2023

ABSTRACT BOOK

INTERNATIONAL SOIL SCIENCE SYMPOSIUM on

SOIL SCIENCE & PLANT NUTRITION

(9th International Scientific Meeting)

8 – 9 December 2023

Samsun, Türkiye

Editors
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Dr.Coşkun GÜLSER
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Preface I

Dear Colleagues,

On behalf of the Federation of Eurasian Soil Societies (FESSS), it is with immense pleasure that we extend a warm welcome to you at the "Soil Science and Plant Nutrition" (EURASIAN SOIL Symposium 2023). Your presence at this esteemed event is truly gratifying, and we trust that the discussions on soil science within this forum will hold significant importance.

Representing our country at this symposium is a great honor for us, and we are eager to contribute to the wealth of knowledge that will be shared during this gathering. The symposium, themed "Soil Science and Plant Nutrition," will delve into applied research and innovative approaches, aiming to integrate scientific insights into the physical, chemical, and biological properties of soil, plant nutrition, and fertility mechanisms across various ecosystems.

Covering a spectrum of scales, from the molecular to the field level, the symposium promises to foster diversity in experiences, opinions, and scientific knowledge. It serves as an excellent platform for learning, discussing the latest advancements in soil science, and establishing meaningful contacts and collaborations with fellow participants. Emphasizing a multidisciplinary approach to soil science, the symposium places particular importance on key research, the latest technological developments, and fundamental concepts related to soil.

We are grateful for the opportunity to host such distinguished individuals, and we look forward to the rich interactions that will take place during the scientific sessions. The symposium not only aims to showcase recent achievements in soil science but also provides numerous opportunities for fruitful interactions among scientists from both public and private sectors.

Once again, thank you for joining us at this significant event. We anticipate a symposium filled with enlightening discussions and meaningful exchanges that will contribute to the advancement of soil science and plant nutrition.

Best regards,

Prof.Dr.Garib Mamadov
President, FESSS

Preface II

Dear Distinguished Colleagues and Esteemed Guests,

Good morning, and it is truly an honor to stand before you as the president of the Federation of Eurasian Soil Science Societies (FESSS) for the opening of the 9th Annual International Symposium on "Soil Science and Plant Nutrition." I extend my warmest greetings to all of you, and I am delighted to welcome each one of you to this significant gathering.

Firstly, I would like to express my sincere gratitude to our co-organizer, the Erasmus Mundus Joint Master Degree in Soil Science Programme (emiSS), and its dedicated Coordinator, Dr. Coskun Gulser, for their invaluable collaboration and presence here today. This marks a special occasion as it is the second symposium co-organized with emiSS, highlighting the growing partnership between our organizations. FESSS continues to be an associate partner in the emiSS Project, fostering a stronger bond within the realm of soil science.

I extend a warm welcome once again to our esteemed colleagues from the University of Agriculture in Krakow, Poland, Agricultural University Plovdiv in Bulgaria, and participants from various countries who have joined us for this symposium. This annual event serves as a platform to facilitate international collaboration and exchange of knowledge, and I believe it has played a pivotal role in fostering connections and advancing our collective understanding.

The theme of this year's symposium is "Soil Science and Plant Nutrition," a subject of paramount importance in addressing the intricate relationships between soil, plants, and the environment across diverse ecosystems. Our goal is ambitious - to integrate scientific backgrounds, applied research, and innovative approaches. Discussions will span physical, chemical, and biological soil properties, mechanisms of plant nutrition and fertility, all studied at different scales, from the molecular to the field level.

This symposium provides a unique opportunity to delve into recent advances in soil science, offering a multidisciplinary approach with a focus on basic research and the latest technological developments in soil science and plant nutrition. The sessions will underscore fundamental soil concepts, and I am confident that the interactions among scientists from various public and private institutions will be both enriching and enlightening.

The Federation of Eurasian Soil Science Societies, with its distinctive organization comprising eight member countries, stands poised to contribute significantly to the critical areas of Soil Science and Plant Nutrition. Since its establishment in 2012, FESSS has grown to include Romania, Kyrgyzstan, Bosnia & Herzegovina, and Serbia Soil Science Societies, all united by the common goal of sharing knowledge and bridging the gap between soil science, policy-making, and public awareness at both national and international levels.

I extend my heartfelt appreciation to the program steering committee for curating an outstanding lineup of speakers, and my gratitude goes to each speaker and moderator for their invaluable contributions. Lastly, I thank all the participants for your unwavering support, and I eagerly anticipate your active engagement in the discussions that lie ahead. Wishing you all a most enjoyable and productive symposium.

Thank you.

Prof.Dr.Rıdvan Kızılkaya
Chair, Organization Committee

Preface III

Dear participants,

It is my great pleasure to joint the International Soil Symposium on "Soil Science & Plant Nutrition" as a part of organizing committee. This symposium has been organized by the Federation of Eurasian Soil Science Societies (FESSS) collaborating with ERASMUS MUNDUS Joint Master Degree in Soil Science (emiSS) programme. I would like to express my grateful thanks to FESSS and Prof. Dr. Ridvan Kizilkaya, who is the Chairman of the Symposium, giving us chance to represent emiSS programme in this International Symposium. The emiSS programme has been founded with the support of the Erasmus+ Programme of the European Union and organized by a consortium of the four Universities: Ondokuz Mayıs University (OMU-Türkiye), University of Agriculture in Krakow (UAK-Poland), Agricultural University Plovdiv (AU-Bulgaria) and Jordan University of Science and Technology (JUST-Jordan) in 2019. The aim of emiSS programme is to raise and meet the need for qualified and skilled soil scientists at the master level through a higher educational programme under the training in soil science, soil management, soil fertility, soil ecosystem with intercultural competence and language skills. So far, there are 74 international emiSS programme students from the different geographical parts of the World, So far 34 of them graduated from the emiSS programme. Some of emiSS students will be among us and make an oral presentation during the Symposium. I think that the mission of the symposium will be successful with sharing novel access that fulfill the needs of applications in soil science and plant nutrition field, and identifying new directions for future researches and developments in soil science area. At the same time, this symposium will give researchers and participants a unique opportunity to share their perspectives with others interested in the various aspects of soil science. I hope this symposium also will be helpful to increase young soil scientists' knowledge and their presentation skills front of the audience. Once more I would like to thank the organizing committee and all participants to their helps and sharing their scientific knowledge in this symposium.

Prof.Dr.Coşkun Gülser
emiSS Coordinator


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CONTENTS

International Soil Science Symposium on
"SOIL SCIENCE & PLANT NUTRITION"
8 – 9 December 2023 / Samsun, Türkiye

Contents

Contents

Contents

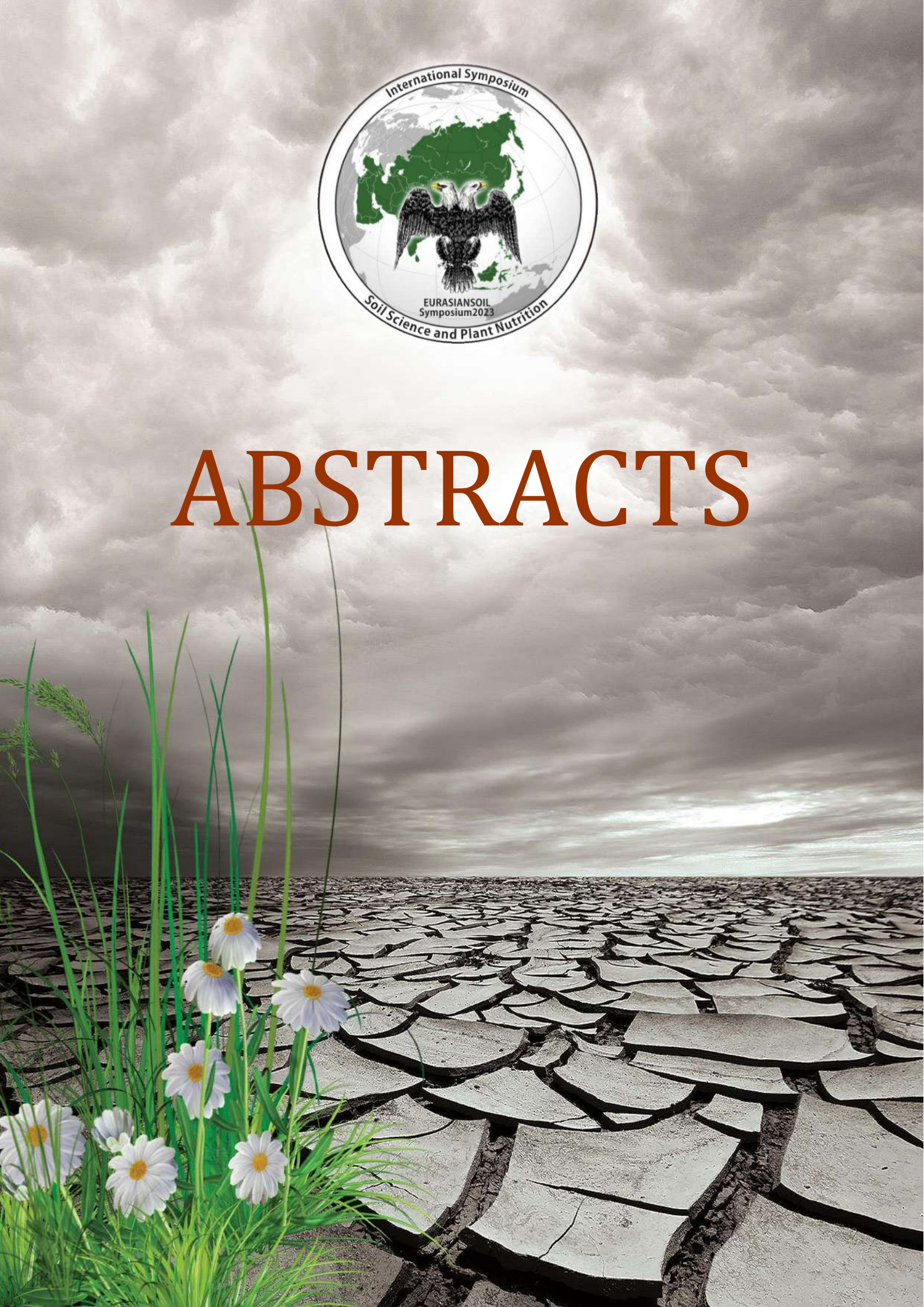
Contents

International Symposium

EURASIANSOIL
Symposium2023

Soil Science and Plant Nutrition

ABSTRACTS



International Symposium on "Soil Science and Plant Nutrition"
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Historical evolution and heavy metal pollution in Solvay Park, Krakow (Poland): A comprehensive analysis

