive the product of tourism activities, which are reflected in tourist consumption, that directly affects the increase in destinations revenue.

Tourism, as a form of activity, takes place in the human and natural environment and therefore produces great impacts. The impacts of tourism are directly related to the destinations planning and management, i.e. tourist destination policy focuses on clearly defined impacts of tourism that seeks to accomplish. The main impacts that tourism produces on the destination (Županović & Zečević, 2020, p. 536):

- Environmental impacts
- Socio-cultural impacts
- Economic impacts

The environment and tourism are interdependent, the environment has many attractive, natural and built facilities for tourists, thus the tourism development has positive and negative impacts. The positive side of the impact is that tourism has greater benefits if tourists experience a quality environment, and thus the environment has benefits if it is preserved and maintained in the right way. Negative environmental consequences include pollutions, destruction of flora and fauna, damage and reduction of natural areas (Hall, 2008, p. 29). Sustainable tourism development within the destination, should contribute to the protection and reduction of negative effects on the environment, from multipart relations between the tourism industry, tourists and the environment (Županović & Krivokapić, 2020, p. 84).

Tourism has a positive and negative impact on culture, on the interaction of the local community towards the tourism development, as well as on the tourists. As the local community has multiple benefits from tourism, it is necessary to achieve a good interaction between host population and tourists, in order to experience the culture in the right way with all its specificity and authenticity. Positive impacts can be characterized through the following (Milićević & Trišić, 2019, p. 31):
- Preservation of cultural heritage
- Revival of tradition and culture
- Increase of the employment within the local community
- Increase of the revenues of the host population and the local community
- Use of the local infrastructure and other attractive facilities

Negative socio-cultural effects are more visible if the destination is in the process of development. It is characterized by the cultural identity loss of the host population, loss in traditions, as well as increase in criminal (Hall, 2008, p.30).

The primary reason for the development of tourism in destinations is to realize the financial revenues. The economic benefits of tourism are large, and can be expressed as follows (Magaš-Zadel et al., 2018, p. 109):
- Large revenue from tourism and share in GDP
- Foreign exchange earnings
- Development of domestic companies
- Employment encouraged by the development of tourism:
    - direct employment of workers in the tourism industry
    - indirect employment of workers whose business is closely related to tourist companies

In addition to the positive economic impacts, tourism can also produce negative impacts on the economy (Mason, 2003, p. 35):
- Inflation as a result of rising real estate and food prices, due to additional tourist demands
- Costs of missed opportunities incurred in tourism engagement instead of investing in other available industries
- The dependence of the economy on tourism occurs when the state invests a lot in the development of this sector, neglecting other industries, over time the economy

depends on tourism revenues and any negative change in tourism trends leads to an economic crisis

In order to reduce the negative tourism impacts on the destination, it is necessary to make a balance between the economic effects we want to achieve, in relation to the long-term impacts on the environment and culture (Butler, 2005).

4. International tourist movements during the pandemic

Economies that are mostly based on the service sector, especially on tourism, have suffered the most, in terms of negative impact of the COVID-19 pandemic. That is logical, considering that in such situations, everyone first waives discretionary income. Restrictions and consumers' fear of contagion have heavily influenced on the tourist movements.

The following graph shows the impact of the pandemic on the reduction of the tourism share in the total GDP on the example of the destinations that generate high revenues from tourism.

Graph 1: Tourism and travel-share in GDP
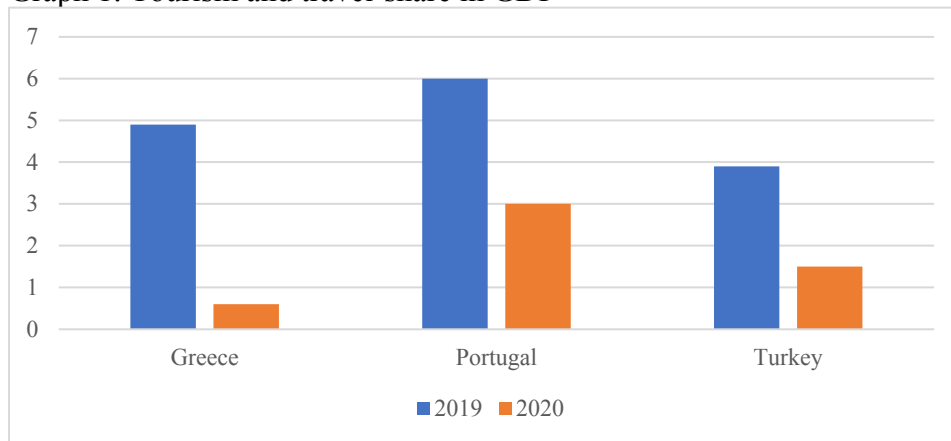
Source: International Monetary Fund (October, 2020), *World Economic Outlook: A Long and Difficult Ascent,* p. 17.

Tourist countries where the economy depends on tourism and travel, have suffered a financial collapse in revenues, such as Greece, Portugal and Turkey as demonstrated in the graph above. Comparing the results from the first half of 2019 and 2020, the share of tourism and travel in GDP has a multiple decreased and produced huge financial losses for destinations.

Restriction on international travel and the services sector, reduced tourist movements and consumption, which has a direct impact on reducing GDP, employment and consumer prices (Table 1).

Table 1: GDP, consumer prices and unemployment

Europe	GDP			Consumer prices			Unemployment		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
Spain	**2.0**	**-12.8**	**7.2**	0.7	-0.2	0.8	14.1	16.8	16.8
Greece	1.9	-9.5	4.1	0.5	-0.6	0.7	17.3	19.9	18.3
Portugal	2.2	-10.0	6.5	0.3	0.0	1.1	6.5	8.1	7.7
Italy	0.3	-10.6	5.2	0.6	0.1	0.6	9.9	11.0	11.8
France	1.5	-9.8	6.0	1.3	0.5	0.6	8.5	8.9	10.2
Malta	4.9	-7.9	4.8	1.5	0.8	1.1	3.6	4.2	4.2

Cyprus	3.2	-6.4	4.7	0.6	-0.6	1.0	7.1	8.0	7.0
Turkey	0.9	-5.0	5.0	15.2	11.9	11.9	13.7	14.6	12.4
Croatia	2.9	-9.0	6.0	0.8	0.3	0.8	7.8	9.3	10.3

Source: International Monetary Fund (October, 2020), *World Economic Outlook: A Long and Difficult Ascent,* p. 55.

As table shows, the largest decline in GDP was recorded in Spain in the amount of -12.8%, which represents that Spain has a very dependent economy on tourism. But also, with the pandemic stabilization, already in 2021, Spain has the largest increase in GDP, which means that the travel and tourism market is relatively recovering. Fall in GDP directly affects both the increase in unemployment and the fall in consumer prices. All destinations for which tourism is the backbone of the economy, in 2020, have a huge drop in GDP. This results in weakening of the economy and decreases in living standards. By easing the restrictive measures caused by the pandemic and enabling the tourist movements, in 2021, all countries will begin to slowly recover and stabilize their economies.

According to the researches, the predictions for GDP recovery are shown in the following graph.

Graph 2: Predictions of GDP recovery
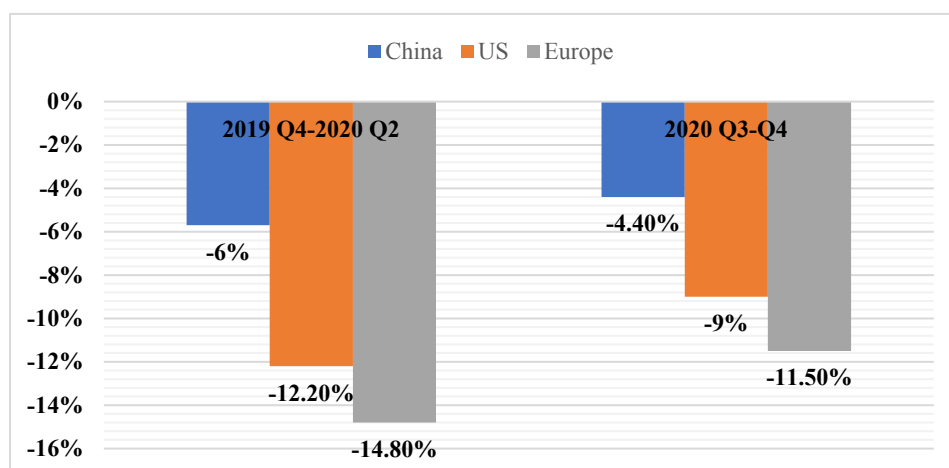
Source: McKinsey & Company (July, 2020). *COVID-19: Briefing materials, Global health and crisis response*, p. 43.

From the data above, the Europe had the biggest fall in GDP and China the lowest. This implies that China is the world's leading economy, which does not rely heavily on tourism, but on production and technology, consequently, it will be the largest recovery in 2020 Q3-Q4 in the amount of 3.3%. While on the other side, the European market has proven to be the most vulnerable as largely dependent on tourism, with the lowest recovery rate of 1.6%.

5. Tourist movements in Montenegro

Montenegro's economy depends on the service sector, primarily tourism, which with all indirect effects, accounts for 25% of total GDP. The pandemic affected the GDP by 17%, that is the largest decline in relation to all countries in the region.

In order to present the negative pandemic effects on the tourist trends in Montenegro, the following graph shows the tourist overnight stays in hotel accommodation during the pandemic in 2020 and before the pandemic in 2019.

Graph 3: Overnight stays in hotel accommodation
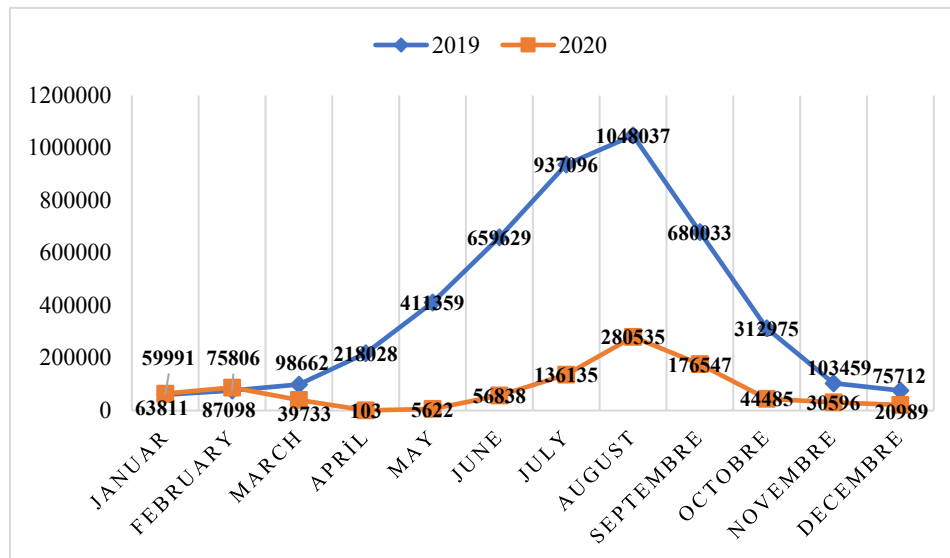
Source: Author's own research

Comparing tourist overnight stays in hotel accommodation, in 2019 and 2020, it is noticeable a huge decline, primarily due to health measures aimed at reducing the number of infected in the country. After reopening in July, number of overnight stays has increased slightly and reached a maximum in August, which is a peak point as in pandemic-free conditions. In 2020, at the peak point, were realized 280.535 tourist overnight stays, that is 73% less compared to the same period last year, where overnight stays amounted to 1.048.037. Comparing the total overnight stays, 80% less than in 2019. Such results are more than insufficient for the normal functioning of the country's economy. This situation has produced vast financial losses for all participants in tourism, as well as additional government borrowing.

The pandemic has landed airplanes all around the world, therefore airline companies had a financial collapse, resulting in bankruptcy. Grounded planes and small number of flights have a direct impact on the number of tourist arrivals in destinations. The following graph shows number of transported passengers in the Podgorica Airport.

Graph 4 Airport Podgorica-number of transported passengers
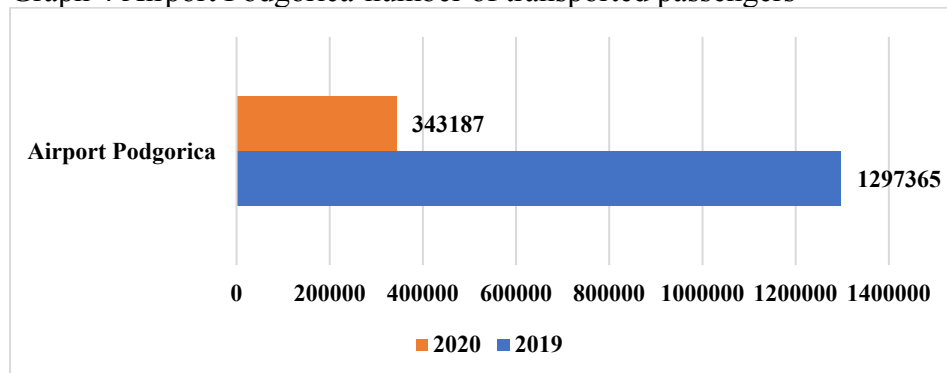
Source: Author's own research

Montenegro had large financial losses in the tourism due to the reduced number of transported passengers by the air. Restrictions on the air traffic implied a smaller number of arrivals and overnight stays in the destination, which confirms that Montenegro is primarily an airline destination. Comparing to the number of transported passengers, in 2020 was realized 73.5% less than in previous year.

The following table shows the change in the structure of the emitting markets.

Table 2 Structure of arrivals by emitting markets

Markets	Arrivals %	
	2019	**2020**
Countries in the region	35.1	**50.2**
Europe markets	**37.3**	25.7
Russian markets	18.4	19.9
Other	9.2	4.2

Source: Author's research

The main emitting markets of Montenegro, under normal pre-pandemic conditions, are the Europe markets with a share of 37%, then the markets of the region (Serbia, Bosnia and Herzegovina, Kosovo, Albania and Croatia) with a share of 35% and the markets of Russia, Ukraine and Belarus with a share of 18%. The pandemic has caused a change in the number of arrivals from emitting markets. The largest share from 50% was achieved by the region markets, which visited the destination by the road infrastructure, due to the proximity of the destination. European markets were less represented, compared to the previous year, due to the fact that Montenegro is an airline destination, with poorly developed road infrastructure, and without marketing communication about the mode of the transport, resulted in the inability to attract these markets. The Russian market was present in a slightly larger number than before.

6. Comparison of tourist movements in Montenegro and Croatia

The following graph is a comparison of tourist trends, arrivals and overnight stays, in Montenegro and Croatia, in the period before and during the pandemic.

Graph 5: Tourist movements in Montenegro and Croatia
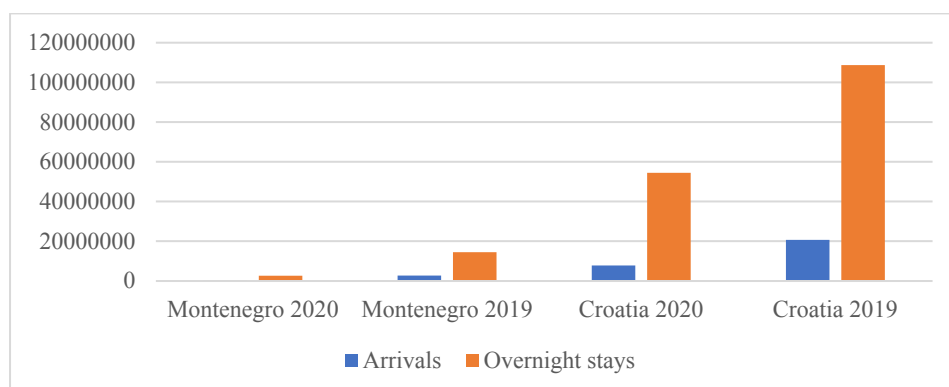
Source: Author's research

In 2020, Montenegro realized the total number of arrivals from domestic and foreign tourists in the amount of 444.065 and realized 2.587.255 overnight stays. For the same time period,

Croatia achieved 7.761.717 tourist arrivals and 54.394.810 overnight stays in the destination. Comparing the achieved results, we can conclude that Croatia realized 108.643.554 in 2019, i.e. in 2020 it realized 50% of overnight stays compared to 2019. In support of these results is the fact that Croatia opened borders throughout the season, organized a good health protocol and has a developed road infrastructure. While on the other side, in Montenegro, the first Covid 19 free destination in Europe, but with closed borders until July and reduced number of flights, implies low results in 2020 compared to 2019 where 14.455.920 overnight stays were realized. Montenegro realized only 18% of tourist traffic compared to 2019.

Due to the pandemic, air traffic was grounded all over the world and the number of flights was drastically reduced. All cities in the region have a large percentage decrease in the number of transported passengers compared to the last year.

Picture 1 Number of transported passengers in the region

Airport	Passengers 2020	Passengers 2019	Change (%)	Difference
Belgrade	1.903.337	6.162.159	▼ 69.1	- 4.258.822
Pristina	1.102.091	2.373.698	▼ 53.6	- 1.271.607
Zagreb	924.823	3.435.531	▼ 73.1	- 2.510.708
Skopje	710.711	2.360.400	▼ 69.9	- 1.649.689
Split	674.366	3.301.930	▼ 79.6	- 2.627.564
Podgorica	343.187	1.297.365	▼ 73.5	- 954.178
Dubrovnik	330.147	2.896.227	▼ 88.6	- 2.566.080
Ljubljana	288.235	1.721.355	▼ 83.3	- 1.433.120
Sarajevo	249.642	1.143.680	▼ 78.2	- 894.038
Tuzla	228.425	592.384	▼ 61.4	- 363.959

Source: EX-YU airport race 2020, https://www.exyuaviation.com/2021/02/ex-yu-airports-race-2020.html (10 March 2021).

The capital of Montenegro, Podgorica, recorded a decrease in the number of flights in the amount of 73.5% compared to 2020. Croatia also noted a huge decline, Zagreb 73.1%, Split 79.6% and Dubrovnik with the largest decline of 88.6%. Despite the huge drop in air traffic, Croatia achieved a good tourist traffic in 2020, due to the developed road infrastructure. Montenegro is primarily an airline destination and without a developed road infrastructure as well as poor border crossings, it directly affects in inability to attract the target markets, which implied a small number of tourist arrivals and overnight stays.

The change in the structure of emitting markets was also caused by the pandemic.

Graph 6: Croatia – Overnight stays by emitting markets 2020
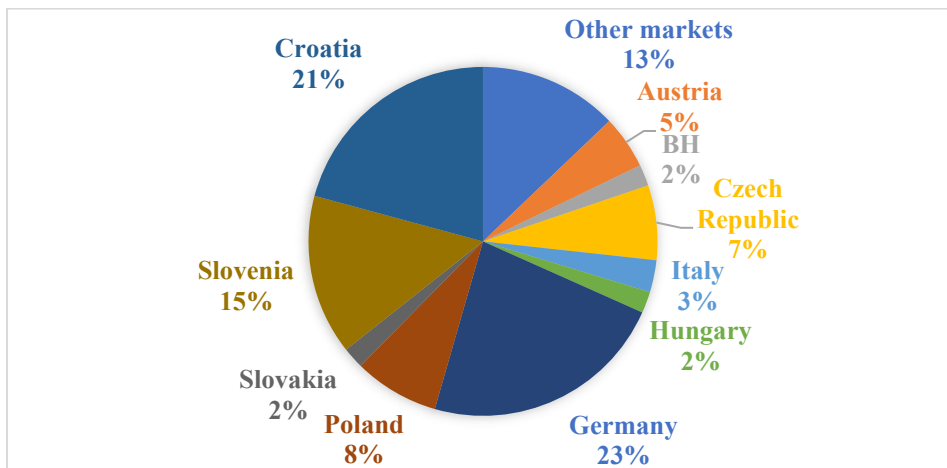
Source: Croatian National Tourist Board (2020). *Information on statistical indicators of tourist traffic - December 2020 / January- December 2020*, p. 16.
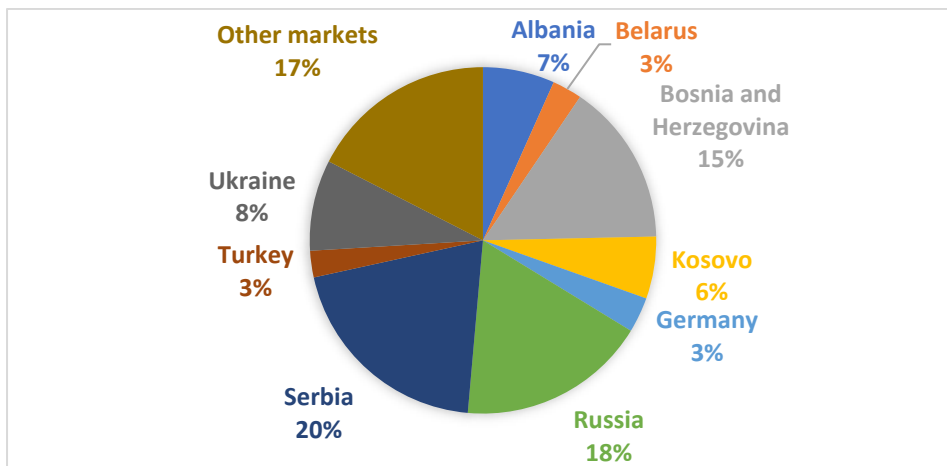
Graph 7 Montenegro – Overnight stays by emitting markets 2020

Source: Monstat - Directorate for Statistics (24th February 2021). Press release, No.2, Montenegro, p. 4-5.

In Croatia, the largest share in total overnight stays is achieved by the German market, followed by the domestic market, and the markets of Slovenia, Poland and the Czech Republic. Due to the well-developed road infrastructure Croatia managed to attract, in the conditions of the pandemic, major emitting markets, which are also markets with a high purchasing power. In the structure of overnight stays of foreign tourists, in Montenegro in 2020, most overnight stays were realized by the tourists from the region, in the amount of 48%, Serbia, Bosnia and Herzegovina, Albania and Kosovo, followed by the markets of Russian Federation, Ukraine and Belarus in amount of 30%. It is noticeable the decline of all European markets, comparing the results from 2019, where European markets had a share of about 35%. High demands of the European markets could not be attracted due to poor infrastructure accessibility of the destination, as well as a poor marketing communication with these markets.

7. Government support package to the economy

Governments have a good response to the pandemic crisis, with various aid packages to the economy, in order to mitigate financial losses. Fiscal countermeasures consist in stimulating the employment, favorable credits and financial assistance. With government measures, corporate bankruptcy and large increase in unemployment have been avoided. In order to preserve jobs, it is important that the government financially helps, still vulnerable companies, and through various financial benefits, such as a moratorium on credits, incentivize the business. But the longer the pandemic crisis lasts, more jobs and workers will be affected.

Developed economies, i.e. countries with high GDP, provide greater financial support for consumption and liquidity, compared to underdeveloped or developing economies. Countries that can provide limited support to the economy need to precisely target crisis countermeasures to priorities economic entities and avoid adverse subsidies. Some countries will have to borrow from creditors or restructure debts to sustain the economy.

The Montenegrin government has adopted four packages of measures to help and maintain the liquidity of the economy, total financial support amounts 1.67 billion euros.

