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PLENARY SESSION

SOIL FERTILITY ASSESSMENT FOR SUSTAINABLE AGRICULTURE: USING NUTRIENT AND PRODUCTIVITY INDICES IN CHEBLI, MITIDJA PLAIN, ALGERIA

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Ensuring food security in the face of growing global demand and environmental constraints requires the sustainable management of agricultural soils. Soil chemical fertility plays a critical role in crop productivity and, consequently, in the long-term capacity of agricultural systems to meet food needs. In this context, understanding the status of key soil nutrients—namely nitrogen, phosphorus, and potassium—is essential for guiding effective land management strategies. This study, conducted in the municipality of Chebli, aims to evaluate the chemical fertility of agricultural soils using both the Nutrient Index (NI) and the Productivity Index (PI). The investigation was based on 18 composite soil samples collected from the surface horizon (0–20 cm). Analytical results show that all samples (100%) exhibit low total nitrogen levels, ranging from 0.10% to 0.23%. Available phosphorus concentrations ranged from 2.07 to 75.46 mg kg^{-1}, with a mean value of 19.70 mg kg^{-1}. Similarly, potassium availability was generally low, with 67% of the samples in the low category, 28% in the medium category, and only 5% in the high category. The Nutrient Index assessment classified the soils of Chebli as having moderate fertility with respect to organic matter and available phosphorus, and low fertility for nitrogen and potassium (NI pattern: MLML). Additionally, the application of the Productivity Index revealed three distinct productivity classes, with a predominance of the moderate productivity class (PI between 41 and 60). These findings highlight the urgent need for targeted chemical and organic amendments to restore nutrient balance, enhance soil fertility, and ultimately support food security through sustained agricultural productivity. Moreover, the results of this study provide a scientific basis for developing site-specific fertilizer recommendations that align with the actual nutrient needs for crops in Chebli.

SOME CHALLENGES IN THE ASSESSMENT OF ECOSYSTEM SERVICES PROVIDED BY AGROECOSYSTEMS AT DIFFERENT SCALES

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Ecosystem services (ESs) are goods and services provided by natural and semi-natural ecosystems that are beneficial to human society. Agroecosystems can also deliver several ESs ranging from provisioning (e.g. food, fodder), regulation and maintenance (e.g. pollination, natural pest control) to cultural (e.g. agritourism, landscape aesthetics) services. The assessment of ESs related to different ecosystems has been in the focus of research and policy for decades. Agroecosystems are also targeted but in their case ES assessments face quite a few challenges. Some of these challenges will be highlighted in the presentation using the results of recent doctoral research projects conducted at three scales: farm, village and landscape levels. The research projects were carried out in Hungary and, at the landscape level, partly in South Africa. Some regulation and maintenance services and - at the village and landscape levels - also some provisioning services were assessed using biophysical indicators combined with mapping at the village and landscape levels. At the farm and village levels extensive and intensive systems were compared. Here we list four of the challenges that were identified and give some examples from the studies. 1) The differentiation of ESs or between ESs and ecosystem state indicators might be problematic, especially in the case of some regulation and maintenance services. For example, soil carbon stock can be considered as an ecosystem state indicator but in some cases, as it was in our farm and landscape level studies, it can be also used for measuring global climate regulation ES related to soil. 2) The human influence on agroecosystems is substantial therefore, the contribution of nature in the provision of some ESs is quite difficult to quantify. Nevertheless, when we compare the ES provision of different farming systems we can see that less intensified farming systems give overall better results. In our studies permaculture and ecological farms performed better compared to conventional farms (e.g. regarding decomposition, global climate regulation, pollination and biological pest control) and ecovillages performed better compared to a non-ecovillage (e.g. regarding genetic resources, pollination and wind protection). 3) Data gathering and analysis are not straightforward and new methods might need to be developed for different scales. Our results show that soil sampling can refine calculations based on soil inventory data (e.g. regarding assessment of global climate regulation) at the landscape level. Indicators based on the qualitative characteristics of some provisioning services (e.g. number of local fruit varieties instead of the quantity of yearly harvested fruits) might be used when quantities are not measured and hard to estimate as it was in our village level study. 4) Aggregation of the results for more ESs might also require creative solutions. Based on field data and secondary data, a scoring system could be developed for the ES assessment at the village level that allowed comparison and aggregation of ESs as well. At the landscape level, maps of soil carbon stock, erosion control and crop production could be integrated assisting spatial planning. We can conclude that assessment of ESs related to agriculture is still in its development phase. Empirical studies at different scales can reveal some challenges but also show some solutions to overcome the obstacles. We

encourage further empirical studies and discussions among researchers about the methodologies and interpretations.

APPLICATIONS OF PHOTOACOUSTIC SPECTROSCOPY IN THE SERVICE OF SUSTAINABLE AGRICULTURE

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Agricultural activities are significantly responsible for the emission of anthropogenic greenhouse gases and the associated climate change. Besides carbon dioxide (CO_2) emissions related to production, fertilizer manufacturing, and intensive farming, we must also consider the emissions of methane (CH_4) and nitrous oxide (N_2O). Agriculture is the primary source of these two greenhouse gases. About 60% of methane emissions from human activities originate from agriculture, with the largest share coming from ruminant livestock. In the case of nitrous oxide, around two-thirds of anthropogenic emissions stem from fertilizer use, manure management, and microbial processes in soils. Additionally, fertilizer application leads to ammonia (NH_3) emissions, which, although having a minor direct greenhouse effect, contribute to environmental harm (e.g., biodiversity loss, nitrate contamination of groundwater, eutrophication, stratospheric ozone depletion, and health impacts) through interactions with other nitrogen compounds. For sustainability purposes, the first step in prevention and emission reduction is identifying the sources and their intensities. Infrared gas analyzers are the most suitable tools for determining concentrations and material fluxes between different media, with photoacoustic spectroscopy standing out among them. In this method, the target gas sample is excited with modulated laser light at a specific wavelength. During relaxation, a local temperature increase occurs, causing thermal expansion, pressure fluctuations, and the generation of an acoustic wave (sound), which can be detected by a sensitive microphone. Photoacoustic technology has several advantages, including linearity over a wide measurement range (from ppbv levels up to 100%), in-situ, non-destructive sampling with open chambers, and high selectivity. Photoacoustic methods can be applied in various agricultural areas to estimate emissions. Globally, it is known that half of the fertilizers are not utilized by crops but instead pollute the environment. Additionally, emissions related to fertilizer production could be reduced by improving efficiency. In our experiments, we analyze the nitrogen cycle in the soil – plant – atmosphere system for different crops, focusing primarily on detecting ammonia emissions after fertilization. We measure nitrogen flux using the relaxed eddy accumulation technique above the plant canopy, combining a quantum cascade laser-based photoacoustic spectrometer with an ultrasonic anemometer. We also plan to measure nitrous oxide emissions resulting from (de)nitrification using a similar approach. Furthermore, we have developed a model and simulations to estimate the ratio of stomatal and soil ammonia emissions and to determine the proportion of soil ammonia emissions recaptured by plants. Source identification is also conducted through laboratory incubation experiments, using the combined measurement of $^{15}NH_4^+$, $^{14}NH_4^+$ isotopologues, and $^{15}N^{14}N^{16}O$, $^{14}N^{15}N^{16}O$ isotopomers. In both our field and laboratory incubation studies, we analyze the effects of climatic stress factors (heat and drought stress) on emissions. Regarding emissions from livestock farming, we measure methane emissions from ruminants at both the individual animal and barn levels. Additionally, ammonia, methane, and nitrous oxide emissions from excrement are primarily measured using chamber methods and photoacoustic spectroscopy. During the presentation, we will discuss the development of these measurement methods and our initial results.

Regular presentations

HUNGARIAN FARMERS' PERSPECTIVES ON THE CHALLENGES OF GENERATION CHANGE

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One of the key challenges in the European Union is the ageing farmers population. In 2016, over half of European farmers were above 55, while those under 40 made up only 10%. In Hungary, by 2023, 36.9% of farmers were over 65, whereas only 4.9% were under 35. My previous research explored factors that either hinder or support generational change in agriculture. This study examines how these factors affect farmers and the difficulties they create. I conducted in-depth interviews with 19 farmers, one from each county, ranging in age from 21 to 62. The sample included 6 women and 13 men from various agricultural sectors, such as livestock, arable crops, vegetable cultivation, forestry, and fruit growing. Participants rated both their personal situation and their perception of the national agricultural landscape on a scale of 1 to 5. Key challenges identified were labour shortages, administrative burdens, climate change, and economic impacts. However, support mechanisms like reducing bureaucracy, support digitalization, subsidized loans, and targeted aid for young farmers proved beneficial. Interestingly, some younger farmers did not perceive administrative burdens as a challenge, having grown up with them. Expert interviews further validated these findings, reinforcing the challenges and support systems shaping the future of agriculture.

MILK PRODUCTION WITH OUT UPBRINGING HEIFERS

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Dairy farming today faces many challenges. Climate change, the resulting social perceptions, anomalies in feed production, the unpredictable economic situation and labour shortages are all placing multiple negative affects on the sector. Decades-old animal husbandry breeding-technologies need to be rethought and reinterpreted in order to maintain and improve the profitability of farming.

The study and shortening of so-called inproductive periods have long been the focus of attention among specialists. We call it inproductive because there is no production of commodities under it. One of these periods is the drying of cows and the other is the rearing and rearing of young cows. In the latter case, the minimum period is 24 months as opposed to 2 months for drying. From a management point of view, replacement breeding animals are a stock in the life of the farm and a significant negative affect on production.

Our work has been carried out on a farm which does not breed breeding stock. The female animals born are sold as soon as possible. It buys the breeding stock it needs in the quantity, quality and time it wants. The continuous purchase of breeding stock does not significantly affect the profitability of milk production and the cash freed up provides additional opportunities for the operation of the farm.

ECONOMIC ISSUES IN LAVENDER PRODUCTION

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Medicinal and aromatic plants are of greater economic benefit than arable crops. Lavender plays a particularly important role among these plants. Understanding the economic viability of growing medicinal and aromatic plants is an important step in developing future policies. The cultivation of medicinal and aromatic plants can be highly profitable, both financially and economically, for small-scale producers and can provide a decent standard of living for many people. In our country, medicinal and aromatic plants are still grown in relatively large areas and in large quantities. In recent years, the area under such crops has been between 37 and 42 thousand hectares, and the weight of drugs produced has been around 35-40 thousand tonnes. However, it has to be recognised that the Hungarian herbal medicine sector is not up to the international challenges facing the sector. Several solutions have been proposed to address this. However, the authors of the article point out that it is essential to assess the economic viability of lavender as a perspective crop. Many people start lavender cultivation without thinking it through, and sales can also be a barrier to cultivation. They do not look at the market, they do not make economic calculations. This work uses data from a lavender grower. However, in many cases, the authors are forced to use modelling because the small growers themselves do not have the information that would allow them to correctly calculate the profitability of the crop. The main aim of this work is, however, to show a method for carrying out an economic analysis of a medicinal or aromatic plant.

WORK ORGANISATION ISSUES IN LAVENDER PRODUCTION

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Lavender started its journey of discovery from the Mediterranean in the Mediterranean Sea and conquered the whole world. Its unbroken popularity is due, among other things, to its many uses, its medicinal properties and the tradition that has been built up around it over thousands of years. In recent times, lavender has infiltrated the household, been discovered by the pharmaceutical industry, and has also retained its natural beauty through the sight of a continuous field of purple lavender. In our work, we are the first in Hungary to venture into the formulation of work organisation issues in lavender cultivation. No literature sources were available for this. With the help of a lavender-growing enterprise, we compiled the technical formulations and, by providing basic data, the calculations that shed light on the characteristics of Hungarian lavender cultivation. We formulated the methods to be used for the study, the Workday Recording Method for manual work and the Operational Cycle Method for machine work. The available data were used to model the inputs and costs of plantation establishment. Based on our tests, we calculated the norms and time requirements of the cultivation operations. Unfortunately, in our conclusions we reported that there are no specific publications on this topic and that most of the producers do not consider the possibilities offered by the study of work organisation.

AGRICULTURAL PRODUCTION

AI AND COMPUTER TECHNOLOGY IN SWEET PEPPER (*CAPSICUM ANNUUM* L.) GROWING IN HUNGARY

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The sweet pepper is the most important vegetable in Hungary. The intensive, soilless technology is widespread in sweet pepper cultivation. The application of computer technology and artificial intelligence can be a great help in everyday work. Can be applied in multiple areas. For example, in the continuous nutrient-supply or monitoring of assessing of insect or fungal infestation of the cultivation. In order to achieve the richest nutrients, it is important to cultivate the stock flawlessly. The application of artificial intelligence may help to gardeners in the future. The review provides insight into the work processes of soilless pepper cultivation, analyzes the most valuable content of peppers, and answers the usefulness of the application of computer technology and artificial intelligence.

CHALLENGES AND SOLUTIONS FOR CARP-DOMINANT POND AQUACULTURE IN HUNGARY TODAY

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Carp-dominated pond aquaculture in Hungary faces several challenges that impact productivity, sustainability, and economic viability. During our investigations, we identified the following types of challenges: i) Environmental, ii) Biological, iii) Economic, iv) Regulatory, v) Technological, vi) Social and Cultural, and vii) Competing Land Uses.

To address these challenges, a multi-faceted approach is necessary:

• Integrated Water Management: Implementing efficient water use practices and enhancing water quality management can mitigate environmental impacts.

• Disease Prevention: Developing comprehensive disease management plans, including biosecurity measures and vaccination programs.

• Economic Diversification: Exploring value-added products and alternative markets to stabilize income and reduce dependency on single revenue streams.

• Policy Advocacy: Engaging with policymakers to create supportive regulatory frameworks and access to subsidies or financial incentives.

• Technology Integration: Investing in technology and training to enhance productivity and sustainability.

• Community Engagement: Building awareness and acceptance of aquaculture through education and outreach programs.

By addressing these challenges through collaborative efforts involving farmers, researchers, policymakers, and industry stakeholders, the sustainability and profitability of carp-dominated pond aquaculture in Hungary can be significantly improved.

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CLIMATE CHANGE AND NEW INSECT PESTS IN VITICULTURE

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Abstract: Climate fluctuation has turned into climate change in the last 10-20 years, the results of which can be seen in extreme weather events. From a climatic point of view, our country is divided into three sub-zones, of which the first sub-zone is warm-temperate or Mediterranean, the second sub-zone is medium-temperate, while the third sub-zone is cold-temperate. So it is essential to monitor the climate changes of these subzones in the future. Since the transformation of the flora requires a relatively long time, witch these pest insects world does not, therefore the change in the climate of our country is already noticeable, which is connected with the completion of globalized networks and the arrival of insects in a new environment. Such new damage recipients in grape culture are the green wandering bug (*Nezera viridula* LINNAEUS 1758), the american grape cicada (*Scaphoideus titanus* BALL 1932), the snake-mining vine moth (*Phyllocnistis vitegenella* CLEMENS 1859), the grape-mining bright moth (*Antispila oinophylla* VAN NIENKERKEN & WAGNER 2012) and the small glow moth (*Holocacista rivillei* STAINTON 1855). Two of these are interesting because of global climate change, two are interesting because of globalized trade, and one is interesting partly because of trade and partly because of climate change.