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ABSTRACT

Solvay Park, located in the southern part of Krakow, specifically in Podgórze, District IX, Borek Fałęcki, unfolds along Kościuszkowcy Street, bordered by Niemcewicza and Żywiecka streets to the west and south-west, and the Urwisko stream to the east. Owned by the Kraków commune since 1990, the park spans 11.0139 hectares, divided into three distinct sections named "pine," "wet," and "forest." Established in the 1920s and 1930s through the efforts of the Solvay Soda Plant, the park has undergone historical transitions, enlargements, and is currently maintained by the Krakow Municipal Board. This study investigates the potential impact of heavy metal pollution in Solvay Park's soils, considering its historical connection to the adjacent Solvay soda plants. The park's infrastructure includes open spaces, asphalt paths, recreational facilities, and sports amenities, reflecting its multifaceted character. From the park's creation to expansions in 2007, it has evolved as an integral part of the city's green landscape, providing a therapeutic environment for residents. The historical context of Borek Fałęcki, Solvay soda plants, and the dynamic development of soda production in the 20th century sets the stage for understanding Solvay Park's origins. Initially cared for by Zakłady Sodowe Solvay and later by municipal bodies, the park remains a testament to industrial history and environmental adaptation. The post-WWII era saw the establishment of a kindergarten for plant employees' children on the park grounds, further integrating it into the community. As Solvay Park is not fenced, the community has marked wild paths, reflecting local residents' engagement with the park's natural beauty. The diverse flora, including Scots pines, hornbeams, ash trees, and various shrubs, contributes to the park's ecological richness. Birds, squirrels, and other wildlife inhabit the park, creating a vibrant ecosystem. The study addresses the interplay of natural and anthropogenic factors contributing to heavy metal pollution, recognizing the park's unique historical and ecological context. By combining historical documentation, contemporary soil analyses, and an understanding of Solvay Park's evolution, this research aims to unravel the complexities of heavy metal concentrations in an urban green space with an industrial past. The findings will inform strategies for sustainable land management, pollution mitigation, and the preservation of Solvay Park's ecological integrity.hazards.

Key words: Heavy Metal Pollution, restoration, Soil Pollution, Urban Parks, Soil Analysis, Environmental Adaptation, Sustainable Management

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Results from the previously neglected element silicon

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ABSTRACT

The study is in the field of Regenerative Agriculture. The main task was the optimization of crop nutrition, especially silicon fertilization. The neglected element silicon (Si) turns out to be extremely necessary and useful for the development of crops, protects them from diseases and climate changes, suppresses toxic elements, and thus increase plant biomass accumulation, and yield. Field trials were conducted on two soils with contrasting soil properties with the application of mineral fertilizers - N, P, K, and Si. Each year, large amounts of silicon are irreversibly leached from the soil. A comparison of the amount of soil silicon determined at sowing and harvesting shows a depletion of this nutrient. Yield models were derived and optimum silicon levels were determined. It is recommended for soil and crop scientists to conduct extensive studies on the influence of silicon on different crops.

Key words: Field experiment, silicon, uptake, yield

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The relationship between soil and insects in the ecosystem

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ABSTRACT

Soil plays a critical role in ecosystems as an essential component that supports biodiversity and influences ecosystem functions. Soil supports the healthy growth of vegetation by providing nutrients necessary for plant growth. In addition, soil plays an important role in the water cycle, contributing to water retention, filtration and storage. Insects are important organisms that play an essential role in soil ecosystems and support biodiversity. Soil has a wide range of physical, chemical and biological properties as one of the key components of an ecosystem. These properties can affect the distribution and activities of insect populations living in soil. There are many positive contributions that insects make to the soil. In view of the important role of soil in the ecosystem, insects have beneficial roles in soil aeration, decomposition of organic matter, soil mixing, improvement of soil structure, activation of soil micro-organisms and prevention of soil erosion. In addition, the level and population of insects in the environment is significantly affected by the different properties of the soil. In particular, soil properties such as physical structure, chemical structure, PH value, soil wetness and soil temperature are very important. In this article, the various relationships of insects with soil were investigated. In addition, the effects of soil structure and properties on insect populations are emphasized.

Key words: Soil, Insects, Natural equilibrium, Biodiversity.

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Effect of liquid organic manures on growth of Amaranthus

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ABSTRACT

Vegetables are heavy feeders of nutrients and requirement mainly met through inorganic fertilizers. Injudicious application of chemical fertilizers can result in decline of soil health and environmental pollution.in order to address this problem, organic manure addition can be taken. It has been observed that applying organic manures in combination with chemical fertilizers increases crop yields. The present study was carried out to test the effect of liquid organic manures on the growth and yield of amaranthus. Amaranthus (Amaranthus sp. L) is the most important leafy vegetable cultivated and consumed in Southern India. The experiment was carried out at College of Agriculture, Vellayani, on amaranthus variety Co-1 during April -May 2023. Liquid organic manures like panchagavya, vermiwash, fish amino acid and egg amino acid of one per cent foliar spray are analyzed against water spray. The experiment was laid out in Completely Randomised Design (CRD) with five treatments and four replications. Organic liquid manures were applied after 15 Days After Transplanting. The study reveals that the panchagavya proves to be an effective fertilizer which contributes the growth of plants. This organic liquid manure enhanced the growth parameters of amaranthus like plant height, girth, number of leaves, yield etc. It was also observed that the plants treated with panchagavya were disease resistant and pest resistant. Thus, panchagavya can be used as a plant growth booster. So, using organic spray with inorganic fertilizer promotes environmentally sound and sustainable agricultural practices.

Key words:

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Approaches to comprehensive soil health assessment for sustainable agriculture

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ABSTRACT

Soil health is the holistic measure of a soil's capacity to function as a living ecosystem, encompassing its physical, chemical, and biological attributes that collectively support plant growth and maintain environmental sustainability. Soil health assessment systematically examines quantifiable properties, including physical, chemical, and biological indicators, to guide decision-making processes related to planting, fertilizing, and soil management practices. Given the inherent challenge of direct measurement of soil health, its evaluation necessitates the examination of quantifiable properties, including physical, chemical and biological indicators. This review paper focuses on a) indicators for soil health assessment: physical, chemical, and biological b) contemporary soil assessment techniques and recent technological progressions and c) prevailing challenges and future directions in soil health assessment. Our analysis emphasizes that effective soil health assessment considers physical, chemical, and biological properties, tailored to specific agroecosystems. Looking forward, the paper anticipates future advancements that may involve the integration of technologies such as remote sensing and infrared screening which ensures quick and efficient estimation of indicators, acquisition of accurate soil data and precise data interpretation, thereby contributing to the advancement of the field of soil health assessment for promoting the resilience of agricultural systems.

Key words: Assessment, Indicators, Management Practices, Soil Health

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Determination of spatial distributions of some macro nutrient element contents of Engiz Sub-basin soils

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ABSTRACT

This study was carried out on an area of approximately 4758 ha in the Lower Engiz basin located in the Ondokuz Mayıs District of Samsun Province. Based on the paddy farming carried out on almost flat lands within the basin soil, it was aimed to determine the contents of total nitrogen (N), available phosphorus (P) and available potassium and map their spatial distribution. In the study area, total 250 sample points were determined by the grid method. These samples were brought to the laboratory and analyzed. According to these results, spatial distribution maps of the N, P and K in the study. In order to generate distribution maps, it was made by evaluating 15 different semivariogram of three different interpolation methods in the GIS program. When the obtained geostatistical data were evaluated with the FAO classification, it was determined that they were sufficient in terms of N, P and K. It has been observed that the areas of the area where intensive agricultural production is carried out are especially high in terms of N but sufficient for P and K elements. When evaluated in terms of agricultural activities, it has been determined that nitrogenous fertilizers can be applied as top dressing in the periods when the plant needs it, and since the amount of alluvial and clay in the area is high, P and K fixation may occur and there is no need for these fertilizations.

Key words: GIS, Interpolation, Nutrient elements, Soil Maps

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The potential of kitchen waste compost and *Bacillus megaterium var Phosphaticum* on improving soil health

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ABSTRACT

There is a huge amount of kitchen waste in the world, produced by restaurants, households, and other institutions. The plastic-bagged food waste that is dumped on the land contributes to global warming. It can release methane (CH4) and carbon dioxide (CO2) into the atmosphere due to microbial activity under uncontrolled anaerobic conditions in landfills. This has become one of the major issues contributing to harmful gas emissions, leachate contamination of groundwater, loss of landfill capacity, and pest infestation. On the other hand, kitchen waste has the potential to contain a high level of organic matter and nutrients when processed into compost. In addition, kitchen waste compost reduces environmental risks by minimizing the use of chemical fertilizers. Priority should therefore be given to the reuse, recycling, or recovery of waste in agriculture. The latest research findings confirm the role of kitchen waste compost in nitrogen uptake. In addition to nitrogen, phosphorus is an essential nutrient for plant growth, which plays a role in the biological function of plant cells. The use of phosphorus fertilizers often hurts soil and environmental health. Soil microorganisms are considered a good indicator of soil quality and play an important role in agroecosystems by recycling soil nutrients and maintaining and improving the soil microbiome. The use of biological fertilizers can be an alternative solution. Bacillus megaterium var. Phosphaticum is a bacterium capable of releasing inaccessible forms of phosphorus and converting them into plant-available phosphates and also has a positive effect on the soil environment.

Key words: Bacillus megaterium, Kitchen waste compost, Soil Health, Sustainable agriculture.

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The effect of zinc application on corn yield and leaf zinc content

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ABSTRACT

Zinc (Zn) deficiency appears to be the most widespread and frequent micronutrient problem, especially resulting in severe losses in yield and nutritional quality. In this study, Zn fertilizer (with ZnSO4.7H2O containing 21% Zn) was applied to corn plants from soil application by seed sow at rate of 0 - 0.25 - 0.5 - 1 - 2 - 4 kg Zn da-1 doses. The experiment was established as a randomized complete block design with 6 Zn applications and 3 replications. At the end of the experiment, Zn applications were found that increased significantly the grain yield and leaf Zn content of corn compared to the control ($P<0.01$). The highest corn grain yield and leaf Zn content were found at 0.5 Zn kg da-1 dose as 906.33 kg da-1 and 47.93 mg kg-1. Also, it was increased the percentage of Zn use of the corn grain yield and leaf Zn content at 0.5 kg Zn da-1 dose, respectively as 14.43% and 142.32%. At the end of the study, the optimal rate of Zn application dose for achieving significant grain yield response, were obtained from 0.5 kg Zn da-1 dose, it was recommended as a soil application dose on corn plant.

Key words: Zinc, soil application, corn, grain yield, leaf Zn content.