The first package of Government measures refers to providing support to the economy, employees and socially vulnerable citizens, by deferring taxes and credit obligations. Second special package of measures has been adopted for the catering, services, transportation and tourism sector, since these activities were completely closed, and it refers to the subsidizing of salaries and taxes and contributions, as well as subsidies for the new employment. These crisis countermeasures have helped the tourism sector and above all to save the jobs and to create the preconditions for a faster recovery. The government's third package of measures to support the economy and citizens is more thorough and comprehensive, providing both short-term and long-term measures to overcome the crisis.

Figure 1 Long-term and short-term crisis countermeasures

SHORT-TERM MEASURES	LONG-TERM MEASURES
Wage subsidies in tourism	IT industry
Tax reduction in F&B	Sustainable tourism
Interest subsidies	Agriculture
Subsidies for tour operators	Energy
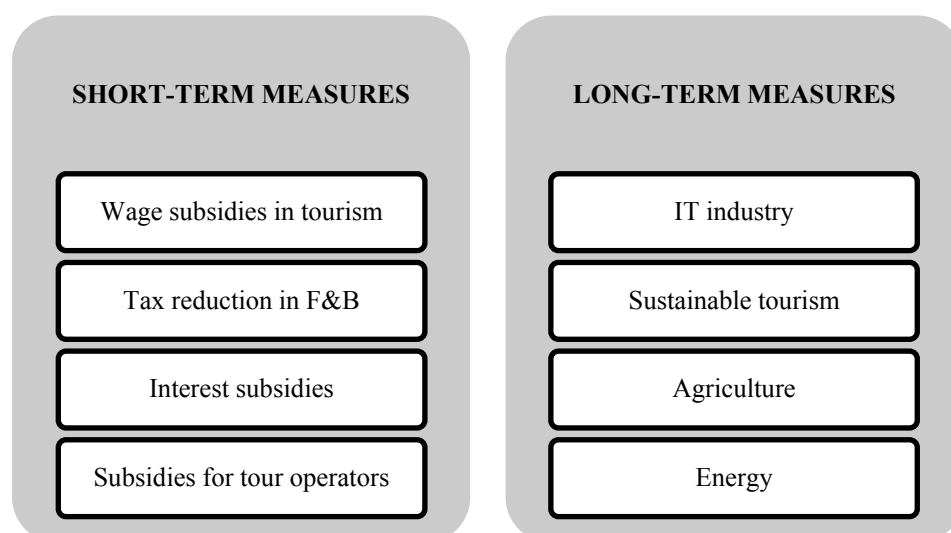
Source: Government (July, 2020). *The third package of socio-economic measures*, Montenegro.

The government's third package of short-term measures to support the economy and citizens, specifically the tourism sector, is stimulating for maintaining liquidity and tourist traffic. A

big contribution to this is the reduction of taxes on food and beverage services from 21% to 7%, for a period of one year. It is advisable, if it is possible from the aspect of sustainability of public finances, to extend this period, because it is certain that the tourism industry will not recover so easily. The interest rate is covered at a level of 80%, which is 3% interest, that is again a stimulating part when it comes to liquidity in general, operating costs and coverage of salaries in the hospitality and tourism sector in a certain percentage. In order to increase tourist traffic, in terms of subsidies, financial assistance to tour operators and travel agencies are included. Long-term measures are reflected in the development of other industries, in which Montenegro has great potential, such as the IT sector, agriculture and renewable energy. What is very important for the further development of the economy is the cluster connection of agriculture with tourism. In the terms of IT sector, digital marketing can be a greatly developed and utilized to the maximum to attract target groups.

The fourth package of economic measures has certain side benefits for tourism companies, such as covering the costs of electronic fiscalization, but it also provides additional support to operational maneuvers, such as deferring taxes and contributions on salaries, but also direct relief when it comes to a new employment.

8. Conclusion

The recovery of the tourism industry on the global scale will primarily depend on the epidemiological situation and progress of vaccination. If the health protocol goes as planned, it is expected that the return to the statistics of the year 2019 will be in 2023, with the faster recovery of countries that have developed a domestic tourism such as Germany and France, and weaker the countries that rely predominantly on international arrivals, such as Spain and Italy.

In Montenegro the escalation of the infected by the COVID-19 contributed to the fact that certain emitting markets were advised not to enter the country due to the recommendations of their host countries. The closure of the border crossings and poor road infrastructure also caused that the certain markets that formed the bulk of our tourist traffic were not able to visit the destination. The future of further development of tourism must be reflected in the development of modern road infrastructure and better border crossing access, which will enable the tourist arrival from European countries as they are the targeted markets.

Because of unexpected changes in tourist trends, that cannot be influenced, Montenegro must develop other economic branches, in order to reduce its dependence on tourism. Further potential in the economy development is the development of agriculture, IT sector and renewable energy. A greater financial benefit and larger destination exposure can be achieved through the development of agriculture and therefore the cluster connection with tourism. The pandemic has largely contributed to the development of digital marketing, and this should be the focus of future promotion of the destination. Montenegro's potential to increase its financial revenues could be from the development of the different renewable energy resources. Providing reliable renewable energy to rural and isolated areas will develop the tourism potential in regions of Montenegro that never had a stable destination marketing and thus invite foreign investment.

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Evaluating Thermal Comfort Conditions of Public Green Spaces in line with Geometrical Characteristics: The Case of Adana City

Muge UNAL CILEK[1*]

Abstract: Public green spaces are one of the essential elements of urban life quality; therefore, it is important to examine the effects of different characteristics of green spaces. This study, it is aimed to statistically compare the temperature changes of the green spaces in Adana City according to their geometrical characteristics. The thermal index Physiological Equivalent Temperature (PET), calculated by ENVI-met microclimate software, was used to evaluate the thermal comfort condition. The study was carried out in four stages: a) determining the geometrical characteristics of the green spaces (area size, aspect ratio, shape) in the study area; b) analysing the thermal comfort condition with ENVI-met according to three canopy ratio scenarios, c) performing statistical analyses with ANOVA Tukey-HSD test; d) developing suggestion that can guide the decision-makers. The study's main findings are as follows: Shading is the essential element in improving thermal comfort. The increase in the shade ratio with the area size affects thermal comfort positively. The most suitable shape is rectangular. The most suitable aspect-ratio are N-S and E-W.

Keywords: Urban green space, Thermal comfort, Physiological Equivalent Temperature (PET), ENVI-met

1. Introduction

Cities are in constant change due to technological developments. This change includes not only physical changes but also changes in the urban ecosystem and climatic conditions. Although the surface change in urban spaces is a phenomenon brought about by the city's physical growth, it also brings many environmental problems and negatively affects the quality of urban life. Therefore, making climate-based physical plans in cities where human comfort is prioritised has gained importance with the emergence of the urban heat island phenomenon in recent years. The urban heat island phenomenon, which creates restrictions on the use of outdoor spaces, emerges as a subject that should be considered in the design and planning of urban spaces. Therefore, studies aiming to reduce the urban heat island (building blocks, public spaces, green spaces, campus areas, urban morphology, etc.) and to determine the outdoor thermal comfort have an important (Wu et al., 2018; Geletič et al., 2019; Hu et al., 2019; Quan, 2019; Ochola et al., 2020).

In order to eliminate the negative effects of heat islands in cities, it is not sufficient to consider only structural criteria, but it is important to include climate-based design and planning decisions of open and green space systems. The necessity of public spaces in urban

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life is a fact that cannot be ignored. It is important about public spaces is not only their presence in cities but also their systematic planning. Quality urban space results from a balanced spatial relationship between buildings, transportation facilities and public spaces (pedestrian zones, squares, open and green spaces, etc.). According to their characteristics and qualities, the types, sizes, equipment, functions, locations and service areas of public spaces determine the impact level on urban life quality (Emür and Onsekiz, 2007). In other words, the systematic existence of public spaces is seen as an important element in increasing the urban life quality (Kuşçu Şimşek and Şengezer, 2012; Lai et al., 2014; Nasir et al., 2015).

Among public spaces, especially urban green spaces (UGS), urban climate studies have been one of the main topics. Many researchers have used different indicators to examine the effects of urban green spaces on the urban ecosystem (Perera, 2015; Chatzidimitriou and Yannas, 2016; Makropoulou and Gospodini, 2016; Kántor et al., 2018; Taleghani and Berardi, 2018). Public spaces are significant for cities because of their many functions, such as providing ecological balance, creating sustainable and liveable environments, supplying fresh air, and creating wind corridors. Such different indicators and methods for green areas reveal that green spaces make versatile and positive environmental contributions. These features are in parallel with the climate-balanced design features. Therefore, it is necessary to examine the spatial adequacy of public green spaces in terms of quantity and quality, quantify their climatic contributions to the city with mathematical models, and obtain measurable data. It is important to create bioclimatic comfort maps according to the city's climatic conditions during the urban planning and design stages and to use these maps as a base map in urban planning and design studies. The development of green areas takes the first place in physical design studies aiming to balance climatic conditions.

The rapid development of urbanisation in Turkey in the last fifty years, as in the rest of the world, has caused public open and green spaces to be replaced by buildings of a different character. Thus urban spaces, where the green spaces lack or absent, have a wide variety of environmental problems. Public spaces, especially green spaces, have gradually narrowed in terms of size, accessibility and content. Cities moved away from national-international standards and had low urban life quality (Altunkasa and Uslu, 2004).

Adana City, Turkey locate hot-humid climate region and its climate negatively affects human comfort in the summer period. Therefore, in this study, the evaluation of the outdoor thermal comfort situation was carried out in the example of the green spaces of Adana City. The study aims to model the thermal comfort conditions of the green areas in Adana City, to evaluate geometric characteristics of urban green spaces with three different canopy layers.

2. Material and Method

2.1. Study area

Adana City is located in the south of Turkey, in the Eastern Mediterranean part of the Mediterranean Region (37º 00' north latitude and 35º 19' east longitude). The study area consists of four central districts of Adana City, including Seyhan, Çukurova, Yüreğir, Sarıçam districts (Figure 1). The agricultural potential of Adana City is the main reason for the urban development. It is not the only reason for urban development, but it is one of the most important factors. The increase in the population density of Adana City with agriculture has led to urban development and land cover change from agricultural to settlements.

The topography of Adana City is nearly flat in the southern region, while the slope increases due to the variability of topography in the northern region. The slope increases to 0-6% in the plain, 6-12% in the north region and 12-20% towards the shores of Seyhan Dam Lake. The slope does not restrict pedestrian access and outdoor activities in urban public spaces (Altunkasa et al., 2011).

Adana is located in the Mediterranean climate zone with hot summers and mild winters; therefore, annual participation in outdoor activities is longer than in other parts of the country. The city can be called Csa according to the Köppen-Geiger climate classification. The average amount of precipitation is 625 mm. Precipitation falls 51% in winter, 26% in spring, 18% in autumn, 5% in summer. The coldest month is January at an average of 9 $^{\circ}$C, while the hottest month is August at 28 $^{\circ}$C. During the hottest period, the temperature does not decrease to 21°C, and this period is quite long. Moreover, the average daily relative humidity is above 65% (Meteoblue, 2020).
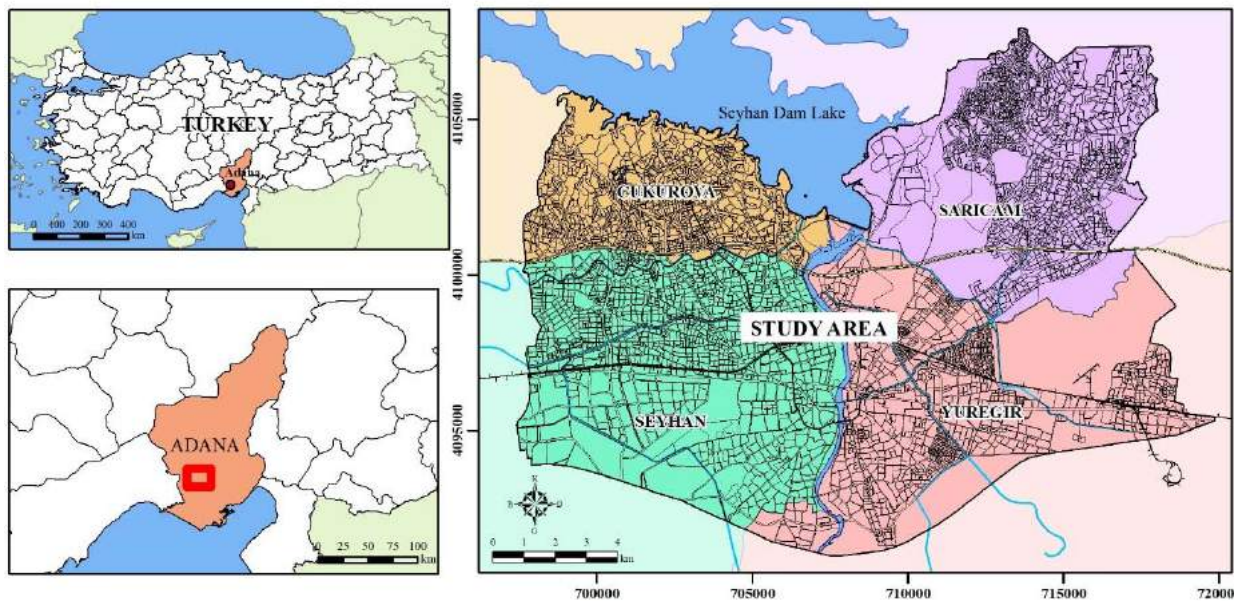
Figure 1. Study area

2.3. Data

To determine the climatic condition of urban green spaces, the data obtained from different institutions and organisations as follows: Environmental plan (1/100,000), Master development plans (1/25,000 and 1/50,000), and Implementation plans (1/1,000), in addition to aerial photos, satellite images, and climatic data.

The software used in the study is that ENVI-met (4.4.5) software to perform microclimate simulations and to calculate thermal comfort index, GIS-based Arc-GIS software to perform spatial analysis and to determine geometric characteristics of UGS, and IBM-SPSS for statistical analysis.

2.3. Methodology

The method of the study consists of four stages.

- Determination of geometric characteristics of green spaces (area size, aspect ratio, and orientation)
- Determining the thermal comfort condition of UGS
  - Determination of scenarios including 100% grass, 50% tree canopy, and 100% tree canopy,
  - Determination of thermal comfort index (Physiological Equivalent Temperature-PET)
  - Performing thermal comfort analyses via ENVI-met (20 x 20 m resolution)
- Statistical analysis
  - The relationship between geometric characteristics of UGS and their PET values were statistically determined with the ANOVA-Tukey test.
- Developing suggestions in line with the findings.

2.3.1. Determining the geometric characteristics

To evaluate the thermal condition of UGS, there are many basic characteristics. The geometric characteristics are one of the main elements for the adaption studies to climatic changes (Sobin and Olgyay, 1963; Oke, 1973; Zeren, 1976; Altunkasa, 1987; Berköz et al., 1995). Three different geometric characteristics were defined to group the UGS, including area size, aspect ratio, and orientation.

a) **Area size:** Many studies have been done; emphasises that the size and shape of green space areas significantly impact the cooling capacity (Kuşçu Şimsek, 2016). In national and international studies, it has been concluded that there is a temperature difference of 2˚C-5˚C between small-scale green areas and urban texture, while larger areas (>500,000 m^2) have a cooling effect of 6˚C-8˚C on the air temperature. Therefore, area size is one of the important criteria to be evaluated.

b) **Aspect ratio:** Aspect ratio is one of the main factors affecting the UGS's thermal comfort in urban settlements (Sözen and Oran, 2019). Because the aspect ratio of green space forms the openings in urban settlements and affects the outdoor thermal condition. Three forms, including square (1.0-1.1), rectangular (1.2-2.4), and linear (>2.5), were evaluated in this study.

c) **Orientation:** One of the main factors affecting the microclimate is the orientation (Sobin and Olgyay, 1963; Altunkasa, 1987). Four directions were evaluated to decide the more comfortable direction of UGS with different aspect ratios. These are the main direction (N-S and E-W) and intermediate directions (NE-SW and NW-SE). The angle made by the long border of UGS with the x-axis was helped in determining the orientation of UGS.

2.3.2. Determining the thermal comfort condition

The ENVI-met microclimate software program was used to determine the thermal comfort conditions of green spaces. ENVI-met is a non-hydrostatic four-dimensional microclimate model with a horizontal resolution starting from 0.5 m, developed to calculate and simulate climate variables in urban areas. ENVI-met has been widely used in the literature for the evaluation of the outdoor thermal environment, and it has been tested and validated in the evaluation of different urban areas (Bruse, 2007). The ENVI-met model is nearly complete in

simulating built environments anywhere from microclimate to local climate scale, combining the influence of buildings, vegetation, surface features, soils, and climatic conditions (Sharmin et al., 2017). This phase consists of the following three steps:

a) **Determination of scenarios:** Increasing the vegetation canopy has a limited effect on healing the air temperature, while it has a significant impact on the surface temperature (Skelhorn et al., 2014). Planting provides shade and prevents the radiant temperature from the ground surface; thus, positively affecting the thermal comfort and indirectly affecting the air temperature (Shahidan et al., 2012; Wang and Zacharias, 2015; Tan et al., 2017; Zhang et al., 2018). There are three scenarios identified in this study to determine the effect of the tree canopy layer according to the geometric characteristics of UGS. The first scenario is where the green spaces do not have any equipment (play lots, pedestrian roads, water surface, etc.), and the land cover is 100% grass-covered. The second scenario is where 50% tree canopy with homogeneous distribution and 50% grass-covered. The last one is the scenario where 100% tree canopy. However, since the study was not aimed at examining tree species' effects on climatic comfort, tree canopy scenarios were not performed on a specific plant species.

b) **Determination of thermal comfort index:** Physiological Equivalent Temperature (PET), which is widely used to examine the relationship between human outdoor thermal comfort and thermal environment, was used (Table 1). PET is defined as adapting human core and body temperature at an indoor condition to real and complex outdoor conditions. It takes into account the physiological capacities of the human body to adapt to stressful microclimates (Lin and Matzarakis, 2008; Matzarakis and Amelung, 2008; Lai et al., 2014). The temperature unit used to interpret the results is Celsius (°C), making it easier to understand the effect of the thermal environment on the human body (Lin and Matzarakis, 2008; Matzarakis and Amelung, 2008). PET was calculated via the ENVI-met Biomet tool.

Table 1. PET thermal comfort classes and thermal perception (Matzarakis and Mayer, 1996)

PET (°C)	HUMAN SENSATION	THERMAL STRESS LEVEL
<4	Very cold	Extreme cold stress
4.1 – 8.0	Cold	Strong cold stress
8.1 – 13.0	Cool	Moderate cold stress
13.1 – 18.0	Slightly cool	Slight cold stress
18.1 – 23.0	**Comfortable**	**No thermal stress**
23.1 – 29.0	Slightly warm	Slight heat stress
29.1 – 35.0	Warm	Moderate heat stress
35.1 – 41.0	Hot	Strong heat stress
>41.0	Very hot	Extreme heat stress

c) **Starting data for ENVI-met analysis:** Climatic, spatial and personal human parameters are required for starting simulations (Table 2).

Table 2. Data used for ENVI-met simulations

Spatial data	with Spaces and Monde	Building height	Variety		
		Outdoor surface materials	Roads and parking lots	ST-Asphalt	
			Urban Green Spaces	Scenario 1: No vegetated. Medium-density grass XX-50 cm tall	
				Scenario 2: %50 tree, %50 grass	
				Scenario 3:%100 tree	
			Other surfaces	LO-Loamy soil	
			Water surface	WW–Water	
			Forest area	BS- 20 m tree density, mixed crown	
			Coast	SD- Sandy soil	
Simulation data	with ENVI-guide	Date	August 8	Hottest day	
		Start Finish	12.00.00-15.00.00		
		Simulation period	3 hours		
		Grid size (m)	x =20; y=20; z=3		
Climate data		Simulation day	August 8 (1990-2019 climate data)		
		Simulation hours	12.00	13.00	14.00	15.00
		Air temperature (°C)	33,80 °C	34,45 °C	34,47 °C	33,92 °C
		Relative humidity (%)	47,50 %	44,22 %	44,00 %	49,10 %
		Wind speed (m/h)	2.4 (min)		2.9 (max)	
		Prevailing wind direction	45° (NE)		225° (SW)	
		Specific humidity (g/kg)	2.2 (min)		8.0 (max)	
Personal Human Parameters	with Biomet	Age	35		
		Size	1.75 m (ISO 7730)		
		Weight	75 kg		
		BMI	18.5-24.9 kg/m^2 (*healthy weight*)		
		Metabolic rate	1.4 (5 km/h walking speed)		
		Clothes	0.60 clo in the summer (trousers or skirts and shirts made of fine fabric)		

d) Statistical analysis: ANOVA test was used to statistically compare the geometric characteristics of UGS and their PET value. As a result of these post-hoc statistical tests, it was determined that there was a statistically significant difference between the groups with a p-value less than 0.05 ($p<0.05$)

3. Results

3.1. Classification of UGS according to their geometric characteristics

In the study, 435 green spaces were evaluated. The distributions of these green spaces according to their characteristics are given in Figure 2, and their numbers are given in Table 3. Figure 2 and Table 3 are shown that UGS are generally located in the southern part of urban settlements. The study area generally has very small and small area size UGS, while the large and very large UGS are very few in the study area. The number of extremely large UGS is two in the study area. Although the green spaces show an equal distribution in the four districts regarding their aspect ratio, rectangular is the green space class with the highest number. N-S orientation is the typical green space class in the study area.

a) Area size   b) Aspect ratio

c) Orientation
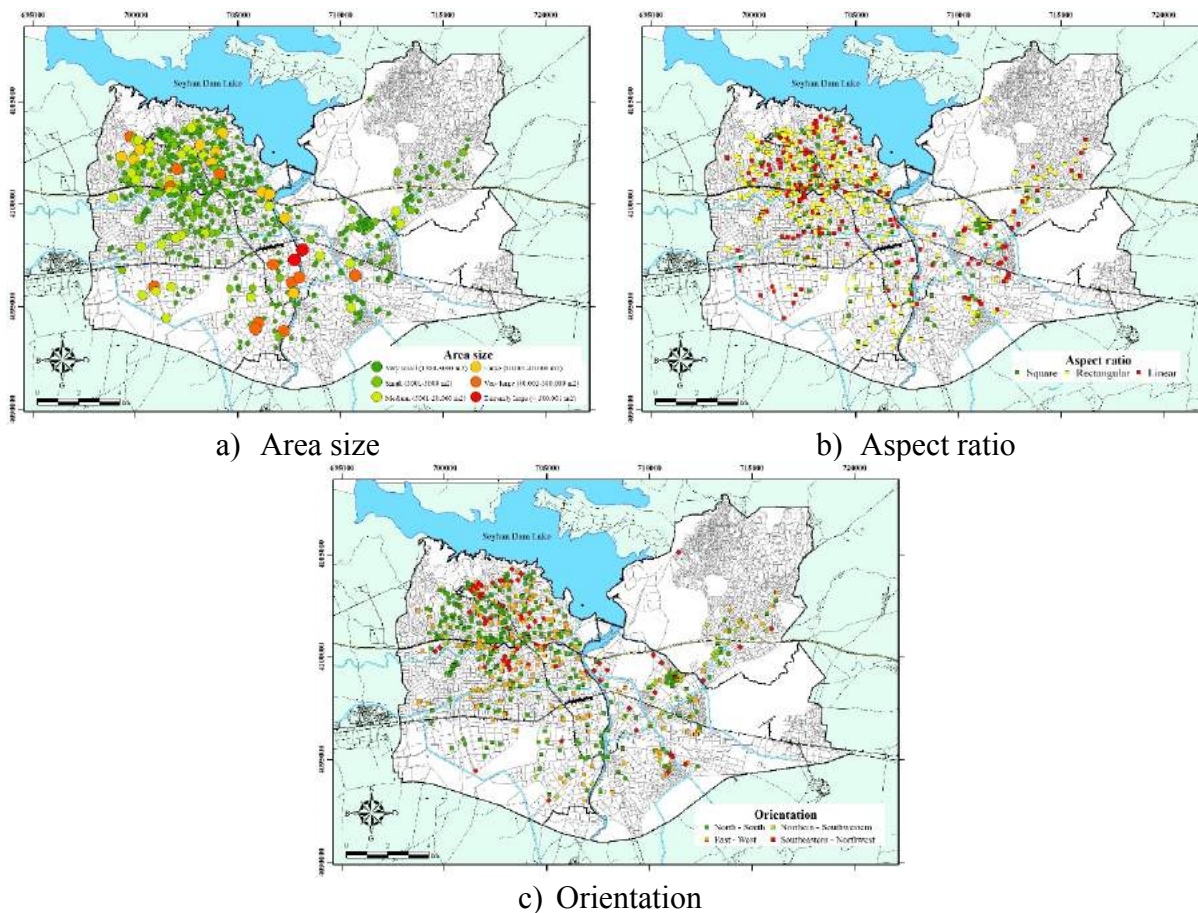
Figure 2. The distribution of UGS according to geometric characteristics

Table 3. The number of UGS according to geometric characteristics

	North-South 0° ve 180° (±22,5°)						East-West 90° ve 270° (±22,5°)					
	Very small 1200-3000 m²	**Small** 3000-5000 m²	**Medium** 5000-20.000 m²	**Large** 20.000-40.000 m²	**Very large** 40.000-100.000 m²	**Extremly large** >300.000 m²	**Very small** 1200-3000 m²	**Small** 3000-5000 m²	**Medium** 5000-20.000 m²	**Large** 20.000-40.000 m²	**Very large** 40.000-100.000 m²	**Extremly large** >300.000 m²
Square (1,0-1,1)	42	7	3	1	3	-	N-S and E-W are the similar orientation in the square shaped UGS:					
Rectangular (1,2-2,4)	35	21	24	2	2	-	39	16	21	-	2	-
Linear (>2,5)	24	23	13	2	2	2	33	7	12	-	-	-
	Northeast-Southwest 45° ve 225° (±22,5°)						**Southeast-Northwest** 135° ve 315° (±22,5°)					
Square (1,0-1,1)	-	-	1	1	-	-	NE-SW and SE-NW are the similar oriantation in the square shaped UGS:					
Rectangular (1,2-2,4)	16	2	3	1	1	-	18	11	9	2	1	-
Linear (>2,5)	7	3	3	1	-	-	10	2	6	-	1	-

3.2. Calculation of PET

ENVI-met analysed the micro climatic condition of the study area for the hottest period. According to the long term air temperature data (1992-2019) obtained from the General Directorate of Meteorology in Turkey, the hottest day was determined as of August 8, and the hottest hours were determined as 12.00-15.00 (Table 2). The hottest period was selected for microclimatic analysis because if the thermal comfort existed in the hottest period, the developing suggestion would be sufficient for other days.