EFFECT OF 6-BENZYLAMINOPURINE ON IN VITRO MICROPROPAGATION OF DIFFERENT SWEET POTATO (*IPOMOEA BATATAS*) GENOTYPES

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Sweet potato (*Ipomoea batatas*) remains a significant root tuber, owing to its economic and health benefits. However, poor planting materials are a significant factor that hinders the economic productivity of the crop globally. *In vitro* micropropagation remains a cheaper and highly effective technique for rapidly producing healthy propagules in a relatively short time. However, the efficiency of micropropagation is contingent on various factors, of which plant growth regulators are prominent. In this study, nodal segments from regenerated shoots of three different sweet potato genotypes (Asothalmi 12, Purple, and Bayou) were cultured on Murashige and Skoog (MS) media supplemented with four different concentrations of 6-benzylaminopurine (BAP) (0 mg/l, 1 mg/l, 2 mg/l, and 4 mg/l) under *in vitro* micropropagation technique. Data on morphological parameters were recorded 28 days after culturing. The results revealed a significant ($p < 0.001$) variation in morphological parameters among sweet potato genotypes in response to BAP treatment. Optimum plant regeneration was recorded from plants grown on MS medium supplemented with 1 mg/l BAP. The findings of this research could contribute to the development of innovative techniques for enhanced sweet potato micropropagation.

EFFECT OF 6-BENZYLAMINOPURINE ON SWEET POTATO'S (*IPOMOEA BATATAS*) RESPONSE TO DROUGHT STRESS

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Sweet potato (*Ipomoea batatas*) is a significant crop owing to its high nutrient content, economic value, and adaptability. Although it is a hardy crop that can withstand unfavorable conditions, the long duration of such conditions tends to significantly affect its growth and development. 6-benzylaminopurine (BAP) is a plant growth regulator whose effect on plant growth and morphogenesis is well established. However, its role in plant development and responses to abiotic stresses, such as drought, has not yet been explored. Therefore, this study sought to determine the effect of 6-benzylaminopurine on the response of sweet potatoes to drought stress. Stem cuttings (15 cm each) of Ásothalmi 12 (a local sweet potato genotype in Hungary) were used for planting. The experiment was conducted in a 2 × 2 factorial design containing four different treatments. Each treatment was replicated thrice. Drought stress was imposed by the complete withdrawal of water for 14 days after the successful establishment of the plants. 5 mg/l BAP was applied using the foliar method to the selected groups. The data collected were analyzed to assess the singular and interactive effects of drought stress and BAP on the morphophysiology of plants, as well as the effect of BAP on the plants' recovery from drought stress. The results revealed significant ($p<0.001$) effects of the applied treatments on the measured parameters over time. This study contributes to the ongoing scientific exploration of the effects of plant growth regulators on crop improvement.

EFFECT OF TILLAGE PRACTICES ON DURUM WHEAT (*TRITICUM DURUM*) PRODUCTIVITY UNDER SEMI-ARID CLIMATIC CONDITIONS.

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Cereal cultivation remains a cornerstone of Algerian agriculture, with barley and wheat covering approximately 5 million hectares annually, representing around 60% of the country's agricultural land. These crops are primarily grown in semi-arid and arid regions under rain-fed conditions, making their productivity highly dependent on irregular and unpredictable rainfall. This climatic variability is a major factor contributing to low yields. Moreover, the tillage practices currently in use are often poorly adapted to such challenging environmental conditions.

The adoption of conservation tillage seeks to mitigate the negative impacts associated with conventional tillage, including soil erosion, compaction, and the depletion of organic matter. By preserving natural resources, particularly soil conservation, tillage offers significant agronomic and environmental benefits. The adaptation and dissemination of no-till systems with surface mulch open new prospects for the sustainable development of cereal production in semi-arid regions.

The main objective of this study is to evaluate the impact of four tillage systems—conservation tillage (notably no-till systems using the "Boudour" and "John Shearer" direct seed drills), conventional tillage, and minimum tillage—on the development of the Vitron variety of durum wheat. The field experiment was conducted over two growing seasons at the Technical Institute of Field Crops in Sétif, a region characterized by a semi-arid climate.

The results showed that tillage practices significantly influenced wheat productivity, root development, and emergence rate. The "Boudour" direct seed drill achieved higher emergence rates and greater root density compared to the "John Shearer" drill. However, conventional tillage yielded the highest root density (1.85 $g \cdot dm^{-3}$) and grain yield (42 $qx \cdot ha^{-1}$), while the lowest yield (16 $qx \cdot ha^{-1}$) was recorded under the John Shearer direct seeding system. Although grain weight per spike and spike length were not significantly affected by tillage type, the number of grains per spike and tillering were notably influenced.

These findings underscore the importance of selecting appropriate equipment and tillage strategies to optimize wheat production in water-limited environments, and they support the promotion of locally developed seeding technologies for more sustainable agriculture.

EXAMINATION OF THE EFFECT OF CORN SMUT (*USTILAGO MAYDIS*) INFECTION ON PHYSIOLOGICAL PARAMETERS IN A SMALL-SCALE FIELD EXPERIMENT

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Corn smut can infect corn at any stage of its life cycle. The principal symptoms are chlorosis, necrosis, growth inhibition, and the formation of tumours on the plant. It has been estimated that approximately 40% of the yield is lost because of the infection. It is of great importance to implement measures to prevent the infestation of corn smut caused by insect damage or by mechanical means. The objective of this study was to examine the impact of corn smut infection on the physiological parameters of the host plant, including plant height and yield quality. The infection was initiated at the 7-8 phenological phase of the plants. The inoculum was created in a laboratory setting. The infestation was done ninety days after sowing. Two hundred plants were infested. Ten plants were randomly selected from the twenty experimental plots. Four treatments were used: Mycostart Bio (mycorrhiza preparation) 35 kg/ha dose, Mycostart Bio + plant conditioner, Genium (plant conditioner), and Fungicide (Prosaro). Based on the preliminary assessment of the treatments in relation to the control plot, Mycostart Bio + plant conditioner, which includes the mycorrhiza treatment and plant conditioner treatment, seems to have the most promising potential. However, further research is essential to reach a definitive conclusion regarding the efficacy of each intervention.

FUNGICIDE EFFECT ON *FUSARIUM GRAMINEARUM* AND CONCENTRATION OF MYCOTOXIN IN THE EAR OF MAIZE (*ZEA MAYS* L.)

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Maize (*Zea mays* L.), being the queen of cereals and one of the most significant crops grown globally, both as human food, raw material for agricultural processing industries, and feeds for animals, is highly threatened by a wide host of fungal diseases. Fusarium Head Blight (FHB) caused by *F. graminearum* is more devastating, thus causing high yield loss and grain contamination, hence posing food safety and health concerns to both human and animal life globally. The objective of the study was to investigate how different fungicides affect Fusarium infection and mycotoxin concentration in maize. The MV Koppány maize variety was planted on 20 small plots (3 m x 6 m) at the Institute of Plant Protection, University of Debrecen, and allowed to thrive under natural infestation with *Fusarium graminearum*. Treatments included: Mycostart Bio (mycorrhiza preparation) 35 kg/ha dose, Genium 4l/ha dose, 60 ml/ 15 square meter plot + Solvitis Zn plant conditioners 1 l/ha dose, 15 ml/ 15 square meter plot, Fungicides Prosaro which contain protionconazole + tebuconazole active substances was used at a dose of 1 l/ha dose and 15 ml/15 square meter plot. T-test analysis showed that *Fusarium* infection was greatly reduced because of the use of fungicide Prosaro, which contains prothioconazole + tebuconazole active substances, as compared to the control plots, however, Further analysis is to be done to establish the concentration of mycotoxins in the ear.

GREENER ALFALFA FIELDS: UNLOCKING DRY MATTER POTENTIAL WITH BIOSTIMULANTS AND FOLIAR NUTRITION

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Medicago sativa is known as the backbone of global forage systems, and its production must evolve to thrive in a future marked by limited resources and environmental stress. A study conducted at the University of Debrecen aimed at exploring how cutting-edge biostimulant technologies, solely and combined with foliar nutrition, can transform alfalfa production, unlocking its full potential for greener, more resilient fields. The experiment was arranged in a randomised complete blocked design with four treatment levels consisting of (i) Biostimulant containing MTU®, pidolic acid, and Si, (ii) Tricho Immun + Ino Green (foliar fertilizer), (iii) Tricho Immun, and (iv) control repeated three times. Data collected, including gas exchange parameters, dry matter content, yield, and yield components, were then subjected to analysis of variance using Genstat edition 18, where significant means were separated at a 5% probability level using the least significant difference. Our findings show that the treatments applied significantly impacted gas exchange parameters, dry matter content, yield, and yield components. The combined application of Tricho immun plus Ino green showed the most promising results by increasing transpiration rate by 51.4%, stomatal conductance by 53.9%, and total biomass yield by 21.1%, while Tricho immun also increased intercellular CO_2 by 10.4% over the control. Our findings depict that the integration of biostimulants and foliar nutrients in alfalfa production demonstrates significant improvements in total biomass yield, dry matter yield, and photosynthetic efficiency. This suggests that biostimulants, along with foliar nutrition, can play a significant role in optimizing crop performance under diverse growing conditions.

IMMUNOCASTRATION IN MALE SHEEP AND GOATS

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Castration is commonly performed to suppress male hormone and spermatozoa production, either through the surgical removal of the testicles or by in situ disruption of testicular function. However, physical castration negatively impacts key production traits such as feed efficiency, growth rate, and carcass characteristics. Additionally, concerns regarding pain and varying levels of stress associated with the procedure raise significant animal welfare issues. As a less invasive alternative, immunization against reproductive hormones offers a practical approach to castration. Immunocastration, which induces antibodies against Gonadotropin-Releasing Hormone (GnRH), luteinizing hormone (LH), and follicle-stimulating hormone (FSH), has been recognized as an effective method for suppressing reproductive function in farm animals. Furthermore, gene immunization presents a novel approach, utilizing plasmid constructs encoding exogenous genes to achieve targeted immunosuppression. However, further improvements are needed for the development of commercially viable immunocastration vaccines. This review evaluates the effects of hormonal and gene immunocastration in male sheep and goats, with a focus on reproductive traits, growth performance, carcass characteristics, meat quality, and feed efficiency.

INTEGRATING CONSERVATION TILLAGE AND SOIL MONITORING FOR OPTIMISED SOIL MOISTURE IN SUSTAINABLE AGRICULTURE

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Sustainable agriculture responds to the global environmental challenges by conserving soil and water resources. Integrating conservation tillage with soil monitoring technologies boosts soil health and moisture retention, which improves water use efficiency. The strategy optimises soil moisture, contributing to better crop growth and less environmental impact, amidst unresolved issues like costs and training. Examining the potential of integrating soil monitoring technologies with conservation tillage as well as assessing how it could impact soil and water parameters, remains a critical area of research. Therefore, content for this study was gathered from three databases, Google Scholar, Web of Science (WoS), and Scopus, with a search conducted using a query comprised of major phrases, "conservation tillage' and "soil monitoring." Microsoft Excel was employed for managing references and creating graphs. Literature published in English from 2005 to 2025 was selected based on inclusion and exclusion criteria with a focus on conservation tillage and soil moisture, and a structured methodology applied to the study objectives. The mean rates for literature screening, synthesis, and search-to-synthesis were 76.23%, 8.47%, and 6.47%, respectively. The variances were 1.62, 16.36, and 8.91, with standard deviations of 1.27, 4.05, and 2.98. The regression model, thus, suggests that increasing soil monitoring technologies boosts water use efficiency by 1.6429 per unit increase. Conservation tillage practices like strip tillage, no-till, ridge tillage, and mulch till significantly improve soil health, water retention, and crop yields. Future research should explore the long-term impacts on soil organic carbon levels and their cumulative effect on crop yield.

INVESTIGATING THE OCCURRENCE OF SPECIES BELONGING TO *GYMNOSPORANGIUM* SPP, MAINLY ON *PYRUS COMMUNIS* AND *JUNIPERUS COMMUNIS* IN DEBRECEN

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Rust diseases caused by Gymnosporangium species are increasingly recognized as significant fungal pathogens affecting Maloideae plants across the northern hemisphere and especially Europe, with an increasing trend of organic farming. However, knowledge about the occurrence and diversity of this genus in Hungary remains limited, necessitating accurate diagnosis and further study. This research aims to investigate rust infections on both wild and cultivated Maloideae and Cupressaceae hosts. Our study employs a randomized complete block design (RCBD), integrating microscopic examination and DNA sequencing to identify the pathogen responsible for observed symptoms. Preliminary findings indicate that the symptoms align with the description of Gymnosporangium sabinae, with infections detected exclusively on Pyrus communis. To confirm its pathogenicity, an artificial inoculation experiment will be conducted in the Debrecen Pallag Garden, using three concentrations of basidiospores. We hypothesize that G. sabinae is the only Gymnosporangium species present in the study area, specifically affecting Pyrus communis with significant infection rates. This might open doors for further research in the future for the sole aim of breeding resistant genotypes of pear.

OPTIMIZING WINTER BARLEY (*HORDEUM VULGARE* L.) YIELD AND SOIL HEALTH: IMPACTS OF FOLIAR NUTRIENTS AND PRIMARY TILLAGE PRACTICES ON PRODUCTIVITY AND CO_2 EMISSIONS

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Sustainable precision farming techniques are vital for ensuring global food security and addressing the challenges of climate change. A field study conducted at the Hungarian University of Agriculture and Life Sciences in Gödöllő between 2023 and 2024 explored the impact of soil tillage and foliar nutrient application on winter barley yields, related traits, and soil CO_2 emissions. The experiment utilized a split-plot design with three replications, incorporating four foliar nutrient treatments (Control, Bio-cereal, Bio-algae, and MgSMnZn Blend) and two primary tillage methods (plowing and cultivator). Results revealed that soil CO_2 emissions varied across crop growth stages under both tillage systems, though tillage type itself showed no direct influence. Similarly, leaf chlorophyll content remained unaffected by both tillage and nutrient treatments. Nutrient applications significantly influenced plant height, leaf area index (LAI), and thousand kernel weights (TKW) across the seasons. Both tillage and nutrient treatments had a significant impact on the number of productive tillers and consistently affected grain yield over the two seasons. Furthermore, the interaction between tillage and nutrient treatments significantly influenced grain yield and TKW. Among all treatment combinations, bio-cereal nutrients paired with plowing resulted in the highest values for most parameters throughout the study. These findings highlight the potential of combining bio-cereal nutrient treatments with plowing to improve winter barley yields. Notably, soil CO_2 emissions were highest during the reproductive stage of the crop, exceeding levels observed during earlier growth stages.