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Effect of vermicompost and biochar applications on plant growth under water stress

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ABSTRACT

In the twenty-first century, the problems caused by the change in the world climate, drought and the increase in the world population have revealed nutrition problems along with the decrease in agricultural lands. The term stress is defined as an external factor that has a negative effect on the plant growth, and stress factors are examined under two headings: biotic and abiotic factors. Living groups such as viruses, bacteria and nematodes constitute biotic stress factors. Abiotic stress factors include some factors such as drought or water stress, salinity, radiation, high temperature, high heavy metals and frost. Water stress is one of the leading factors that causes significant yield losses in agricultural production and negatively affects plant growth and development. The most important abiotic stress factor is water stress. Various methods are used to combat water stress. Since reclamation work requires many years, there has recently been a transition to environmentally compatible organic fertilizer applications. Among these applications, the use of vermicompost and biochar become very common recently. Vermicompost is created by decomposing vegetable and fruit waste and passing it through the digestive system of worms. Biochar is a carbon-rich, decomposition-resistant and porous material obtained by changing biomass of plant and animal origin under high temperatures in an oxygen-free or low-oxygen habitat. This review focused on determining the effect of vermicompost and biochar applications into growing media on the growth and development of plants subjected to water stress.

Key words: Abiotic stress factors, Biochar, Vermicompost, Water stress.

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Silphium perfoliatum L. – A promising plant for phytoremediation of heavy metal-contaminated soils

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ABSTRACT

Silphium perfoliatum is a perennial plant in the Asteraceae family that occurs naturally in eastern and central North America. It is resistant to drought and frost, which makes it suitable for growing in Europe on anthropogenic soils that are not used for growing other crops. This review analyzes the phytoremediation potential of Silphium perfoliatum, biomass yield, and quality and characteristics as feedstock for bioenergy production (calorific value and chemical composition) and other purposes (in medicine and pharmacology). The heavy metal content in different plant organs during the growing season have been established. The bioaccumulation factor (BAF), translocation factor (TF), metal uptake (MU), and removal efficiency (RE) of Zn, Cd, and Pb by Silphium perfoliatum were determined. Preliminary results indicate that Silphium perfoliatum may be an alternative in the phytoremediation of heavy metal-contaminated soils.

Key words: Anthropogenic, bioaccumulation factor, heavy metal, phytoremediation, translocation factor.

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Soil health and crop productivity: Implications of integrating biofertilizers with chemical fertilizers

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ABSTRACT

Conventional farming systems rely on the use of chemical fertilizers, herbicides, and pesticides. The unintended consequences of these chemicals range from reduced soil fertility to soil degradation, biodiversity loss, and environmental pollution, among others. Despite these well-reported adverse environmental impacts of chemical fertilizers, their role in achieving high crop yields cannot be disregarded. Biofertilizers provide a promising alternative by promoting nutrient cycling, supplying vital micronutrients to crops that are often deficient in conventional chemical fertilizers, and minimizing the environmental footprint of conventional agriculture. The aim of this article is to review the recent research on the combined application of biofertilizers and chemical fertilizers towards optimization of their use for improving soil health and crop productivity. This approach could bring a balance to the need to achieve high crop yields in an environmentally sustainable manner and reasonable prices for everyone, minimize the high use of chemical fertilizers, and enhance soil health.

Key words: Biofertilizers, chemical fertilizers, crop productivity, nanobiofertilizers, nutrient management, soil health.

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Soil reclamation after the oil extraction industry

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ABSTRACT

The extraction of crude oil is a vital sector of the world economy, supplying raw materials and energy. But it also presents serious environmental problems, degrading ecosystems and soil. The interaction between soil, plant, and water is disrupted, and soil toxicity is increased as a result of oil spills, leaks, and inappropriate waste disposal from these oil extraction industries. The effects affect human health, wildlife, and the integrity of the ecosystem as a whole. Soil reclamation operations are essential to addressing these problems. In order to remediate these contaminated soils, a variety of techniques are used. One such technique is bioremediation, which uses microorganisms to break down and neutralize pollutants in the contaminated soil. More recently, enzymes from the microorganisms have been extracted and injected directly into the soil for remediation. The use of plants to break down, absorb, or immobilize oil contaminants. Physical and chemical remediation includes chemical oxidation, excavation, thermal desorption, soil washing, and electrokinetic soil processing. These methods seek to lower oil concentrations, stop more contamination, and improve soil quality. In conclusion, a variety of elements must be considered when selecting the best soil reclamation methodology, and successful remediation that frequently necessitates a combination of approaches. Adherence to local legislation and consultation with environmental specialists are crucial when organizing and carrying out oil extraction-related soil reclamation projects. This review seeks to explore in detail the various techniques used for rehabilitating soil and restoring ecosystems after oil extraction activities.

Key words: Oil Companies, Petroleum, Reclamation, Soil health.

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Geospatial technology-based soil erosion and sediment yield models

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ABSTRACT

According to the most recent estimates, almost 36 billion tons of soil are lost year worldwide. Globally, soil erosion is leading to serious environmental concerns such as land degradation, downstream sedimentation, dam siltation, and loss of ecological value. Numerous soil erosion and sediment transport models exist, each with unique advantages and disadvantages. Soil erosion models differ in terms of output production, accuracy, complexity, and input requirements. In general, there are three types of models for soil erosion and sediment: conceptual, physical-based, and empirical. Especially for local or regional forecasting, the Revised Universal Soil Loss Equation (RUSLE) becomes a common option for estimating long-term rates of erosion. However, its limitation in routing sediment through channels restricts its applicability to small areas. Despite its effectiveness in modeling soil loss from storm events, the Watershed Erosion Prediction Project (WEPP) model has limitations because of its non-GIS interface and specific data needs. The soil and Water Assessment Tool (SWAT) model provides extensive evaluation by taking into account the whole hydrologic system of the watershed, spatial variability, and in-depth knowledge of numerous aspects. A model's suitability for a given project is determined by factors specific to it, including cost, project objectives, availability of input data, and simulation of either continuous or single-event processes. geospatial technology plays a crucial role in understanding and addressing soil erosion and sediment yield issues. These models' capacity to forecast the possibility of erosion and the transport of silt is improved by the application of geographic information sciences and data from remote sensing. This review paper shows the limitations and advantages of different soil erosion and sediment yield models.

Key words: Geographic Information System, Soil Erosion, Sediment yield.

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Determination of soil quality index for production of hazelnuts in Ordu Provinces, Türkiye

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ABSTRACT

Land suitability analysis is a prerequisite to ensure optimum utilization of the available land resources for sustainable agricultural production. Identification of the soil quality index for a given crop is required for effective and better production. Therefore, the main aim of this study is to determine the soil quality index for hazelnut production by integrating key soil properties, nutrients and land parameters in Ordu provinces using a standard scoring function and analytical hierarchy process. A total of 22 soil parameters were determined from 461 soil samples based on the respective principles. The soil quality index was determined by using the integrated soil quality index method which considers standard scoring function and Analytical hierarchy approach. These soil parameters were grouped into four major classes, soil physical properties, soil chemical properties, nutrient content, and land parameters. The soil quality index was calculated both in linear and nonlinear scenarios. The results of the study revealed that the highest SQI value obtained was 0.83, which indicates areas with higher slopes and shallow soil depth are more suitable for hazelnut production. About half (49%) of the study area is under moderate to highly suitable range of suitability. The SQI classification ranged from "Very low" to "highly suitable" based on the Jenks' optimization techniques in ArcGIS, providing valuable insights into land suitability for hazelnuts in the region.

Key words: Analytical hierarchy process, Hazelnuts, Soil quality index, Soil quality indicator.

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Digital soil mapping in Türkiye: Insights from a systematic bibliometric analysis

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ABSTRACT

The research objective aimed at determining the diversity within the heterogeneous environment naturally located the soil, which is the focal point of soil survey and mapping science, remains persistent. Nowadays advancements in information processing technology and the increasing abundance of open accessible earth observation data, the rise in digital representation of soil formation factors enables this process to be carried out inclusively, encompassing its quantitative uncertainties. Therefore, Pedometrics, as a scientific discipline, focuses on a wide array of research questions globally, analyzing regional research orientations significantly. This study aims to evaluate the scientific outputs obtained from the Web of Science (WOS) database about digital soil mapping through bibliometric analysis, with a focus on Türkiye. The 38 studies related to "digital soil mapping" that encompassed the years 2018 to 2023 and were associated with "Turkey" or "Turkiye" in the countries/region section were exported from the WOS database under the "topic" section (searching title, abstract, author keywords, and Keywords Plus). The selected 22 publications authored by individuals with a minimum of two publications on the subject were subjected to bibliometric analysis using the open-source VOSviewer 1.6.20 software. The results indicated the presence of publications in the index concerning the increasing trend since 2018. Co-authorship-based outcomes highlight the existence of international integration. The bibliometric analysis revealed that more than 10 researchers generated two or more scientific outputs, while the results of the co-occurrence-based analysis provide insights into the focused topics for future studies. The results facilitate Turkish scholars working in this field to reference regional studies and gain rapid access to pertinent information.

Key words: Bibliometric Analysis, Challenges, Digital Soil Mapping, Insights, Pedometrics, Soil Science.

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Addressing soil salinity in Bulgaria: Challenges and innovative solutions

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ABSTRACT

Soil salinization, impacting more than 800 million hectares of land globally, is a significant concern in Bulgaria, with natural and anthropogenic factors contributing to the problem. This issue affects approximately 1% of the country's total land area, including 35,500 hectares affected by natural salinization and 25,000 hectares influenced by industrial and drainage activities. Soil salinization in Bulgaria primarily results from intensive irrigation and tectonic events like earthquakes. Climate change and extended summer seasons have further increased salinity levels, as drier soils accumulate higher salt concentrations. The effects of soil salinity in Bulgaria are far-reaching, affecting plant growth, soil structure, water dynamics, and the cultivation of roses, a significant contributor to the country's economy. To address this issue, the objective of this study is to propose a range of proven solutions to reduce or eliminate salinization in Bulgaria. Researchers have also proposed several innovative solutions to tackle this problem among which chemical amelioration with chalk has proven to be an effective method. However, this method is expensive and laborious. Therefore, cultivating halophytic crops (deep-rooted salt-tolerant plants) offers a sustainable approach to lower groundwater levels and combat salinization. These innovative approaches provide a comprehensive framework to tackle soil salinization in Bulgaria, safeguarding agricultural productivity.

Key words: Anthropogenic factors, Chemical amelioration, Drainage, Halophytic crops, Salinization.