Three tree canopy scenarios were analysed via ENVI-met, and the thermal indices Physiological Equivalent Temperature (PET) were calculated through ENVI-met Biomet. The geometric characteristics of UGS were classified by Arc-GIS software, and their PET values were given in Table 4. UGS were categorised as 'Extreme Heat Stress' regardless of the geometrical characteristics in 100% grass cover; on the other hand; UGS were categorised as 'Strong Heat Stress' and 'Extreme Heat Stress' in the 50% canopy cover, and 'Moderate Heat Stress' and 'Slight Heat Stress' in 100% canopy cover scenarios. Table 4 is shown that the 100% grass cover scenario has the highest PET (40-41℃), while the 100% canopy cover has the lowest PET (31-36℃). This proves that vegetation has a significant effect on thermal comfort because of the shade effects and decreasing solar exposure. Therefore, the radiant temperature was decreased and provided more comfortable outdoor spaces.

Table 4. PET values of UGS according to their geometric characteristics in three tree canopy scenarios

| | ID | Classes | Attribute | Physiological Equivalent Temperature (℃) | | | | | | | | |
| | | | | 100% Grass cover | | | 50% canopy cover | | | 100% canopy cover | | |
				Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Area size	A1	Very small	1200-3000 m²	41.66	41.44	41.88	37.79	34.39	41.19	34.95	33.01	36.9
	A2	Small	3000-5000 m²	40.68	40.45	40.91	35.8	31.55	40.04	32.47	30.5	34.44
	A3	Medium	5000-20.000 m²	42.08	41.94	42.23	35.23	31.47	38.99	31.44	29.98	32.91
	A4	Large	20.000-40.000 m²	41.74	41.46	42.01	33.34	28.99	37.7	29.76	28.27	31.25
	A5	Very large	40.000-100.000 m²	42.93	42.77	43.1	33.85	29.33	38.36	29.95	28.75	31.15
	A6	Extremely large	>300.000 m²	43.46	43.31	43.61	33.31	28.94	37.68	30.22	29.41	31.03
Orientation	O1	N-S	0° and 180°	42.45	42.35	42.54	35.62	31.8	39.45	31.84	30.42	33.25
	O2	NE-SW	45° and 225°	42.46	42.15	42.76	36.82	32.26	41.38	33.64	31.71	35.57
	O3	E-W	90° and 270°	42.37	42.18	42.55	35.13	31.25	39.02	30.65	29.12	32.18
	O4	SE-NW	135° and 337°	42.09	41.88	42.29	35.79	31.89	39.7	31.95	30.15	33.74
Aspect ratio	B1	Square	1,0-1,1	42.67	42.42	42.91	35.69	31.44	39.94	30.76	29.2	32.32
	B2	Rectangular	1,2-2,4	41.88	41.76	42.00	35.14	31.33	38.96	31.19	29.71	32.68
	B3	Linear	>2,5	42.71	42.6	42.81	36.22	32.25	40.19	32.75	31.07	34.43

3.3   Statistical Analysis

In order to perform ANOVA, the data in the data set must be homogeneous. Therefore, firstly, the homogeneity of the data sets was examined. The whole data set shows homogeneity in terms of distribution. Tukey HSD test was used for multiple comparisons of PET values. As a result of these post-hoc statistical tests, it was determined that there was a statistically significant difference between the groups with a p-value less than 0.05 ($p < 0.05$) (Figure 3-

Figure 5). Figures demonstrate that the groups whose minimum and maximum PET values distributions do not coincide with each other show the groups with statistically significant differences.

Figure 3 shows that the PET value increased as the area size increased due to the absence of any shading element in the 100% grass-covered scenario. Very small and small size UGS are statistically separated from the very large and extremely large size UGS. In the 50% canopy cover scenario, PET values are similar in all area size classes. The similarity of PET makes it difficult to distinguish the classes from each other statistically. In the 100% canopy cover scenario, the PET decreases as the area size increases, unlike the 100% grass cover scenario. Very small area size is statistically distinguished from large, very large and extremely large size UGS. When the three scenarios are compared, the PET in the 100% grass cover scenario is statistically distinguished from the 50% and 100% canopy cover scenarios.

Figure 4 demonstrates the effect of the orientation of green areas on thermal comfort. Orientation has no statistically significant impact on thermal comfort in the 100% grass cover scenario. In other words, the PET distributions of the orientation classes do not show a statistically significant difference in the 100% grass-covered scenario. Even though the E-W orientation has the lowest PET compared to other classes, it does not significantly differ in the 50% canopy cover scenario. In the 100% canopy cover scenario, E-W and N-S orientation have the lowest PET; however, there is no statistically significant difference. When the three scenarios are evaluated within themselves, the 100% grass cover scenario is statistically distinguished from the 50% and 100% canopy cover (p<0.05). On the other hand, the orientation classes in the 50% cover scenario and 100% canopy cover scenario cannot be statistically differentiated (p>0.05). It is concluded that N-S and E-W are the most suitable orientation in terms of thermal comfort because they have the lowest PET in the three scenarios.

Figure 5 indicate that rectangular-shaped UGS have the lowest PET in the 100% grass cover scenario and are statistically distinguished from the square and linear-shaped UGS (p<0.05). In the 50% canopy cover scenario, the rectangular-shaped UGS are not statistically different from the square and linear-shaped UGS (p>0.05). In the 100% canopy cover, the lowest PET is square-shaped UGS, followed by rectangular and linear-shaped UGS. However, these classes are not statistically differentiated. When the three scenarios are evaluated within themselves, the 100% grass cover scenario is statistically distinguished from the 50% and 100% canopy cover scenarios (p<0.05). On the other hand, the orientation classes in the 50% cover scenario and 100% canopy cover scenario cannot be statistically differentiated (p>0.05).

4. Discussion and Conclusions

This study aims to investigate the statistical relationship between geometric characteristics of UGS and their thermal condition. The study results include applicable results for hot-humid Adana City and other similar climatic condition cities. However, to determine the thermal comfort more accurately, urban morphology which neighboured to UGS and land survey and measurements should be integrated into outdoor thermal comfort studies. The study results affected urban plan and design decisions were given as follows:

Shading is the most important factor to mitigate thermal stress. To improve thermal comfort, the sun exposure of surfaces should be reduced or blocked. The vegetation that provides shade are one of the thermal comfort elements. However, the geometric characteristics of UGS

should be taken into account in the planting design and determination of the appropriate canopy ratio. Thus, it will help to reduce the urban heat island effect.
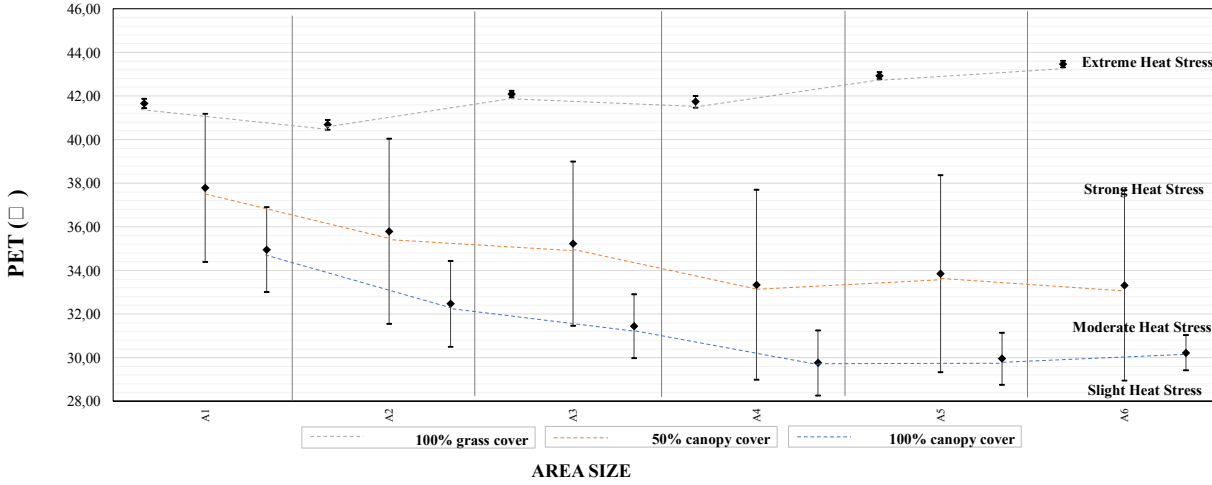
Figure 3. The ANOVA test results for statistically compare the area size of UGS
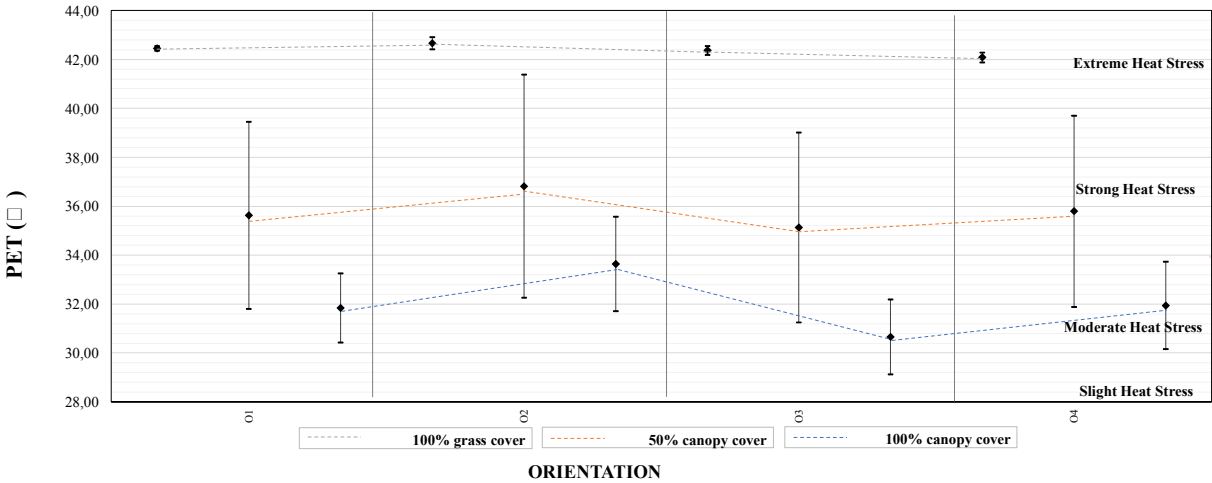
Figure 4. The ANOVA test results for statistically compare the orientation of UGS
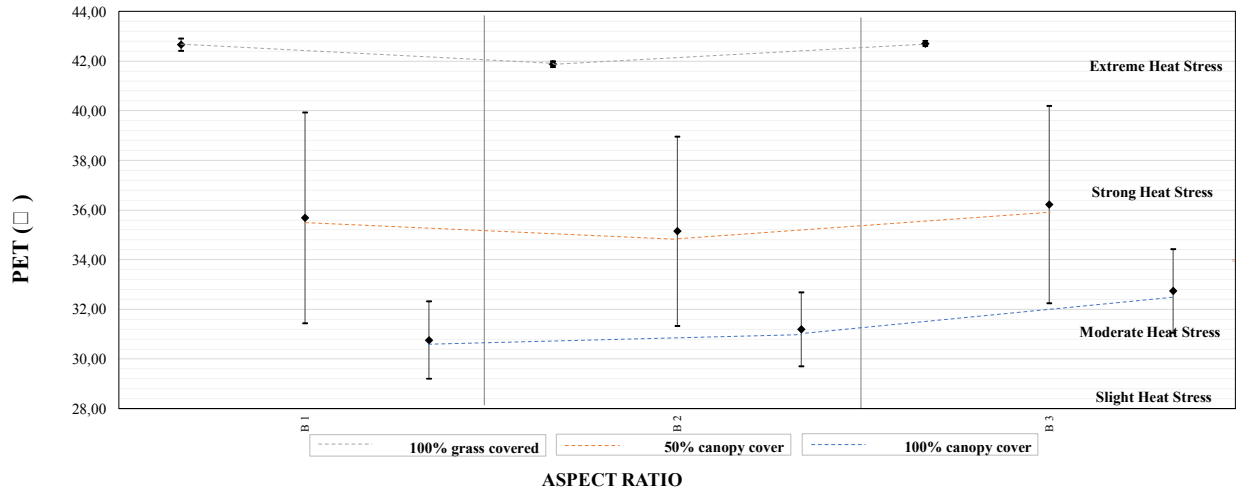
Figure 5. The ANOVA test results for statistically compare the aspect ratio of UGS

This study methodology does not include the planting design principles and plant species based analysis to evaluate the thermal comfort change. In this study, vegetation distribution was shown homogeneity. However, the planting design should be performed according to the climatic condition of cities such as prevailing wind direction and wind speed and geometric characteristics of UGS. Controlling the wind and sunlight can improve thermal comfort.

Area size with a suitable canopy ratio is another factor that affected positively on outdoor thermal comfort. However, expansion of the area size in an urban settlement is complicated. Therefore, it is essential to determine the appropriate area size of UGS in the city plans to benefit both UGS and urban climates. The determination of orientation and aspect ratio for UGS besides area size will ensure the climatically integrated UGS in urban settlements.

The study's outputs will help develop energy-efficient and climate-sensitive planning and settlement principles for similar climate regions and prepare a guide for the effective implementation of sustainable urban settlement plans. In addition, the study methodology will be carried out for different climatic regions. It will help create urban design guides that may be appropriate for microclimate, including optimum area size, orientation, and aspect ratio characteristics for green areas.

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Evaluation of the Urban Heat Island in Hot-Humid Adana City Based on Local Climate Zone

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Abstract: The Urban Heat Island (UHI) effect, which arises from the combination of various factors such as land cover change, anthropogenic impacts, and climatic interactions, is one of the most important factors affecting thermal comfort in recent years. Therefore, examining the climatic condition of different urban morphology is a necessity. This study aims to compare the temperature differences of different urban morphology in the example of hot-humid Adana City. The study was carried out in five steps: a) Climate-based classification of the city with Local Climate Zone (LCZ); b) determination of the thermal comfort of the city via ENVI-met microclimate software; c) creation of maps; d) comparison of LCZ temperatures, and e) developing suggestions which implemented in a city plan. This study will help the decision-makers to take into account the climatic characteristics and urban morphology; therefore, more comfortable cities can be designed and planned.

Keywords: Urban Heat Island (UHI), Local Climate Zone, Thermal comfort, Physiological Equivalent Temperature (PET), Hot-Humid City, ENVI-met

1. Introduction

Immigration brought about by rapid population growth has led to rapid urbanisation throughout the world, resulting in the deterioration of land cover, the transformation of rural areas into urban areas, the decrease in the understanding of urban plan and design integrated with the environment, the formation of unplanned urban geometry and the change of urban climate. (Zheng *et al.,* 2018; Geletič *et al.,* 2019; Hu *et al.,* 2019; Quan, 2019; Ochola *et al.,* 2020). The increase in environmental problems with urbanisation, the transformation in surface change due to the replacement of permeable natural areas (soil, grass, etc.) with impermeable artificial areas (concrete, asphalt, etc.), has led to a change in the urban climate by storing the radiation coming to the city. The temperature difference between urban and rural areas due to the surface change as a result of anthropogenic effects has been defined as Urban Heat Island. (Budhiraja *et al.,* 2019; Gholami and Beck, 2019; Hu *et al.,* 2019; Chen *et al.,* 2020). Urban heat island studies are one of the most common topics in the literature in recent years. Still, they differ in cities according to location, urban morphology and local climate zones.

Although thermal comfort and UHI studies are based on the urban morphology, surface materials, climatic factors, and the presence of vegetation, actually these studies focus on the human. To increase urban life quality and increase thermal comfort, the climate-based design studies have importance. Thermal comfort can be defined as the state of comfort that the majority of individuals have in terms of climatic conditions (temperature, humidity, wind, etc.)

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while continuing their indoor or outdoor activities (Altunkasa, 1987; Hisarlıgil, 2009; Yücekaya, 2017). Today, there is not any international standard, including an outdoor survey, to classify outdoor thermal comfort. However, there are several criteria lists and guidelines that cover human bio-meteorological studies. To determine thermal comfort criteria and standards, the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) studies are important.

Generally, thermal indices were used in the evaluation and classification of thermal comfort. There are more than 100 human thermal indices which include human-based parameters (age, gender, metabolic rate, clothing, etc.) in addition to climatic parameters. However, indices developed specifically for the evaluation of outdoor thermal comfort are limited (Höppe, 2002). The most common of these indexes in international studies are Predicted Mean Vote (PMV), Effective Temperature (ET), Standard Effective Temperature (SET), Perceived Temperature (PT), Physiological Equivalent Temperature (PET), and Universal Thermal Climate Index (UTCI). PET is one of the most popular outdoor thermal comfort indices in terms of its use in both cool climates and hot climates (Lin and Matzarakis, 2008; Matzarakis and Amelung, 2008; Lai *et al.,* 2014). Indexes, which were initially calculated with mathematical formulas, started to be calculated with climatic simulation programs (ENVI-met, Rayman, Skyhelios, etc.) and to be visualised. The models contributed to the analysis of different resolutions from local scale to regional scale and to the determination of climatic differences due to changes in design features (building layout, aspect ratio, presence of water and greenery, albedo, etc.) (Bruse and Fleer, 1998; Huttner, 2012; Acero and Herranz-Pascual, 2015; Alchapar and Correa, 2016).

The thermal comfort of hot-humid Adana City may encounter climatic problems because of the climatic condition, increased building density, and anthropogenic activity (such as heating, traffic, etc.), especially in the hottest summer period (Altunkasa, 1987). The aim of the study is to classify the urban settlements of hot-humid Adana City, Turkey, to perform climatic analyses with ENVI-met, and to determine the temperature differences according to the urban morphology. Thus, it will be determined how the urban heat island varies according to the urban morphology. It is expected that the result of the study will help to develop suggestions for reducing the urban heat island effects and will guide the decision-makers.

2. Material and Method

2.1. Study area

Adana, the 6th city with the highest population in Turkey, approximately 2,200,000 (TSI, 2020), is also the center of the Çukurova metropolitan area. Geographically, the city is located at the intersection of 37º 00' north latitude and 35º 19' east longitude (TSMS, 2019). Adana City settlement area is bordered by Seyhan Dam Lake in the north, Çukurova University Campus and Incirlik facility area in the northeast, commercial and residential areas intertwined with agricultural uses in the west, and intensive agricultural areas in the south. The urban area is divided into two parts by the Seyhan River in the East-West direction (Figure 1).