PRESERVING SILAGE QUALITY: THE SCIENCE BEHIND AEROBIC STABILITY AND SPOILAGE CONTROL

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Climate change exerts a fundamental influence on the quality of the forage base and the safety of feed in Hungary, with the negative effects of interrelated climatic factors, in part due to their unpredictability, proving challenging to mitigate in practice. To maintain the health status of dairy herds and sustain the expected production level, it is essential to provide silage with a nutrient content adapted to the given lactation stage, high digestibility, proper fermentation quality, and stability after opening. Ensiling is a multi-step process requiring strict technological discipline, and the quality of the ensiled feed is influenced by the species and variety of forage crops, their cultivation techniques, and the ensiling technology itself. After the ensiling process, upon silo opening, aerobic deterioration processes may occur, which can negatively affect even well-fermented forage quality. In light of these factors, there is an increasing need to understand the factors influencing the aerobic deterioration of silage. Monitoring the aerobic stability characteristics of feed is crucial for assessing the quality, shelf life, and feed ability of fermented forages. This summary study reviews the microbiological and closely related biochemical factors influencing aerobic stability, as well as the effects of ensiling technology and environmental parameters on the aerobic deterioration of fermented feed.

THE EFFECT OF HEAT STRESS ON THE INSEMINATION RESULTS IN DAIRY COWS

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Heat stress is a significant challenge affecting dairy cow performance, particularly reproductive success. This study evaluated the impact of heat stress on insemination outcomes using 512,801 insemination records from 5780 cows collected between 2002 and 2024. The univariate logistic regression was used for statistical analysis. As a result, a temperature-humidity index (THI) below 59 had no significant effect on success rates. However, from THI 59 onwards, a progressive decline was observed, becoming statistically significant ($p < 0.05$). At THI $\geq$ 62, the odds of pregnancy dropped sharply, with success rates decreasing from 28.0% at THI 60 to 14.7% at THI 76. Heat stress significantly reduced pregnancy odds at all evaluated time points relative to insemination ($p < 0.001$). Compared to non-heat stress conditions, odds ratios (OR) for pregnancy remained consistently below 1 (range: 0.558–0.641; all $p < 0.001$), indicating a strong negative association. The most pronounced effect occurred two days before insemination (OR = 0.558, 95% CI: 0.526–0.592), followed by insemination day (OR = 0.587, 95% CI: 0.553–0.622) and seven days before (OR = 0.606, 95% CI: 0.603–0.680). The effect persisted from 21 days before to over 21 days after insemination, highlighting the prolonged impact of heat stress on fertility. In conclusion, these findings highlight that heat stress exposure during the peri-insemination period significantly reduces reproductive success in dairy cows, underscoring the need for improved management strategies to mitigate its effects during this critical period.

THE RELATIONSHIP BETWEEN SOIL CO_2 EMISSIONS AND DAILY EVAPORATION UNDER DIFFERENT WEATHER SEASONS

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Carbon dioxide (CO_2) is one of the potent greenhouse gases found in agricultural soils and is one of the major contributors to the global greenhouse gas effects. The relationship between soil CO_2 emissions and daily evaporation is extremely complex, and its net efflux is inseparably linked to the agro-climatic factors, especially soil moisture and temperature. In this study, we aim to examine the relationship between CO_2 emissions and evaporation and their seasonal variations determined in a lysimeter experiment. Sorghum and grapes were grown in precision weighing lysimeters in 3 replications. Results indicate that soil CO_2 fluxes showed evident seasonal variations across the year and seasons. The CO_2 efflux was highest at 0.3 $g^{-1}m^{2-1}h^{-1}$ with sorghum and 0.27 $g^{-1}m^{2-1}h^{-1}$ with grapes during the summer of 2023, while the lowest CO_2 effluxes were 0.03 $g^{-1}m^{2-1}h^{-1}$ and 0.02 $g^{-1}m^{2-1}h^{-1}$ during the winter of 2023. The trend is similar to evaporation as high peaks were 4.22 mm day^{-1} with sorghum and 3.62 mm day^{-1} with grapes in summer, while lower peaks were 0.4 mm day^{-1} and 0.401 mm day^{-1}, respectively, in winter. There was a significant, strong positive correlation of soil CO_2 emission with evaporation at (r=0.87) under grapes, and a moderate positive correlation (r=0.46) under sorghum. Our study suggests that there is a significant relationship between soil CO_2 emissions and daily evaporation. Therefore, reducing evaporation through apt management techniques may stabilize CO_2 and reduce emissions. Furthermore, measuring one of these two parameters may be the basis of the estimation of the other one.

THE ROLE AND IMPORTANCE OF VARIETY SELECTION IN THE CULTIVATION OF SALAD ONIONS

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In our country, the size of traditional red onion growing areas is decreasing, but the demand for non-spicy, sweet-tasting salad onions is also increasing. It is mainly used for fresh consumption and for making cold dishes due to its lower content of sulfur and dry matter. Salad onions have a milder taste, but are superior to traditional varieties in terms of size and unique weight. The experiment was carried out on chalky chernozem soil, where 3 varieties (Globo, Spanish giant, Exhibition) were evaluated, with the Makói bronz domestic market onion used as a control. To perform t the experiment, we produced seedlings, which were planted (April 13, 2022) at 6 weeks of age. The harvest was done on August 1, 2022. After harvesting, individual onion weight (g/piece), sulfur (mg/kg) and vitamin C (mg/100 mg) content were measured, and the amount of polyphenols (mg GAE/100g) and flavonoids (mg CE/100g) as well as the Brix (%) value were determined. Sensory evaluation was evaluated on a scale of 1-5. The Exhibition variety showed the highest individual onion weight (364±62 g/pc). It also showed a high value for vitamin C content (142 mg/100g). On the other hand, we measured lower sulfur and total polyphenol content compared to the control. During the sensory evaluation, Exhibition received the best value, but Globo was also popular among the varieties. Overall, it can be concluded that salad onions can be grown successfully in our country. The Exhibition variety proved to be the best under the given experimental conditions.

TOWARDS SUSTAINABLE AND INCLUSIVE AGRICULTURE IN SKOURA M'DAZ: THE ROLE OF TERROIR PRODUCTS AND AGROECOLOGICAL PRACTICES

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Located in the Middle Atlas region of Morocco, Skoura M'daz is renowned for its distinguished terroir products, particularly olive oil and aromatic and medicinal plants (AMPs). These products, cultivated using traditional methods that respect natural cycles, are central to the local cultural identity and represent a model of sustainable agriculture. Against the backdrop of global climate change and evolving agricultural practices, this study investigates the value chains of olive oil and AMPs in Skoura M'daz, focusing on their current challenges and opportunities for sustainable development. The research examines the production processes, transformation techniques, and marketing strategies employed by local cooperatives, which play a pivotal role in structuring agricultural supply chains and promoting quality standards. Key findings reveal that while traditional methods help preserve biodiversity and product quality, the absence of specific certifications limits market visibility and competitiveness. Additionally, logistical constraints and high production costs hinder broader accessibility for consumers. To address these issues, the study proposes strategic interventions, including product diversification, improved logistics infrastructure, and the adoption of agroecological practices aligned with Morocco's Generation Green 2020-2030 strategy. Furthermore, enhancing women's participation in decision-making processes is identified as critical for inclusive development. In conclusion, strengthening professional organizations and mobilizing resources to support resilient practices could transform Skoura M'daz into a model of sustainable agriculture, preserving its natural and cultural heritage while contributing to global food security.

ANALYSIS OF PHYTOPLASMA DISEASE OF APRICOT PLANTATIONS WITH LABORATORY AND REMOTE SENSING METHODS

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The health condition of apricot (*Prunus armeniaca*) trees is affected by various abiotic and biotic factors, for example, spring frost and diseases that cause the death of trees. I started to analyse the most aggressive apricot disease, the European stone fruit yellows, '*Ca*. Phytoplasma prunorum' pathogen that, in many cases, results in severe crop loss and the sudden death of trees. Our main objective was to verify the presence of the pathogen in the major apricot-growing regions. We verified the phytoplasma presence in the laboratory circumstances with PCR analysis. In the plantations where phytoplasma was confirmed, our objective was to try to detect or even predict the infection using drone-based remote sensing. With the use of UAVs, we took monitoring images over the plantations and conducted the data analysis using QGIS software. Using the vegetation indices calculated from the monitoring images, we could obtain information about the health of the apricot trees. Research on the pathogen is of fundamental importance, as there is currently no effective method for controlling the disease it causes. Currently, protection can only be based on prevention, the key elements of which are planting infection-free propagating material and controlling the vector responsible for its spread in the plantation. Apricots are one of the most important cultivated fruits in Hungary; therefore, it is highly important to better understand and map this dangerous disease.

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IMPACT OF SOWING DATES ON THE PERFORMANCE OF SWEET CORN HYBRIDS (*ZEA MAYS* L. SACCHARATES)

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This study, conducted at the Látókép Experimental Station of the University of Debrecen during the 2023 growing season, assessed the performance of 32 sweet corn hybrids under two sowing dates using a randomized complete block design. Key traits evaluated included plant height, yield, dry matter content, and ear characteristics. The highest plant heights were observed in HMC305 (242 cm) for the first sowing date and Impress (251 cm) for the second. Yield performance differed across hybrids, with HMC302 producing the highest yield (29,300 kg/ha) in the first sowing and Messenger (22,300 kg/ha) leading in the second. The dry matter per cob increased from 31.54 g in the first sowing to 34.99 g in the second, suggesting enhanced nutrient accumulation with later planting. The highest number of cobs per plot was recorded in SVSK4540 (89) for the second sowing and HMC302 (114) for the first. Grain yield showed variation, with ZHY5022OD achieving the highest in the first sowing (2.0) and SVSK2949 leading in the second (2.02). Ear length ranged widely among hybrids, with ZHY5022OD (22.6 cm) and ZHY5233OD (23.15 cm) displaying the longest ears in the first and second sowing dates, respectively. The study also revealed that delayed sowing could enhance cob dry matter, contributing to better crop quality. Moreover, hybrids demonstrated diverse adaptability to different planting windows, underscoring the need for targeted hybrid selection. These results emphasize the substantial influence of sowing date on hybrid performance. The study highlights the importance of selecting suitable hybrids for specific sowing windows to optimize sweet corn yield and quality. This research contributes valuable insights for developing agronomic strategies to enhance productivity and sustainability in sweet corn cultivation, offering practical guidance for growers and agronomists.

LONG TERM TILLAGE AND FERTILIZATION EFFECTS ON SOIL MICROBIAL ACTIVITY AND BIOMASS IN CORN RHIZOSPHERE

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Soil microorganisms secrete enzymes that play a vital role in organic matter decomposition and cycling of nutrients, hence valuable indicators of soil health and fertility. Agrotechnical interventions, namely tillage and fertilization, have a great influence on soil microbial activities and biomass, hence the need to investigate their effect in long-term experiments. The objective of this study was to determine the effects of long-term tillage and NPK fertilization on soil microbial activity and biomass in corn rhizosphere grown under biculture rotation. The soil samples were collected in June and September of 2024 from the long-term field experiment established in 1991 at the University of Debrecen's Látókép research station. The treatments included control (no fertilizer), NPK fertilization (160 kgN/ha, 60kg P_2O_5/ha, 90kg K_2O /ha), and tillages (plough tillage-PT, strip tillage-ST, and ripper tillage-RT). Soil enzymes (Saccharase, Urease, Dehydrogenase, Phosphatase), microbial biomass and community (Arbuscular mycorrhiza fungi, saprophytic fungi, Gram negative bacteria, Gram positive bacteria, Actinobacteria) were measured by PLFA analysis of soil extract. NPK fertilization and tillage had a significant effect on microbial activity and biomass. Generally, higher enzyme activity was observed in NPK fertilized plots under RT and ST, with PT showing the lowest enzyme activity. Soil microbial biomass was greatly influenced by tillage. Arbuscular mycorrhiza fungi, saprophytic fungi, Gram-positive and Gram-negative bacteria biomasses were lowest under PT compared to ST and RT. In conclusion, RT and ST are more favorable tillages for soil microbial life than PT.

BIOLOGICAL CONTROL IN THE CULTIVATION OF DIFFERENT BUTTON MUSHROOMS

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In our previous research, we demonstrated the potential of *Bacillus velezensis* strains in the cultivation of white button mushroom (*Agaricus bisporus*), showing their effectiveness against the most serious challenge in industrial mushroom production: the green mould disease caused by *Trichoderma aggressivum*. A *B. velezensis* strain, SZMC 25431, has been selected, which has the potential of reducing or even eliminating the need for prochloraz-based pesticides (Büchner et al., Agronomy 2022, 12, 467). Building on these findings, our recent study extends the investigation to brown button mushroom, a more nutritious and flavourful variety of *A. bisporus*, aiming to enhance yield and promote pesticide-free cultivation. The research focused on developing a novel cultivation technology, emphasizing the role of *Bacillus* strains in promoting mushroom development. The B . *velezensis* strain SZMC 25431 was tested for its efficacy in improving overall cultivation outcomes and increasing final harvesting results. Yields of brown button mushroom from growing houses untreated, or treated with prochloraz, *B. velezensis,* or their combination, were compared with our previous data for white button mushroom. Our results validated the applicability of this new technology, indicating that *Bacillus velezensis* strains can contribute significantly to sustainable, pesticide-free mushroom production by improving yields and reducing chemical usage.

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COMPARATIVE ANALYSIS OF TWO-ROW WINTER BARLEY VARIETIES IN A SMALL-PLOT TRIAL IN 2024

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Globally, barley (*Hordeum vulgare* L.) is cultivated on approximately 47.15 million hectares, ranking as the fifth most extensively grown crop (FAOSTAT, 2022). In Europe, the agricultural sector is increasingly challenged by the accelerating impacts of climate change, necessitating the urgent adoption of sustainable production practices to safeguard food security (Werner et al., 2018). Consequently, the utilization of optimally adapted genotypes is imperative. During the 2023/2024 growing season, we conducted a small-plot field experiment to assess three two-row winter barley varieties. Instrumental measurements were taken three times throughout the growing season, followed by post-harvest assessments. Significant differences were observed among the varieties in terms of NDVI (Normalized Difference Vegetation Index) values, SPAD (relative chlorophyll content) values, LAI (Leaf Area Index) values, and assimilation rate values. We confirmed a negative correlation between yield and protein content. Significant differences in LAI values among varieties were only evident in the early stages of vegetation, whereas NDVI and assimilation rate values differed consistently throughout the entire vegetation period. The KH Korsó genotype demonstrated the highest yield, while Casanova had the lowest. The Mv Fáta genotype exhibited the highest protein content, whereas KH Korsó had the lowest.