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Determination of Landslide Susceptibility with the Fuzzy-Analytical Hierarchical Process- Andırın Example

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ABSTRACT

Landslide susceptibility is a term that expresses the probability of a landslide disaster occurring in a region. Producing susceptibility maps before a landslide occurs in any region is important in terms of recognizing geological hazards in advance and managing topographic processes in a more controlled manner. In the study; Landslide susceptibility map of Kahramanmaraş's Andırın district was obtained by using slope, aspect, elevation, major soil groups, rainfall amount, normalized difference vegetation index (NDVI), distance to fault lines, distance to the stream, distance to the road, lithology and land use parameters. Priority values were obtained by weighting the evaluated parameters with Fuzzy AHP and landslide susceptibility was evaluated in 5 classes: very low, low, medium, high and very high. As a result of the study, approximately 19% of the area was evaluated as high and very high, and approximately 10% was evaluated as low in landslide susceptibility classification.

Key words: Andırın, landslide, Fuzzy AHP, geographic information systems, land use.

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Impacts of biochar on tropical soil quality: A Review

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ABSTRACT

Biochar has gained considerable attention due to its potential for soil health improvement, fertility enhancement, and positive effects on both soil quality and crop productivity. Multiple nutrient deficiencies together with severe soil quality degradation are regarded as the major constraints on highly weathered soils that hinder sustainability of agriculture in a tropical region. Several research studies have reported significance effect of biochar on improving properties of tropical soils. This review article aims to discuss the effects of biochar on tropical soil quality based on selected soil quality parameters (SOC, pH, total N, BD, MWD, porosity, FC). Various type of biochars have found to improve soil quality of typical highly weathered soils. Biochar hold potential to rejuvenate degraded tropical soil. The properties of both biochar material and recipient soil should be considered carefully prior to application

Key words: Biochar, Soil Quality, Tropical soils.

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Acidic soils amelioration; Past, current and future direction for sustainable agricultural productivity

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ABSTRACT

Soil acidification is increasingly hindering sustainable Agricultural productivity and a major driver of soil degradation. The effects of soil acidity overlap influence on nutrients availability and toxicity of harmful elements. Hence, playing key roles in crops yield and quality. This has become more worrying by the need to increase food production to meet demands of increasing world population and changing climates. Several approaches have been adopted to ameliorate these effects, notably mineral lime has been the predominantly used. This paper employed three key techniques 1) Systematic literature mapping; 2) Snowballing and 3) Systematic literature review; to critical review acidic soils ameliorants; past, current and future direction for sustainable Agricultural productivity.

Key words: Ameliorants, Climate, Soil acidity, Sustainability.

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Humic and fulvic acids and their role in sustainable agriculture

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ABSTRACT

Currently, one of the biggest challenges for agriculture is to reduce the dependence on chemical fertilizers, in order to preserve soil health and fertility but to retain expected crop yield. The prolonged use of mineral fertilizer was justified by higher and consistent crop yield, but the chemicals turn out to be one of the major underground water and soil pollutants. The replacement of chemical fertilizer in agriculture would require different approaches depending on factors such as: soil type, climate conditions, management systems, available machinery, and financial resources. Among the available options for chemical fertilizer`s reduction is application of humic and fulvic acids. The aim of the current review paper is to discuss the most important characteristics of humic and fuvic acids and their role in sustainable agriculture. Humic and fuvic acids are natural components of soil organic matter, but they can be extracted from various sources. The application of humic and fuvic acids is related to their positive effect on plant growth through stimulation of plant`s biochemical pathways and acquisition of nutrients. One of the important advantages of humic substances is that they can be combined with organic fertilizers and could substitute chemical fertilizers. It is expected that the application of humic acids in agriculture is about to increase, especially if the non-renewable resources like brown coal (leonardite) and peat which are used for their production are replaced by sustainable sources based on agricultural or food wastes.

Key words: Biostimulants, humic substances, renewable resources, soil health.

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Organic matter pros and cons in soil: An overview

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ABSTRACT

Organic matter profoundly influences soil and plant dynamics, with both advantageous and potential drawbacks. Positively, it serves as a nutrient reservoir, enhancing soil fertility and structure, promoting microbial activity, and augmenting water retention. This leads to improved plant growth, resistance to drought, and reduced soil erosion. However, challenges include the risk of rapid decomposition causing nutrient imbalances, the potential hosting of pathogens, and the introduction of weed seeds. Additionally, excessive organic matter in poorly-drained soils may induce anaerobic conditions, while nutrient leaching in sandy soils can impact water quality. Careful management practices, such as proper composting and attention to soil drainage, are crucial to harness the benefits of organic matter while mitigating potential drawbacks. This comprehensive review examines the advantages and disadvantages associated with the presence of organic matter within soil ecosystems.

Key words: Organic matter, soil fertility, hosting of pathogens, proper composting.

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Effects of groundwater salinity on soil salt accumulation and pH values for sweet maize under shallow groundwater depths

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ABSTRACT

Controlling saline groundwater at shallow depths increases the risk of salt accumulation in the root zone, leading to increased salinization and reduced agricultural productivity. Understanding how saline groundwater affects salt accumulation in the root zone is of great significance for the sustainability of agriculture and use of freshwater resources. Therefore, the present investigation was conducted during the 2019-2020 growing season in Samsun, Black Sea region of Türkiye, on sweet maize in a drainable lysimeter under rain-shelter conditions. The study investigated the effects of three groundwater depths (30, 55, and 80 cm) and three groundwater salinity levels (0.38, 5.0, and 10.0 dS m^{-1}) on the dynamic changes in soil salinity and pH at different soil depths at the end of the maize growing season. The results showed that soil salinity was remarkably changed by lowering the groundwater depth under all groundwater salinity conditions. Besides, soil salinity ranged from 3.9 to 21.9 dS m^{-1} for 30 cm groundwater depth, from 2.7 dS m^{-1} to 8.9 dS m^{-1} for 55 cm groundwater depth, and from 1.2 dS m^{-1} to 6.9 dS m^{-1} for 80 cm groundwater depth. The soil pH values varied between 7.6 - 8.1 at all groundwater depths. The higher salt accumulation rate (80.23%) was observed at 15 cm soil depth under combination of 30 cm groundwater depth and 10 dS m^{-1} groundwater salinity. However, the lowest salt accumulation rate (3.41%) was found at 15 cm soil depth under 80 cm groundwater depth and 0.38 dS m^{-1} groundwater salinity conditions. Finally, controlling the groundwater at a depth of 80 cm with a salinity level equal to or less than 5.0 dS m^{-1} will be beneficial for decreasing soil salinity risk and ensuring environmental safety and sustainable agriculture.

Key words: Soil salinity, sweet maize, shallow groundwater, sustainable agriculture, salt accumulation.

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Microplastics in soil: A critical review of their effects on soil quality parameters

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ABSTRACT

Microplastics (MPs) have emerged as a significant environmental pollutant, with particles measuring less than 5 mm in diameter introduced into the environment through various pathways. This review aims to systematically analyse the effects of microplastics on different soil properties, summarizing the current knowledge on the occurrence and characteristics of microplastics in various soil environments. MPs have been found to alter the fundamental properties of the soil biophysical environment, with the extent of impact dependent on the type, size, shape, and concentration present in the soil. Specifically, MPs affect the physical properties of soil, including soil aggregate stability, bulk density, porosity, and water-holding capacity. Furthermore, the impact of MPs on soil fauna is evident, leading to a reduction in microbial activity and diversity in the soil. It is noteworthy that different types of microplastics exhibit varying effects on the soil, encompassing both positive and negative outcomes. These effects can cascade through soil food webs, influencing microbial functioning, nutrient cycling, and the overall soil ecosystem. By shedding light on the potential of MPs to alter fundamental soil properties and their subsequent implications for soil ecosystems, this review aims to provide a comprehensive understanding of the effects of MPs on soil quality parameters.

Key words: Microplastics, Soil fauna, Soil pollution, Soil properties, Physical properties of soil, Soil quality parameters.

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The effects of *Azotobacter Chrococcum* inoculation on some microbiological characteristics in soils with different organic waste added

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ABSTRACT

In this study analyzed, with a greenhouse test, the impact of Azotobacter chroococcum indigenous isolate inoculation on the microbial respiration and microbial biomass C content of soils with different organic waste added. For this purpose, wheat straw, rice straw, tobacco waste, soybean stem were used as organic waste while RK49 race was used as the indigenous A.chroococcum isolate. 5% over dry weight doses of organic wastes was added to loamy soil within pots of 5 kg, and afterwards, the soils were inoculated adding 10 ml of A.chroococcum isolate from liquid culture (109 CFU/ml). The seeds of wheat (Triticum aestivum) were planted manually to each pot (15 pieces/pot). The test lasted for 124 days. The microbial respiration (BSR) and microbial biomass C (Cmic) contents of soil samples obtained from each pot was determined at the end of harvest, and changes in microbiological characteristics of soils caused by the applications were analyzed. At the end of the experiment, it was determined that the BSR and Cmic content of the soils increased considerably as a result of the application of different organic materials. It was also determined that the BSR and Cmic content increase of the soils inoculated with A.chroococcum RK49 isolate besides different organic wastes was higher than that of soils without inoculation. While the highest BSR content was attained in tobacco waste application in soils without A.chroococcum RK49 isolate inoculation, the highest Cmic content was determined where A.chroococcum RK49 was inoculated with tobacco waste.

Key words: Organic waste, Azotobacter chroococcum, soil respiration, microbial biomass carbon.

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Supervised classification of sentinel-2A MSI data using GIS-based support vector machine and random forest algorithms

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ABSTRACT

Determining the land use/land cover classes' current distributions and analyzing the changes in land use/land cover are the fundamental aspects of the studies made in many fields such as economy and socio-cultural. For this reason, land use/land cover needs to be classified systematically and produced at certain standards. With this study, we aimed to apply support vector machine (SVM) and random forest (RF) classification algorithms based on geographical information systems (GIS) for Ladik district. For the classification process, high resolution Sentinel-2A MSI was used to create 6 different land use/land cover classes as ''water bodies'', ''forests'', ''heathlands'', ''bare rocks'', ''agricultural lands'' and ''artificial surfaces''. As a result, it has been observed that both SVM and RF classification algorithms gave the same results for overall accuracy (86%) and kappa coefficient (0.83). Within the context of our study, both SVM and RF classification algorithms achieved the highest precision (SVM:1.00, RF:1.00) and F1-score (SVM:0.98, RF:0.94) for the ''water bodies'' class. Simultaneously, the sensitivity (recall) metric exhibited its peak values for the ''artificial surfaces'' class in both SVM (0.96) and RF (0.96) classifications. The study's findings suggest that Sentinel-2A MSI, in combination with SVM and RF classification algorithms, provides reliable results for monitoring land use/land cover for the study area.

Key words: Sentinel-2A MSI, Random Forest, Support vector machine, Supervised classification, Land use/land cover classification, Geographical information system.