Adana city, which is located in the hot-humid Mediterranean climate zone, has suitable for outdoor use and activities during the 8 or 9 months of the year. During the daytime of summer, the temperature and relative humidity are high for most of the year. The low effect of the cooling winds in the urban area due to multi-storey buildings limits human activities to a great extent. However, the share of the time during the year in which thermal comfort is felt in the total annual period is between 15-18% in the city's southern regions, while it is 20% in the northern

areas. The most important factors that reduce the thermal comfort in the city are the high relative humidity, the high air temperature, and the prevention of air circulation (Altunkasa, 1987).
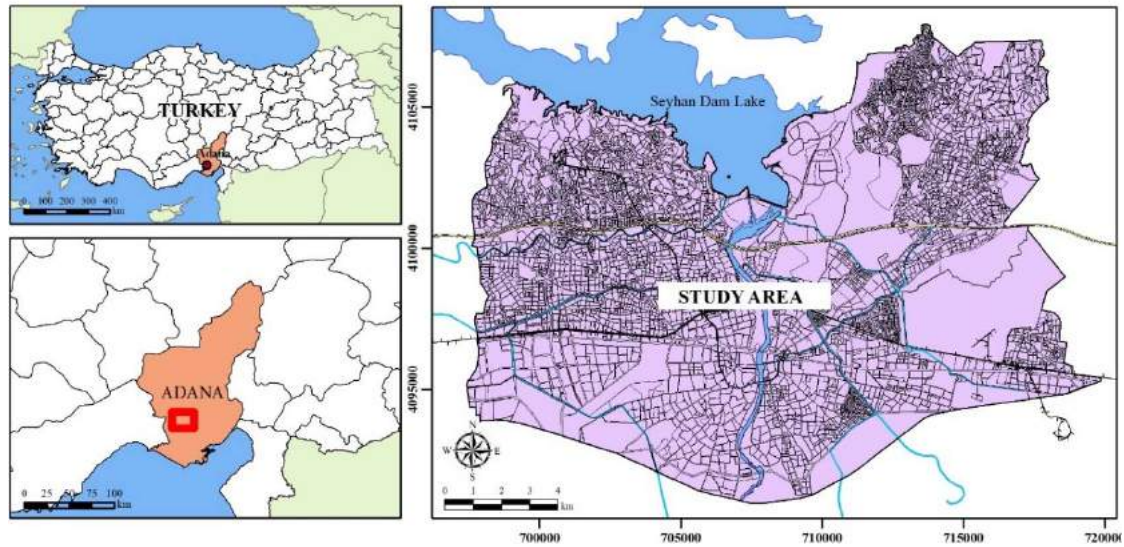
Figure 1. Study area

2.2. Methodology

The method of the study consists of five stages;

- Climate-based classification of the city with Local Climate Zone (LCZ),
- Carrying out the climatic analyses of Adana city via ENVI-met microclimate software,
- Mapping the thermal comfort conditions of Adana city (air temperature, wind, relative humidity and Mean Radiant Temperature, PET),
- Comparison of LCZ temperatures,
- Developing suggestions implemented in the city plan.

a) Climate-based classification of the city: Local Climate Zones (LCZ) were used to classify urban cover in the study. LCZ define the region with similar surface-air temperature distributions at 100 m - 10000 m on the horizontal scale (Stewart and Oke, 2009). To determine zones, there are 17 climate zones, divided into two groups as building types (LCZ 1-10) and land cover types (LCZ A-G), according to surface characteristics of urban and rural areas (Figure 2). In the LCZ approach, which is dependent on the urban morphology, many criteria were used in the evaluation; however, the main elements in the determination of LCZ classes were the characteristics of the settlement areas. These are building height (BH), aspect ratio (building height/street width- H/W), the pervious surface fraction (PSF), and the impervious surface fraction (ISF). Each classification criteria have different threshold values, which were developed by Stewart and Oke (2012). Settlement types generally classify built areas where artificial materials (concrete, stone, brick, asphalt, etc.) are predominantly used in the land cover and where vegetation is sparse or absent. Land cover types, on the other hand, are dominated by natural surfaces, forest, bushes, maquis areas, dune areas, etc. characteristics in the classification of urban areas.
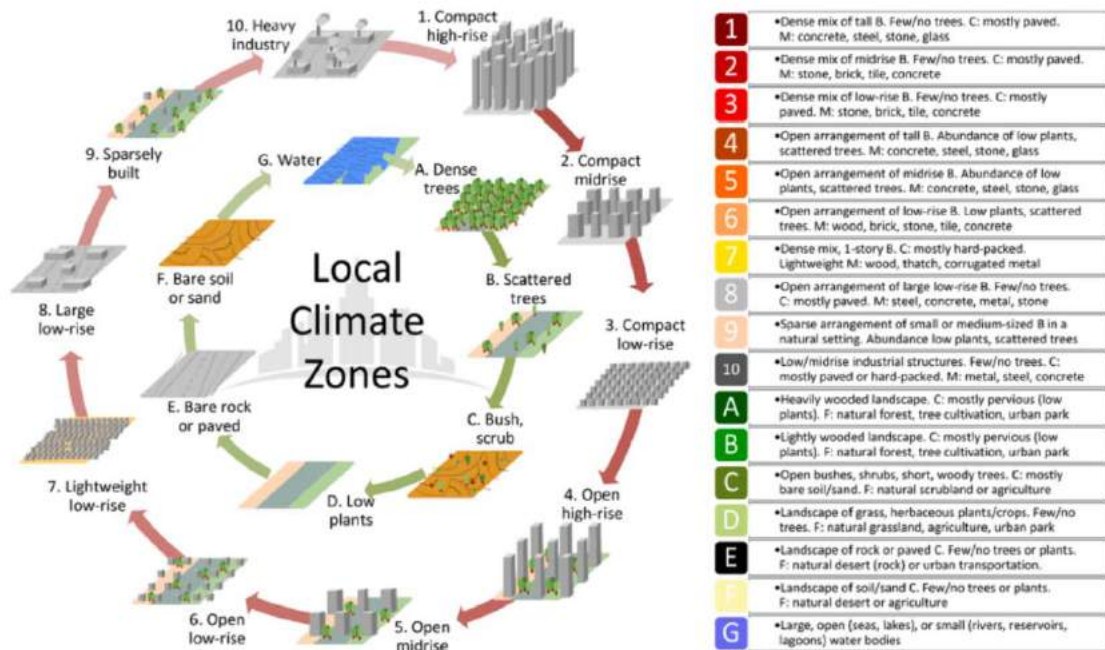
Figure 2. The classification of Local Climate Zone (Stewart and Oke 2012)

Adana City LCZ classes were determined in line with the vector-based classification method developed by Unal Cilek and Cilek (2021). To define LCZ classes of Adana City, data were obtained from different institutions and organisations. There are as follows:

- Adana City Environmental Plan (1:100.000),
- Adana Master Development Plan (1:25.000 and 1:50.000),
- Adana Implementation Development Plan (1:1.000)
- and Adana base map including urban development areas data.
- Moreover, aerial photographs, Urban Atlas data, and previous studies and reports are also supplementary materials.

b) Microclimatic analysis: In this study, ENVI-met (4.4.5) software was used to perform microclimatic analyses. ENVI-met is a non-hydrostatic (non-moving, fluid) four-dimensional (three spatial dimensions plus one-time dimension) microclimate model with a horizontal resolution of 0.5 m, developed to calculate and simulate climate variables in urban areas. ENVI-met is a model that aims to reproduce the main processes in the atmosphere that affect the microclimate on a well-established physical basis (i.e. the fundamental laws of fluid dynamics and thermodynamics). The model simulates microclimate dynamics within a 24 or 48-hour cycle, taking into account all change processes, including air temperature and humidity, wind speed, radiation fluxes, turbulence, and mean radiant temperature (Bruse and Fleer, 1998; Bruse, 2007). The ENVI-met model is nearly complete in simulating built environments anywhere from microclimate to local climate scale, combining the influence of buildings, vegetation, surface features, soils, and climatic conditions (Bruse, 2007).

Basic data on climatic, spatial and personal human parameters are required for starting simulations.

- **Climatic data:** The temperature data of the hottest day of the hottest period in Adana were determined in line with the climate data (wind speed, relative humidity, prevailing wind direction, air temperature) obtained from the General Directorate of Meteorology (TSMS, 2019).
- **Spatial data:** The resolution of the ENVI-met simulation was determined as 20x20 m due to the large area size of the study area. In addition, building heights, surface features and vegetation that may be compatible with LCZ classes are defined in the area. In order to clearly compare the temperature differences caused by the LCZ classes, the vegetation in the building areas, streets, refuges, and gardens are ignored because the vegetation positively affects thermal comfort. However, the forest area and area with dense tree canopy were taken into account in the study. The differences of building surface colours and material albedo are eliminated
- **Personal human parameters:** The used thermal index in this study is Physiological Equivalent Temperature (PET). PET allows users to compare their outdoor thermal experiences with indoor experiences and considers the human body's physiological capacities to adapt the stressful microclimates (Lin and Matzarakis, 2008; Matzarakis and Amelung, 2008; Lai *et al.,* 2014). At this stage, the mean values, which are commonly used in the literature, were taken into account. These characteristics are as follow: age (35), height (1.75), weight (75), BMI (18.5-24.9 kg/m2), metabolic rate (1.4), and clo value (0.60).

c) Creation of maps: In the study, two software were used to create maps. The first software used in the study is GIS-based Arc-GIS for performing spatial analyses and determining LCZ classes. The second software is ENVI-met to analyse the microclimatic condition of Adana City. ENVI-met LEONARDO was used to visualise the air temperature, wind speed, specific humidity, and Mean Radiant Temperature (MRT) results. In addition to these parameters, ENVI-met Biomet was used to calculate PET using personal human parameters.

It also was investigated in which LCZ classes have higher PET. d) Comparison of LCZ's PET: In the study, the lowest, highest and average PET values of each LCZ were determined with the findings obtained in the previous stages. The variability of these values was determined.

e) Developing suggestions: According to study results, suggestions will be developed to reduce the urban heat island.

3. Results

To classify LCZ, firstly, the analysis was performed for each building parcel in Adana City. GIS-based vector method was preferred for easy, precise, detailed, and comprehensive analysis of LCZ classes. While 46.8% of the study area is composed of LCZ 1-10, which are building types, 53.2% is LCZ A-G which are land cover types. Although there are all LCZ classes (except LCZ F) exist in the study area, some classes are dominant. The city center, where low-rise buildings are located, is generally defined as LCZ 3 due to its compact building pattern. From the city center to the south, the building pattern changes as the open low-rise LCZ 6 class. In the north-northwest parts of the city, where open high-rise buildings are located, the LCZ 4 class is dominant. LCZ A, where areas with dense vegetation is generally located around the lake and river. In the northwestern part of the city, it is defined as LCZ D, as there are generally agricultural areas.
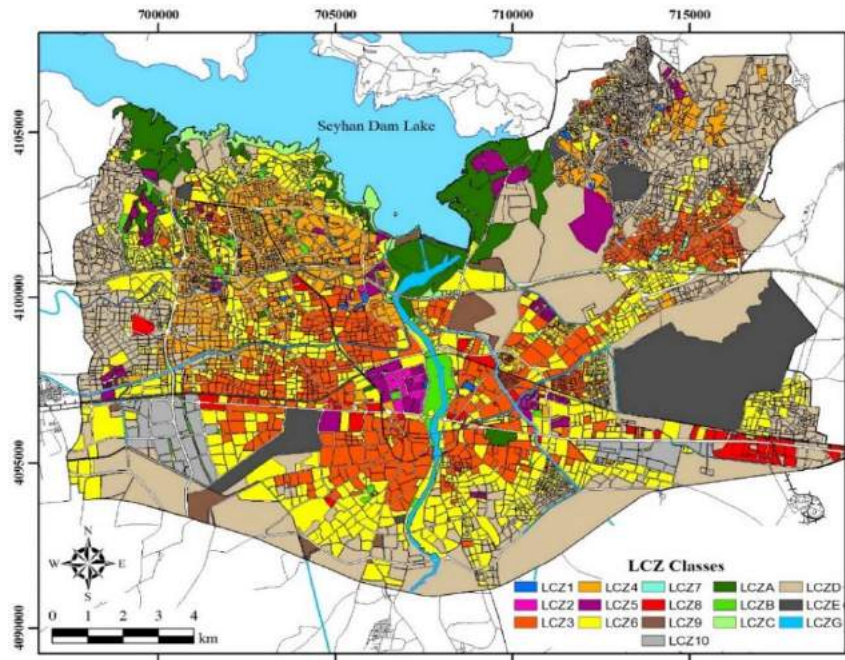
Figure 3. Adana city local climate zone map

Secondly, the microclimatic simulations of the study area were analysed by ENVI-met for the hottest period. The hottest period was selected for microclimatic analysis because if the thermal comfort existed in the hottest period, the developing suggestion would be sufficient for other days. According to the long term air temperature data (1992-2019) obtained from the General Directorate of Meteorology in Turkey, the hottest day was determined as August 8, and the hottest hours were determined as 12.00-15.00.

Thirdly, air temperature, wind speed, MRT and specific humidity were visualised in ENVI-met LEONARDO and were mapped in Arc-GIS (Figure 4 and Table 1). Figure 4 and Table 1 show the following issue:

o **Air temperature:** It has been observed that the settlement in the northwest of the study area has a lower temperature than other areas due to its proximity to the water surface and the presence of low-density high-rise buildings (LCZ 1 and LCZ 4). Similarly, it has been determined that the open high-rise (LCZ 2) and open mid-rise (LCZ 5) building areas in the city center have similar air temperatures. The areas, located in rural areas and characterised by low building density, also have medium air temperature. While water surfaces (LCZ G), coastal and near-shore settlements (LCZ C), areas with dense vegetation (LCZ A) have the lowest air temperature (30°C); airports, highways, wide boulevards (LCZ E), shopping malls and parking area which have high rate of impervious surface, have the highest air temperature (34°C). Moreover, it has been determined that compact low-rise (LCZ 3) and open low-rise (LCZ 6), located predominantly in the south of the city, have high air temperature values. The agricultural areas surrounding the city (LCZ D) have an average temperature value.

o **Wind speed:** While the wind speed is high in open areas such as agricultural areas (LCZ D), green spaces (LCZ B), airports (LCZ E), water surfaces (LCZ G) and residential areas with low building density (LCZ 4, 5, 6), the wind speed is blocked by buildings and has a low speed in areas with high building density.

o **Mean Radiant Temperature (MRT):** To minimise the differences caused by vegetation or different surface characteristics in the study area, simulation was performed by removing the existing plants. Therefore, the MRT in building types has higher value compare to land cover types. While the highest MRT is 64 °C in the area without any shade due to direct exposure to solar radiation, the lowest MRT is nearly 30 °C in the areas with dense tree texture (LCZ B), water surfaces (LCZ G), and areas with building shadows. In the study, green areas (LCZ B) were defined as covered with grass, while agricultural areas (LCZ D) were defined as soil. It has been observed that grass surfaces are cooler than soil surfaces. Moreover, LCZ classes with low building density (LCZ 4, 5, and 6) and compact low-rise (LCZ 3) are cooler than the other building types classes.

o **Spesific humidity:** Specific humidity refers to the amount of water vapor in a unit humid air mass. Therefore, forest areas (LCZ A) that respiration and photosynthesise during the day had the highest specific humidity. Since the wind provides the air flow, the specific humidity orientation is carried in the direction of the prevailing wind direction, and it has been observed that the neighboring units of the high specific humidity areas also have high specific humidity. When the specific humidity is ranked from highest to lowest value, forest areas (LCZ A), agricultural areas (LCZ D) and water surfaces (LCZ G), open areas and green areas (LCZ B, C and E) and settlements areas. While the specific humidity is low due to the decrease in wind speed in regions with high building density, the specific humidity is high in the open or green areas within the urban settlement.

(a) **(b)**
(c) **(d)**
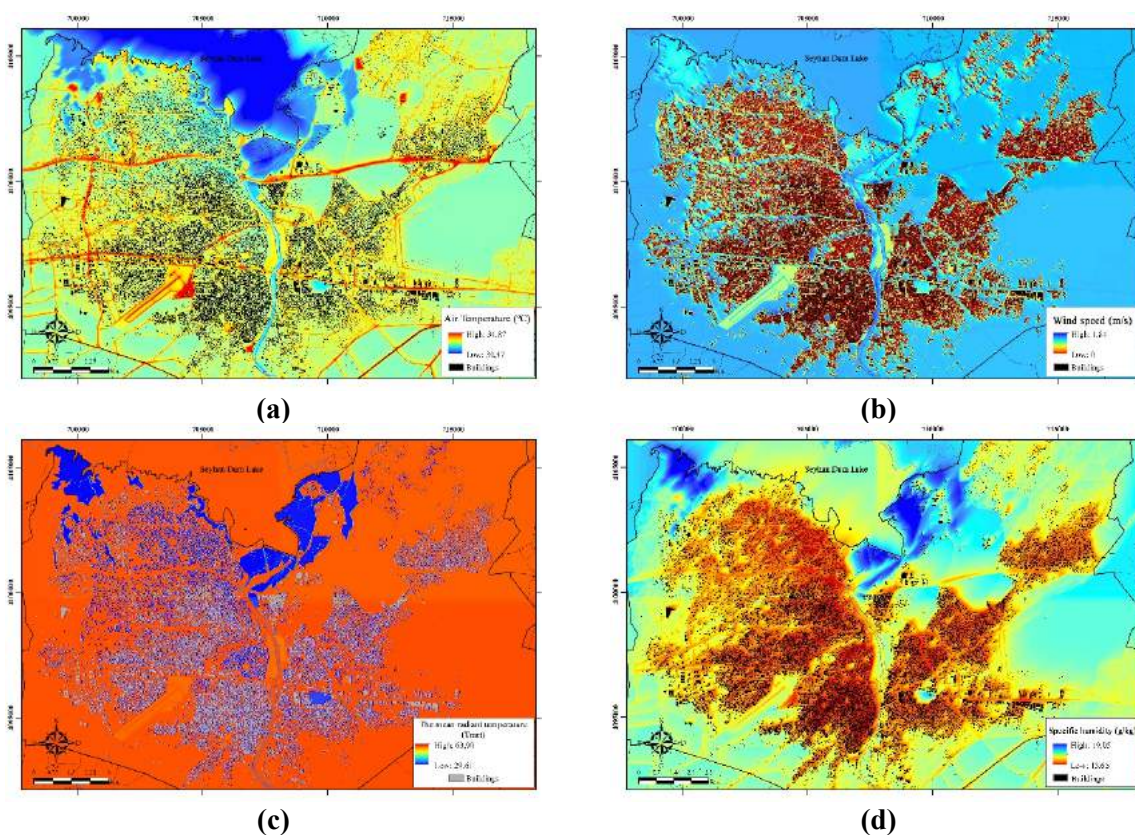
Figure 4. ENVI-met results for a) air temperature, b) wind speed, c) MRT, and d) specific humidity

The evaluation of PET and thermal comfort focus on the human. In addition to climatic parameters, the personal human parameters are taken into account to calculate PET in ENVI-met. Body mass index, age, height, weight, and clothing values suitable for the summer season were used to calculate PET (Figure 5 and Table 1).
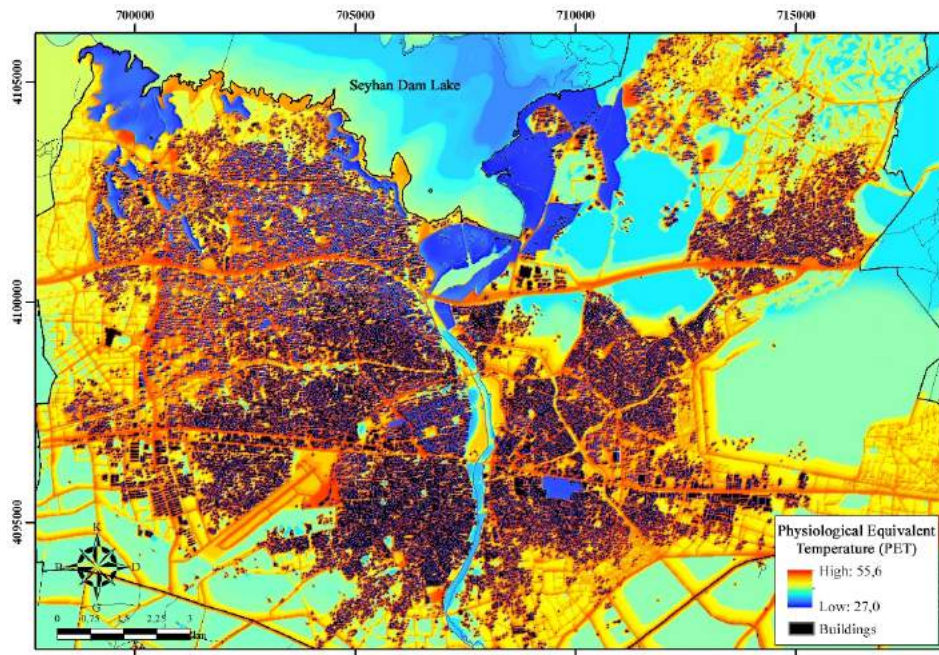
Figure 5. Physiological Equivalent Temperature map of Adana city

Table 1. ENVI-met model results according to LCZ classes

		BUILDING TYPES										LAND COVER TYPES					
		LCZ 1 n=1.306 grid	LCZ 2 n=1.731 grid	LCZ 3 n=66.489 grid	LCZ 4 n=41.192 grid	LCZ 5 n=14.980 grid	LCZ 6 n=106.262 grid	LCZ 7 n=381 grid	LCZ 8 n=8.520 grid	LCZ 9 n=6.973 grid	LCZ 10 n=14.154 grid	LCZ A n=27.691 grid	LCZ B n=8.376grid	LCZ C n=4.792 grid	LCZ D n=156.440grid	LCZ E n=129.336 grid	LCZ G n=58.008 grid
Air temperature (°C)	Minimum	31,6	32,1	32,2	31,4	31,3	31,4	32,6	32,1	32,0	32,3	30,8	31,6	31,0	31,5	31,8	30,8
	Maximum	34,0	33,6	34,4	34,2	34,3	34,5	33,3	34,3	34,4	34,0	34,0	34,4	34,4	34,3	34,9	33,9
	Difference	2,3	1,6	2,2	2,7	3,1	3,1	0,7	2,2	2,3	1,7	3,2	2,7	3,4	2,8	3,1	3,0
	Mean	32,7	32,5	32,8	32,6	32,5	32,7	32,8	32,8	32,6	32,8	31,7	32,8	33,0	32,6	32,6	32,3
	Standard deviation	0,3	0,2	0,2	0,3	0,3	0,3	0,1	0,3	0,3	0,2	0,3	0,3	0,4	0,3	0,5	0,6
Wind speed (m/sa)	Minimum	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,2
	Maximum	1,6	1,4	1,4	1,8	1,5	1,8	1,2	1,3	1,3	1,2	1,3	1,3	1,1	1,7	1,4	1,4
	Difference	1,6	1,4	1,4	1,8	1,5	1,8	1,2	1,3	1,3	1,2	1,3	1,3	1,0	1,7	1,4	1,2
	Mean	0,7	0,5	0,6	0,8	0,8	0,8	0,5	0,9	0,9	0,9	1,0	0,9	1,0	1,0	1,0	1,0
	Standard deviation	0,3	0,3	0,3	0,3	0,3	0,2	0,3	0,2	0,1	0,2	0,1	0,1	0,1	0,1	0,1	0,1
Mean Radiant Temperature (°C)	Minimum	31,0	31,1	29,9	29,7	30,5	29,8	33,1	31,0	30,8	33,2	31,3	29,6	30,8	30,8	30,9	30,9
	Maximum	63,1	62,8	63,3	63,3	63,1	63,7	62,0	62,6	62,5	62,6	63,9	63,0	62,3	63,1	62,5	63,7
	Difference	32,1	31,7	33,4	33,6	32,5	34,0	29,0	31,6	31,7	29,4	32,6	33,4	31,5	32,2	31,6	32,8
	Mean	49,7	44,7	51,0	52,4	55,8	57,9	51,0	59,3	60,5	59,2	36,5	59,0	59,9	61,4	61,7	60,9
	Standard deviation	14,3	13,8	13,8	13,4	11,4	9,7	13,8	8,3	5,7	8,4	4,4	6,0	2,8	2,2	1,9	4,1
Spesific humidity (g/kg)	Minimum	13,7	13,7	13,7	13,7	13,7	13,7	14,1	13,8	14,1	14,1	14,0	13,8	14,0	14,0	13,8	13,9
	Maximum	17,1	15,7	17,1	18,1	19,0	17,9	15,9	16,9	18,0	16,7	19,0	17,6	18,1	18,5	18,2	18,4
	Difference	3,4	2,0	3,3	4,4	5,4	4,2	1,9	3,1	4,0	2,6	4,9	3,8	4,1	4,4	4,4	4,5
	Mean	14,9	14,1	14,4	15,0	15,8	15,3	14,4	15,5	15,9	15,5	17,4	15,3	15,9	16,3	16,3	15,3
	Standard deviation	0,8	0,4	0,5	0,8	1,2	0,7	0,4	0,8	0,5	0,6	1,0	0,7	0,8	0,5	0,6	0,9
Physiological Equivalent Temperature (°C)	Minimum	27,8	28,4	28,0	27,2	27,6	27,4	29,85	28,0	28,5	29,54	27,2	27,3	27,9	27,9	28,1	27,0
	Maximum	56,8	53,8	57,2	57,4	55,4	57,0	51,0	52,4	50,4	52,4	49,2	54,2	48,3	52,0	49,6	47,0
	Difference	29,0	25,4	29,2	30,2	27,8	29,6	21,1	24,4	21,9	22,9	22,0	26,9	20,5	24,1	21,5	20,0
	Mean	38,68	36,69	39,95	39,62	41,3	42,2	40,14	42,8	43,1	42,8	30,24	42,7	43,0	43,3	43,5	42,8
	Standard deviation	7,4	7,3	7,1	6,8	5,6	4,8	7,2	4,0	2,8	4,1	2,3	3,1	1,5	1,1	1,0	2,3
PET categories		Slightly Heat Stress				Moderate Heat Stress				Strong Heat Stress				Extreme Heat Stress			
PET value(°C)		23,1-29.0 °C				29,1-35.0 °C				35.1-41.0 °C				>41.0°C			

When Figure 5 and Table 1 are examined based on local climate classes, it has been observed that the land cover types are generally about 1-2°C cooler than the building types. LCZ E class (43.5 °C), which represents the transportation network, had the highest mean PET value among the land cover types. The lowest mean PET (30.2 °C) was found in forest areas and cemetery areas with high vegetation density (LCZ A) in both building and land cover types. Because these areas have high shade, low air temperature and low MRT. In building types, high, medium and low-rises areas with high building density (LCZ 1, 2, and 3) and open high-rise (LCZ 4) areas have low PET values because the shading effects of these areas is higher than other building areas due to the low aspect ratio (building height/street width). The mean PET of these areas varied between 36-40°C, which categorised in strong heat stress.