EFFECT OF DROUGHT STRESS ON MENTHA SPICATA AND *MENTHA* × *PIPERITA* PHYSIOLOGICAL PARAMETERS

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The experiment aimed to assess the drought stress responses of *Mentha* × *piperita* and *Mentha spicata* 'Moroccan' under controlled conditions in a growth chamber. Plants, propagated from cuttings, were grown in a standardized peat-based substrate and maintained in a growth chamber. Prior to stress exposure, plants were well-watered and fertilized weekly with a half-strength Hoagland solution. Drought stress was induced by withholding irrigation until physiological indicators of water stress appeared, with soil moisture monitored daily using the gravimetric method. While control plants were kept above 80% field capacity, drought-stressed plants experienced a progressive decrease in soil moisture to approximately 30% field capacity. At the end of the pot experiment, chlorophyll fluorescence measurements were conducted using Pulse Amplitude Modulated technology with a FluorPen FP-100 on leaves that had been dark-adapted for 30 minutes while still attached to the mint plants. The relative water content (RWC) of the leaves was determined to assess the water status of the mint plants under drought stress. Our findings suggest that after drought exposure, *M. spicata* maintains a more efficient electron transport (ETR) system under high light conditions, whereas *M.* × *piperita* may experience greater photoinhibition or limitations in photosynthetic recovery. The reduction was more pronounced in *M.* × *piperita*, suggesting a higher susceptibility to drought-induced photoinhibition. RWC decreased significantly in both species, with a higher reduction in *M.* × *piperita*. Following drought stress, *M. spicata* retained a significantly higher RWC (60%) compared to M. × piperita (45%). The greater decline in *M.* × *piperita* suggests a lower ability to maintain cellular water balance under water deficit conditions, indicating a higher susceptibility to drought stress compared to *M. spicata*. These findings align with the observed differences in photosynthetic efficiency and chlorophyll fluorescence parameters, further supporting species-specific drought tolerance strategies.

EFFECTS OF CHEMICAL FERTILIZERS ON MAIZE (*ZEA MAYS* L.) GROWTH, YIELD, AND PRODUCTIVITY

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The application of chemical fertilizers plays a crucial role in enhancing maize (*Zea mays* L.) growth and yield by supplying essential nutrients. This study evaluates the effects of different fertilizer treatments, namely control, N80+PK, and N160+PK, on maize growth parameters, yield, and grain quality during the 2024 growing season. Fertilizer rates were N 0 kg ha^{-1} P_2O_5 0 kg ha^{-1} K_2O 0 kg ha^{-1} (control), N 80 kg ha^{-1} P_2O_5 60 kg ha^{-1} K_2O 90 kg ha^{-1} (N80+PK), and N 160 kg ha^{-1} P_2O_5 60 kg ha^{-1} K_2O 90 kg ha^{-1} (N160+PK). Data on yield (t/ha) and grain quality (moisture, protein, starch, and oil content) were collected. The results indicated that increasing fertilizer application improved yield and plant height, with the highest application rate producing the tallest plants (278 cm) compared to the control (227 cm). Protein content also increased significantly ($p<0.05$) with higher nitrogen doses. However, no significant differences were observed between N160+PK and N80+PK, making N80+PK the recommended treatment for economic and sustainability reasons. While fertilizers improve maize productivity by addressing soil nutrient deficiencies, excessive application may degrade soil health and contribute to environmental contamination. The study highlights the importance of balanced fertilizer application and suggests integrating chemical fertilizers with organic amendments to enhance soil fertility and ensure sustainable maize production.

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EFFECT OF MEDICINAL PLANTS IN THE THERAPY OF HORSES WITH COPD

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16 horses in Csongrád-Csanád county were examined for chronic obstructive pulmonary disease (COPD). During the study, several types of herbal mixtures were used in the study. Clinical baseline values and capillary saturation were measured over 3 months.

Our hypotheses and results are as follows:

1. We hypothesised that in COPD, a specific herbal blend would improve the quality of life of horses within 3 months. The hypothesis was confirmed, with a 94% reduction in respiration rate in 15 horses and a 50% reduction in pulse rate in 8 horses.

2. We hypothesised that herbal mixtures given as a preventive treatment significantly reduce the frequency of symptoms in horses with COPD. Partially confirmed. In scientific research horses that were also treated with steroids, the time between the two treatments was herbal tea mixtures could be used to increase the time between two treatments.

3. It was hypothesised that because the horses are in a potentially infected environment, the herbs fed as a preventive treatment could help horses with COPD to recover within 3 months. Our hypothesis was not confirmed because COPD disease is strongly influenced by husbandry technology and weather. The research took place in Csongrád-Csanád County, where summers are getting drier and dust concentrations are high.

RESULTS OF FOLIAR FERTILIZATION APPLICATIONS IN MAIZE PRODUCTION

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Nowadays, the use of foliar fertilizers in field crop production is increasing. We examined the effects of three different foliar fertilizers (Algafix, Amalgerol, Fitohorm Turbo Zn) on the yield amount, yield components, and quality of maize (cv. . Barrington) grain. The foliar application was done at the 6-8 leaf stage of maize. We evaluated the obtained data by single-factor analysis of variance. The foliar applications did not increase the yield of maize. In the case of the examined yield components, the foliar fertilizer treatments did not result significant difference, except for the thousand grain weight. The foliar fertilizers did not significantly affect the protein, starch, and oil content of maize grain. The biggest change was in the protein content, while the smallest change was in the oil content. During the experiment, we obtained valuable data regarding the effect of the investigated maize hybrid and foliar fertilizer preparations. We would like to continue our studies to get to know the effect of the preparations even better.

SURVEY OF SOIL-DWELLING PESTS AND COMPARISON OF CONTROL TECHNIQUES

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The aim of my research was to provide a comprehensive overview of current methods and technologies and to compare their effectiveness and applicability in different agricultural environments, in my case, in South-East Hungary, Békés county, to help orient myself in the range of soil disinfectants currently available on the market. The experiment was carried out in Battonya, with the help of Agrokemol Ltd. I set up 6 experimental plots in two replications. I tested 4 different soil disinfectants. No difference was found in the effect of the soil disinfectants. What I observed in the preliminary field inspection and survey of my experiment, namely, no insect was found in the field, was confirmed by the inspection and results of the plots set up. In general , the application of a control technology should always be based on predictions and a survey of the area. Comparing pest control techniques and analysing their effectiveness is key to the sustainability and efficiency of agricultural production. The control of polyphagous soil-dwelling pests is of particular concern as these pests can attack a wide range of crop species, thus posing a more complex challenge for farmers. I described and investigated some of the soil-dwelling pests and the climatic factors affecting their populations, global weather variability, and the effects of rainfall deficits.

SUSTAINABLE GUINEA FOWL BREEDING IN AFRICA: HARNESSING GENETIC DIVERSITY TO MEET SOCIO-ECONOMIC AND ECOLOGICAL NEEDS

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Guinea fowls (*Numida meleagris*) are native to Africa, namely sub-Saharan West Africa, where they were domesticated, and most continue to flourish in the wild. These avians are essential for food security as they produce meat and eggs with minimal maintenance, rendering them suitable for free-range agriculture in unfavourable climates. Nonetheless, their socio-economic and cultural significance, together with their genetic diversity status, remains inadequately comprehended. This review elucidates the significance of guinea fowl farming in Africa, focusing mainly on social, economic, and cultural aspects. Additionally, we review their genetic diversity to improve comprehension of their genetic landscape for enhanced sustainable exploitation. Our work was based on previously published materials and the authors' firsthand experiences. We emphasize the significance of guinea fowls by underscoring their genetic resilience to climate change effects, including extreme heat, water scarcity, and resistance to diseases. They remain productive in these challenging environmental conditions even with minimal external inputs, thus rendering them an economically viable choice for resource-limited smallholder farmers in rural areas. Reviewed sources have also highlighted their cultural relevance within African communities, including their role in ceremonies and gastronomic customs . Moreover, research indicates that these birds possess ecological significance, such as regulating agricultural pests and minimizing reliance on chemical pesticides. Genetic characterization studies indicate that guinea fowls exhibit substantial genetic diversity, highlighting their importance in this modern era of climate change. Enhanced exploitation of this genetic resource offers an opportunity for the sustainable supply of high-quality animal proteins to the expanding human population.

THE EFFECT OF DIFFERENT NITROGEN FERTILIZATION APPLICATIONS ON THE YIELD, OIL, AND PROTEIN CONTENT OF VARIOUS PEANUT CULTIVARS

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The objective of this study was to evaluate the impact of different nitrogen fertilizer doses on the yield and nutritional composition of various peanut cultivars. The experiment was conducted in 2024 in Ebes, Hungary, using a randomized block design. Five peanut cultivars (Balla, Zoltán, Georgia-06G, Kata, and Viviana) were tested under four nitrogen fertilization levels: control (0 kg N/ha), 60, 90, and 120 kg N/ha. The results indicate that all five cultivars adapted well to the heavy soils of the Hajdúság region, with Kata and Viviana exhibiting the highest yield potential. However, excessive nitrogen application (120 kg N/ha) generally led to yield depression, while moderate fertilization (60-90 kg N/ha) or even the control treatment often resulted in superior yield performance. Nutritional analyses revealed that oil and protein content were generally higher in the control plots, suggesting that excessive nitrogen fertilization may negatively influence peanut quality parameters. These findings highlight the importance of carefully optimizing nitrogen supply to maximize both yield and nutritional value. Future research will focus on gaining a deeper understanding of the physiological responses of peanuts to different fertilization levels. Long-term studies will also help determine the sustainability of these fertilization practices under varying climatic conditions.

THE IMPORTANCE OF PEPPER (*CAPSICUM ANNUM L.*) GRAFTING IN HUNGARY

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Sweet pepper (*Capsicum annuum L.)* holds substantial economic value globally. Grafting serves as an efficient technique within intensive vegetable cultivation, ensuring consistent quality and yield. Despite its benefits, the utilization of grafted seedlings in pepper farming is less prevalent compared to other vegetable types. Selecting a suitable rootstock can positively impact production and mitigate environmental pressures. Grafting involves the fusion of two or more living plant parts, enabling them to develop as a unified plant. This practice is commonly employed to diminish susceptibility to soil-borne pathogens and enhance resilience against abiotic stressors like temperature extremes, salinity, and waterlogging. In Hungary today, grafting is used for the propagation of six vegetable species (melons, cucumbers, tomatoes, peppers, and eggplants). Grafting offers both advantages and disadvantages: Monoculture cultivation has contaminated our soils to such an extent that growers are left with two choices: either to switch to soilless cultivation or to plant grafted crops. Inoculation not only protects against soil-borne pathogens and pests, but also increases the cold and heat tolerance of the root system of the graft compared to the autochthonous plant, which can lead to earlier planting and even earlier harvesting. Other benefits of grafting are that it can regulate the growth of the noble, increase the size of the fruit and thus the yield average, and even affect the nutritional value of the fruit. A major disadvantage of this technique, apart from the increased manual labour required, is that two seeds are needed for this method of propagation, which further increases the cost of seedling production. Furthermore, there is a risk of incompatibility between the rootstock and the seedling. Grafted peppers are mostly cultivated in a greenhouse for five to six months, and fruits are harvested continuously in green and unripe form. Some greenhouse pepper growers noted that the fruit length of grafted peppers is shorter or longer than non-grafted peppers, depending on rootstock genotypes.

POLLEN CONCENTRATION DATA SET FOR *AILANTHUS ALTISSIMA* IN 2019-2020, IN HUNGARY

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Nowadays, there is an increasing emphasis on the problem of invasive species. In areas where the tree of heaven (*Ailanthus altissima*) appears and multiplies, the original vegetation degrades and transforms. The tree of heaven is of great importance in urban environments, where it causes building damage, static problems and endangers utilities. In addition, it is worth mentioning that the pollen of Ailanthus altissima is allergenic, although less important than ragweed pollen. The p ollen concentration of the tree of heaven was measured in six counties of the Great Plain region (Jász-Nagykun-Szolnok county, Hajdú-Bihar county, Szabolcs-Szatmár-Bereg county, Bács-Kiskun county, Csongrád-Csanád county, Békés county) with the 7-day Hirst-type (Burkard) pollen trap. The highest annual total pollen count was detected in 2020 in Szabolcs-Szatmár-Bereg county (968 pieces). Our work draws attention to the differences in the distribution of the tree of heaven in the Great Plain region, based on which it can be seen that there can be many differences between the cities in terms of the total annual pollen count.

POLLEN CONCENTRATION DATA SET FOR COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA*) IN 2019-2020, IN HUNGARY

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Common ragweed (*Ambrosia artemisiifolia* L.) pollen allergy has become a major public health problem. In Hungary, more than 1 million people suffer from ragweed pollen allergy. The p ollen concentration of the tree of heaven was measured in six counties of the Great Plain region (Jász-Nagykun-Szolnok county, Hajdú-Bihar county, Szabolcs-Szatmár-Bereg county, Bács-Kiskun county, Csongrád-Csanád county, Békés county) with the 7-day Hirst-type (Burkard) pollen trap. The highest annual total pollen count was detected in 2019 in Hajdú-Bihar county (17,590 grains). Our work draws attention to the differences in the distribution of common ragweed in the Great Plain region, based on which it can be seen that there can be many differences between the cities in terms of the total annual pollen count.

THE ROLE OF MOSSES IN CAPTURING CHRYSOTILE RELEASED FROM AGED AND DEGRADED ASBESTOS CEMENT ROOFING

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Mosses are among the first colonizers of artificial surfaces and can play a crucial role in the retention of airborne pollutants. Aged and degraded asbestos-cement roofing materials release chrysotile fibres over time, posing environmental and health risks. This study investigates whether mosses growing on these surfaces can capture and retain chrysotile fibres, potentially reducing their dispersion but also creating secondary exposure risks. Field sampling was conducted on naturally colonized asbestos-cement roofs, followed by Fourier-transform infrared (FT-IR) spectroscopy to detect and identify chrysotile fibres within the moss tissues. Our results confirm the presence of chrysotile fibres in moss samples, demonstrating their ability to trap asbestos particles. While this retention may mitigate fibre release into the air, it also raises concerns about potential fibre reintroduction into the environment through biological processes, such as decomposition or herbivory. These findings highlight the dual role of mosses in both reducing airborne asbestos exposure and serving as potential secondary sources of contamination. The study emphasizes the importance of further research on moss-mediated fibre dynamics and their implications for risk assessment and environmental management strategies.