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Estimation of weathering indices and determination of effective soil properties

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ABSTRACT

Soil formation: It occurs as a result of dynamic events such as physical disintegration of rocks and minerals, their decomposition by chemical and biological events, and the recombination of some decomposed materials to form new compounds. Weathering indices are widely used in in situ formations and are also evaluated in determining soil development and soil fertility status. However, determining these parameters is long and laborious. For this purpose, in the study; Using the basic soil properties of soils formed on sedimentary rocks, soil properties effective on Chemical Alteration Index (CIA), Chemical Weathering Index (CIW) and weathering indices were determined. Additionally, using these features, predictability was examined with artificial neural networks (ANN). Soil properties affecting the CIA index were determined as Mg, K, organic matter, pH, silt, CaCO3. In CIW, these features were detected as Mg, silt, EC, CEC and clay. In prediction with ANN, both indices were predicted with approximately 91% accuracy. As a result of the study, it was demonstrated that weathering indices, which are difficult to determine, can be predicted by artificial neural networks using basic soil properties.

Key words: Soil formation, pedotransfer functions, parent material, machine learning.

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A review on the potential of biochar to abate toxic level of copper and manganese for plant growth

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ABSTRACT

Metal contamination in agriculture is becoming increasingly common throughout the globe. Metals such as copper (Cu) and manganese (Mn) are essential part for plant metabolism in trace amount. It is only when these metals are present in bioavailable forms at excessive levels that they have the potential to become toxic to plants. Adsorption of heavy metals on carbonaceous materials i.e., biochar has received considerable attention to remove toxic metals due to its large surface area and high porosity. It is important that we understand the toxicity responses of plants to heavy metals so that we can utilize appropriate dosage of biochar in the rehabilitation of contaminated areas. This article details the toxic symptoms of Cu and Mn contaminated soil on green leafy vegetables and the potential of biochar to retain and limit the plant uptake of heavy metals (Cu, and Mn) present in the soil at toxic level. Based on research achievements of biochar remediation of heavy-metal-contaminated soils in recent years, it is found that the effect of biochar on heavy metal mobility and bioavailability includes two conflicting aspects: immobilizing heavy metals to reduce bioavailability or mobilizing heavy metal to increase bioavailability. The adsorption mechanisms of heavy metals on biochar include physical adsorption, ion exchange, electrostatic interaction, complexation and precipitation. At concentrations of 100 to 200 p.g L^{-1}, Cu disturb metabolic processes and growth. Copper toxicity often causes foliar interveinal chlorosis, the leaf becoming necrotic with increasing exposure. In Mn toxicity, symptoms include chlorosis of older leaves, necrotic spotting and a symptom on young foliage known as ìcrinkle leafî. It is found that application of biochar decreased the concentrations of Cu and Mn in cilantro by 42.5%, and 34.3% respectively as compared to control.

Key words: Abatement, Biochar, Heavy metal, Toxicity.

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Synergistic effects of bio-char and other eco-friendly fertilizers on soil health and plant productivity

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ABSTRACT

Soil deterioration is a result of intensive agricultural soil cultivation that uses toxic chemicals to raise productivity in order to fulfill the rapidly rising demand for food. This highlights the necessity for sustainable soil management. Applying bio-char to agricultural soils has gained a lot of interest lately since it has been shown to have a number of positive effects on improving soil quality as a soil conditioner and plant productivity as a fertilizer. Additionally, it serves as an adsorbent to remove pollutants from the soil and promotes greenhouse gas mitigation by increasing the soil carbon pool; yet, by itself, bio-char typically lowers plant N availability. Given that the effectiveness of bio-char is dependent on a number of variables, including feed stock, soil type, biotic interactions, and temperature during production, it may potentially prove to be harmful in certain situations. These issues might be resolved by using bio-char in conjunction with either organic N sources or Plant Growth Promoting Microbes (PGP-Ms) as bio-fertilizers. An excellent source of nitrogen and microbes that are vital to soil and plants are other eco-friendly fertilizers prepared out of several agricultural wastes and macro-micro-organisms. Therefore, the purpose of this review paper is to investigate the combined application of bio-char and other eco-friendly fertilizers for improving soil health and plant productivity in an unsuitable situation involving soil pollution and nutrient scarcity. This review study also hopes to pave the way for upcoming scholars by providing an understanding of the field that requires investigation.

Key words: Greenhouse Gas, Bio-fertilizers, Sustainable Soil Management, Soil Carbon.

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Investigating the impact of NPK fertilizer and seed rates on barley 'Celilabad-19' production in the arid conditions of Gobustan, Azerbaijan

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ABSTRACT

This study is based on field trials conducted over a three-year period on the "Celilabad-19" barley variety in the Gobustan region. The research aims to address a significant knowledge gap by investigating the impact of varying NPK fertilizer application rates and seed quantities on barley yield and soil nutrient availability. The Gobustan district, characterized by distinct climate patterns and evolving agricultural practices, provides a complex setting for barley cultivation, particularly in arid regions like Azerbaijan. The study focuses on Chestnut soils, known for their moderate drainage and fertility levels, which play a pivotal role in shaping barley yield and quality in the region. Climate change introduces uncertainties in temperature and precipitation patterns, emphasizing the need for adaptive agricultural approaches. The role of agricultural irrigation gains prominence in ensuring a consistent water supply for crops in these semi-arid climates. Through a randomized complete block design with four replications, the study explores the responses of the "Celilabad-19" barley variety to different NPK fertilizer application rates and seed quantities. The experimental design includes varied seed rates (120 kg/ha, 140 kg/ha, and 160 kg/ha) and NPK fertilizer doses (30 kg/ha, 45 kg/ha, and 60 kg/ha). Results from the field trials reveal significant dependencies of above-ground biomass on irrigation and fertilizer norms during plant development phases. The absence of fertilization during the summer growing season led to a variation in above-ground biomass, with notable increases observed with mineral fertilizer applications. The influence of seed rate and fertilizer norms on biomass was particularly pronounced during heading and full maturity phases. This study contributes valuable insights into sustainable barley farming practices in the Gobustan region, crucial for addressing challenges posed by changing climatic conditions and evolving agricultural landscapes.

Key words: Barley cultivation, NPK fertilizer, Seed rates, Celilabad-19 variety.

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The pathogenicity of *Bipolaris sorokiniana* and *B. spicifera* in wheat plants and the effect on plant development

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ABSTRACT

Bipolaris sorokiniana (Sacc.) Shoemaker is one of the major causes of root and crown rot, causing significant yield and quality losses in wheat in the world. The study examined four isolates of *B. sorokiniana* isolated from wheat plants, and seven of *Bipolaris spicifera* isolates in terms of disease severity, root length, leaf length and biomass. For this purpose, the seeds of the Altındane wheat variety were surface disinfected and allowed to germinate for three days. Two sterile papers were placed inside the nine-cm-diameter petri, and the papers weted. Isolates were inoculated in a potato dextrose agar medium, and 10 pieces were placed on Petri, cutting discs of six mm in diameter from the cultures. The germinated seeds are also grounded on the fungus discs. Ten days later, the developing plants were evaluated. A second repetition of the experiment was done 15 days later. The evaluation resulted in the highest disease severity of isolates of *B. sorokiniana* 32, 37, 40 and *B. spisifera* 2 and 45 compared to control. When the root length was studied, it was determined that *B. spicifera* isolate 2 affected the roots most, but that inoculated plant isolates 67 and 46 were into a different class, with roots developing better than controlled. *B. sorokiniana*'s 32 and *B. spicifera*'s 62 isolates have also been found to reduce the length of the plant's leaf. *B. sorokiniana*, 32, 37, 47 and *B. spicifera*, isolates 8 and 42, were found to increase root weight compared to control in plants, while *B. spicifera* isolate 67 increased root weight relative to control. A study of weight in the leaf also found that *B. sorokiniana*'s 32, 37 and 40 isolates resulted in a significant reduction in weight. As a result, some *B. spicifera* isolates have been found to be both non-pathogenic and promoting plant development in plants. On the other hand, *B. sorokiniana*'s 32 and 37 isolates have been found to have high virulence, resulting in reduced plant weight and shortened plant length.

Key words: *Bipolaris sorokiniana, Bipolaris spicifera*, Altındane, root rot.

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Impact of biostimulants on soil quality

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ABSTRACT

The soil constitutes the basis for economic and cultural activities in our ecosystem. Nonetheless, factors such as population growth, climate change, intensive agriculture, and excessive grazing have led to deteriorating soil quality and health. Consequently, soil productivity and sustainability have decreased. Scientists have developed numerous soil quality models, and soil monitoring programmes have been initiated in response. The adoption of synthetic fertilisers has enhanced productivity. However, their prolonged use has resulted in leaching, leading to mixing with groundwater and consequent water pollution, poor water quality, and at times, eutrophication. Researchers have hence focussed on reducing synthetic fertiliser use and turning to biostimulants containing animal and plant material. This research investigated the effects of biostimulants, specifically ekofertile® and microfertile®, produced by the ECOLIVE corporation, on soil quality. The study was conducted in a controlled greenhouse environment, utilizing two distinct soil types—clayey and sandy-loam—each replicated three times. The experiment involved five treatments: control, inorganic fertilization, and two biostimulants at doses of 2.5%, 5%, and 10%, arranged in a complete randomized design. At the trial's conclusion, physical, chemical, and biological analyses were performed on the soil of each pot. Using the analytic findings, the soil qualities were determined using the SMAF model. Based on the results obtained, the most effective approach to enhancing soil quality in clayey soil was the application of 10% ekofertile®, which improved soil quality from 72.09 to 77.93. For sandy loam soil, the application of microfertile® at a 5% dose proved to be the most effective, resulting in a significant increase in soil quality from 76.53 to 78.19.

Key words: Biostimulants, *Ekofertile®* and *microfertile®*, SMAF model, Soil quality.

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Isolation of nucleic acids from sugar beet roots by using fibrous cellulose for the detection of soil-borne viruses and their vector Polymyxa betae

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ABSTRACT

Rhizomania is a common soil-borne viral plant disease that occurs in sugar beet (Beta vulgaris L.) fields and causes high decreases in yield and sugar content. The disease is caused by Beet necrotic yellow vein virus (BNYVV) and transmitted by the soil-inhabiting protozoan plasmodiophorid vector Polymyxa betae Keskin. This vector also transmits other sugar beet viruses such as Beet virus Q (BVQ), Beet soil-borne virus (BSBV) and Beet soil-borne mosaic virus (BSBMV). In this study, BNYVV, BVQ and P. betae were propagated by the bait plant technique using BNYVV-susceptible cultivar (cv. Ansa). Then, total nucleic acids (NAs) from the lateral root samples of the bait plants were purified by using fibrous cellulose. A small amount (1.5 g) of root sample was sufficient in total NA isolation. One-step reverse transcription-polymerase chain reaction (RT-PCR) have been applied to identify BNYVV, BVQ and P. betae. As a result of the study, the expected sizes (997 bp, 291 bp and 350 bp) of DNA fragments were obtained for BNYVV, BVQ and P. betae, respectively. This cellulose-based NA isolation method was found to be highly economical and recommended for detection of the soil-borne viruses and their vector in sugar beet.