The total grid numbers of the LCZ classes and their distribution to the physiological stress categories are given in Table 2. Due to the simulation of the study area without any vegetation, the absence of any shadow-forming element other than the buildings in the study area, the PET values of building shadows (27°C) in the LCZ 1 (compact high-rise) and LCZ 4 (open high-rise) were determined as "Slightly heat stress". LCZ A (dense woodland) has the lowest PET value of all LCZ classes, and this class is in the "Slightly heat stress" category. Especially in areas exposed to direct solar radiation, such as areas and industrial areas with low building density, agricultural areas and roads has 41-43°C of the mean PET, and is in the category of "Extreme heat stress".

Table 2. Distribution of LCZ classes by Physiological Stress Categories

	Physiological Stress Categories								Total grid number
	Slightly Heat Stress 23,1-29.0 °C		Moderate Heat Stress 29,1-35.0 °C		Strong Heat Stress 35.1-41.0 °C		Extreme Heat Stress >41.0°C		
	n	%	n	%	n	%	n	%	
LCZ 1	4	%0	411	%31	526	%40	365	%28	1.306
LCZ 2	0	%0	318	%18	1.371	%79	42	%2	1.731
LCZ 3	0	%0	521	%1	53.431	%80	12.537	%19	66.489
LCZ 4	10	%0	2.922	%7	24.550	%60	13.710	%33	41.192
LCZ 5	0	%0	373	%2	5.730	%38	8877	%59	14.980
LCZ 6	0	%0	137	%0	22.600	%21	83.525	%79	106.262
LCZ 7	0	%0	0	%0	321	%84	60	%16	381
LCZ 8	0	%0	0	%0	1.542	%18	6.978	%82	8.520
LCZ 9	0	%0	0	%0	23	%0	6.950	%100	6.973
LCZ 10	0	%0	0	%0	1035	%7	13.119	%93	14.154
LCZ A	0	%0	27.689	%100	2	%0	0	%0	27.691
LCZ B	0	%0	33	%0	768	%9	7.575	%90	8.376
LCZ C	0	%0	0	%0	32	%1	4.760	%99	4.792
LCZ D	0	%0	3	%0	527	%0	155.910	%100	156.440
LCZ E	3	%0	6	%0	1	%0	129.326	%100	129.336
LCZ G	0	%0	0	%0	1473	%3	56.534	%97	58.007

4. Discussion and Conclusions

Since the main factor in urban heat island studies is to provide human thermal comfort, the PET index was used to evaluate UHI in Adana City. The climate-based classification of urban morphology enabled the determination of differences arising from structural characteristics. Accordingly, the results that can be reflected in the plan decision and implementation can be listed as follows:

- While urban heat island is formed in areas such as airport, highways and highways where the impermeable surface ratio is high, urban heat ısland effect is rare in the forest and cemetery areas with high tree density. Therefore, increasing shade by making appropriate planting and design studies around these areas will reduce the heat spread from these areas.
- The use of suitable surface materials, increasing pervious surface and green ratio in settlements with low building density will reduce the urban heat island effect. However, all urban settlements were not planned and designed according to thermal comfort conditions. In the high building density settlements, appropriate orientation and aspect ratio should be provided, and positioning by taking into account the prevailing wind direction.
- The high city canyons are more comfortable than the low canyon because of the higher shadow ratio. However, the prevailing wind direction should be taken into account in the positioning of these areas because wind helps to improve thermal comfort by dispersing moisture in the air. The parallel positioning of the city canyons to the prevailing wind direction will not prevent air circulation; thus, the city can be cooler.

To create comfortable cities, decision-makers take into account the climatic characteristics in addition to physical characteristics in newly urbanised areas.

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Determination of Soil Losses in Forest Road Cutslopes in Semi-Arid Mountainous Areas by UAVs: Preliminary Results

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Abstract: Forest roads are the most important infrastructural facilities for the utilization of renewable natural forest resources. Like all roads, forest roads are forced to deformation after construction. Surface erosion occurring in forest road slopes, long-term use of forest road affects and harms the environment. Soil erosion is especially important in semi-arid ecosystems. With the development of remote sensing technology in recent years, access to soil loss data and obtaining results can be economical, easy and fast. In this study; it is aimed to investigate the erosion determination the cutslopes by UAVs technique. The first 50-meter section of the 001-coded Type B forest road which builded in August 2019 was selected. The forest road is located on the borders of Taşlıyayla Forest Management Chief (Bolu / Seben). This study is to determine the surface erosion (wearing, accumulation) rate of the surface and volumetric basement of the cutslopes of forest road by UAV. In the presented study; in order to conduct four months (May-September periods) periodical analysis, 2020 May and 2020 September flight data were compared. According to the analysis results; volumetric erosion in the examination; total accumulation of 0.69 m^3, -3.82 m^3 wearing was determined. According to these results; it was determined that the volumetric amount of erosion varied in time.

Keywords: Forest road cutslopes, Erosion, Drone, Semi-Arid areas, Turkey

1. Introduction

Although roads are the first step in the development of forestry resources, they are also infamous for bringing about erosion and sedimentation and for adversely impacting wildlife and water resources, all of which devastate the forests in terms of production and other significant forestry activities. One of the major environmental problems due to improper forest road construction is the acceleration of soil erosion. In a forest ecosystem during the road construction stage, fertile topsoil rich in organic matter, suitable for bulk density and permeability, and erosion-resistant is stripped from the surface and surface slope is changed. This changes the structure of soil as it is bared and compacted for the construction area. Therefore, soil loss by erosion and surface runoff are accelerated in both cut and fill slope surfaces of forest roads. These effects emerge as the most important factor affecting and determining soil loss by erosion (Potocnik,1996; Bayoglu, 1997; Görcelioglu, 2004; Aruga and et all., 2005; Bjorklund, 2006).

Turkey is very sensitive to erosion in terms of geographical location, topography, climate, geological structure and soil conditions. Erosion is the phenomenon of erosion, transport and accumulation of soil by various factors (URL, 2020). Karabulut and Küçükönder (2008)

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stated that erosion is more severe in arid and semi-arid regions, and the severity of erosion has increased in other regions, especially due to human influence. Balcı (1969) examined the effects of geological structure, topographic condition (aspect) and soil depth factors on soil properties related to erosiveness in Central Anatolia. He also determined that the soils of each geological parent material, whether north-facing or south-facing, topsoil or subsoil, are all soils that are not resistant to erosion or erosional forces.

Usually the main reasons for increased erosion after the construction of forest roads is the elimination of protective flora along the route in part or in whole. (Megahan, 1977; Görcelioglu, 2004; Jordan and Martinez-Zavala, 2008; Zemke, 2016). In additon to, with increased cut slope length there was also an increasing rate of soil loss (Luce and Black 1999; Nasiri and Hosseini, 2012; Hacisalihoglu et al., 2019).

In general, the methods used to determine erosion are direct, indirect and predictive measurement methods. There are also classifications as direct measurement of water erosion in the field and under laboratory conditions and its determination using predictive methods (Balcı 1996; Stroosnijder 2005). Direct measurement (measurement of erosion in the field) can be performed using a variety of methods. Establishing a runoff plot and measuring erosion, soil loss and runoff is one of these methods. By using the plot, erosion and surface runoff are measured in a controlled laboratory environment or field conditions under natural rain or by applying artificial sprinkler. The parcels used in erosion and runoff measurements made on the land under natural conditions are generally called runoff plots. Runoff plots are one of the most important methods used to measure erosion, soil loss, runoff and infiltration (Şensoy et al. 2011). It requires intensive work in the surface flow plots method. For this reason, it is thought that it will be important to try new technological developments in these studies. The aim of the study is to examine the usability of the erosion occurring in forest road cutslopes in semi-arid mountainous areas by UAV as novel digital photogrammetric method.

2. Material and Method

2.1. Study Area

Within the scope of the study, Taşlıyayla Forest Management Chief (Bolu / Seben), the first 50-meter section of the 001-coded Type B forest road (totally 3.7 km) which builded in August 2019 was selected. The study area is located to the south of the Western Black Sea Region (Figure 1).

Figure 1. Study area and surroundings

2.2. Monitoring road cutslopes degradation with unmanned aerial vehicle (UAV)

In the present study, it was aimed to monitor forest road cutslopes erosion by using UAV data, which enables to obtain very high resolution orthophotos and DEMs with SfM processing. Two surveys were conducted using DJI Phantom 4 RTK (Figure 2), first one was in May 2020 and the second one was on September 2020. The ground control points (GCPs), which are necessary for image rectification and image geo coding, were surveyed using the SATLAB SL600 GNSS device. Totally, 12 GCPs, which had to be clearly visible in the base imagery, were applied in the field before the flight missions were carried out. Flights were planned from about 87 m above ground level (AGL) flight height. All flights approximately took 16 minutes 23 seconds in the way that providing 90% in both front and side overlapping.

Figure 2. DJI Phantom 4 RTK model UAV

Following UAV flights, post-processing including all office work were carried out in order to obtain the high-resolution DEMs and orthophotos from the UAV data. In the present study, the SfM algorithm was applied using Agisoft Photoscan Professional version 1.3.2. Following the UAV data processing, the degradation on the road surface was simply calculated by applying DoD (DEM of Difference), subtracting first DEM from the second one, which are in raster format. DoD was created using ArcGIS 10.6 and pixel values in resulted data was filtered as: I) if pixel values between ±3 cm, then filtered since it bias due to modelling error, and ii) if pixel value lower than -50 cm or higher than +50 cm, then filtered, because these are outliers due to the density of the forest around the road platform. By this way, degradation over the road cutspoes was calculated as areal and volumetrically.

3. Results

According to the first results of the study; 2020 May and 2020 September flight data were compared (Figure 3) and four months periodical analysis of total wearing (erosion) of -3,82 m^3 and 0.69 m^3 accumulation were determined (Figure 4). According to these results; it was determined that the surface and volumetric amount of degradation varied in time.
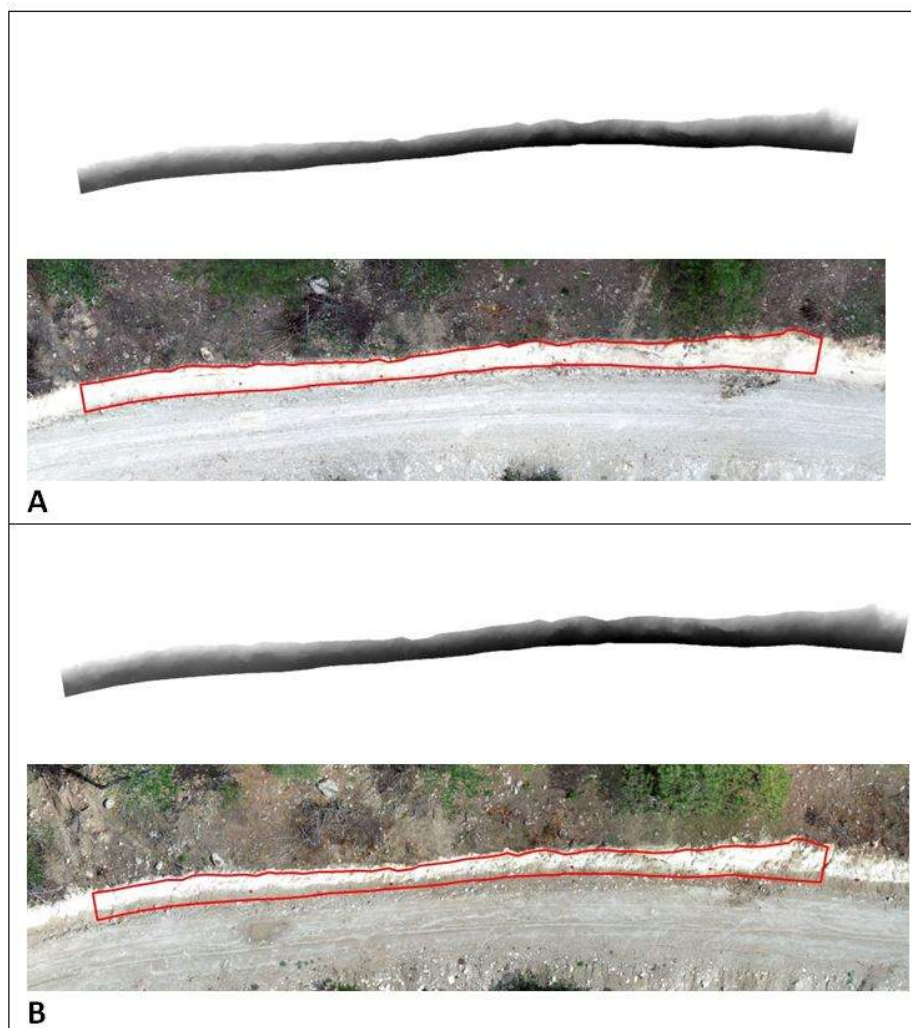
Figure 3. DEMs and Orthophotos: A) May 2020 and B) September 2020
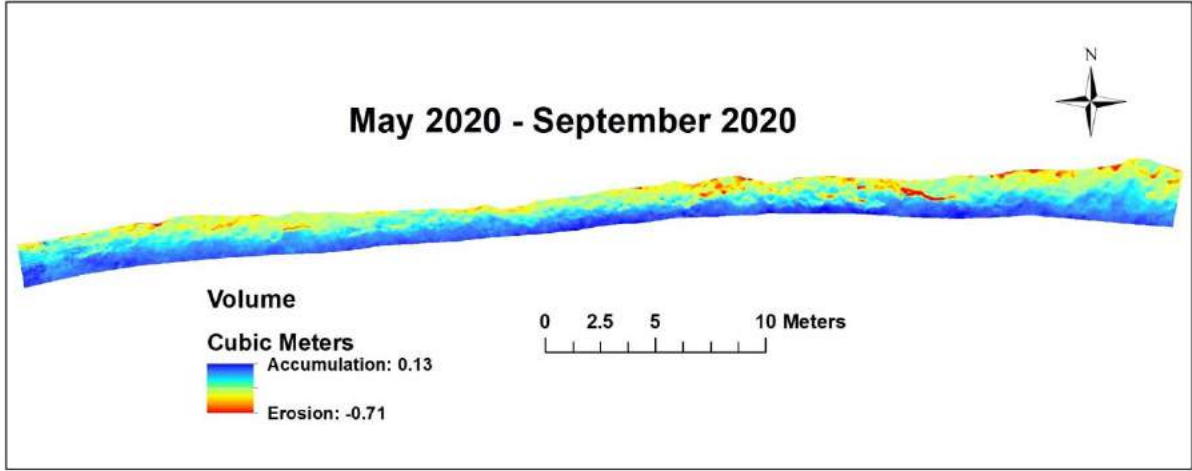
Figure 4. Forest road cutslopes surface degradation map (volumetrical)

4. Discussion and Conclusions

The amount of sediment loss in the cutslopes ranging from 0.5-37 kg m^{-2} yr^{-1} per year has been determined in the studies performed in different regions of the forest road cutslope (Wilson, 1963; Dyrness, 1975; Megahan, 1980; Kartaloglu, 2011; Demir et al., 2012; Demir et al., 2013; Erdem et al., 2018). The values obtained in this study were more than other studies. Erosion may be greater after road construction until the road becomes stable.

With this study, it was easily possible to determine the local points or areas where cutslopes maintenance and repair is required. In this study, it was determined that the total areal wearing values and total areal sediment accumulation values were significantly different in monthly periods for four months. Consequently, UAVs can be used effectively in monitoring and in evaluating road cutslopes erosion. Also, UAVs is useful and it is a necessary system to obtain high accuracy data for periodic monitoring operation in all kind of engineering structures like forest roads.

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Predictive Modelling and Mapping of Turkish Oak (*Quercus cerris* L.): A Case of Study Gölhisar Region

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Özet: Ormanlar ekonomik ve ekolojik olarak insanlara çeşitli hizmetler sunmaktadır. Ayrıca ormanların başka canlı türü için de sayısız önemli ekosistem hizmeti bulunmaktadır. Bu hizmetlerin devamlılığı doğrudan orman kaynaklarının sürdürülebilirliğine bağlıdır. Bu aşamada özellikle ormanlardaki ağaç türlerinin verimliliğinin artırılması ve dağılım alanlarının genişletilmesi teknik bilgi ve beceri gerektiren çok önemli bir konu olmuştur. Türkiye'de orman alanlarının önemli ağaç türlerinden birisi saçlı meşe (*Q. cerris*)'dir. Bu türün özellikle Akdeniz Bölgesi'ndeki orman alanlarında biyolojik çeşitlilik, erozyon kontrolü ve yangına karşı dirençli orman tesisi gibi önemli fonksiyonları bulunmaktadır. Buradan hareketle Gölhisar (Burdur) yöresinde türün potansiyel dağılım alanlarının modellenmesi ve haritalanması amaçlanmıştır. Çalışmada 20x20 m büyüklüğe sahip 400 örnek alanda saçlı meşe türünün var – yok verileri kaydedilmiştir. Bu örnek alanlara ait çevresel değişkenler ile Saçlı meşe türünün potansiyel dağılımı Lojistik Regresyon analizi kullanılarak modellenmiştir. Analiz sonucunda elde edilen geçerli modelin ROC değeri 0,724 olarak bulunmuştur. Yükselti, eğim ve radyasyon indeksi elde edilen modeli yapılandıran değişkenler olmuştur. Bu değişkenler kullanılarak oluşturulan potansiyel dağılım haritasında Saçlı meşe türünün daha çok alt ve orta yükselti kuşağındaki, eğimli alanları tercih ettiği tespit edilmiştir. Sonuç olarak, türün özellikle yöredeki yangına dirençli ormanların tesisi ya da öne çıkan bir başka fonksiyonundan faydalanılmak istenildiğinde, elde edilen potansiyel dağılım haritası uygulayıcılar için yön verici olacaktır.

Anahtar kelimeler: Orman ekolojisi, orman fonksiyonları, orman yangınları, potansiyel dağılım modellemesi

Abstract: Forests provide various ecosystem services to people economically and ecologically. In addition, forests have numerous important ecosystem services for other living species. The continuity of these services directly depends on the sustainability of forest resources. At this stage, increasing the productivity of tree species in forests and expanding their distribution areas have become a very important issue that requires technical knowledge and skills. Turkish oak (*Q. cerris*) is one of the important tree species of forest areas in Turkey. This species has important functions such as biodiversity, erosion control, and fire-resistant forest facility, especially in forest areas in the Mediterranean Region. n this direction, it is aimed to model and map the potential distribution areas of the species in the Gölhisar (Burdur) district. In the study, the presence and absence data of the species were recorded in 400 sample plots with a size of 20x20 m. The environmental variables of these plots and the potential distribution of the species were modeled using Logistic Regression technique. As a result of the analysis, the ROC value of the obtained valid model was found to be 0.724. Elevation, slope and radiation index were

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statistically significant variables of the model. In the potential distribution map created by using these variables, it has been determined that the Turkish oak prefers the sloping areas in the lower and middle elevation ranges. As a result, the potential distribution map of the Turkish oak will be a guide for practitioners, especially when it is desired to benefit from the establishment of fire resistant forests in the region or another prominent function of the species.

Keywords: Forest ecology, forest functions, potential distribution model, wildfire

1. Giriş

Ekolojik dengenin korunması ve devamlılığı konusunda birçok önemli fonksiyonu üstlenen ormanlar dünyanın yenilenebilir en önemli doğal kaynağıdır. Dolayısıyla günümüzde ormanlar, sadece odun hammaddesi sağlayan kaynaklar değil, aynı zamanda toplum sağlığını koruyan, iklim özelliklerini düzenleyen, sınırsız sayıda canlı organizmaya yaşam ve faydalanma ortamı sağlayan doğal kaynaklar olarak nitelendirilmektedir (Çepel, 1995; Kindermann vd., 2008).

Ormanların ekosistem işleyiş sürecinde her canlı organizmanın ayrı bir önemi bulunmakla birlikte, ağaçlar sistemdeki kilit rolleri ile ormanların iskeletini oluşturmaktadır. Toprak besleme ve erozyon kontrolü, su ekonomisi, meşcere örtüsü, odun üretimi ve karbon birikimi gibi ormanın birçok temel fonksiyonunda ağaçların varlığı ve devamlılığı çok önemlidir (Annand ve Desrochers, 2004). Dolayısıyla bir orman alanında yer alan ağaç türlerinin ekolojik isteklerinin bilinmesi, ormanlarda sürdürülebilirliğin sağlanması için potansiyel dağılım alanlarının belirlenmesi ve belirlenen alanlara ait modelleme ve haritalama çalışmalarının gerçekleştirilmesine ihtiyaç duyulmaktadır (Şentürk, vd., 2014).

Ağaç türlerinin potansiyel alanlarının modellenmesi ve haritalanması konusunda ülkemizde tamamlanan önemli çalışmalar bulunmaktadır (Özkan, vd., 2014; Şentürk vd., 2014; Gülsoy vd., 2016; Mert vd., 2016; Karakaya vd., 2016). Bu çalışmalarda genel olarak ağaç türleri için en uygun ekolojik uyum sunan orman yetişme ortamlarının tanımlamaları yapılmıştır. Fakat ülkemizin coğrafik yapısı ve iklim özellikleri göz önüne alındığında, özellikle yöresel ve bölgesel ölçekte orman ağaç türleri için ekolojik bilgi birikimine katkı sağlayacak bilimsel araştırmalara ihtiyaç vardır. Buradan hareketle gerçekleştirilen bu çalışmada Gölhisar (Burdur) yöresinde Saçlı meşe (*Q. cerris*) türünün potansiyel dağılım alanlarının modellenmesi ve haritalanması amaçlanmıştır.