IMPACT OF FERTILISATION TREATMENT ON CHEMICAL COMPOSITION OF TALL FESCUE GROWN ON FLOTATION TAILING DETERMINED BY FTIR SPECTROSCOPY

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Tall fescue (*Festuca arundinacea* Schreb.) is an adaptable species used for phytostabilisation of soils contaminated with heavy metals. The chemical composition of *F. arundinacea* grown on the flotation tailings of a Pb/Zn/Cu mine in central Serbia in two treatments (control-C and 200 kg ha^{-1} AN-N2) was characterised by Attenuated Total Reflectance Fourier transform infrared spectroscopy (ATR FT-IR) (IRAffinity-1, Shimadzu, Japan). The averaged FTIR spectra of root and leaf samples are in the range of 600–1800 cm^{-1} , with the highest intensity band at 1032 cm^{-1}, characteristic of xyloglucan. The C–O–C stretching vibration in the range up to 900 cm^{-1}, at ~1161 cm^{-1}, the CH_2 wagging vibration at ~1319 cm^{-1}, and the C–H bending vibration at 1373 cm^{-1} were recognised as specific for cellulose. The bands at 1516 and 1605 cm^{-1} specific only to the root samples are from aromatic skeletal vibrations, specific to lignin, as is the band around 1647 cm^{-1} representing a C=C bond in the side chain of the lignin monomer. According to the PCA of the FTIR spectra, the control root samples differed from the N2 treatment mainly in the plant cell components, cellulose and xyloglucan (from band position 979, 1271, 1165 and 1023 cm^{-1}), aromatic ring vibrations such as lignin derivatives (band at 1510 cm^{-1}) and lipid acid esters (band at 1734 cm^{-1}). PCA of the leaf samples showed no differences, but mainly similarities, between the control and treatment samples based on carbohydrates (bands at 979, 1033, 1249, 1462 cm^{-1}) and lipid esters (band at 1732 cm^{-1}). Raman spectroscopy, in combination with multivariate analysis based on PCA, could provide deeper insights into the chemical differences in plant organs caused by N2 treatment of *F. arundinacea*.

MONITORING ANAEROBIC DIGESTION EFFICIENCY AND SLUDGE UTILIZATION PRE-TREATMENTS VIA DIELECTRIC PARAMETER MEASUREMENT

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In multicomponent heterogeneous systems, where both chemical and structural changes occur during the process under investigation, the models used to calculate dielectric parameters cannot be applied with sufficient accuracy, therefore, dielectric parameters should be determined by measurements. The measurement of dielectric parameters enables indirect and non-invasive monitoring of the anaerobic digestion (AD) process.
Depending on the applied frequency, dielectric parameters can be sensitive to the changes in sludge composition (organic matter content, bound /free water ratio, microbial activity), making them suitable for evaluating disintegration degree in sludge pre-treatments; and, furthermore, the biodegradation efficiency and/or process stability during AD.
In our research, the dielectric behaviour of sludge from municipal and industrial wastewater sources was determined using an open-ended coaxial dielectric probe (DAK 3.5, Speag) connected to a vector network analyser (ZVL3, Rhode and Schwarz). The measurements were conducted in the frequency range of 200–2400 MHz both during pre-treatments (chemical, microwave, and combined treatments), and throughout the subsequent lab-scale batch mesophilic AD process.
During the pre-treatments, sludge disintegration degree was determined using COD fractionation methods, while in the AD process, the rate of organic matter reduction and the volume of produced biogas were monitored as well.
It was found that measuring the dielectric constant and loss factor within the frequency range of 200-600 MHz enables the identification of stages of the batch AD process and the determination of the optimal digestion time for maximising biogas production.

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OCCURRENCE OF ANTIBIOTIC RESISTANCE IN AQUACULTURE: A REVIEW OF CHALLENGES AND RESEARCH TREND ANALYSIS

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Antibiotic resistance in aquaculture has emerged as a global concern, representing a threat to the health of aquatic animals, food security, and public health. The extensive use of antibiotic-resistant bacteria in fish farming has led to the rapid development of resistance, resulting in environmental contamination and the dissemination of resistant pathogens. A comprehensive understanding of the research trends, key contributors, and thematic evolution of this field is essential for guiding future studies and policy interventions. This study aims to conduct a bibliometric analysis of research on antibiotic resistance development in aquaculture, identifying key areas of research, leading institutions, and emerging challenges. Data were extracted from the Web of Science (WoS) database covering the period from 2015 to 2025. A systematic search strategy was employed, utilizing keywords such as "antibiotic resistance," "antimicrobial resistance," "AMR," "aquaculture," "fish farming," "shrimp farming," and "marine aquaculture," along with "resistance genes," "horizontal gene transfer," "antibiotic use," and "water pollution." Relevant publications were extracted from the WoS database using these keywords. VOSviewer (version 1.6.20) was then used to analyze the keywords, citation patterns, and co-authorships, including countries and organizations. The analysis revealed a significant increase in publications over the past decade, with key contributions from China, India, and the USA. The most common articles focused on the relationship between aquaculture and antimicrobial resistance, antibiotic-resistant genes, and horizontal gene transfer. Keyword maps highlighted emerging research areas, including probiotics, virulence genes, and metagenomic analysis. Future research should focus on interdisciplinary collaboration, novel antimicrobial alternatives, and global monitoring frameworks.

OPTIMIZATION OF EXPERIMENTAL CONDITIONS FOR LABORATORY STUDIES OF HONEY BEES (*APIS MELLIFERA*) USING UREA SOLUTIONS

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Recent studies are increasingly focusing on potentially toxic compounds for pollinators. However, the LD_{50} and LC_{50} values of many basic chemicals have not been determined to date. We compared the effects of acute, prolonged acute and chronic oral administration in laboratory studies. As a test substance, we chose urea, which is naturally formed in the bee 's body during protein metabolism, and is also a widely used biostimulator in plant cultivation. In acute and chronic tests, the fed solutions were in the 0,005 – 0,320 g/ml urea concentration range, dissolved in 50% saccharose-water syrup. In the case of the prolonged acute test 20 µl of 0,08 g urea dissolved in 1 ml 50% saccharose-water syrup per bee was consumed only once on the first day and resulted in an increase in the mortality rate over 40% by the 8th day, while the mortality rate of the control remained at 20%. The observed mortality rate in the case of chronic administration was proportional to the administered concentration. In order to set the conditions of the test, we examined the effects of changing light exposure, temperature and humidity levels on food consumption habits and mortality rates.

Regular presentation

HYPERSPECTRAL IMAGING: A VERSATILE TOOL FOR NON-INVASIVE ANALYSIS ACROSS FOOD ANALYSIS DOMAINS

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Hyperspectral imaging (HSI) is an advanced analytical technique that integrates imaging and spectroscopy to capture detailed spectral information for each pixel in an image. Originally developed for remote sensing and military applications, HSI has expanded rapidly into diverse scientific and industrial domains, including agriculture, food quality control, medicine, environmental monitoring, and materials science. Its strength lies in its ability to detect subtle chemical and structural differences in materials through the analysis of reflectance or transmittance spectra across hundreds of contiguous wavelength bands.

This review presents a comprehensive overview of HSI's fundamental principles, acquisition systems, data processing workflows, and applications. Key components such as pushbroom, whiskbroom, and snapshot imaging systems are discussed, along with common spectral ranges including visible (VIS), near-infrared (NIR), and short-wave infrared (SWIR). The review also covers essential pre-processing steps—such as noise correction, normalization, and spectral calibration—as well as multivariate statistical methods and machine learning models employed in spectral feature extraction and classification.

Recent advances demonstrate how HSI enables non-invasive, real-time decision-making in contexts like the detection of adulterants in food (milk, oil, spices), contaminant screening (mycotoxins, bacteria), composition analysis (fat, moisture, protein) and the early identification of egg fertility and chick sex . Despite its transformative potential, HSI faces several challenges, including the high cost of equipment, large data volumes, and the need for robust, standardized analytical protocols.

Looking forward, the integration of HSI with artificial intelligence (AI), deep learning, and miniaturized portable devices promises to enhance its accessibility and applicability in both laboratory and field settings. Hyperspectral imaging is thus emerging as a cornerstone technology for the next generation of smart, data-driven sensing and diagnostics.

PRODUCTION OF MYCO-NANOMATERIAL PRODUCTS FROM *PLEUROTUS OSTREATUS* (AGARICOMYCETES) MUSHROOM

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Pyrolytic heating technology was applied to process *Pleurotus ostreatus* mushrooms to develop an environmentally friendly method for producing carbon nanodots (CNDs). The Maillard reaction (MR), occurring during pyrolysis, facilitates the formation of CNDs, which exhibit strong fluorescence properties and contribute to the utilis ation of bioactive compounds with antimicrobial potential. Our study explores the effect of pyrolysis temperature on product yield, molecular weight, fluorescence intensity, CND concentration, and their correlation with the carbon-to-nitrogen (C/N %) ratio. Our findings indicate that temperature significantly influences the yield of water-soluble CND fractions, with an optimal fluorescence intensity observed at 210 °C. Molecular weight analysis revealed an increasing trend up to 200 °C and a decline at higher temperatures. Additionally, the C/N ratio demonstrated a strong relationship with CND content. The antimicrobial activity of the processed samples was evaluated against *Escherichia coli* and *Staphylococcus epidermidis*, revealing effectiveness against *E. coli only.* These findings underscore the potential of myco-nanotechnology for the sustainable production of nanomaterials with promising functional properties.

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AEROBIC FERMENTATION OF SORGHUM BY *LACTOBACILLUS ACIDOPHILUS*: IMPACT ON BACTERIAL GROWTH, PHENOLIC COMPOSITION, AND ENZYMATIC ACTIVITY

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Sorghum (*Sorghum bicolor* L. Moench) grain is a gluten-free cereal with a rich phenolic profile, including flavonoids and tannins. Fermentation with lactic acid bacteria (LAB) is a traditional method to adjust the nutritional and functional properties of various grains. Our aim was to characterise extracts obtained after LAB fermentation of sorghum samples. In this study, we investigated the growth of *Lactobacillus acidophilus* in finely ground sorghum material under aerobic fermentation at 37 °C. Sprouted and non-sprouted sorghum samples were inoculated with *L. acidophilus* and compared to control media (MRS broth and distilled water). Bacterial viability and pH were monitored during the 24-h fermentation, and the total phenolic and flavonoid content, antioxidant activity, and cellulolytic and esterolytic activities were analyzed from the extracted cell-free supernatant (CFS) obtained after cultivation. Sprouted sorghum supported the highest bacterial growth, with CFU increasing from 5.5 to 8.4 log CFU/ml up to the 24-h incubation. However, no significant increase in phenolic or flavonoid content was observed post-fermentation. Notably, fermented non-sprouted sorghum showed elevated cellobiohydrolase and lipase activities, while sprouted sorghum fermentation led to a marked reduction in all tested enzymes. These findings highlight the complex biochemical interactions during LAB fermentation, warranting further investigation to elucidate the underlying mechanisms. The probiotic-enriched sorghum ferment obtained can be used as a bioactive additive in functional food development .

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ANTIOXIDANT ACTIVITY AND GLUCOSIDASE INHIBITORY ACTION OF CEREAL-BASED EXTRACTS

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Plant phenolic antioxidants have many beneficial effects on the human body. For instance, they can reduce the risk of diabetes through the inhibition of alpha-amylase and alpha-glucosidase activities. This property can control the rise in blood glucose levels after meals in diabetics. In grains, only a small amount of phenolics exists in free form; most of these compounds are covalently bound to different polysaccharides. Enzyme-assisted and physical treatments are eco-friendly extraction methods that can release these phenolics from the conjugated form. In this work, the aim was to produce and characterize bioactive extracts from colored sorghum and barley varieties using an enzyme-assisted extraction approach combined with microwave treatment. Total phenolic and flavonoid content and antioxidant activity were determined in the extracts, and their effects against alpha-amylase and alpha-glucosidase activities were evaluated. Kinetic characteristics of effective inhibitory actions were also analyzed. The combined treatments resulted in free phenolic-rich antioxidative cocktails from the sorghum and barley residues, that acted as competitive inhibitors towards alpha-glucosidase activity. An alpha-amylase inhibitory effect for the extracts was also identified. The antioxidant activity and glucosidase inhibitory potential of colored sorghum and barley residue extracts prepared make them promising ingredients in anti-diabetic natural food-additive developments.

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UTILIZATION OF PLUMS AS FUNCTIONAL INGREDIENTS IN BAKERY PRODUCTS

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At present plums are the most popular fruits used for the production of fruit spirits. This fruit is notably rich in antioxidants, being an important source of vitamins A, B and C, carotenoids and phenolic compounds like chlorogenic and neochlorogenic acids, catechin, epicatechin, cyanidin and quercetin derivatives. Because of its enhanced hydration properties, fermentability, phytochemical content, and balanced ratio of soluble and insoluble fibre, plums can be utilised as a fibre enrichment ingredient in bakery products. In recent years, plums have been described as foods with health-promoting properties. Research into the health benefits of the plums keeps showing promising results regarding their memory-boosting, antioxidant, and anti-inflammatory qualities. Since ancient times, people have been aware of and have eaten plums. Plum foods currently include around 2000 distinct types of natural products. They can be processed to create jams, compotes, jellies, candied fruits, and baked items, or they can be consumed fresh or dried. The literature has extensively discussed the use of plums in the food sector, including for making dough for extruded foods, creams, puddings, ice cream, and bakery and pastry products. The importance, production, nutritional profile, availability of bioactive components, and phenolic and flavonoid constituents of plums are all discussed in the paper. The benefits of plum bioactive compounds for circulatory, pulmonary, and cardiac problems are also covered. Overall, this paper synthesises specialized literature on the use of plums in the bakery industry.

Regular presentation

EDIBLE COATINGS FOR FRUITS AND VEGETABLES PRESERVATION

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World fruit and vegetable production is constantly increasing in order to meet the demands of the growing global population. However, a large proportion of the fruits and vegetables produced is susceptible to post-harvest losses. This percentage of loss is higher in developing countries, where food security is crucial. These post-harvest losses are due to mechanical, physiological, pathological and environmental factors. To address these losses, researchers are working on the development of new, innovative methods to minimize losses and maintain the nutritional value of food. The technology of edible coatings for food preservation is increasingly being used to preserve fruits and vegetables. It aims to protect food against attacks from post-harvest phytopathogenic microorganisms and environmental damage. Tomatoes, apples, oranges, strawberries, and even cut potatoes; all of these widely consumed products can be treated using edible coating technique in order to minimize losses during storage, transportation, or retail display. This will ensure sustainable local development for farmers, especially in developing countries where the cold chain is difficult to apply and storage at low temperatures for long periods is sometimes inaccessible. Our work focuses on the application of natural biopolymers, derived from by-products from the agri-food industry, for the development of edible coatings for the preservation of fruits and vegetables . The food coatings developed were evaluated for their efficacy and characterized to ensure consumer food safety. The development of these edible coatings for food preservation has a direct socio-economic impact on society, notably in terms of optimizing food availability, reducing costs and creating wealth.