Key words: BNYVV, BVQ, P. betae, cellulose fibres, ITS, RT-PCR.

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Comparison of the effects of vermicompost and mineral fertilizer applications on some properties of loam texture soil and pepper yield

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ABSTRACT

In this study, comparisition of the effects of vermicompost doses and mineral fertilizer applications on the properties of loam texture soil and the yield of pepper grown were investigated. According to the data obtained at the end of the experiment, the doses of vermicompost significantly increased the organic matter, total nitrogen, EC, Mg, Fe, P, K content and porosity values of the soil compared to the control. The pH, bulk density, suspension percentage, aggregation percentage and structure stability index values of the soil decreased statistically with the application of vermicompost. There were no statistically significant changes in the particle density, lime content, field capacity, wilting point, available water, aggregation percentage obtained by wet sieving, and Cu, Na, Ca, Zn, K, Mn values that can be taken by plants with vermicompost applications. A statistically significant increase was determined in the yield of pepper compared to the control with vermicompost applications. When vermicompost applications are compared with mineral fertilizer applications; It was determined that the bulk density value of the soil showed a statistically significant decrease with vermicompost applications compared to mineral fertilizer application. With vermicompost applications, soil organic matter, soluble salt, porosity, total N, Available P and Mg values increased statistically significantly compared to mineral fertilizer application. Pepper yield was statistically in the same group with 2 and 3 t/da doses of vermicompost application and mineral fertilizer application. Due to the positive effects of vermicompost on some soil properties and yield of pepper, it may be preferred to use it as a fertilizer material and soil conditioner instead of mineral fertilizer.

Key words: Mineral fertilizer, pepper yield, soil properties, vermicompost.

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Environmental threats in conflict zones: Assessing the fallout of white phosphorus munitions on soil and water in the Jordan River Basin

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ABSTRACT

The substances released by white phosphorus (WP) munitions can be harmful to soil and agriculture. White phosphorus is a highly reactive and toxic substance that can cause damage to the environment. When a white phosphorus bomb is detonated, it releases phosphorus pentoxide (P4O10) and other phosphorus oxides, which can react with moisture in the air to form phosphoric acid (H3PO4). Phosphoric acid is corrosive and can lead to soil acidification. This can have detrimental effects on soil fertility and plant growth. The acidification of soil can alter its pH, making it less suitable for many crops and disrupting nutrient availability. Additionally, the release of phosphorus compounds into the environment can contribute to water pollution if not properly contained. Furthermore, white phosphorus is highly flammable, and its combustion can result in the production of toxic by-products, including phosphorus pentoxide and phosphoric acid. These by-products can pose risks to both the environment and human health. In summary, the substances released by white phosphorus bombs can indeed be harmful to soil and agriculture, contributing to soil acidification and potential water pollution. The impact on the environment depends on factors such as the scale of the release, the local ecosystem, and the measures taken to mitigate the environmental impact. The objective of this study is to assess the repercussions resulting from the detonation of white phosphorus munitions on the soils in the Jordan Valley Basin, a region of agricultural significance.

Key words: White Phosphorus, Soil Contamination, Soil Acidification, Soil Fertility, Water Pollution, Jordan River Basin.

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A comprehensive overview of humic substances as plant biostimulants for sustainable agriculture

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ABSTRACT

In a world confronted with the dual challenges of feeding a growing global population and addressing environmental concerns, plant biostimulants have emerged as a promising avenue to enhance crop productivity and sustainability. This study elucidates the potential of humic substances as a sustainable and eco-friendly solution to the challenges facing modern agriculture, while also addressing associated limitations to promote environmentally friendly agricultural practices. Humic substances, including fulvic acid, humic acid, and humin, derived from the decomposition of plant and animal matter in soil and sediments, have gained attention for their effectiveness as plant biostimulants. These compounds, abundant in carbon (C) and characterized by complex molecular structures, play a pivotal role in promoting plant growth and development. Additionally, the advantages of utilizing humic substances may align with the goals of sustainable agriculture, as evidenced by their ability to improve nutrient absorption, enhance soil health, and bolster stress resilience in plants. However, challenges and limitations, such as variations in commercial product quality, application methods, and associated costs, must be addressed to maximize the benefits of humic substances in agriculture. Developing standardized guidelines for their application emerges as a crucial step towards cultivating a more resilient and environmentally responsible food production system to meet the demands of the 21st-century global population.

Key words: Environmental impact, Humic substances, Plant biostimulants, Sustainable agriculture.

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Global impact of conservation agriculture on crop yields yield improvement and soil erosion control

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ABSTRACT

Erosion can be accelerated by violated engagement of cultivation that results in a total breakdown of soil structure and overall soil quality. Tillage-induced unevenness significantly influences the process and extent of runoff and erosion, and therefore runoff occurring in the field will greatly cause the topsoil washed away. Crop production from such areas can't be sustained to meet the food demand of people. Nowadays conservation agriculture is promoted as an Innovative strategy that enables farmers to produce more food from less land while preserving resources sustainably. It advances minimum soil disturbance, permanent soil cover, and diversified plant species hence enabling the natural and biological life forms above and below the soil surface. Novel conservation agriculture is practiced widely to reduce or avoid practices that take a toll on the environment, enabling the soil to be mineralized and intensive mobilization of soil fertility. From this review, most literature proved that conservation agriculture can be practiced as an alternative for soil erosion control and sustainable crop production though short-term effects are not anticipated and its impact varies from place to place due to agro-climatological diversities. Finally, it is concluded that practicing conservation agriculture targeting the long-term benefit could resolve food insecurity problems and then meet the demand of the growing population for the coming decades while maintaining the natural environment healthy.

Key words: Conservation Agriculture, Crop Yield, No-Tillage, Soil Erosion.

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Efficacy of OBLIGA BONACRAFT organic fertilizer on the growth, yield and quality of cabbages

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ABSTRACT

Nowadays, the use of organic fertilizers is becoming an inevitable trend to replace chemical fertilizers for sustainable agriculture. The aim of the research was to study the effectiveness of Obliga Bonacraft, a new biofertilizer produced by Geofert Ltd. in Georgia, on cabbage (variety Baraka f1) in Kenya. The research tasks were: i. To determine the effectiveness of OBLIGA BONACRAFT on the growth, yield, and quality of cabbage. ii. Determination of the effective rate of the biofertilizer on cabbage growth, yield, and quality, iii. Comparison of efficacy of the biofertilizer and standard reference product on cabbage growth, yield, and quality. The research was conducted on cabbages in Kenya at four study sites. The trial plots were 4 m × 3 m, arranged in a randomized complete block design, and replicated three times. The study objects consisted of an untreated control, a test product at three rate levels (150, 200, and 250 kg/ha), a standard regime (RFP), and a reference product. Treatments were applied at planting, and data assessments of the target parameters were done every 14 days. During the trial in the four sites, among the three treatments of Obliga Bonacraft, the 150 kg/ha rate was the most effective dose that showed a consistent and effective positive effect on the growth, quality, and yield of cabbages. The height of cabbages increased significantly in all the sites where the organic fertilizer was applied, with the tallest under the 150, 200, and 250 kg/ha rates, which were comparable to the reference product and conventional practice. The same trend was also observed on the stem diameter, where lower efficacy by the reference product was exhibited only in one plot, which was more effective than the untreated control but comparable to conventional practice (RFP). In view of the consistent results obtained from the four trials, we recommend that Obliga Bonacraft as a biofertilizer and applied at plants at a rate of 150 kg/ha.

Key words: Cabbage, Efficacy, GeoFert, Organic Fertilizer, OBLIGA BONACRAFT.

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Research of arsenic-contaminated areas of Racha-Lechkhumi and Kvemo Svaneti region of Georgia and assessment of environmental impact risks

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ABSTRACT

In the mining and processing region (Racha-Lechkhumi and Kvemo Svaneti), the negative statistical indicators of population health are significantly higher. The situation is particularly serious in terms of the spread of cardiovascular and oncological diseases. The paper discusses the content of arsenic in the ecosystems of the arsenic-contaminated areas of the region and their risk assessment in connection with the spread of diseases. Natural water samples were taken from polluted and background sites, and soil samples were taken from polluted, agricultural, recreational and background sites. Total arsenic content was determined in the samples and vulnerable points of soil contamination were identified. The phytoremediation of soil was carried out from the agricultural fields of the villages of Abari and Likheti. The following conclusions are drawn:

- In surface waters, (river Lukhuni and Tskhnistskali) the arsenic hazard index is less than 1 (HQSW<1) and they are not in danger;
- In artesian and drinking waters, the arsenic hazard index is greater than 1 (HQDW>1), hence these waters are at risk. Arsenic is considered a potential risk to the aquatic environment and therefore to the health of the population.
- The soils of Uravi-2 and Tsana-1 are the most contaminated with arsenic;
- 30 at-risk soil sampling facilities (in both municipalities) were identified, where the hazard index is greater than 1 due to high arsenic concentrations (HQS >1);
- In all cases, the content of arsenic is higher in the upper soil (0-5 cm depth) than in the lower layer (5-20 cm depth);
- A map of arsenic contamination of the soils of the Racha-Lechkhumi and Kvemo Svaneti region was compiled in the GIS system;
- Healthcare statistical materials have been processed and the list of priority diseases in the region has been identified.

Key words: Arsenic, contamination map, hazard index, natural waters, soils.

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Physical-mechanical composition and properties of dark grey soils of Georgia in Imereti region

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ABSTRACT

Georgia, in particular, the dark grey soils of the middle belt of the Imereti mountain-forest zone are widespread. This soil is of bioclimatic type which analogues are found in many regions of the world forest zone and are formed in geographical and landscape conditions similar to Georgia. According to the vertical zoning, forest dark grey soils are spread from 600-900 meters above sea level to 2000-2100 meters. In Imereti, in the lower zone of the distribution of these soils, they border the yellow and red soils, and in the upper zone, the subalpine soils of the mountain-meadow. They, like the relief of the territory of all mountainous countries, the relief strip of forest dark grey soils in Imereti is very difficult in relief. It is fragmented, which in turn is related to the geological structure, lithological composition of rocks, tectonic processes, erosion-denudation occurrences and more. The thickness of the soil changes with the inclination of the slope, gravel, properties, the greater the slope, the less soil moisture, the slower the soil is washed away, and the dryness of the soil is known to be unfavorable for the plant. Under these conditions, a very small amount of humus-accumulation horizon is formed, which is unsatisfactory in terms of soil protection importance and fertility. At the same time it is noteworthy that the soils of the southern exposure are hotter than those of the north. Dark grey soils are developed on the Tertiary and post-Tertiary sandstones, clays and their overcrop products in the southern Imereti region, which includes the northern slopes of the Meskheti Range, within the Zestafoni, Bagdati, Samtredia, Vani districts. Soil-forming rocks are Lower and Middle Eocene sandstones, marls, clay-shales, erupted (andesites, tuffs) rocks. These soils are developed under broadleaf (hornbeam, chestnut, oak) and deciduous-coniferous forest cover. Sandy soils are spread in Khoni, Baghdati, Vani, Tkibuli, Chiatura, Kharagauli, Imereti region.