Dünyada çoğunluğu Kuzey Yarımkürenin ılıman bölgelerinde yayılış gösteren 400'den fazla meşe türünün olduğu bilinmektedir. Ülkemizde ise alttür ve varyeteleri ile birlikte toplam 23 meşe taksonu yayılış göstermektedir (Yaltırık, 1984; Öztürk, 2013). Türkiye ormanlarında meşe türlerinden Mazı meşesi, Tüylü meşe, Saçlı meşe, Sapsız meşe ve Kermes meşesinin en geniş yayılış alanlara sahip meşe türleri olduğu bilinmektedir. Ülkemizde meşe ormanlarında özellikle açmacılık, kaçak kesim, yangın, aşırı otlatma gibi nedenlerden dolayı geçmişten günümüze büyük oranlarda tahribat meydana gelmiştir. Ülkemizin hemen hemen her yerinde yayılış gösteren meşe türleri bu durumdan etkilenmiş ve pek çok alan, ya bozuk orman vasfına dönüşmüş ya da tamamen yok olmuştur (Şenol, 2015). Dolayısıyla bu alanların tespit edilerek yeniden normal kuruluşta meşe ormanlarına dönüştürülmesi hem ülke ormancılığımız hem de dünya ormancılığı adına büyük önem arz etmektedir. Normal kuruluşta ormanların oluşturulma sürecinde ise özellikle tür bazlı ve model tabanlı potansiyel dağılım alanlarının belirlenmesi önem arz etmektedir. Zira, türlerin ekolojisine en uygun şekilde potansiyel dağılım alanlarının belirlenmesi ve bu alanlarda verimlilik ilişkilerinin tespit edilmesiyle ormanların sürdürülebilirliğine önemli katkı sağlanmış olacaktır.

Saçlı meşe ülkemizde hem ekonomik hem de ekolojik değeri açısından oldukça önemli bir asli orman ağacı türüdür. Diğer meşe türleri içinde özellikle orman yangınlarına karşı dirençli, geniş yapraklı bir tür olan saçlı meşenin ekolojik anlamda önemi ön plana çıkmaktadır (Tzvetkova ve Kolarov, 1996). Bahsedilen açıklamalardan da anlaşılacağı üzere Gölhisar (Burdur) yöresinde Saçlı meşe türünün potansiyel dağılım alanlarının modellenmesi ve haritalanması sayesinde, bu türe ilişkin yöredeki ormancılık faaliyetlerinin gerçekleştirilmesinde ihtiyaç duyulan önemli ekolojik bilginin ortaya koyulması amaçlanmıştır.

2. Materyal ve Yöntem

2.1. Çalışma alanı

Çalışmanın gerçekleştirildiği Gölhisar Yöresi Burdur'a bağlı Gölhisar, Çavdır, Tefenni, Altınyayla ilçeleri ile Denizli'ye bağlı Çameli ve Muğla iline bağlı Fethiye ilçesi sınırları içerisine girmektedir. 35º 44′ 54″ - 35º 19′ 27″ doğu boylamları ile 36º 44′ 03″- 37º 21′ 33″ kuzey enlemleri arasında konumlanan çalışma alanı 252680 ha büyüklüğe sahip olup, 136743 ha ormanlık alana sahiptir. Yörede iğne yapraklı orman ağacı türlerinden karaçam (*Pinus nigra*), kızılçam (*Pinus brutia*) ve Toros sediri (*Cedrus libani*), boylu ardıç (*Juniperus excelsa*), diken ardıç (*Juniperus oxycedrus*), yağlı ardıcı (*Juniperus foetidissima*), adi ardıç (*Juniperus communis*) yayılış gösterirken, geniş yapraklı orman ağacı türlerinden en fazla meşe türleri (saçlı meşe (*Quercus cerris*), kermes meşesi (*Quercus coccifera*), pırnal meşesi (*Quercus ilex*), mazı meşesi (*Quercus infectoria*), tüylü meşe (*Quercus pubescens*), palamut meşesi (*Quercus ithaburensis*)), yayılış göstermektedir. Çalışma alanı daha çok Akdeniz iklimi etkisi altındadır. Ancak, yörenin geçiş kuşağında yer almasından dolayı dağlık iklim tipine de rastlanmaktadır. Köppen – Geiger iklim sınıflandırmasına göre Akdeniz iklimi (Csa) ve Kışı ve ılık, yazı ılık ve kurak iklim (Csb) tiplerinin görüldüğü ifade edilmiştir (Rubel vd., 2017). Farklı jeolojik yapı ve zamandaki formasyonlara sahip olan yörede daha çok kireçtaşı, kumtaşı, marn, konglomera ve ofiyolit anakaya tipleri bulunmaktadır (Elitez, 2010; Varol, 2011).

2.2. Arazi envanter çalışması

Yörede, saçlı meşe türünün potansiyel dağılım alanlarının belirlemek amacıyla 20x20 m büyüklüğünde 400 örnekleme alanında var – yok verisi toplanmıştır.

2.3. Açıklayıcı değişkenlerin oluşturulması

Gölhisar yöresinde hedef türün dağılım modellemesini ve haritalamasını gerçekleştirebilmek için çalışma alanının değişkenlerinin oluşturulması gerekmektedir. Bu amaç doğrultusunda ilk olarak çalışma alanının Sayısal Yükseklik Modeli (SYM) elde edilmiştir. Elde edilen SYM aracığıyla bakı, eğim ve yükselti haritaları oluşturulmuştur. Ardından, *ArcMap 10.2* yazılımında Jennes (2006), tarafından kullanıma sunulan "*Topographic Tool*" eklentisi kullanılarak çalışma alanının arazi yapısını temsil eden topografik pozisyon indeks haritası oluşturulmuştur. SYM aracığıyla elde edilen bakı haritasındaki hücresel değerler Denklem 1 kullanılarak *ArcMap 10.2* yazılımında "*Raster Calculator*" aracıyla hesaplanmıştır ve radyasyon indeksi haritası oluşturulmuştur. Elde edilen radind haritasına ait yeni hücresel değerler 0 – 1 arasında değişiklik göstermektedir. Sıfır ve sıfıra yakın olan değerler gölgeli bakıları (kuzey ve kuzeydoğu) temsil etmektedir. Bir değerine doğru yaklaştıkça daha sıcak ve kuru güney ve güneybatı yamaçlardaki araziler temsil ettiği ifade edilmektedir (Moisen ve Frescino, 2002; Aertsen vd., 2010).

radyasyon indeksi = [1−cos ((π/180) ×(θ −30))]/2   Denklem 1

Burada, θ bakı değerlerini temsil etmektedir.

Maden Tetkik ve Arama Genel Müdürlüğünden temin edilen jeoloji haritası *ArcMap 10.2* yazılımında sayısallaştırılmış ve gerekli projeksiyon ataması gerçekleştirilmiştir. Ardından, sayısallaştırılmış harita üzerinde yer alan her bir farklı anakaya tipleri vektör veri modeli olarak çizilmiş ve öznitelik tablosu hazırlanmıştır. Son aşamada, vektör veri modeli olarak hazırlanan katman dönüştürme seçenekleri kullanılarak raster formatında kaydedilmiştir.

2.4. İstatistiksel değerlendirmeler

Hedef türün potansiyel dağılım modellemesi ve haritalanması için oluşturulan çevresel değişkenler sürekli veri ve ikili veri tipine sahiptir. Modelleme aşamasına geçilmeden önce değişkenler arasındaki çoklu bağlantı problemini ortadan kaldırmak amacıyla veri tipine bağlı olarak farklı istatistiksel yöntemler kullanılmıştır. İlk olarak, hedef tür ile sürekli veri özelliğine sahip eğim, radyasyon indeksi, topografik pozisyon indeksi ve yükselti değişkenlerine Wilcoxon sıra istatistiği testi uygulanmıştır (Wilcoxon, 1945). Ardından, hedef tür ile anakaya tiplerini içeren kategorik yapıdaki verilere Ki Kare testi uygulanmıştır. Hedef tür ile anakaya arasındaki ilişkinin yönünü tespit edebilmek amacıyla Ki Kare testine bağlı nitelikler arası ilişki analizi uygulanmıştır. Nitelikler arası ilişki analizinde C3 katsayı kullanılmıştır (Cole, 1949; Poole, 1974; Özkan, 2002). Son aşamada, geriye kalan değişkenler ile birlikte saçlı meşe türünün potansiyel dağılım modellemesini gerçekleştirmek amacıyla lojistik regresyon analizi uygulanmıştır.

3. Bulgular

Gölhisar yöresinde, 400 örnek alanda gerçekleştirilen bu çalışmada 134 örnek alanda saçlı meşe türünün var verisi kaydedilmiştir. Türün var – yok verileri kullanılarak istatistiksel değerlendirme aşamaları gerçekleştirilmiştir. İlk olarak, saçlı meşe ile sürekli veri özelliği taşıyan değişkenlere Wilcoxon sıra istatistiği testi uygulanmıştır. Bu test sonucunda hedef tür ile sürekli veri özelliği taşıyan değişkenler arasındaki ilişkilerin önem seviyeleri Çizelge 1 verilmiştir. Öte yandan, hedef tür ile çevresel değişkenler arasındaki ilişkilerin yönü Wilcoxon sıra istatistiğinde yer alan sıralama ortalaması tablosunda verilmiştir (Çizelge 2). Çizelge 1 incelenecek olursa, yükselti, eğim ve radyasyon indeksi değişkenleri istatistiksel anlamda önem seviyesi ($p<0,05$) %5 değerinin altında önemli çıkmıştır. Wilcoxon sıra testi sonucunda istatistiksel anlamda önemli çıkan değişkenlerin ilişki yönleri yükselti ve radyasyon indeksi değişkenleri ile negatif, eğim değişkeni ile pozitif olarak tespit edilmiştir (Çizelge 2).

Çizelge 1. Wilcoxon sıra istatistiği testi sonuçları

	yükselti	eğim	radyasyon indeksi	topoğrafik pozisyon indeksi
U	11399,500	15342,000	14568,000	17539,000
W	20444,500	50853,000	23613,000	53050,000
Z	-5,885	-2,272	-2,982	-0,259
p	*0,000*	*0,023*	*0,003*	0,795

Çizelge 2. Sıralama ortalaması sonuçları

Sıra Ortalaması	yükselti	eğim	radyasyon indeksi	topoğrafik pozisyon indeksi
Var	152,57	219,01	176,22	202,61
Yok	224,64	191,18	212,73	199,44

Saçlı meşe türü ile kategorik veri özelliği gösteren anakaya tipleri değişkenlerine Ki Kare testi uygulanmıştır. Anakaya tipleri değişkenleri ile hedef tür arasındaki ilişki yönü Ki Kare testine bağlı nitelikler arası ilişki analizinde C3 katsayısı kullanılarak belirlenmiştir (Çizelge 3). Ki Kare testi sonucunda anakaya tipleri değişkeninden sadece kumtaşı ile istatistiksel anlamda ($p<0,05$) bir ilişki tespit edilmiştir. Ki Kare testiyle istatistiksel anlamda önemli çıkan kumtaşı değişkeninin C3 katsayısına göre ilişki yönü pozitif olarak bulunmuştur (Çizelge 3).

Çizelge 3. Ki Kare testi ve nitelikler arası ilişki analizine ait C3 katsayısı sonuçları

	A	B	C	D	Ki Kare	p	C3 Katsayısı
kireçtaşı	183	83	104	30	3,416	0,065	-0,1564
kumtaşı	153	113	62	72	4,537	*0,033*	*0,1974*
serpantinit	234	32	120	14	0,219	0,640	-0,0267
alüvyon	261	5	130	4	0,495	0,482	0,0178
çört	238	28	121	13	0,066	0,797	-0,0138
bazalt	264	2	134	0	1,031	0,314	-0,0122
kuvarsit	263	3	133	1	0,131	0,717	-0,0062

Son aşamada, Wilcoxon sıra istatistiği ve Ki Kare testi sonucunda geriye kalan değişkenler ile hedef tür arasında lojistik regresyon analizi uygulanmıştır. Saçlı meşe ile geriye kalan çevresel değişkenler arasında Backward LR seçeneği kullanılarak 2 aşama elde edilmiştir. Analiz sonucunda Çizelge 4'teki Hosmer – Lemeshow Test sonuçları incelenecek olursa aşama 2'nin önem seviyesi %5'in üzerinde çıkmıştır. Yani modeli oluşturan değişkenlerin birbirleriyle istatistiksel anlamda ilişkili olmadığı anlamı çıkmaktadır. Bu yüzden Hosmer – Lemeshow Testi sonucunda aşama 2 geçerli model olarak kabul edilmiştir. Öte yandan, lojistik regresyon analizi sonucunda elde edilen aşamaların denklemdeki hesaplanan değişken değerleri incelendiğinde de sadece aşama 2 içerisinde yer alan değişkenlerin önem seviyelerinin istatistiksel olarak anlamlı ($p<0,05$) olduğu görülmektedir. Bu durum Hosmer –Lemeshow Testinde olduğu gibi aşama 2'nin geçerli model olduğunu göstermektedir. Diğer bir deyişle, saçlı meşe türünün potansiyel dağılım alanlarının belirlenmesi amacıyla yapılan lojistik regresyon analizi sonucunda elde edilen aşama 2 test sonuçları itibariyle geçerli model olarak seçilmiştir (Çizelge 5). Elde edilen geçerli modeli yükselti, eğim ve radyasyon indeksi değişkenleri yapılandırmıştır. Bu değişkenler içerisinde yükselti ve radyasyon indeksi ile negatif, eğim ile pozitif yönlü ilişki göstermiştir (Çizelge 5).

Çizelge 4. Hosmer – Lemeshow testi sonuçları

Aşama	Ki Kare	Serbestlik Derecesi	Önem Seviyesi
1	11,883	8	0,157
2	15,436	8	0,051

Çizelge 5. Denklemdeki hesaplanan değişken değerleri

		Beta Değeri	Standart Sapma	Wald	Serbestlik Derecesi	Önem Seviyesi	Üssel Beta Değeri
Aşama 1	yükselti	-0,003	0,001	33,051	1	0,000	0,997
	eğim	0,057	0,015	15,107	1	0,000	1,059
	radyasyon indeksi	-0,967	0,346	7,786	1	0,005	0,380
	kumtaşı	-0,124	0,260	0,228	1	0,633	0,883
	Sabite	3,576	0,877	16,638	1	0,000	35,713
Aşama 2	yükselti	*-0,003*	0,001	37,011	1	*0,000*	0,997
	eğim	*0,058*	0,015	15,819	1	*0,000*	1,060
	radyasyon indeksi	*-0,940*	0,342	7,556	1	*0,006*	0,391
	Sabite	3,338	0,717	21,663	1	*0,000*	28,166

Saçlı meşe türünün dağılım modellemesini oluşturan değişkenleri içerisinde en fazla katkıyı eğim ve yükselti değişkenleri yapmıştır (Çizelge 6).

Çizelge 6. Modeli oluşturan değişkenlerin katkı oranları

	Katkı Oranı	En düşük C.I.	En Yüksek C.I.
yükselti	0,9967	0,9956	0,9978
eğim	1,0607	1,0308	1,0914
radyasyon indeksi	0,3886	0,1986	0,7604

Lojistik regresyon analizi sonucunda geçerli modelin eğitim ve test seti ROC (Receiver Operating Characteristic) eğrisi altında kalan alan değerleri sırasıyla 0,724 ve 0,714 olarak bulunmuştur. Modelleme aşaması sonucunda elde edilen geçerli modelin beta katsayıları lojistik regresyon denkleminde yerine konarak kestirim değerleri hesaplanmıştır. Daha sonrasında kestirim değerleri çalışma alanının tamamı için yaygınlaştırılmış ve haritalanmıştır (Şekil 1).
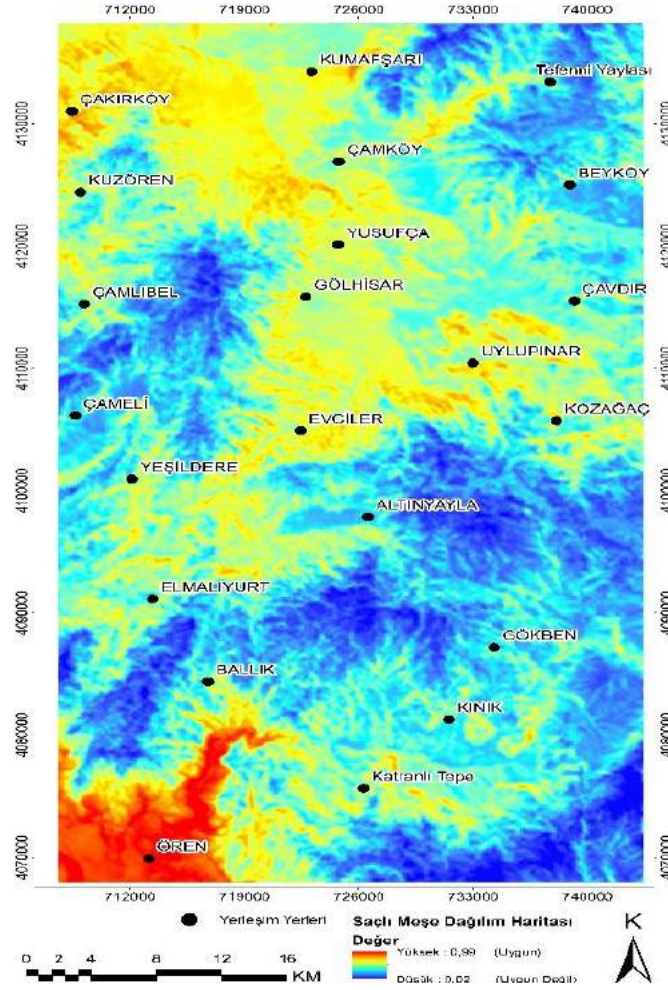
Şekil 1. Saçlı meşe türünün potansiyel dağılım haritası

4. Tartışma ve Sonuçlar

Bu çalışma Gölhisar yöresinde doğal olarak yayılış gösteren saçlı meşe türünün potansiyel dağılım modellemesi ve haritalanması amaçlanmıştır. Bu amaç doğrultusunda 20x20 m büyüklüğüne sahip 400 örnek alanda hedef türün var – yok verileri toplanmıştır. Hedef türün dağılım modellemesini gerçekleştirmek için çevresel değişkenler (eğim, radyasyon indeksi, topoğrafik pozisyon indeksi, yükselti, anakaya tipleri) kullanılarak lojistik regresyon analiziyle modellenmiştir. Son aşamada, elde edilen geçerli model yaygınlaştırılarak haritalaması gerçekleştirilmiştir.

Çalışmada modelleme aşamasına geçilmeden önce çevresel değişkenlerin kendi içerisindeki çoklu bağlantı problemini ortadan kaldırmak amacıyla Wilcoxon Sıra istatistiği testi, Ki Kare testi ve nitelikler arası ilişki analizi uygulanmıştır. Bu testler sonucunda sürekli veri özelliği gösteren değişkenlerden eğim, radyasyon indeksi ve yükselti, kategorik veri özelliği gösteren anakaya tiplerinden sadece kumtaşı değişkeni geriye kalmıştır. İstatistiksel sürecin son aşamasında saçlı meşe türünün dağılım modellemesi için geriye kalan değişkenler kullanılarak lojistik regresyon analizi uygulanmıştır. Analiz sonucunda, elde edilen modeli yükselti, eğim ve radyasyon indeksi değişkenleri oluşturmuştur. Modelleme aşamasının ardından geçerli modelin beta katsayıları lojistik regresyon denkleminde yerine konularak kestirim değerleri elde edilmiştir ve çalışma alanı için yaygınlaştırılarak haritalaması gerçekleştirilmiştir.

Saçlı meşe türünün potansiyel dağılım modelinde yer alan yükselti ve radyasyon indeksi değişkenleriyle negatif yönlü, eğim değişkeni ile pozitif yönlü bir ilişki gösterdiği bulunmuştur. Diğer bir ifadeyle, çalışma alanında saçlı meşe daha çok orta yükselti basamaklarında, orta eğim derecelerinde ve nispeten nemli bakıları potansiyel olarak tercih ettiğini söylemek mümkündür. Diğer taraftan, saçlı meşenin potansiyel dağılım haritası incelendiğinde, yörenin güneybatı ve kuzeybatı kısımlarının (Ören çevresi, Kumafşarı çevresi, Çakırköy çevresi, Yusufça'nın kuzeydoğusu, Uylupınar, Evciler, Elmalıyurt kuzeydoğusu ve Katranlı Tepe çevresi) hedef tür için en uygun alanları oluşturduğu görülmektedir. Belirtilen alanlara bakıldığında yaklaşık olarak 300 – 1250 m arasındaki yükselti basamakları, orta ve çok eğim dereceleri ve nispeten nemli bakılar saçlı meşenin potansiyel dağılımı alanlarını oluşturmuştur. Özellikle yörenin orta yükselti kuşağının üzerindeki, az ve orta eğimli ve çok güneşli bakıların olduğu yerler (Ballık mevkiinin kuzeydoğusu, Tefenni Yaylasının çevresi, Çameli'nin kuzeydoğusu, Katranlı Tepenin güneydoğusu, Altınyayla ve Gökben mevkiinin arasında kalan alan, Çavdır ve çevresi) hedef türün potansiyel dağılımı için uygun olmayan alanları temsil etmiştir. Özkan vd. (2006), Buldan yöresinde saçlı meşenin yetişme ortamı özellikleri üzerine yapılan çalışmada yörede saçlı meşe yükseltinin 600 m altındaki alanlar ve düz, az ve orta eğimli alanları tercih etmediği tespit etmişlerdir. Özkan ve Kantarcı (2008), tarafından yapılan çalışmada Beyşehir Gölünün batı kısmında 1200 – 1400 m arasında Meşe – Ardıç kuşağında saçlı meşenin yer aldığını belirtmişlerdir. Gülsoy vd. (2016), tarafından Vezirköprü yöresinde saçlı meşenin potansiyel dağılım modellemesi ve haritalaması yapılmıştır. Yapılan çalışmada elde edilen model sonuçlarına göre, 854 – 1056 m arasındaki yükseltiler, düşük yükseltilerde metakumtaşı anakaya tipinin olmadığı ve güney bakılar saçlı meşe türü için potansiyel alanları oluşturduğunu ifade etmişlerdir.