FORMULATION OF FUNCTIONAL EDIBLE CUTLERY

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Plastic cutleries are mostly used for the consumption of foods especially in restaurants, fast-food, joints and street foods. This consumption has increase significantly after COVID-19 pandemic. Edible cutlery represents a good sustainable alternative, they not only contribute to the preservation of the environment by reducing plastic waste, but they also offer nutritional benefits. The aim of this work is to develop new probiotic and functional edible cutlery, in order to provide the Algerian market with a product that can support efforts to improve public health and reduce the consumption of plastic cutlery. In order to carry out this study, a questionnaire survey was diffused to study the Algerian consumers' orientations on the consumption of functional foods and their cutlery use. This allowed us to formulate functional edible spoon enriched with probiotics strains: *Lactobacillus acidophilus, Lactobacillus plantarum, Bifidobacterium lactis, Bifidobacterium breve*. A scan with Raman Spectroscopy shows that the coating of the probiotic strains in the bowl of the spoon was effective with a percentage of 51%. The ornamentation of the surface with scanning electron microscopy (SEM) shows adequate adhesion of the strains on the spoon. The thermogravimetric analysis (ATG) shows that the degradation begins at 280°C. A series of physicochemical analyses, microbiological, nutritional analyses and sensory test were applied on developed spoons. The results of tests revealed their satisfactory quality and comply with Algerian legislation. The developed probiotic functional edible spoons are an eco-friendly alternative to conventional plastic and can be the subject of a Start-up project and wealth creation.

PHYSICAL-MECHANICAL PROPERTIES, SURFACE MORPHOLOGY, AND ANTIMICROBIAL ACTIVITY OF STARCH/CHITOSAN FILMS INCORPORATED WITH VANILLIN

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Vanillin has an exceptional inhibitory potential against a variety of microorganisms. This study aimed to determine the antimicrobial efficacy of a starch/chitosan film incorporated with vanillin against nine common food-borne bacteria, including *Escherichia coli*, *Staphylococcus aureus*, *Salmonella enterica, Pseudomonas putida, Pseudomonas aeruginosa, Bacillus subtilis, Bacillus cereus*, *Listeria monocytogenes*, and methicillin-resistant *Staphylococcus aureus*. We also aimed to characterize some of the mechanical properties and the surface morphology of the films prepared. Films were prepared through the casting method using vanillin as an additive. In preliminary tests, vanillin demonstrated a minimum inhibitory concentration (MIC) of 2 mg/mL against planktonic growth of the bacteria studied. The highest susceptibility was observed for *E. coli, S. aureus, S. Enterica, and L. monocytogenes*. The vanillin-supplemented carbohydrate film tested in a 24-well microtiter plate reduced the bacterial count compared to the phenolic-free control. the study of the physical-mechanical properties of the films showed an increase in the film hardness and the time of elongation after the addition of chitosan. Differential scanning calorimetry analysis showed the sharp endothermic peak of vanillin in the films was at 83.5 °C. The scanning electron microscope analysis showed a smoother and more compact surface for the vanillin-supplemented films compared to the control. The bioactive films developed in this study could serve as a promising foundation for future consumer-friendly food preservation technologies.

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BOTANICAL COMPOSITION OF SOME MULTIFLORAL HONEY DOMINATED BY *CASTANEA SATIVA*

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Chestnut honey is well known throughout Eastern Europe, and is also widespread in Hungary, especially in its southwestern regions. Castanea sativa is not only an important source of nectar and pollen for honeybees but it is also often used to collect honeydew from them . In this work we present the melissopalynological characteristics of 20 multifloral honey samples which were collected during early summer from 2020 to 2022 . To determine the botanical origin, qualitative and quantitative microscopic analyses were carried out according to the Hungarian Standard. In addition, we compared the honey samples based on the presence or absence of pollen of the nectar-producing plant species using heat map analysis. Pollen from nearly 100 plant species was identified, ¾ parts of which were nectariferous. Pollen of Castanea sativa was predominant in 13 samples represeting 45-96 % of the total pollen content. The o ther 7 samples contained 21-42 % of chestnut pollen so it was classified as secondary pollen. Pollen of Tilia species, Helianthus annuus and Plantago species were also characteristic of the honeys. Some plant species whose blooming period preceded that of sweet chestnut, such as Robinia and rapeseed, also frequently occurred in them. Honeydew elements and microcrystals could be found in the samples too. The number of identified plant taxa shows that honeybees find diverse food sources in early summer. The pollen of plants that produce unifloral honey in the samples suggest that species which are important for agriculture or forestry and cultivated in large areas provide an essential food source for bees.

THE ROLE OF SPORE SURFACE PROTEINS IN *MUCOR LUSITANICUS*

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Fungal pathogens belonging to the order *Mucorales* pose a significant threat to agricultural productivity, as they not only cause severe postharvest decay in fruits and vegetables but they are also responsible for human infections such as mucormycosis. The spore surface proteins (CotHs) of these fungi play crucial roles in adhesion, germination initiation, colonization, and infection establishment on plant surfaces. In our study, we examined *Mucor lusitanicus cotH* disrupted mutant strains to assess alterations in the cell wall. To monitor these changes, we employed fluorescent staining and transmission electron microscopy (TEM). Additionally, we evaluated spore viability using the XTT tetrazolium colorimetric assay and the FUN1 viability test. To investigate growth abnormalities and germination defects, we exposed the mutant strains to various stress conditions and a range of temperatures. Our findings revealed that the absence of the CotH12 protein led to unusual septa formation. The response of the *cotH* mutants to cell wall stressors varied, with specific *cotH* gene deletions resulting in structural modifications in the inner spore coat, as well as differences in fungal growth and sporulation. TEM analysis of the cotH9 mutant revealed morphological markers indicative of programmed cell death, suggesting that the *CotH9* protein plays a critical role in spore viability. The infection mechanism of *cotH* proteins holds considerable potential for developing novel defense strategies against *Mucorales* fungi, as these proteins represent key virulence factors. Several identified cotH proteins play indispensable roles in the infection process, contributing to spore formation and structural organization.

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ESTIMATING THE POPULATION DENSITY OF EUROPEAN BADGER AND RED FOX USING CAMERA TRAPS

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The Eurasian badger (Meles meles) and the red fox (Vulpes vulpes) are common, medium-sized predators in Hungary. Based on these characteristics, it can be assumed that they play a regulatory or even apex predator role in ecosystems.. For wildlife managers, the amount of active burrows can be used as an indicator of population dynamics, but is uncertain in itself for determining population size. Following this line, the aim of our study was to improve and refine the estimation of the population based on the number of burrows. The study area is located in the southern part of Somogy County, a special hunting area of the Danube-Drava National Park Directorate. The field survey consisted of two main methodological parts. In the first step, a complete census of burrows was carried out in the area, followed by the deployment of camera traps in the vicinity of the active burrows found. During the survey, a total of 23 burrows were recorded, of which 12 (8 badgers, 4 foxes) were actively used. Based on camera traps and field observations, a minimum number of 11 adults and 9 cubs were recorded for the 8 badger burrow surveyed. For the 4 fox burrow, 7 adults and 8 cubs were observed. Based on the data, the adult density (individuals/1000 ha) was 9.7 for badger and 6.2 for fox in the study area. It can be said that the density of badgers is more than twice the national value, and the density of foxes is approximately the same.

WINTERING BEHAVIOUR AND HABITAT USE OF GPS-TRACKED EURASIAN WOODCOCKS IN HUNGARY

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Our study examines the wintering behaviour and habitat use of GPS-tracked Eurasian woodcocks in Hungary, concentrating on their movement patterns and habitat preferences during the winter season. Using data from satellite tracking involving eight individual woodcocks, the study aims to identify variations in home range size and location between day and night, as well as to assess differences in movement distances across various regions. The collected data was then separated into locations, daytime periods, and nighttime periods by filtering the raw data. This was done for all the countries the birds travelled to. The distance the birds travelled between their daytime and nighttime areas was also calculated. The home ranges were estimated using the Kernel density estimation (KDE) method. The results indicated that Eurasian woodcocks migrate for the winter to other countries, such as Slovenia, but their migration occurs during different time periods depending on the individual. In terms of home range during the day and night, the night-time home ranges are wider and larger compared to daytime home ranges. The findings suggest that Eurasian woodcocks adapt their foraging strategies and habitat selection according to their diurnal and nocturnal behaviours, which has implications for their management and conservation. This study underscores the significance of habitat conservation and targeted management strategies in ensuring the survival of Eurasian woodcocks in Hungary.

FROM GREENHOUSES TO GREEN GOALS: EXPLORING THE FITOWISE AND ENOUGH PROJECTS

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The ENOUGH project aims to significantly reduce greenhouse gas (GHG) emissions in the agricultural sector, a major contributor to global emissions. . This presentation will provide an overview of the project's objectives, methodologies, and expected outcomes. Special emphasis will be placed on the innovative approaches being developed and implemented by Campden BRI Hungary, a a project partner . Campden BRI Hungary is dedicated to advancing environmentally friendly precision agriculture technologies to mitigate the environmental impact of farming practices. One of the highlighted initiatives is the FitoWise project, which focuses on optimizing greenhouse production through data-driven decision-making. FitoWise employs advanced IoT sensors, AI-powered image analysis, and precision irrigation systems to monitor and enhance plant growth, water usage, and nutrient management. By integrating these technologies, the project aims to achieve higher yields and healthier crops while minimizing resource consumption and environmental impact. The presentation will discuss the synergy between the ENOUGH and FitoWise projects, showcasing how these collaborative efforts contribute to sustainable agricultural practices. Attendees will gain insights into the practical applications of these technologies and their potential to transform the agricultural landscape, promoting a more sustainable and resilient food production system.

IMPLEMENTATION SCALE-UP IN THE PRODUCTION OF PEPTAIBOL COMPOUNDS

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The increasing challenges in agriculture are prompting the search for new solutions in biological plant protection. To avoid problems caused by chemicals, the application of new alternatives is necessary. Products containing filamentous fungal species from the genus *Trichoderma* are already successfully used in practice thanks to their rapid growth and intensive metabolic production. However, plant, fungal, and human pathogenic species found among the strains may pose risks. Peptaibols, bioactive secondary metabolites produced by *Trichoderma* species, may open new avenues in plant protection, and their use avoids the direct application of fungal species to agricultural areas. The inhibitory effect of these biologically active short *peptides is known against several plant pathogenic bacterial and fungal species, and they are rich in non-proteinogenic amino acids* . In addition to their antagonistic effect, when applied in appropriate concentrations, they can also have a beneficial impact by inducing systemic resistance in plants. We are developing a large-scale method that can sustainably and easily produce large amounts of peptaibols using *Trichoderma* strains. Two methods were developed, using different grains as well as a mycelium-regrowth process, which means the producing *Trichoderma* is regrown on the same media after harvesting the mycelia several times. Both methods significantly increased the final amount of peptaibols. Our results can help to establish the commercial production of peptaibol extracts for application in biological plant protection, opening new avenues in modern biocontrol.

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THE EFFECT OF FEED CONTAINING BEETROOT MEAL ON THE DIFFERENT PARAMETERS OF QUAILS

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This study investigates the effect of feeding quails a diet containing beetroot meal, focusing on parameters such as weight, behavior, egg production, and physiological responses. The objective was to assess whether beetroot meal supplementation could improve quail health and productivity. Quails were fed a diet supplemented with varying levels of beetroot meal, and their weight, behavior, egg production, and overall health markers were monitored. While some initial weight loss occurred, likely due to the adaptation period to the new diet, no significant long-term effect on weight was found. Behavioral observations showed increased activity and improved social interactions. Egg production remained optimal in the beetroot-supplemented groups, with no adverse effects. Additionally, the study also explored the potential impact of beetroot meal on antioxidant and anti-inflammatory responses in quails. The study concludes that beetroot meal supplementation positively influences quail behavior and egg production, and further research is needed to better understand its full physiological effects and determine the optimal levels for inclusion.

DEVELOPMENT OF CASING MATERIALS USED IN WHITE BUTTON MUSHROOM CULTIVATION BY COMPOSTING OF SPENT MUSHROOM COMPOST

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A critical component for efficient and cost-effective cultivation of champignon mushrooms (*Agaricus bisporus*) is the development of a superior casing layer. This layer, applied over mushroom compost infused with mycelium, is essential for fruiting body development and compensates for the compost's low water retention capacity. Due to decreasing peat availability in Hungary and Europe and environmental concerns about peat extraction, alternative casing materials are increasingly explored. However, the transition is slow, given the cost-effectiveness and availability of peat-based casings. But now more than ever, creative solutions are required. Our research focuses on creating a casing layer with enhanced water retention, tailored for white button mushroom cultivation. This goal is achieved through the controlled microbial re-composting of spent mushroom compost. We first evaluated physical, chemical, and microbiological transformations during the natural re-composting process. Subsequently, we established a comprehensive monitoring technique to observe dynamic changes in the chemical, analytical, and microbiological parameters of both raw materials and the final casing products.

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INVESTIGATING THE USE OF ARTIFICIAL INTELLIGENCE AND LEARNING ALGORITHMS IN DAIRY COWS

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The aim of the project is to develop a comprehensive, artificial intelligence-based decision support system (IntelliFarmMoo or "Smart Farmer's Eye") for dairy farms. The system employs a multimodal sensor platform (image, sound, thermal imaging) to continuously (24/7) collect data on the vital signs and behavioral patterns of individual cows and animal groups.

The system covers five key areas:
1. Animal Health— Capable of early detection of diseases (particularly mastitis and hoof diseases), even before clinical symptoms appear.
2. Feeding— Monitors and optimizes feed intake and utilization.
3. Individual Identification— Uses cameras and other sensors to individually identify and track animals.
4. Animal Welfare— Continuously monitors animal behavior, stress levels, and environmental conditions.
5. Economic Efficiency— Optimizes operational efficiency of the farm by analyzing collected data.

The project's innovative approach includes utilizing environmental DNA (eDNA) sampling technology, enhancing the measurement capabilities to a new level, and employing multi-level AI models for data analysis. An advantage of the system is that it does not require attaching sensors to animals, which can cause stress and frequent malfunctions .

The system is flexible and adaptable to various environments (e.g., farms with different husbandry technologies), enhancing competitiveness and broadening the potential market uptake.