Key words: Dark grey soil, Imereti, Marls, Overcrop, Shale, Soil.

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Heavy metal accumulation in organic soil: A review

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ABSTRACT

Histosols or internationally known as peat bog soils or organic soils are formed from inadequately decomposed plant tissues They are exclusively found in arctic and subarctic zones and also in temperate regions especially lowlands, enormous hill ranges while a very low percentage of them found in the tropical areas of the world. Soil organic carbon content ranges from above 20 percentage in this soil type. Studies are mainly being conducted to analyze the presence of dominant trace metals like notably Cu, Zn, Cd, Pb, Ni and Cr in organic soils. Based on review with other literature suggest that organic matter is they key factor in retention, release and bioavailability of heavy metals. Thereby, Organic soils generally have more trace metals accumulated compared to the mineral soils. The deposition of toxic metals is not constant and are affected by organic soil development, climate and biological activity of plants. Accumulation of potentially toxic metals, in these organic soils can affect the vegetation of that particular area. The accumulation of heavy metals in these soils can be due to anthropogenic and natural activity during the earlier centuries.

Key words: Heavy metals, organic matter, peat soil, urban area.

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Morphological properties of soils in natural oil seeps in the Carpathian Mountains

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ABSTRACT

This paper presents the current information available on the morphological and physico-chemical properties of soils in natural oil seeps along the Carpathian Mountains. It also aims to relate this information with the current data on the effects of oil contamination/presence on soil properties. Soils in natural oil seeps along the Carpathian Mountain range has a unique physico-chemical and morphological properties, this is true as compared to similar soils but is influenced by anthropogenic oil contamination. the driving force for the morpho-physical changes is the surface coating and sealing of surface soils which enables the development of gley properties. Illuviation of soil components is also affected through alternations in particle smoothness, aggregation and pore continuity. With this information, a question can be raised on whether oil on natural oil seeps can be considered as a contaminant or an integral component of pedogenic and environmental processes, and what conservation measures should be undertaken to conserve these unique eco-pedological sites.

Key words: Oil, Seeps, Carpathians, Petroleum Hydrocarbon, Soil.

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Effects of tree species on soil organic carbon: A comprehensive review

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ABSTRACT

Soil organic carbon (SOC) is a cornerstone of terrestrial ecosystems, influencing soil structure, nutrient cycling, and carbon sequestration. As trees contribute substantially to above and belowground biomass, their impact on SOC is pivotal for understanding ecosystem dynamics. Tree species traits, such as litter quality and root architecture, emerge as critical determinants influencing SOC dynamics. Environmental context, including climate and soil conditions, further modulates these effects, highlighting the context-specific nature of the tree-SOC relationship. Empirical evidence suggests both positive and negative impacts of specific tree species on SOC, emphasizing the complexity of these interactions. Mechanisms such as litter quality influencing decomposition rates and root-microbe interactions shaping nutrient cycling contribute to a holistic understanding. Recognizing the practical implications for ecosystem management, including strategic afforestation, is crucial for mitigating climate change effects. Despite progress, research gaps persist, necessitating future studies to explore long-term stability and interactive effects in diverse ecosystems. This ensures a nuanced comprehension of the intricate dynamics between tree species and SOC. This comprehensive review delves into the intricate relationship between tree species and SOC, synthesizing diverse literature to elucidate the underlying mechanisms shaping these interactions.

Key words: Soil organic carbon (SOC) tree species, root microbe.

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Heavy metal pollution in some urban parks: A comprehensive review

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ABSTRACT

Urban parks, often considered green havens, become focal points in this comprehensive analysis, unraveling the historical evolution and contemporary challenges posed by heavy metal pollution. The exploration begins with an introduction, setting the stage by emphasizing the intricate relationship between nature and human activities in shaping the soil composition of urban parks. The historical echoes, from medieval ore processing to industrial revolutions, imprint distinct patterns in the soil of Planty Park, Krakow, and resonate in the ancient roots of Beijing, Mashhad city, NE of Iran. Seville's parks, adorned with historical significance, mirror global concerns for urban soil health, highlighting the universality of heavy metal pollution challenges. The methodology section details field studies and analyses conducted across these diverse locations, employing various techniques such as ICP-OES, HCA, PCA, ICPMS analysis, and the BCR sequential extraction method. The amalgamation of these methodologies forms the foundation for a comprehensive analysis, shedding light on the historical evolution and dynamics of heavy metal pollution within urban parks. Results from the comprehensive analysis reveal elevated concentrations of heavy metals, including Zn, Cr, Pb, Cu, Ni, As, Hg, and Cd, in urban park soils compared to non-urban soils across the studied locations. Spatial correlations between certain metals suggest shared pollution sources, with influential factors such as soil type, pH, and proximity to the city center identified. Distinct hotspots in spatial distribution maps highlight concentrations of specific metals in different regions. Multivariate analyses and sequential extraction studies provide insights into metal mobility, availability, and contamination indicators, underscoring the complexity of urban park soil dynamics. The discussion section synthesizes the combined insights from the diverse studies, emphasizing the role of historical legacies, urbanization impacts, and the multifaceted nature of heavy metal pollution in urban parks. From Seville's focus on traffic-related factors to Mashhad's nuanced understanding of heavy metal availability and mobility. In essence, this review paper serves as a cohesive narrative, and contemporary challenges of heavy metal pollution in urban parks across different geographical contexts. The shared journey through Krakow, Beijing, Seville, and Mashhad provides a holistic understanding that transcends isolated tales, guiding future endeavors in urban environmental care.

Key words: Heavy Metal Pollution, Soil Pollution, Urban Parks, Soil Analysis, Environmental Adaptation

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The changes in pH and EC values of lettuce growth soil with salicylic acid application under salt stress

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ABSTRACT

In this study, it was aimed to determine the effects of salicylic acid applications on soil PH and Electrical conductivity. The experiment was conducted according to factorial experimental design with three replications at the controlled chamber room of Soil Science and Plant Nutrition Department of Agricultural Faculty in Yüzüncü Yil University, Türkiye. The total set of 36 pots was used in the experiment in pots including 3 kg soil in each one. Four doses of salicylic acid (SA_0:0, SA_1:1 mM, SA_2:2 mM and SA_3:4 mM) and three doses of NaCl ($NaCl_0$:0, $NaCl_1$:30 and $NaCl_2$:60 mM) were applied. The experiment was ended after 8 weeks. Generally increasing NaCl doses decreased soil pH values and increased EC values. These changes were significant for pH ($P < 0.05$) and EC ($P < 0.01$) statistically. The effects of SA applications on pH and EC were found as significant ($P < 0.01$) statistically. The interactions between in SA and NaCl were significant ($P < 0.05$) for soil EC statistically. In NaCl added media SA1 and SA2 applications decreased the EC of the soil, and the pH values make became more alkaline up to 8, while SA3 applications decreased the pH values and increased the EC values. At the SA applications the lowest pH mean were obtained as 7.620 in SA0 application while the highest pH means were in SA1and SA2 applications as 7.970 and 7.853 respectively. The lowest and the highest EC means in SA applications were obtained as 1135.000 µS cm^{-1} and 1546.444 µS cm^{-1} in SA2 and SA3 applications respectively as a result increasing SA applications increased soil pH values while EC values decreased by SA1and SA2 applications under salinity conditions..

Key words: Salinity, salicylic acid, soil, pH, Electrical Conductivity

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Unlocking field capacity: A reliable, simple, and budget-friendly indirect approach

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ABSTRACT

This study presents a cheap, fast and uncomplicated technique for indirectly determining the field capacity (FC) in soil, which is a crucial parameter for hydropedology, environmental modeling and irrigation applications. Relationships between FC and soil moisture constants, specifically maximum capillary water capacity (MCWC) and retention water capacity (RWC), were established using undisturbed soil core samples analyzed by pressure plate method and by "filter paper draining method". This method involves determining the gravimetric soil water content of core samples. The samples were saturated and then allowed to drain naturally on the filter paper for a specified time interval (max. 24 hours). This method has long history of use in the Czech Republic as an approximate of FC, but it has never been correlated with a soil water content determined at a specific matric potential. The objective was to lower the time and expenses linked to conventional FC measurement techniques, and to enable the utilization of legacy databases comprising MCWC and RWC figures. The outcomes exposed the significant possibility of the "filter paper draining method" as an encouraging strategy for indirect FC determination. FC as soil water content at -33 kPa can be well approximated by the equation FC33 = 1.0802 RWC - 0.0688 (with RMSE = 0.045 cm^3/cm^3 and R = 0.953). For FC as soil water content at -5 or -10 kPa, either of the following equations can be used: FC5 = 1.0146 MCWC - 0.0163 (with RMSE = 0.027 cm^3/cm^3 and R = 0.961) or FC10 = 1.0152 MCWC - 0.0275 (with RMSE = 0.033 cm^3/cm^3 and R = 0.958), respectively.

Key words: Field capacity; filter paper draining method; maximum capillary water capacity; pedotransfer functions; retention water capacity

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Evaluation of multi-tillage treatments under different soil physical and chemical signatures

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ABSTRACT

Topsoil physical and chemical properties can vary subject to different soil treatment approaches. Tillage especially has been historically followed as an approach to improve these properties. In Europe, conventional tillage practices involving intensive ploughing are common relative to other tillage approaches mainly because comparative studies within the region are lacking. This study looks at a comparison of physicochemical properties under four long term tillage approaches namely: 1. Reduced Tillage (RT), 2. Occasional Tillage (ST), 3. No Tillage (NT) and 4. Conventional Tillage (CT). Analyses of short-term variances for soil volumetric water content, soil organic matter, bulk density and saturated hydraulic conductivity subject to tillage were done for experiments during harvest, and after tillage and seeding operations. While using point-based measurements as the basis, the eXtreme Gradient Boosting model was used to predict soil moisture content from Sentinel 2, Spectral Indices and Terrain Attributes (TA) datasets, and an inverse distance weighting interpolation technique was adopted to compare spatial distribution of soil moisture content from all the datasets employed. Between the first and second experimental phases, soil organic matter increased on all conservation tillage plots (RT, ST and NT) but decreased under CT. Insignificant changes in dry bulk density were observed on the conservation tillage plots whereas CT reduced dry bulk density by some 15.3%. Saturated hydraulic conductivity fluctuated significantly under ST and CT, while remaining stable under RT and NT. The plotted maps for this study show that by interpolating predicted soil moisture content values, the predicted TA dataset explain better the spatial variability of soil moisture content. Generally, the results reflect a variation in the soil properties subject to tillage. The use of remote sensing data (specifically TA) can help overcome hindrances in spatial coverage that may be caused by varying soil management practices.