Saçlı meşe türü üzerine yapılan çalışmalar incelendiğinde benzer sonuçların elde edildiği görülmektedir. Saçlı meşe orman ekosistemi içerisinde ekonomik değerinin yanı sıra daha çok ekolojik anlamda önemli bir asli orman ağacı türüdür. Son yıllarda dünyada ve ülkemizde meydana gelen orman yangınlarının sayısında artış olmuştur. Orman yangınları ile mücadele kapsamında alınacak önlemlerin içerisinde karışık ormanların kurulması ve daha çok geniş yapraklı türlere ekosistem içerisinde yer verilmesinin gerekli olduğu bilinmektedir. Bu kapsamda bakılacak olursa saçlı meşenin yanmaya karşı oldukça dirençli bir tür olması orman yangınları ile ilgili ekolojik anlamda alınacak tedbirler kapsamında orman ekosistemi içerisinde türün dahil edilmesinin faydalı olacağı düşünülmektedir. Diğer taraftan, saçlı meşe sürgünden gelen bir tür olması nedeniyle yangından sonra ortama ilk gelen türler içerisinde yer almaktadır. Bunun yanı sıra, saçlı meşe kuvvetli bir kök sistemine sahip olması (Tzvetkova ve Kolarov, 1996), kuraklığa dayanıklı olması ve farklı toprak özelliklerinde dahil yetişebilmesi (Mayer, 1984) ve ekolojik tolerans aralığının geniş olması (Popović vd.,1997) yönünden ağaçlandırma çalışmalarında değerlendirilmesi gerek türlerden biri olarak karşımıza çıkmaktadır. Son olarak, Gölhisar yöresinde gerçekleştirilen bu çalışmada elde edilen dağılım modelinin sonuçları ormancılık alanında yapılması düşünülen faaliyetler için hedef tür ile ilgili model tabanlı ekolojik bilgiler sunması farklı çalışmalara entegre edilebilir ve elde edilen dağılım haritası özellikle ormancılık faaliyetlerini gerçekleştiren uygulamacılara pratik bilgiler sağlayacağı düşünülmektedir.

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Assessment of Physic-chemical Pollutants and Detergents from Urban and Industrial Discharge Waters in Lumbardh River

Sami Gashi[1], Vehebi Sofiu[2*], Shkelzim Ukaj[3]

Abstract: The aim of research of this paper is to offer all participants knowledge from filed of agents for washing and cleaning with look at their use as well as their impact on the environmental e special for polluting on river Lumbardhi in Prizren from the discharge waters that contain polluting chemicals and detergent ingredients. With the slogan "Chemistry in our daily lives - washing agents", it includes the knowledge on washing agents for the general opinion as well as the emancipation of consumers. During our study we analyzed the discharge water which comes from the urban and industrial area of Prizren, which has no prior treatment in some locations and in the fourth location now we think we will have better results as the water is undergoing treatment from the plant newly built and commissioned which is in the testing phase. The monitoring points of physico-chemical analyzes in our study were: Prevalla (L1), Reqane (L2), City Park (L_3) and Vlashnje L_4 sampling site. The first source, Prevalla, during the study served us as a comparison point to compare the degree of pollution with other points, with discharges with: detergent components (phosphors, perborates, LAB - sulfonate) and nitrogen compounds. According to the results obtained, it turns out that we have surface water pollution.

Keywords: Total phosphorus, LAB - sulfonate, Sodium triply phosphate, Ammonia ion NH_4^+, Nitrites.

1.Introduction

Managing surface water quality and reducing their pollution are important and complex issues. These concerns are further complicated by the discharge of liquid waste, mainly wastewater, untreated municipal and industrial liquid waste, and as a result, water quality damage is observed in the aquatic world as well. So, synthetic detergents include a wide range of washing agents such as: soaps, powder detergents, liquid detergents, etc. Unlike other pollutants, a synthetic cleaner, which is discharged into water, cannot be broken down by microorganisms and it generates oxygen bubbles in the water so it causes a rapid growth of algae but also reduces the oxygen in the water, which will say reduced oxygenated water ecosystems will support fewer individuals and fewer species living organisms.

This monitoring aims to assess wastewater contaminated by synthetic detergents and chemicals, in particular, used locally. Since in Kosovo all rivers are exposed to this pollution phenomenon, the Lombardh river that passes through the city of Prizren has been attacked by

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discharge waters without any prior treatment up to the L_4 sample from the wastewater plant that is in the testing phase. In this discharge water will be experimentally evaluated chemical pollutants such as: ammonia ion NH4 +, nitrite ion NO2 - and nitrates NO3 -, then detergent components such as: phosphorus compounds, LAB - sulfonate (linear alkyl benzene sulfonate) and sodium perborate. Phosphates and nitrates are found in wastewater and synthetic detergents. Phosphorus is an essential element for life, both as a nutrient for plant life and as a key element in the metabolic processes of all living things. Small increase in phosphates can result in a rapid increase in plant growth such as blue-green algae, water plants become overcrowded and die. When they die the bacteria decompose using oxygen. This process is called eutrophication, and can be enhanced by human activities.

2.Material and methods

The materials for our study are samples in four localities:

➢ Location of the source of the river Lumbardhë of Prizren, Prevalla (L $_1$). The main source of the river is located below the top of Mount Lumbardh (2640 m) at an altitude of 2360 m;
➢ Location of surface water along the flow in Reqane L_2;
➢ Construction site of urban and industrial discharge waters in the river Lumbardhë, City Park L $_3$;
➢ Rimi Sampling site of Lumbardh before its discharge in Drini i Bardhë, Vlashnje, L $_4$.

The source of the Lumbardhë river has served as a reference point to other monitoring points. During the study we treated the physico-chemical parameters and some of the components of detergents where their discharges in Lumbardhë are more pronounced. Lumbardhi of Prizren from the source to the point of demonstration L_3 has no treatment but in the demonstration of L_4 Vlashnje we think we are dealing with water treated before pouring into the Drini i Bardhë. Also, Vlashnje, serves as an assessment of all these discharges. In these monitoring points of physico-chemical analyzes in our study, was done the evaluation of chemical pollutants and detergents from discharged waters, ie:

❖ At Substances that may cause an increase in the rate of eutrophication of water [4], such as detergents containing phosphorus and nitrogen,
❖ Substances that impair the quality and appearance of water [4], such as tension active substances such as linear alkilbenzen sulfonate,
❖ Anca Substances for bleaching sodium perborate, a component of detergents, where boron as a toxic substance for aquatic life, originates from perborates.

The methods applied in the physico-chemical analysis of water quality in the monitoring points are based on the European Union directives on surface water quality and have been performed in the laboratory of the Hydro meteorological Institute of Kosovo and in the laboratories of UBT, Pristina. Based on the maximum allowed values of WHO, comparing their physico-chemical values with the values obtained from our laboratory analysis, we have reached the final results presented in Table 1 and diagrams, as well as the categorization of Lumbardh from polluting discharge waters.

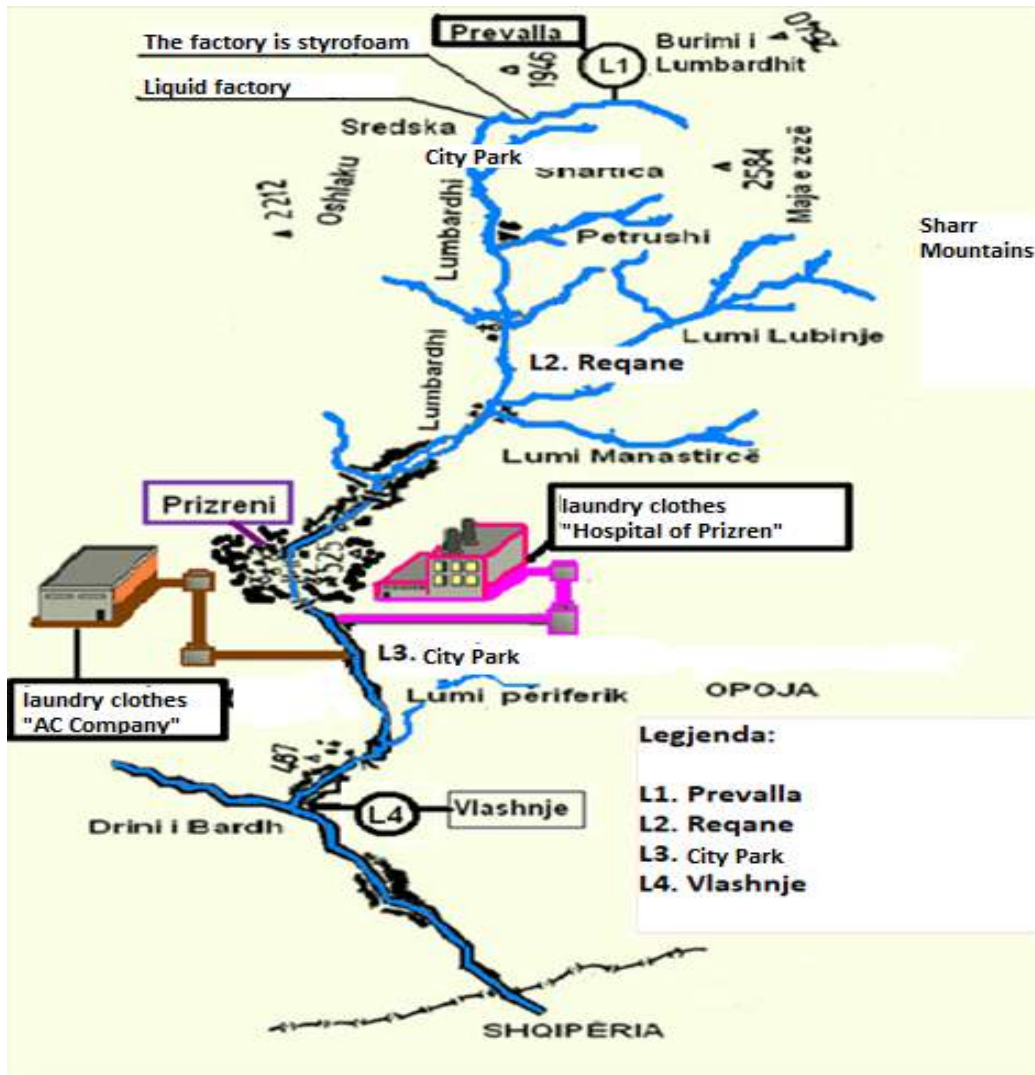**Map of sampling sites in Lumbardhi of Prizren and discharge waters**

Fig.1. Sampling site map

Some general physic - chemical characteristics of Lumbardh of Prizren and discharge waters

The obtained results of urban and industrial discharge waters in the Lumbardhë River are presented in Figure 1 and in the following diagrams 2, 3, 4. Three analyses were performed on the sample, where the average was calculated.

Overview 1. Final results of experimental analyses

No.	PARAMETERS	Symbol	Measuring unit	Sampling points that showed			
				Prevalla L_1	Recane L2	City park L3	Vlashnje L4
Physical parameters					**Date 27.03.2021**		
1	Time	00:00	h	9:15	9:40	11:30	13:35
2	Weather	Weather	Observation	Sunny	Sunny	Sunny	Sunny
3	Water temperature	T_U	^0C	7.4	11.4	16.8	10.0
4	Turbidity	Tur	NTU	0.0	18.50	24.51	1.8
5	Electrical conductivity	χ	µScm-1	128.26	418.2	594	138
6	Water soluble substances	WSS.	mg/L	64.07	209.13	297	79
Chemical parameters							
7	Hydrogen ion concentration	pH	0-14	7.50	7.27	7.45	7.19
8	Joni phosphate	PO_4^{3-}	mg/L	0.001	0.903	1.354	0.015
9	Phosphorus Total	P tot	mg/L	0.001	0.36	0.642	0.323
10	Phosphorus	P_2O_5	mg/L	0.0	0.639	1.140	0.84
11	Sodium tripolyphosphate	Na_3PO_4	mg/L	0.0	1.105	1.972	o.o3
12	Sodium perborate	$NaBO_3$ x H_2O	mg/L	0.0	0.337	1.012	0.035
13	LAB - sulfonates	$C_{12}H_{25}$ C_6H_5 SO_3H	mg/L	0.0	0.47	2.87	0.02
14	Joni i ammonium	NH_4^+	mg/L	0.034	3.321	7.125	o.163
15	Joni nitrite	NO_2^-	mg/L	0.004	0.039	0.634	0.021
16	Nitrates	NO_3^-	mg/L	0.02	0.89	0.49	0.07

Indicators of: phosphate ion, phosphorus as Penta phosphorus, and total phosphorus, as pollutants of discharge water in the river Lumbardh of Prizren
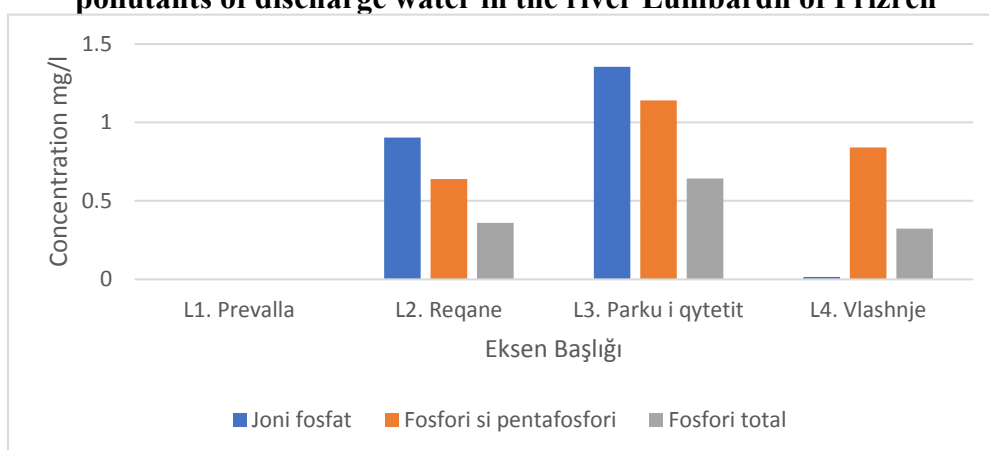
Fig. 2. Graphical representation of concentrations of: Phosphate ion, Phosphorus as Penta phosphorus and Total Phosphorus

Indicators of detergent components as pollutants of discharged water in the river of Prizren

Fig. 3. Graphical representation of concentrations of detergent ingredients: Sodium tripolyphosphate, Sodium perborate, linear alkyl benzenesulfonate

Concentrations of associated discharge water pollutants in the Lumbardh River of Prizren

Fig. 4. Graphic representation of pollutant concentrations: ammonium ion, nitrite ion, and nitrates.

3.Results and discussion
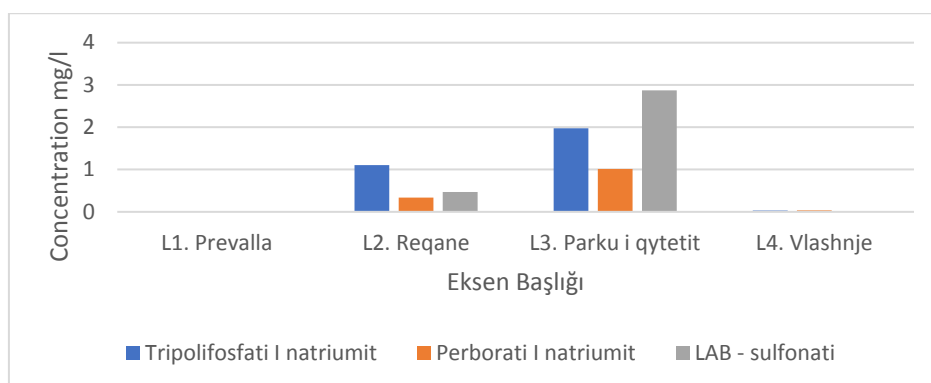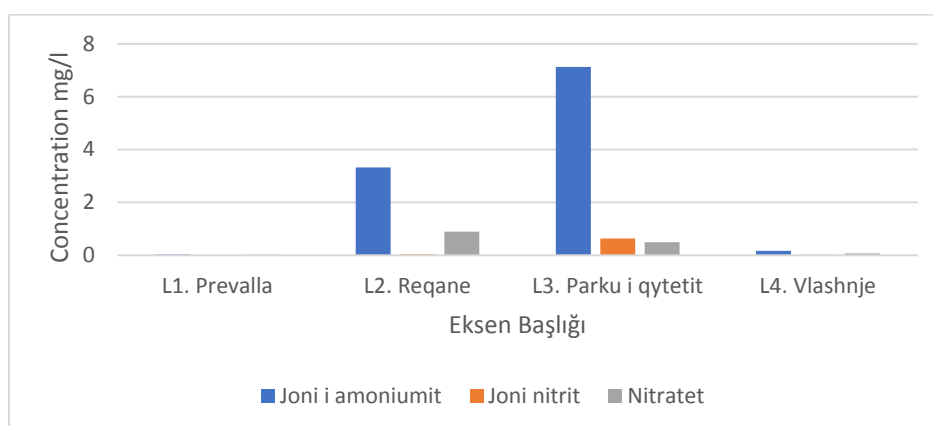
Referring to the data in fig. 2, 3, 4 as well as the indicators in Table 1: It is found that the concentrations of: phosphate ion phosphate ³, phosphorus as Penta phosphorus, total phosphorus, sodium tripolyphosphate, sodium per bate, linear alkyl sulfonate, then ammonium ion, nitrates, and nit from the site of the Lumbardh spring, Prevalla, (L1) to the sample L of concentrations as we are dealing with sampling site already where urban and industrial discharge waters are in the test phase of their treatment. Referring to the data presented in Table 1 and the indicators presented in Figures 2, 3,4: It is concluded that urban and industrial discharge waters belong to category II and III, while the values of concentrations at location L_1 and L_4 belong to category I and of II of surface waters.

4.Conclusion

1. In our study we have managed to qualitatively evaluate the monitoring of surface water from urban and industrial water discharges in the river Lumbardhë of Prizren.

2. In our study we have made the assessment of chemical pollutants and detergents from the discharge waters of the urban and industrial area in the Lumbardhë River.

3. Our results show that there is no treatment of discharge water before its discharge in Lumbardhë to the sampling site L_3 and instead of the demonstration L_4 we have surface water treatment and therefore at this point we have a reduction of pollutant values.

4. Our study shows that from discharge waters, especially industrial ones, we have exceeded the allowable values according to the indicators in table 1, namely:

> q. joint phosphate PO4- 3,
>
> b. total phosphorus,
>
> c. LAB - sulfonates,
>
> d. joint ammonia, NH4 +,
>
> e. joint nitrite, NO2-.

5. We have managed to compare our results obtained from physico-chemical analyzes of water quality in the sampling sites, which shows that the discharge waters belong to category II and III, which are indicators of pollution of the Lumbardhë River from these discharge waters.

6. These assessments of chemical pollutants and detergents from discharge waters have a special importance because it is one of the first studies of this type in the country, for the problem of the degree of pollution from detergents to determine the quality and categorization of Lumbardh of Prizren

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Investıgation Of Genotoxic Effect of Insecticide Chromagor At Goldfish (*Carassıus auratus*) After 10 Days Of Treatment

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Abstract: The main purposes of this study is to investigate the damage of DNA, through micronucleus test, after treatment of goldfish Carassius auratus for ten (10) days with insecticide chromagor. The micronucleus test have been used to evaluate genotoxicity of many compounds in polluted aquatic ecosystems. In order to investigate the frequencies of micronuclei and to assess the sensitivity of species, the results were compared with samples taken at the reference site and maintained in the laboratory, and fish treated with insecticide chromagor. Micronuclei can be formed as the result of aneugenic (whole chromosome) or clastogenic (chromosome breakage) damage. Our results show significant increase of number of micronuclei in erythrocytes of treated goldfish, compared with control group.

Keywords: genotoxic, insecticide, chromagor, mn test, fish.

1.Introduction

Different agricultural activities increase pollution, particularly in the aquatic environment, which is contaminated by various toxic chemicals from the discharge of waste waters and agricultural drainage.

The micronucleus test (MN-test), is one of the most applicable techniques to identify genomic damage in environmental animals. This procedure is technically easier and more rapid than the microscopic analysis of chromosomal aberrations in metaphase, considering also that many aquatic organisms have small chromosomes difficult to be analysed. This assay targets interphase cells of any proliferating cell population regardless of its karyotype. This is one of the reasons why this biomarker is widely utilised in environmental biomonitoring programmes.

Micronucleus (MN) are formed in the process of cell division and their expression can occur at different times after the DNA damage event, depending on the cell cycle kinetics and the mechanism of induction.

Erythrocyte MN test in fish was also widely applied for genotoxicity assessment of freshwater (Ergene,2007) and marine (Barsiene, et al, 2004; Cavas , 2005) environments in situ using native or caged animals following different periods of exposure. MN frequency in freshwater species was demonstrated to be a sensitive biomarker to detect genotoxic damage induced by urban or industrial discharges contaminated by different pollutant sources, such as petrochemical products, heavy metals and pesticides, and it allowed detection of pollutant concentration gradients (De Lemos, 2008).

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Material and methods

We used one species of fish, Carasius aureatus. The fish collected in the lake Stublina, south - east part of Kosovo, nearby city of Gjilan. After the capture, they were placed in aquariums with aerated tap water and taken to the laboratory. After acclimation to reduce the stress of capture and transport, fish treated in aquarium with insecticide for 10 day. Slides stained with May-Grunwald-Giemsa the frequency of, micronuclei estimated by counting 2000 cells. At each aquarium put 10 fish. Golden fish (Carasius aureus) chosen for this study because it is very adapt for investigation, also due to proven sensivity to genotoxic chemicals. Total number of fish is 50 fish. Concentration of insecticide chromagor it was in first aquarium, 0.05 ml insecticide chromagor / liter water, in second aquarium 0.04 ml insecticide chromagor/ liter water, in third aquarium 0.03 ml insecticide chromagor / liter water, in fourth aquarium 0.02 ml insecticide chromagor / liter water. Fifth aquarium use as control, without insecticide chromagor, contains only drinking water.

Experimental design: Fish Carasius aureus placed in five different aquaria, each one containing tap water (negative control) and four different aquaria containing different concentration of insecticide chromagor. The fish cut in caudal region and smears of peripheral blood made on free clean slides.

Slide preparation and staining: For each fish, prepare four slides. Slides coded, for each fish. The smears are air-dried and fixed in absolute ethanol for 25 minute. Treatment it was 10 day. After fixation, the slides were stained in aqueous Giemsa (diluted in distilled water ratio 1:3) for 45 minute.

Stained slides were rinsed thorouhly in distilled water,air-draid, and mounted with coverslip. For each individual-fish, counted 2000 erythrocyte, 500 per slides were scored under objective.

Results and discussion

The results of average number of micronuclei (per aquarium) in peripheral erythrocyte in fish species Carasius aureus treated for 10 days, are sumarised at the table 1. According to investigation (Tab.1) in fishes treated in concentration 0.05 ml insecticide/ l water is proved high frequency, statistically significant,compared with control group of fish. Also it was verified that frequency of micronuclei in peripheral erythrocite of Carasius aureus, increase proportionallity with increase of concentration of insecticide. Frequency of micronuclei at fish Carasius aureus in first aquarium with concetration 0.05 fungicid/ l water was about fivefould higher compared with control fish. Frequency of MN in second aquarium (with concentration of insecticide 0.04 ml/l water) was about fourfold higher and threefold in third aquarium compared with control fish.

According to these results (tab.1) it can be conclude that Carasius aureus exposed in different concetration of insecticide chromagor is verified the high frequency of micronuclei in concentration 0.05 ml insecticid/ 1l water (68 MN), 0.04ml insecticide (57 MN), 0.03 ml insecticid (31 MN) and 0.02 ml insecticid (23 MN), which are statistically significant compared with controll group (6 MN). Statistical analysis is done by statistical software SigmaStat version 3.4, 2004 year . Average number of micronucleus at treated fish in aquariums, with different concentration are 45 MN/2000 erythrocytes.