Dairy farms today face numerous challenges related to animal health, optimizing feeding practices, and achieving economical operations. Traditional monitoring systems often rely on invasive sensors, causing stress to animals and frequently malfunctioning. This project aimed to develop an artificial intelligence-based decision support system addressing these issues. The IntelliFarmMoo system collects data using multimodal sensors (image, sound, thermal imaging) and environmental DNA sampling technology, analyzed through multi-level AI models. The system optimizes five key areas: animal health (early disease detection), feeding (monitoring intake and utilization), individual identification (camera-based animal tracking), animal welfare (stress-level monitoring), and economic efficiency (optimization of operational effectiveness). The system is widely adaptable to farms employing various husbandry technologies, significantly enhancing competitiveness through precision farming.

MICROGREEN PRODUCTION UNDER DIFFERENT LIGHT INTENSITIES - PRELIMINARY STUDY

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Microgreens are a simple and easy way of consuming human health related beneficial phytochemicals in a concentrated way. As indoor plant production technologies are becoming affordable and widely applied, knowledge about grow light recipes shows a rapid increase. The application of indoor plant production facilities opens new horizons in science. A pre-experiment was set up for testing a newly adopted grow box device at the Department of Agroecology and Organic Farming, MATE in order to test different light environments on the vegetative parameters of cress (*Lepidium sativum* L.), sunflower (*Helianthus annuus* L.) and wheat (*Triticum aestivum* L.) microgreens. Two distances (30 and 60 cm) from a full spectrum LED lighting device were applied with an 8/16 h daily light regime. Height, aboveground weight, leaf and root color were measured; volume and stand density was modelled using a parabolic model. The plant species reacted adversely to the different light intensities, i.e. wheat was less affected, while cress showed increased weight and density with lower PPFD. In contrast, sunflower favored higher PPFD resulting in higher yield and stand density. The L* values of both microgreen canopies and roots showed some differences among treatments; higher PPFD values enhanced the chlorophyll content of the plants and supported their root development at the same time. Low impacts of the differing light environments were experienced; this might be due to the relatively low PPFD deviations, or the short cultivation time of microgreen plants. The improvement of the experimental environment will be in line with the present experiences.

SHORT-TERM NITRATE UPTAKE AND ITS IMPACT ON THE BIOELECTRICAL IMPEDANCE SPECTRUM OF LETTUCE LEAVES

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Monitoring plant nutrient uptake dynamics is essential for optimizing cultivation practices. In this study, we investigated the short-term uptake of nitrate (NO_3^-) by lettuce leaves and the associated changes in their bioelectrical impedance spectrum (BIS). Plants were grown in a nutrient solution based on Hoagland's protocol and, after 14 days, were transferred to an N-free medium for five days to suppress root nitrate uptake mechanisms. Subsequently, the leaves were exposed to 5 mM KNO_3 for 5 and 6 hours, during which BIS measurements were performed in the 1 Hz–100 kHz frequency range. Our findings indicate that the N-free treatment led to a significant increase in leaf impedance, particularly at lower frequencies (1–10 Hz). Upon reintroduction of NO_3^-, a significant decrease in impedance was detected within one hour, with this decrease becoming more pronounced over time, especially at low frequencies. Examination of correlation coefficients revealed a significant drop at higher frequencies (~10^4 Hz), while values at lower frequencies (around 1 Hz) remained close to 1, suggesting that BIS is highly sensitive to the alterations in tissue fluid environment. Overall, these results demonstrate the potential of BIS as a rapid and non-destructive method for assessing early NO_3^- uptake responses in lettuce leaves. Frequency-dependent changes in impedance may serve as a valuable indicator of plant nutritional status and metabolic activity.

STUDYING BIOACTIVE PEPTAIBOLS WITH POTENTIAL TO MITIGATE THE ADVERSE EFFECTS OF CLIMATE CHANGE IN AGRICULTURAL CROPS

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The agricultural industry faces new challenges due to increasingly extreme weather conditions and the spread of new plant pathogens. The use of chemical pesticides is problematic; therefore, new solutions like biological plant protection techniques are needed. Many *Trichoderma* strains are successfully used as biocontrol agents. Short, bioactive peptides produced by these *Trichoderma* strains, known as peptaibols, are characterized by highly variable amino acid composition and ion channel-forming ability. They show antagonistic effects against several plant pathogenic bacterial and fungal species. Peptaibols can also exert beneficial effects on plants via induced systemic resistance. For future practical application of peptaibols we need a better understanding of their background mechanism of action by using computational molecular modeling techniques.
We investigated the peptaibol production of 12 *Trichoderma* strains. The produced peptaibols were determined using mass spectrometry. The bioactivity of extracts was determined against 11 bacteria, as well as 6 plant pathogenic fungi. The structure of selected peptaibols produced in the largest percentages was investigated using accelerated molecular dynamics simulations. Comparing our laboratory and computational results revealed structure-activity relationships, which can be used to establish a rapid and targeted selection of the bioactive peptaibol compounds. Our results may lay the foundation for future practical applications of peptaibol extracts as new alternatives in biological plant protection.

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SZEGED MICROBIOLOGICAL COLLECTION: A HUNGARIAN CULTURE COLLECTION SUPPORTING AGRICULTURE, FOOD INDUSTRY, AND BIOTECHNOLOGY

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The Szeged Microbiological Collection (SZMC) is a member of the World Federation of Culture Collections (http://www.wfcc.info/ccinfo/index.php/collection/by_id/987); dedicated to the collection, preservation, identification, and characterization of bacterial, yeast, and mold strains. Currently, SZMC maintains over 15,000 isolates, representing more than 120 microbial genera, including 3.000 bacterial and 10,000 yeast and filamentous fungal strains. A significant portion of the collection consists of strains with environmental, agricultural, and industrial relevance, such as mycotoxin and metabolite producers, plant pathogens, and postharvest decay agents, as well as biocontrol, bioremediation, and bioaugmentation organisms. SZMC has a large variety of fungi, including types like *Agaricus, Armillaria, Pleurotus, Aspergillus, Cochliobolus, Fusarium, Mucor, Mortierella, Penicillium, Rhizopus, Rhizomucor, Scedosporium, Trichoderma, Cryptococcus, Saccharomyces*, and *Candida*. The bacterial collection primarily comprises *Bacillus, Pseudomonas*, and *Streptomyces* strains, crucial for soil quality improvement, bioaugmentation, and biocontrol studies. Strains are preserved through cryopreservation in deep and ultra-deep freezers and liquid nitrogen. In addition to maintenance, SZMC conducts molecular identification, characterization, and screening for metabolite and enzyme production. Over the decades, SZMC has become a valuable genetic resource, significantly supporting biotechnological, agricultural, and food industry research and development.

THE ROLE OF COMMUNICATION IN ADVANCING INNOVATION IN AGRICULTURAL PRODUCTION

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The Role of Communication in Advancing Innovation in Agricultural Production Communication plays a pivotal role in fostering innovation within agricultural production, acting as a bridge between new technologies, practices, and the people who can benefit from them. In an industry traditionally rooted in established methods, effective communication facilitates the exchange of knowledge, encourages collaboration, and helps overcome barriers, such as resistance to change. This paper explores how various forms of communication—ranging from information sharing among farmers to interactions between research institutions, policymakers, and industry leaders—are essential to the diffusion and adoption of innovative practices. It also examines how communication platforms, both traditional and digital, contribute to building networks that can accelerate the pace of innovation. The study highlights the importance of creating a collaborative environment that nurtures continuous learning, problem-solving, and the application of cutting-edge technologies, ultimately leading to more sustainable and productive agricultural systems.

THE POTENTIAL OF MACHINE LEARNING ALGORITHMS AND SENSOR TECHNOLOGIES IN MODERN DAIRY CATTLE PRODUCTION

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This study presents an intelligent decision support system that utilizes machine learning algorithms and advanced sensor technologies to revolutionize dairy cattle production. The system detects diseases such as udder inflammation and foot-end problems in cows at an early stage, before clinical signs are visible. By utilizing cameras and other sensors, the system optimizes feeding, accurately monitors feed intake, and improves feed utilization efficiency. Each cow can be uniquely identified using the sensor systems, allowing continuous monitoring of their condition and performance. Moreover, the technology enables the continuous monitoring of animal behavior, stress levels, and environmental conditions, all of which contribute to improving production outcomes and ensuring animal welfare. By analyzing the data collected and making decisions based on it, the economic efficiency and competitiveness of the economy can be increased. Overall, the main objective of the research is to reduce losses from animal health problems through technological innovation, increase production efficiency, improve animal welfare, all in a way that minimizes stress for cows!

EVEN THE SMALLEST GAPS FACILITATE THE INVASION OF THE TREE OF HEAVEN (*AILANTHUS ALTISSIMA*) IN HUNGARY'S MOUNTAIN FORESTS.

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The invasion of *A. altissima* has recently extended towards the interiors of Hungary's mountains. In the South Börzsöny Mts. I t is increasingly appearing even in gaps with a diameter of one tree length. In our research, we aimed to identify which factors are hindering or facilitating its spread. A field survey was carried out in altogether 150 gaps in 2022 and 2024 using a multiple of biotic and abiotic variables. Data were analysed using multivariate methods and GLMMs. According to our results several factors affect the abundance of *A. altissima*. Abundance was explained by the position within the gap, the species became more abundant towards the interior of the gap and in a north-western orientation. Native woody vegetation played a defensive role, but this was also counteracted by game browsing. Increased game pressure on native vegetation led to higher *A. altissima*. The abundance increased with gap size and decreased with altitude. The highest numbers occurred in semi-dry oak stands and the lowest in the submontane beech stands. Between the two years, a large increase occurred in blackberry cover, which also explained *A. altissima* abundance. This may be indirectly due to the shrub's negative impact on native sapling growth. However, in the best models, these variables explained only 20-30% of the variance, while random factors (gaps and quadrats) explained as much as 80%. Further spread of *A. altissima* is highly likely and therefore preventive measures, such as changes in forest management and selective treatments, should be taken.

THE SCIENCE OF NATURE CONSERVATION CITIZEN SCIENCE PROJECTS: HOW TO ENSURE SCIENTIFIC RIGOR?

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Citizen science (CS) has yet to achieve full acceptance within the scientific community, with ongoing concerns regarding data quality. This review article examines strategies implemented in Nature Conservation Citizen Science (NCCS) projects over the past decade (2015-2025) to ensure scientific rigor. Our analysis of forty-seven studies revealed that data quality assurance is a prevalent concern, particularly regarding species misidentification by non-experts, which introduces bias and compromises data reliability. We found that a multi-strategy approach was primarily employed for enhancing data quality and ensuring scientific rigor in NCCS initiatives. Key strategies included integrating training programs with methods for assuring data quality and using technology to support further expert validation. Although standardized data collection protocols received less emphasis in the analyzed studies, their importance is underscored by the successful scientific outcomes reported (mostly related to quality data generated followed by management and policy outcomes). This is especially crucial for the long-term sustainability of the NCCS projects. When aiming to ensure scientific rigor in CS initiatives, we recommend adopting a multidimensional approach rather than relying on a single strategy (implementing training programs, standardizing data collection protocols, and using advanced technologies for validation to enhance data quality). Utilizing diverse strategies will enhance the robustness of scientific outcomes in CS projects, thereby increasing their acceptance within the scientific community and maximizing their benefits.

EXAMINATION OF THE MORPHOLOGICAL CHARACTERISTICS OF THE PANNONIAN ECOTYPE OF *APIS MELLIFERA CARNICA* IN BREEDING STOCKS IN HUNGARY

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In Hungary, the Pannonian ecotype of the Carniolan bee (*Apis mellifera carnica*) is considered native, well adapted to the local climate and environmental conditions, and known for its excellent production and behavioural traits. However, its genetic conservation and maintenance of its purity pose major challenges for domestic beebreeders. Hungary has an extremely high bee density, which increases the likelihood of hybridization, especially with the Italian bee and the Buckfast hybrid. The situation is further complicated by unsuitable geographical conditions for isolated mating stations and the natural aerial mating of the queens, which hinders genetic purity.

The preservation of breed purity of the Pannonian bee is carried out by the Hungarian Beebreeders National Association in Hungary, which is the only state-recognised breeding organisation in this field. After the breeding selection conducted by association members, our department performs the morphological measurements on the bee samples. In this study, we present the 2023 examination results of 360 bee colonies originating from 72 queen breeders. Three main morphological characteristics were identified during the breed classification: the cubital index of the wing, the colour of the tergit, and the length of the proboscis. The results show that 95.8% of the samples meet the criteria for the Pannonian bee in terms of cubital index, 89.5% in terms of tergit colour, and 94.5% in terms of the proboscis length. In addition to the protection of wild pollinators, the preservation of the genetic integrity of the Pannonian native honey bee is essential due to its beneficial traits.

PRELIMINARY RESULTS OF A STUDY OF FACTORS INFLUENCING SPONTANEOUS REGENERATION OF STREAMSIDE ALDER FOREST IN AN URBAN STRETCH

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Woody vegetation along watercourses has, or would have, a significant role in the municipal green infrastructure network in mitigating the adverse effects of climate change. However, the beds of urban streams are often narrow, the banks are steep, often paved, and utilities pass through the soil and air, making it difficult for the woody vegetation lane to develop and regenerate. In many cases, flood protection considerations do not even allow trees to grow in the riverbed. Nevertheless, there are urban stream sections where spontaneous regeneration does occur, and it is therefore necessary to study, understand, and control the process itself. I studied the regeneration of the alder grove in Hungary along the Bükkös stream, which flows into the Danube at Szentendre. The landscape- scale study of the woodland along the 18 km long stream was mainly based on historical maps. The focus of the study is on the 4 km urban section, of which a 700 m long section is treeless. According to the original habitat, alder is the dominant tree species. The majority of the alder population is made up of older specimens, and natural regeneration has been lacking for a long time and has been replaced by planting. Spontaneously released young specimens are present in small areas, despite the high seed yield. Urban trampling, the effects of flooding, the strong shading provided by mature trees, the presence of a continuous grass cover on mown areas, which prevents the trees from maturing, and mowing itself, among other factors, make it difficult for this species, which germinates on mineral soils with adequate water supply, to establish. The persistent flooding of the Danube is also unfavorable for the species in the lowest section. However, cracks in the fragmented concrete pavements provide a suitable surface for colonization , but the pavements need to be removed to restore the dynamics of the stream.