Key words: Remote sensing, Soil physical properties, Tillage.

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Effects of urbanization and vegetation density on land surface temperature using satellite remote sensing indices in Prague, Czech Republic

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ABSTRACT

Recently, rapid population growth and the increase in migration from rural areas to cities have caused some negatives in the world. At the beginning of these negativities are excessive urbanization and some inadequacies in energy resources because industrialization is increasing in order to provide sufficient resources for the population. In addition to this, the need for shelter from the increasing population causes natural areas to be built and urbanised. As buildings absorb heat more than vegetated areas, surface temperatures in industrial and urban areas are higher than vegetated areas in cities. Thus, the temperature increases experienced triggers heat-related deaths and negatively affects the comfort of life in metropolitan areas, as well as it causes global warming and climate change. In this study, the relationship between vegetation density, surface temperature and urbanisation in Prague was analysed using remote sensing indices from the Google Earth Engine online platform. The capital of the Czech Republic, covering an area of 496 km2 and population is approximately 1.3 million. The Landsat-8 operational land imager (OLI) and thermal infrared sensor (TIRS) satellite images were selected as the month of July in summer and time series of these images are 2016 and 2020. The normalized difference vegetation index (NDVI), the normalized difference build-up index (NDBI), and the land surface temperature (LST) were calculated for both years and the correlation relationships between the indices were statistically analysed. As a result of statistical analysis, a strong negative correlation was detected between NDVI and LST, while a strong positive correlation was observed between NDBI and LST. Thus, these statistical relationships show that the increase in urban areas has a positive effect on temperature. The accuracy analysis of Landsat LST data was performed with Moderate Resolution Imaging Spectroradiometer (MODIS) daily 1 Km spatial resolution LST data using 12 control points homogeneously distributed over the study area, since there was not enough ground station data. As a result of the accuracy analysis, the values of the root mean square error (RMSE) were found to be 3.04 ° C and 2.17 ° C for 2016 and 2020, respectively. Furthermore, a strong positive correlation was found between the two datasets, 0.81 for 2016 and 0.84 for 2020.

Key words: Land surface temperature, Climate change, Remote sensing, Vegetation index.

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Effects of organic amendments on aggregate stability in three different textured soils

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ABSTRACT

This study was carried out to examine the effects of the addition of garbage compost(GC), barnyard manure(BM), wheat straw (WS) and vetch straw(VS) on soils in three different texture classes (silty clay loam, clay and clay loam) on aggregate stability and thus erosion susceptibility under laboratory conditions. The study was carried out in factorial order and in three parallels (3x4x5x3). Four kg soil samples were placed in plastic containers and organic residues were mixed into these samples at 0.0, 0.5, 1.0, 2.0 and 4.0% based on dry weight. Tap water was dripped into the boxes until they reached the field capacity. The samples moistened with tap water were weighed once every two days and tap water was added to the boxes until they reached field capacity again when 75% of the available moisture in the soil was depleted. Soil samples were incubated under these conditions for ten weeks. During the incubation, the laboratory temperature ranged between 20 ±2 ^{0}C. Soil samples were used in the relevant analyzes after they were crushed by hand at the end of the incubation period. Soils are soils with fine to moderately fine texture, low organic matter content, medium and low lime content, and no alkalinity problem. These soils with low initial stability are susceptible to erosion. The organic residues, which are the subject of the experiment, mixed with these three soil teksture classes, It statistically significantly increased the amount of water-stable aggregates larger than 250 microns and their resistance to erosion. The activities of organic residues differed among themselves and according to soil teksture groups. The effectiveness of garbage compost in this regard was lower than that of barn manure, wheat straw and vetch straw.

Key words: Soil texture, physical properties, susceptibility to erosion, organic, organic conditioners.

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The effect of acid modification on rice husk biochar: pH, EC, and micronutrient content

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ABSTRACT

The chemical activation process enhances the surface area and porosity of biochar, making it applicable in various domains such as soil and water contaminant removal and heavy metal remediation. In recent years, acidified biochar has been employed as a soil amendment, especially in calcareous and high pH soils. This study investigates the effects of two different acids (HNO_3 and H_2SO_4) on pH, electrical conductivity (EC), and microelement concentration by applying them both before and after obtaining biochar from rice husk. The highest pH (9.03), total Fe (1752 mg kg^{-1}), and Mn (251 mg kg^{-1}) content were found in rice husk biochar (RB) that was not modified with acid. The maximum Cu content (40 mg kg-1) was observed in RB + HNO_3, while the highest EC (51.00 dS m^{-1}) and Zn content (35 mg kg^{-1}) were found in RB + H_2SO_4. It was noted that the addition of acid increased some nutrient contents, but there was a significant decrease in pH and a noteworthy increase in EC. As a results, the type, concentration, and addition time of acid are very important when obtaining acid biochar.

Key words: Acidification, Biochar, Rice Husk, Micronutrient.

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The effect of biochar and acidified biochar on dehydrogenase activity in soil

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ABSTRACT

This study was carried out to determine the effect of biochar (B) and acidified biochar (AB) on dehydrogenase enzyme activity (DHA) of a sandy loam calcareous soil. The biochars were applied as C (%0), %1, %2, %4 doses to each pot with three replicates and incubated for 4w, 8w, 12w and 16w in incubator at 25 ^{0}C. In the B treatments, depending on the dose pH values increased while EC values decreased. pH values decreased and EC values increased by AB treatments. After each incubation period, the highest DHA activity in the B treatments was obtained in the C treatment while in AB treatments, the highest DHA activity was obtained at 1% dose. At the first and last incubation periods determined lowest DHA enzyme activity in the soil, while the most DHA activity of the soil measured at the end of 2nd and 3rd incubation period. According to the results of the study, B and AB treatments decreased the DHA activity except for AB1 treatment.

Key words: Calcareous soil, dehydrogenase, biochar, acidified biochar.

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The effect of some antagonistic fungi against Bipolaris sorokiniana, root rot of barley

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ABSTRACT

Barley ranks second after wheat in terms of cultivation area and production amount among the cereal crops grown in Turkey. Fungal diseases are the most important biotic factors affecting production. One of the most important diseases is root and crown rot disease caused by *Bipolaris sorokiniana* (Sacc) Shoemaker. In addition to root and crown rot disease, it also causes leaf spot blotch and black point in wheat and barley. In this study, the effects of six *Chaetomium* spp., one *Trichoderma* sp. and one *Fusarium oxysporum* isolates on barley plants and the pathogen were investigated against a highly virulent isolate of *B. sorakiniana* isolated from wheat. *Chaetomium* spp. culture was grown in potato dextrose liquid medium for 10 days by shaking. The seeds of Fahrettinbey and Oberek barley varieties, which were pre-germinated, were placed in the *Chaetomium* liquid culture and shaken in the shaker for four hours. Then the seeds were placed on sterile blotting papers and left to dry. On the other hand, two layers of blotting paper were placed on Petri dishes and 10 discs cut from *B. sorakiniana* cultures with a diameter of 6 mm were placed on the papers and one seed was placed on top of them. A spore suspension of 1x106 spores/ml of *Trichoderma* T2 and *F. oxysporum* isolate 24 were prepared and the seeds were kept in this suspension for 3 min. In the same way, the seeds removed from the suspension were dried and placed on fungus discs. The experiment was carried out in triplicate for both varieties. Control plants were treated with sterile distilled water only, while positive controls included only discs of *B. sorokiniana* culture and uninoculated seeds. The experiment was evaluated after ten days of incubation. In the root and leaf length measurements, it was determined that *Trichoderma* T2 isolate in Fahrettinbey cultivar showed better development in terms of root and leaf length compared to the positive control, while in Oberek cultivar*, Trichoderma* T2, *F. oxysporum* 24, *Chaetomium* spp., isolates 1, 3 and 4 showed better development in terms of leaf length compared to the positive control. It is understood that there are statistically differences between the varieties in terms of plant height and disease severity. When the disease severity was analysed in Fahrettinbey and Oberek cultivars, it was revealed that *Chaetomium* spp. could not reduce the disease severity in general, but *F. oxysporum* 24 and *Trichoderma* T2 isolacaused a 10.5-43.5% and 21-34,5% reduction in disease severity respectively.

Key words: Bipolaris, Leaf lenght, Pathogenicity, Root lenght, Root rot.

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Removal of biogenic elements by spelt plants depending on the influence of experimental factors

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ABSTRACT

The use of such agrotechnical factors as foliar fertilization and the use of growth regulators and microfertilizers is actively spreading in spelt growing technologies. The yield of spelt is limited not only by moisture and macronutrients, but also by a low level of basic micronutrients in most regions of Ukraine. Micronutrients play a key role in plant development, and their deficiency negatively affects yield and crop quality. According to the removal of biogenic elements of wheat crops, spelled assimilated 158.4 kg/ha of nitrogen, 71.1 kg/ha of potassium and 131.3 kg/ha, while the values of 163.5, 73.8, 136, 2 kg/ha, for the Europe cultivar - 170.8, 76.6, 141.3, and for the Atterhauer Dinkel cultivar - 140.8, 62.8, 116.5 kg/ha, respectively. According to the influence of research factors on the removal of macroelements, it was established that during the treatment of crops with humate of potassium GK-17 in the earing phase, in general, the yield was 2.1 kg/ha more nitrogen, 1.1 kg/ha phosphorus and 2.6 kg/ha ha more potassium, and during the treatment of Humate potassium GK-17 crops in the earing phase and again in the milk ripeness phase - 10.7, 4.1, 9.2 kg/ha. Also, the treatment of crops with a growth stimulator contributed to the fact that plants carried 2.6, 1.5, 2.4 kg/ha more nitrogen, phosphorus and potassium. According to the amount of removal, we determined that during the processing of crops Humate potassium GK-17 in the earing phase and again in the phase of milk ripeness in combination with the application of Agriflex Amino in the earing phase in Zorya of Ukraine varieties, nitrogen removal was 170.6 kg/ha, phosphorus - 77.0 kg/ha, and potassium was 141.4 kg/ha, in Europe varieties – 186.9, 83.8, 154.2 kg/ha, and in Atterhauer Dinkel varieties – 149.9, 66.4, 123.8 kg/ha, respectively.

Key words: Biogenic elements, spelt, cultivars, growth regulator, plant density, removal.

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