Table 1: Average number (per aquarium) of micronuclei(MN) in 2000 erythrocytes of peripheral blood of fish Carasius aureus after 10 days treatment in different concentration of insecticide chromagor

Aquarium **Each aquarium contain 40 litre drinking water and insecticide chromagor**	Average number of MN/2000 erythrocytes per aquarium
Aquarium 1(0.05 ml insecticid / l water)	**68**
Aquarium 2, (0.04 ml insecticid / l water)	**57**
Aquarium 3 (0.03 ml insecticid / l water)	**31**
Aquarium 4 (0.02 ml insecticid / l water)	**23**
Aquarium control	**6**
Average number of MN at treaed fish , without control group	**179 : 4 = 44.75 , 45 MN**

At table 2, we present the Statistical elaboration of MN, between aquariums. Only between aquarium 1 and aquqrium 2, there are no significant differences. While between other aquariums are significant differences(Table 2).

Table 2: Statistical elaboration of MN, between aquariums

Statistical elaboration , between aquariums	Significance -P
Aquarium 1(0.05 ml insecticid / l water) : 68 MN Aquarium 2, (0.04 ml insecticid / l water: 57 MN	**Ns ,** P = 0.333
Aquarium 1(0.05 ml insecticid / l water): 68 MN Aquarium 3 (0.03 ml insecticid / l water):31 MN	P = <0.001
Aquarium 1(0.05 ml insecticid / l water): 68 MN Aquarium 4 (0.02 ml insecticid / l water) : 23MN	P = <0.001
Aquarium 1(0.05 ml insecticid / l water): 68 MN Aquarium control :6 MN	P = <0.001
Aquarium 2, (0.04 ml insecticid / l water): 57 MN Aquarium 3 (0.03 ml insecticid / l water):31 MN	P = <0.001
Aquarium 2, (0.04 ml insecticid / l water): 57 MN Aquarium 4 (0.02 ml insecticid / l water) : 23 MN	P = <0.001
Aquarium 2, (0.04 ml insecticid / l water): 57 MN Aquarium control : 6 MN	P = <0.001
Aquarium 3 (0.03 ml insecticid / l water):31 MN Aquarium 4 (0.02 ml insecticid / l water) : 23 MN	P = <0.001
Aquarium 3 (0.03 ml insecticid / l water):31 MN Aquarium control : 6 MN	P = <0.001
Aquarium 4 (0.02 ml insecticid / l water): 23 MN Aquarium control : 6 MN	P = <0.001

Genotoxic evaluation of aquatic environment is a key mechanism for translating the principle of sustainable development into action. Genotoxic pollutants have been associated with gene mutation (mutagenic) and proliferation of tissue (carcinogenic potential). These chemicals are

capable of transforming the future generations if unchecked because of its potential to cause genetic hazards. Our findings are in concordance with the results of other authors, such as Shugart (1988), who investigated the genotoxic and neoplastic effects in both vertebrate and invertebrate organisms following metabolism of certain PAHs. The compounds selected for the environmental assessment, such effects were observed under laboratory conditions for B[a] P, phenanthrene, and naphthalene (Black et al., 1983; Hose et al., 1984; Hose, 1985; Shugart, 1988). Exposure of fish to PAHs leads to clastogenic effects resulting from DNA damage.

Biomarkers are biological responses to environmental chemicals at the individual level or below demonstrating departure from normal status (Walker et al., 2003). Biomarker responses may be at the molecular, cellular or 'whole organism' level.

Conclusion

Based on this investigation we can conclude that insecticide chromagor is genotoxic, as it were damage the chromosome of fish, seeing that chromosome are fragmented, and formed the small nucleic body called micronuclei. The averge number of micronuclei it was higher, at treated fish, statistically significant compared with control group(P<0.001).

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Environmental Education About Environmental Degradation

Voglushe Kurteshi[1*], Kemajl Kurteshi[2]

Abstract: Man with his activity to improve his life, at the same time has damaged the environment and technology have brought problems on the environment. Such issues include over population, greater pollution, the death and destruction caused by toxin spills and dumps, the massive deforestation of the world forest for commercial purposes, the harm caused by numerous oil spills, the destruction of wildlife habitats for human development amongst others. This paper investigates to what extent environmental education at school can explain environmental degradation, at pupils of class 9, in Kosovo. In this investigation have participated 120 pupils, 60 students belonged to gender females and 60 students to gender males. The survey was anonymous. The questioner had only one question: do students have environmental education

The relationship between environmental education and awareness of renewable energy technologies is even weaker. Our findings therefore suggest that environmental education should not be considered a magic wand in promoting environmental literacy among students.

Keywords: environmental, education, environmental, degradation

1.Introduction

Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions.

Environmental education does not advocate a particular viewpoint or course of action. Rather, environmental education teaches individuals how to weigh various sides of an issue through critical thinking and it enhances their own problem-solving and decision-making skills(https://www.epa.gov/education/what-environmental-education).

Over the past few decades, the international governmental and non-governmental organizations, policymakers, and education ministers have continually argued to enhance the environmental literacy of their citizens. Environmental education (EE) is considered one of the silver bullets in developing environmental knowledge, awareness, and attitudes at the student age already in order to encourage civic participation for sustainable development (Hungerford & Volk, 1990).

Broadly speaking, environmental knowledge includes both knowledge of and knowledge about the environment (Lucas, 1979). According to the Organisation for Economic

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Co-operation and Development (OECD, 2007), knowledge of can be defined as the student's ability to recall and understand a range of various environmental concepts, problems, and issues. Knowledge about can be described as the means (scientific inquiry) and goals (scientific explanations) of environmental education.

Environmental education "resonates with the model which refers to the environment in a holistic, human-oriented approach as interacting biophysical (organisms and life-support systems), social (people living together), economic (livelihood, money and services) and political (power, policy and decisions) dimensions" (Goldman, Assaraf, & Shaharabani,2013).

Science and socioscientific topics (SSTs) in the science curriculum play an important role in preparing students to participate in modern social life effectively, shape the society in a sustainable way, and become responsible citizens in the future (Wan & Bi, 2019).

Environmental Education is seen as a process of infusing into the educational system environmental content in order to enhance the awareness of the people on environmental issues at all levels of education

2. Material and Method

The research was conducted with a survey of 9-year school students regarding the environmental education. The study included 120 students. According to gender, 60 students belonged to gender females and 60 students to gender males. The survey was anonymous. The questioner had only one question: do students have environmental education.

3. Results and Discussion

The results are presented at table 1, where we can show that students have enough knowledge about environmental education.

We will present in table the answers of students. From obtained results we show that answer: " Better laws are needed to protect the environment", has been written 97. This answer dominated, compared with other answer. This answer is written two-fold more than answer "The greatest destroyers of the environment are humans, while animals have the least destructive effects" which has been written 44 times. The second answer who has been written frequently are "The main source of pollution is man" written 94 times. This answer also is written two-fold more than answer "The greatest destroyers of the environment are humans, while animals have the least destructive effects" which has been written 44 times.

And third answer ("Conservation of nature helps to protect the environment from loss, waste and harm") is written two-fold more than answer The greatest destroyers of the environment are humans, while animals have the least destructive effects" which has been written 44 times.

Table 1. The answers of students about environmental education about environmental degradation

Answers	How many times has it been written
Better laws are needed to protect the environment	has been written 97 times
The main source of pollution is man	has been written 94 times
Conservation of nature helps to protect the environment from loss, waste and harm	has been written 89 times
Natural environment consist of fields, mountains, buildings, bridges, monuments , roadways, .	has been written 81 times
Gradual increase of temperature in the earth is known as global warming	has been written 63 times
Environment is composed from plant, man and animals.	has been written 58 times
Waste is thrown everywhere	has been written 46 times
The greatest destroyers of the environment are humans, while animals have the least destructive effects.	has been written 44 times

The result in table 1, revealed that the students have a enough level of knowledge towards the environment in Kosovo .

The major causes of environmental degradation are population growth, industrialisation, changes in consumption patterns, and poverty threatening the dynamic equilibrium that could exist between people and ecosystems. In an effort to address these issues, environmental education for sustainable development (EESD) is emerging as an important approach to encourage students to conserve and protect the natural environment in their schools and in their neighbourhoods (Alexandar et al., 2014).

Environmental education traditionally has focused on changing individual knowledge, attitudes, and behavior. Concern about environmental education's lack of effectiveness in instilling an understanding of human's role within ecosystems has led us to an exploration of the relationship of learning and education to the larger social-ecological systems in which they are embedded(Tidball, 2011).

Environmental degradation is a global concern and an increasing one. Increasing population pressures, escalating consumption patterns and rapid industrial development are key contributors to this degradation.

There is a growing recognition that sustainable development policies, plans and actions have a better chance of being implemented when they are supported by an educated, informed public. The objective of this paper is to highlight the need for the inclusion of environmental education into the curricula of engineering studies in order to raise environmental awareness at an early stage in their careers. The main aim of such environmental education is to provide engineers with the background to environmental issues such that they develop solutions that take into account the needs of the natural environment and which seek to minimise any negative impact.

The environmental degradation is the deterioration of the environment through depletion of resources which includes all the biotic and abiotic element that form our surrounding that is air,

water, soil, pant animals, and all other living and non-living element of the planet of earth. The major factor of environmental degradation is human (modern urbanization, industrialization, overpopulation growth, deforestation, etc.) and natural cause (temperatures, fires, flood, typhoons, droughts, rising, etc.). The automobile and industries increase the number of poisonous gases like SO_x, NO_x, CO, and smoke in the atmosphere.

Environmental degradation is a very serious problem worldwide which covers a variety of issues including pollution, biodiversity loss, and animal extinction, deforestation and desertification, global warming, and a lot more (Tian et al., 2004).

The damage that we cause to the environment is currently not counted as a cost in economic and social terms.

Today, environmental education in world practice is a purposeful, systematic pedagogical activity, the purpose of which is the development of environmental education and environmental culture of children and adults (Boca, 2019; Jull, 2003). Environmental education gives a person environmental knowledge, skills, and abilities to work in nature. Moreover, environmental education helps to awaken in people high moral and aesthetic feelings, highly moral personal qualities, and a strong will in the implementation of environmental work (Boca, 2019).

5. Conclusion

The rapid development, especially construction, in country are degrading the environment through the uncontrolled growth of urbanization, expansion and intensification of agriculture and the destruction of natural habitats. One of the significant reasons for environmental degradation in Kosovo could be quick development of urbanization which is dramatically influencing the natural resources and condition. Must find the ways which can help to decrease the degradation of our environment

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Illegal Tea Consumption in Turkey and Its Effects on Human Health

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Abstract: Tea, which has been consumed in liquid form for thousands of years, is a beverage that comes after water in the use of non-alcoholic beverages and its consumption habits are increasing day by day. Tea plant, whose Latin name is Camellia sinensis It is both produced and consumed in various parts of the world. According to the World Tea Report prepared by the World Tea Committee; Asian countries account for 86% of tea production. Sri Lanka, which is one of these countries, produces 329 thousand tons of tea annually. Although this production in Turkey is 259 thousand tons, for various reasons; taste, density, etc. smuggled tea originating from Sri Lanka is provided to our country by legal or illegal means from abroad. Unfortunately, there are limited number of studies on the effects of this beverage type, which is called smuggled tea, on human health due to its features such as not having a legal production permit, uncontrolled production conditions, and unknown content. In our country, the consumption of this type of illegal tea, which is provided especially from the eastern parts, is quite remarkable in that region. Today, illegal tea consumption has spread not only in the eastern parts of the country, but also in almost every region of the country. Unfortunately, research on this subject is limited, and the content of illegal teas is unknown. In this context; It is of great importance to monitor such products, which are entered from the borders of the country, with stricter measures, to test the reliability of smuggled teas to be consumed as a result of various analyzes and to investigate their effects on human health.

Keywords: Smuggled tea, Sri Lanka, human health

1. Introduction

Shen Nung, who is believed to have been alive about 5000 years ago, has an important place in Chinese history and is known as the Red Emperor, one of the three rulers of classical Chinese medicine, compiled the first book of medicinal herbs, Pen T-Sao (2800 BC), and in this work he tried his best. He described the effects of 365 drugs. The tea was first made in BC. It is stated that Shen Nung found it by chance, after the tea leaves fell into the boiling water in 2737. After the leaves fell into the water, the mixture formed due to the formation of different colors in the water and the change in the taste of the water began to be consumed. The use of this mixture

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spread first to China and then to the whole world. Tea plant, known as *Camellia sinensis in* Latin , is the most consumed beverage in the world after water. Tea is produced in many countries such as India, China, Sri Lanka, Japan and Taiwan (1). According to the World Tea Report prepared by the World Tea Committee; Asian countries account for 86% of tea production. Sri Lanka is one of these countries with 329.000 tons of tea production. In this report, after Sri Lanka, tea production is followed by Kenya and India. Turkey is in the fifth place in this ranking. (2nd). The teas drunk in Turkey are of two types, usually grown in the Black Sea region and brought to the country from the Eastern region by legal or illegal means. Most of the teas used by many people in our country and called "Smuggled Tea" are Sri Lankan tea. The difference of this tea with a strong aroma from Turkish tea is the region where it is grown, the large leaves, the differences in smell and taste. In our country, the consumption of this type of illegal tea, which is provided especially from the eastern parts, is quite remarkable in that region. Today, illegal tea consumption has spread not only in the eastern parts of the country, but also in almost every region of the country. There are deficiencies in the production and control of these illegal teas, whose use has become widespread in Turkey, and it is not known whether residue analyzes such as pesticides and heavy metals have been made of these teas.

Tea plant, known as Camellia sinensis , belonging to the Theaceae family in herbal science, is a perennial herb that preserves its greenery in all seasons . There are two varieties of Camellia sinensi : Chinese tea (Camellia Sinensis) and Assam tea (Camellia Assamica) (3). There is a special tea group in some varieties of Camellia Sinensis plant. Tea in this group is obtained from buds and young leaves (4).

Tea is a type of plant that requires plenty of precipitation. It is grown in regions with an annual temperature average of 14 ºC, precipitation over 1200 mm and humidity of more than 70%. Especially during the harvest seasons, it is necessary to rain heavily and continuously. The tea plant, which cannot receive the expected precipitation, cannot show the desired development and thus the amount of product may decrease significantly (5).

The exact homeland of the tea plant is unknown. However, there are still differences of opinion on this issue today. There are different opinions and articles about the name of the tea plant and its homeland. While some views accept the Southwest regions of China as the homeland of tea, another view accepts the Northwest regions of India (6).

TEA IN THE WORLD AND IN TURKEY

According to FAO statistics, tea cultivation areas in the world reached 3,149,608 hectares in 2010, 3,412,539 hectares in 2011, 3,517,383 hectares in 2012, 3,521,220 hectares in 2013, and 3,779,382 hectares in 2014. In line with the same statistical figures, tea production in the world was 4,606,606 tons in 2010 (black tea, green tea and other tea varieties), 4,771,205 tons in 2011, 5,034,967 tons in 2012, 5,361,523 tons in 2013. and in 2014 it was 5,561,339 hectares. Turkey ranks 8th in the world in terms of the extent of tea agricultural lands, 6th in dry tea production, and 3rd in dry tea consumption (7).

Countrıes	Tea Regıons
Chınese	1.996
Indıa	604
Srı-Lanka	222
Kenya	203
Indonesıa	119
Vıetnamese	115
Myanmar	83
Turkey	76
Other Countrıes Total	382
Grand Total	3,800

Table.1 FAO 2014 data(8)

On the other hand, tea cultivation in Turkey is carried out as a small family business in the east of the Black Sea region in the provinces of Rize, Artvin, Giresun and Ordu due to reasons such as land structure, number of people, and difficulty in working conditions. Tea harvesting in Turkey can be done between April-May and October-early November, except for the winter season. Turkey is considered to be one of the countries that produce tea without being affected by tea pests due to climatic conditions and therefore without using chemical pesticides (9).

4. LEAK TEA AND ITS EFFECTS ON HUMAN HEALTH

These teas, which are defined as smuggled tea and illegally entered from the eastern parts of our country, are now widely consumed. Although tea production is high in our country, when we examine the reasons for consumers to prefer illegal tea, smell, color and taste differences can be listed. In addition, the low demand due to the high tea prices and the fact that smuggled teas can be bought unpackaged and as much as desired cause them to be preferred more by consumers.

According to a study; Pesticide analysis was carried out on smuggled teas from Iran and Sri-Lanka and 594 pesticides that could be found in it were examined. According to the results of the research; No pesticide residues were found. However, researchers reported that larger studies covering the entire region should be conducted in order to be able to make a clear judgment about whether the smuggled teas commonly used in the Eastern Anatolia Region contain pesticides (10).

According to another study; As material, a total of 15 commercial tea samples, 13 imported (smuggled tea) and 2 Rize black teas, were used. Heavy metal analyzes of these samples were made and heavy metal levels of Al, Cd, Ni, Co, Zn Mn, Cr, Cu, Fe, Pb were investigated. According to the results of the research; It was found that 15 samples had high Al heavy metal content. According to the World Health Organization, the maximum limit value for Cr has been determined as 1.3 ppm. According to the results of the analysis, 3, 5, 6, 9, 13, 14, 15 samples from 15 tea samples were below the allowable limit value, while the Cr content in the other samples exceeded the determined limit value. Pb average values were found to be

between 4.02-12.66 ppm. The lowest average Pb value was found in sample 11, and the highest mean value was found in sample 12 (leak tea). The limit of Pb content in tea leaves determined by the World Health Organization is 10 ppm. In this study, the fact that heavy metal values are highly variable and can affect human health is quite remarkable, revealing the importance of the subject (6).

3. Results

There are very few studies in the literature on the content of illegal teas, whose consumption is increasing in our country, and the results of the studies show the importance of this issue and a positive attitude towards further studies. In this context; It is of great importance that the relevant institutions analyze the contents of these products that may affect many human health such as heavy metals and pesticides, that the control in the areas where illegal tea is entered in the eastern parts of the country should be increased to the highest level, that studies should be carried out (increasing the demand) so that the tea produced in our country can reach the highest level in terms of quality. offers.

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Evaluation of The Activities of The Aerob Bacteria in Unpackaged Tobacco

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Abstract: The microbial communities of the oral fluid are in direct contact with tobacco smoke, which may thus affect these communities. Few culture-based studies have analyzed the effects of tobacco smoking on the oral fluid microbiota. Using bacterial culture we investigated whether tobacco smoking altered the microbial diversity of the oral fluid, focusing on aerobic and facultative anaerobic Gram-positive bacteria otherwise comprising of major pathogens. Among 10 oral fluid specimens collected in 8 tobacco-smokers and 2 controls, the diversity did not significantly differ with age and with sex. We isolated the human pathogen Streptococcus australis for the first time from oral fluid. Tobacco smoking significantly alters the saliva Gram-positive bacterial microbiota, including pathogens with potential implication in the pathogenesis of tobacco-related diseases.

Keywords: Smuggled tea, Sri Lanka, human health

1. Introduction

For many years, scientists have undertaken studies to define the chemical composition of green tobacco leaf, cured-fermented-stored tobacco leaf, and tobacco smoke with the intent of identifying chemicals that may pose a significant health risk [1–4]. An illustration has been prepared of the annual increase, from 1954 to 2005, in the total number of tobacco smoke chemicals that have been identified [4]. Today, there is a consensus of opinion that cigarette smoke consists of at least 5,300 different chemicals [4]. These chemicals are present in the complex aerosol that consists of a heterogeneous mixture of gas- (vapor-) phase and particulate- ("tar-") phase components [1–4].

Detailed listings of the chemicals in mainstream and sidestream tobacco smoke are available, and an assessment of their propensity for harm has been presented; a partial listing of references is included [1–4]. Most of the chemicals, toxicants, and carcinogens in tobacco smoke arise from the burning (pyrolysis) of the tobacco [1, 2, 4]. The potential for harm has also been studied for chemicals that do not arise from the burning of tobacco. The chemicals include metallic and nonmetallic elements, isotopes, and salts [1, 2, 4]. In addition, pesticides and other intact agrochemicals have been identified in tobacco smoke [1, 2, 4]. Also included in this tabulation of chemicals in smoke are menthol and flavorants [4].

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In 1985, Hoffmann and coworkers, who had studied the chemical composition of tobacco smoke for many years, began formulating a list of chemicals that were designated as biologically active, carcinogenic, cocarcinogenic, or tumorgenic, reviewed previously in [4]. The tabulation was revised and became the basis for the list of "Hoffmann Analytes" [4]. In 1985, different working groups met to identify those chemicals in tobacco smoke that are most likely to be carcinogenic to humans as defined by criteria of the International Association for Research on Cancer (IARC), an intergovernmental agency forming part of the World Health Organization, and by the US National Toxicology Program (NTP) [1, 2, 4].

2. The Changing Cigarette

The identification, classification, and concentration of the various chemicals in cigarette smoke have been challenged by changes in the design of cigarettes. A comprehensive review of "The Changing Cigarette" was published by D. Hoffmann and I. Hoffmann in 1997 [5].

Subsequently, other investigators addressed changes in cigarettes and their potential for risk [6–12]. By way of example, a partial tabulation of changes in cigarette includes (a) increased cigarette length (85 mm king sized and extra long "120's") and, for some brands, reduced circumference (23 mm "slim" cigarettes), (b) variation in the blend of natural tobaccos of diverse types, country of origin, and curing processes, relative percent tobacco leaf (lamina) versus tobacco ribs/stems, and tobacco weight per rod, (c) incorporation of manmade tobacco, sometimes referred to as reconstituted or "sheet" tobacco, (d) introduction of additives to the tobacco (casings) that include diverse flavorings (licorice and honey), humectants to retain tobacco moisture, and menthol to ameliorate smoke irritation and promote smoking acceptance by youngsters and "starters" (e) addition of ammonia, to facilitate "freebasing" the nicotine to enhance the pharmacological effect (impact), (f) application of diverse glues and printing ink, (g) configuration of diverse cigarette filter materials (cellulose acetate, paper, or combination of both), (h) alteration of filters with charcoal and schemes whether the carbon was dispersed throughout the filter plug or retained in a filter cavity, (i) variation in filter design (filter length, fiber packing/crimping, fiber density, and filter ventilation) to effect tar delivery (full flavor cigarettes versus ultralight low-tar cigarettes), (j) paper type, paper porosity, with burn accelerators to promote burning, or with modifications to reduce the propensity for sustained burning and affect a "fire safe" designation, and (k) diverse methodologies to reduce "tar" and nicotine yields in mainstream smoke of cigarettes that have been smoked mechanically [6–12].

The topic of "The Changing Cigarette" has been addressed and summarized in a recent report of the Surgeon General entitled "How Tobacco Smoke Causes Disease" [13]. A review of the scientific and medical literature has shown that (a) changing cigarette designs over the last five decades, including the introduction of cigarette filters and low-tar cigarettes, have not reduced overall disease risk among smokers and may have hindered prevention and cessation efforts, (b) there is insufficient evidence that novel tobacco products reduce individual and population health risks, and (c) the introduction of novel tobacco products that are marketed as reduced-risk cigarettes may encourage tobacco use among youngsters. These changes have challenged tobacco policy and regulation [13].

3. Results

The results of this literature review have documented that the tobacco microflora has been the subject of many studies by investigators of tobacco industry and academic communities. During the last 50 years, there has been an imbalance, however, in the attention devoted to addressing the identification and propensity of the harm of tobacco- and tobacco-smoke-associated

chemicals and in the attention devoted to characterizing microbes and microbial-derived factors.

Ample information has accumulated to suggest that microbes and microbial-derived factors may contribute to the health risks of smoking and smokeless tobacco products. Moreover, the microbes may facilitate microbial colonization of the mouth and airway, the induction of chronic inflammation through the activation of diverse leukocyte subsets, alteration of the tissue microenvironment, and microbial-toxin-induced pathologies.

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