PRELIMINARY SURVEY AND CLIMATE-LINKED DISTRIBUTION INSIGHTS OF THE EGYPTIAN VULTURE (*NEOPHRON PERCNOPTERUS*) IN THE HIGHLANDS OF TAMANRASSET, SOUTHERN ALGERIA"

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The Egyptian Vulture (*Neophron percnopterus*) is a globally endangered scavenger species, yet remains poorly documented in southern Algeria, particularly within the Saharan highlands of Tamanrasset. To assess its local population and habitat preferences, a year-long monitoring survey was conducted from December 2022 to December 2023 across four sampling sites, with bi-monthly field visits. A total of 153 individuals were recorded, indicating a relatively significant local population. However, densities varied significantly between sites, reflecting differences in ecological characteristics and anthropogenic pressures. The species showed a marked preference for areas surrounding slaughterhouses, where carcass waste provides a reliable food source, particularly due to the high volume of livestock slaughter. Additional sightings were made in remote rocky habitats and high mountain cliffs, where densities were comparatively higher. Key threats identified include the decline in natural food resources, increasing human disturbance, poaching, and the use of toxic pesticides that contaminate carrion. These findings underscore the need for continued ecological monitoring and the implementation of conservation strategies focused on safeguarding natural habitats and managing anthropogenic food sources. The study also highlights the potential influence of climate change on the species' distribution and feeding behavior, warranting further investigation in arid mountain ecosystems.

THE IMPACT OF ENVIRONMENTAL CHANGES ON THE DISTRIBUTION OF AOUDAD IN THE REGION OF TAMANRASSET (ALGERIA)

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The Aoudad (*Ammotragus lervia*) is a key mountain species in the arid and semi-arid regions of North Africa, facing increasing threats from climate change and human activities. While species are generally expected to shift their ranges up-slope in response to rising temperatures, recent studies suggest that other environmental factors may play a more significant role. This study examines the impact of climate change, vegetation cover, and human disturbances on the distribution of Aoudad in the highlands of Tamanrasset. Using occupancy analysis, camera trap data, and previous research from the region, we tested three main hypotheses: (1) whether increasing temperatures drive Aoudad populations to higher elevations, (2) whether changes in precipitation influence their distribution, and (3) whether habitat degradation due to overgrazing and resource exploitation forces Aoudad to relocate. Our findings indicate that Aoudad populations have not shifted upslope in response to warming, suggesting thermal tolerance. However, habitat degradation—particularly vegetation loss due to overgrazing and desertification—has significantly influenced their distribution. Aoudad populations were more closely associated with rocky areas with sparse shrub cover, which have been declining due to land-use changes. These results highlight that habitat changes, rather than direct climate effects, are the primary drivers of Aoudad distribution shifts. Conservation efforts should therefore focus on habitat restoration and sustainable land management to mitigate the pressures on this species and ensure its long-term survival.

DIFFERENCIATED DEMOGRAPHIC TRENDS IN HUNGARIAN RURAL AREAS AND ITS IMPLICATIONS FOR RURAL SUSTAINABILITY

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The future outlook for rural areas varies significantly based on their demographic development trajectories. While some areas have experienced population decline for decades, or even over a century, others have seen rapid population growth. These trends have profoundly influenced not only the number of inhabitants but also the age structure of these communities. This paper examines these divergent demographic trends using data from population censuses and the results of a spatially detailed demographic forecast using recent data from the . For creating the projections, agent-based methodology was utilized. Agents representing the inhabitants of Hungary, each assigned with an individual set of attributes (e.g. age, sex, residency, socio-economic background). In each cycle, every agent faces two possible natural events (childbearing , passing away) and may participate in one of the four possible migration decisions (employment- related migration, university- related migration, suburbanization , or counterurbanization). International migration is also considered in the model. The results indicate a deepening divide in the demographic outlook of the rural areas. This raises critical questions regarding environmental and social sustainability at both ends of the spectrum, such as urban sprawl versus the degradation of cultural landscapes and increasing demand for services versus an insufficient workforce to sustain human services.

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THE EFFECTS OF REGULATORY CHANGES ON THE ONGOING TRANSFORMATION OF PERI-URBAN AREAS IN HUNGARY

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In Hungary, significant populations reside in peri-urban areas and scattered settlements. Rapid suburban development over the past decades has reshaped these areas, attracting both economically disadvantaged individuals and wealthier urban residents seeking affordable land and lifestyle changes. This paper examines the current legal framework governing land use, property registration, and construction regulation, highlighting its inadequacies in addressing contemporary challenges. The research compares the factual situation with the new regulatory framework, as analyzed through relevant literature. Our analysis reveals that legal inconsistencies contribute to fragmented spatial organization and fail to mitigate the adverse effects of urban sprawl, such as the urban heat island phenomenon. Peri-urban green spaces, crucial for environmental resilience, remain poorly protected, while zoning and legal classifications exacerbate chaotic development. The Land Act and building regulations (TÉKA) often hinder the efficient utilization of former agricultural plots and impede local economic development. This paper underscores the urgent need to revise policy tools to better address the socio-economic and environmental impacts of peri-urban growth in Hungary.

BIOECONOMY AND RURAL DEVELOPMENT IN THE EUROPEAN UNION: A SYSTEMATIC LITERATURE REVIEW

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The bioeconomy is a key priority for the European Union (EU) in promoting sustainable rural development, given that many bio-based activities—such as agriculture, forestry, and fisheries—are concentrated in rural areas. These areas, often characterized by economic stagnation and demographic challenges, stand to benefit significantly from enhancing the transition towards a bio-based economy, which is essential for fostering innovation, circularity, and resource efficiency while unlocking significant regional benefits. However, despite strong policy support such as the EU Bioeconomy Strategy of 2012 and 2018, its integration into rural development remains uneven across member states due to policy fragmentation, financial constraints, and technological disparities. This study examines the bioeconomy's role in rural development within the EU using a systematic literature review based on PRISMA methodology. The analysis synthesizes peer-reviewed literature, policy frameworks, and empirical studies to identify key opportunities and challenges. Findings highlight the bioeconomy's potential for job creation, environmental sustainability, and economic diversification. However, its success depends on coherent policies, targeted investments, and multi-level governance. Innovation in bio-based industries, sustainable agriculture, and renewable energy is crucial for strengthening rural resilience. Y et challenges persist- such as unequal access to technology, insufficient financial incentives, and weak stakeholder coordination persist. The findings contribute to the academic discourse on bioeconomy transition and provide valuable insights for policymakers seeking to promote sustainable rural development in the EU.

CIRCULAR ECONOMY— A KEY FACTOR IN THE SUSTAINABLE DEVELOPMENT OF RURAL MOUNTAIN AREAS

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Sustainable development in rural mountain areas is crucial due to the ecological sensitivity of these regions and their vulnerability to climate change, depopulation, and economic marginalization. Traditional economic models, which rely on linear resource extraction and consumption, exacerbate these challenges. The circular economy, prioritizing the continual use of resources, offers an alternative pathway to sustainable development by fostering economic resilience, environmental protection, and social well-being. Traditional circular economy practices in these regions often arise out of necessity rather than environmental awareness . Emerging bioeconomy approaches can help traditional farmers in mountain areas achieve financial sustainability by transitioning from mono-functional activities (e.g., livestock farming or orchard cultivation) to multifunctional activities. This transition can be achieved by incorporating non-agricultural activities such as agritourism farms, educational farms, and artisan farms or by complementing these services with new business and marketing models, as well as technologies (e.g., biogas plants) to add value to existing supply chains and generate new bio-based products. A better understanding of current and potential innovation systems is necessary to improve livelihoods and enhance the economic and environmental sustainability of mountain communities and small businesses. The circular economy offers a transformative approach to sustainable development in rural mountain areas by optimizing resource use, reducing waste, and fostering local economic resilience. Through sustainable agriculture, forestry, tourism, and renewable energy initiatives, mountain communities can create self-sustaining, resilient economies while preserving their unique ecological and cultural heritage.

LONG-STANDING PROBLEMS AND DEVELOPMENT PATHS OF THE SAND RIDGE REGION

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Climate change adaptation has become an urgent global task, but some regions face disproportionate challenges in mitigating its impacts. One such area is the Sand Ridge Region on the Duna-Tisza Interfluve, which is an extremely vulnerable area. These semi-arid zones have been grappling with water shortages for decades, which, in turn, has led to a range of complex socio-economic problems. For these reasons, the region requires high attention, well-considered spatial planning, and innovative rural development strategies. Our research indicates that in recent decades, no substantive responses have been provided to address the challenges facing the region. Recognizing these shortcomings, our work aims to identify the factors that have hindered or delayed the resolution of these issues. Insights drawn from our interviews with experts (n=14) and a survey of affected municipalities (n=56) reveal that even European Union funds have failed to resolve the region's long-standing conflicts. Deficiencies in territorial planning have contributed to a reduction in local autonomy and an increasing polarization between settlements. Thus, we propose a paradigm shift in spatial development. We highlight that models which consider territorial inequalities and are adapted to the region must be developed. In our opinion, bioregional planning can play a significant role in all of this, introducing novel ideas and practices regarding environmental and agricultural sustainability.

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PARTICULAR ASPECTS OF INTRODUCING AGROSILVOPASTORAL SYSTEM INTO THE FOREST FUND

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Agrosilvopastoral systems are efficient ways of utilizing land through activities specific to agricultural and horticultural crops, forestry activities, and livestock farming. In Romania, post-1989 agricultural and forestry reforms , especially in non-collectivized areas, activities within agrosilvopastoral systems have been considerably reduced, even to the point of partial abandonment. As a result, some of these systems have degraded, and processes of pioneer forest vegetation succession have been initiated in these areas. A solution for reintroducing these areas into productive use is to incorporate them into the national forest fund through specific works. Consequently, studies are required to establish the specifics of the necessary interventions for establishing the forest vegetation and its management until the stand state. Additionally, consideration is given to integrating the existing tree biogroups from the main species into the future forest stand. The case study was conducted in the western part of Romania, in Dobrești, Bihor county, on an area of 7.60 ha, located in a hilly area, starting in 2013 and continuing to the present. The results of the studies and research show that the process of transforming and introducing an agrosilvopastoral system into the forest fund presents a series of particularities, due to vegetation conditions, especially climate changes, and the impact of game species on the established forest crops. Accordingly, the forest management plan accounts for the stand's origin, prescribing a 60-year production cycle.

RESPONSIBILITY IN PRODUCTION AND CONSUMPTION - OBJECTIVE OF SUSTAINABLE DEVELOPMENT IN ROMANIA

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The concept of sustainable development emerged during the global ecological crisis of 1929-1933 and later developed by incorporating all economic, social and human spheres, reaching the present day, to represent the new path of humanity. In this situation, measures are also required in the direction of responsible production and consumption, which ensure sustainability. Representing fundamental concepts (elements) in the economy, sustainable production and consumption imply efficiency, sustainable waste management and, in general, activities in accordance with the principles of environmental protection, including conscious behavior in production and consumption activities. The paper includes an analysis of specific indicators related to production/consumption responsibility, in Romania, according to European commitments in the 2020 Framework Programmes and the 2030 Agenda for Sustainable Development. Using statistical data for Objective 12 (sustainable consumption and production), we assess trends between 2008 and 2022. The findings reveal positive advancement in meeting Romania's national targets during this period.

APPLICATION OF INTERROW CROPS IN SUNFLOWER CULTURE

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Sunflower has become the most important oil crop in Hungary in the past decade, and its production area is constantly growing worldwide. In 2024, it reached 700,000 hectares in Hungary and 24 million hectares worldwide. Its success is due to the growing demand for vegetable oil and its drought resilience , and its dual role as a protein source and bee forage. Traditionally, it requires strict plant protection technology, which means more herbicides, fungicides and insecticide treatments during the growing season, increasing the cost of cultivation to a considerable extent. Recently, many previously used seed treatment actives and herbicides have been withdrawn from the market, which may have been harmful to pollinating insects, and their lack causes problems for farmers to ensure successful plant protection. Advances in breeding have enabled the transfer of resistance genes from wild sunflowers to modern hybrids, opening the door to low- or zero-chemical cultivation methods. In the experiment, sunflowers without seed treatment were planted in one pass with two different cover crop mixtures, the expected positive effects of which are as follows:

- Soil shading effect of ground cover plants, which reduces evaporation and inhibits the development of weeds.

- The flowers of some ground cover plants are pollinating insect attractants, which also have a positive effect on the pollination of sunflowers.

- the mixture also included nitrogen-fixing plants, which increase the N content of the soil indirectly for the main crop in small quantities, but in larger quantities for the follow-up crop.

36 plots of 21 square meters were sown per treatment, where the treatments mean the different soil cover seed mixtures and control. During the growing season, soil moisture content, base surface relative humidity, the leaf area index, plant height, head diameter was measured. Harvesting was done with a parcel harvester. The weight of the crop, its oil and protein content, moisture content, and the weight of the thousand grains were also measured. Based on the experimental results of the 3 years, it can be stated that the production of sunflowers can be successful on weaker soils, with the use of ground cover crops, even without the use of chemicals.

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INVESTIGATION OF SPRING RYE CULTIVATION POTENTIAL IN THE SOUTHERN GREAT PLAIN

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The increasing frequency and severity of drought periods pose a significant challenge to crop production, particularly in the Southern Great Plain region, as a consequence of climate change. The aim of our research was to investigate the potential of spring rye as an alternative crop in this region, with a particular focus on the challenges posed by climate change. The selection of the 'SM Stefano' spring rye variety, bred in Poland, was based not only on its novelty but also on its outstanding adaptability and low input requirements. The field experiment was conducted in 2023 and 2024, with trials set up at three locations in the first year and two locations in the second year. Prior to harvest, plant samples were collected from one meter per replication and subjected to laboratory analysis. This publication examines the effects of different growing sites and years on the yield and yield components of spring rye. The results were processed using statistical methods. Our findings indicate that under certain conditions, spring rye can serve as a viable alternative crop in the region and may even exceed the national average yield of winter rye. Due to its short growing period and low input requirements, it can play a crucial role in sustainable farming and crop diversification.

THE INVESTIGATION OF ZINC OXIDE NANOPARTICLES (ZnONPs) ON AEROBIC GRANULATION

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Nanoparticles, which are defined as tiny particles with sizes under 100 nm, have special physical properties that include ionization potential, reactivity, small size, high surface-to-mass ratio, chemical stability, improved absorption capacity, resistance to pH, and resistance to heat. Zinc oxide nanoparticles have been widely utilized in almost all scientific disciplines due to their remarkable features. However, several studies have claimed that concentrations of zinc oxide nanoparticles greater than 10 mg/L could pose a potential threat to the entire ecosystem due to their strong bioavailability, aggregation, and mobility. Since aerobic granular sludge has been shown to successfully eliminate heavy metals, sewage wastewater, slaughterhouse wastewater, high-strength food wastewater, aniline wastewater, printing dye wastewater, and more, it has been recognized as one of the most promising approaches in wastewater treatment technologies. Because aerobic granular sludge utilizes sustainable methods for treating pollutants through biosorption, bioaccumulation, and biodegradation, it has a wide range of uses in wastewater treatment. The aim of this research is to investigate the effect of two different doses of zinc oxide nanoparticles (1 mg/L and 5 mg/L) on granulation. The results showed that the efficiency of ammonia removal was considerably inhibited in the presence of 5 mg/L ZnO NPs. However, neither dosage application significantly altered the nitrite removal rates, while both ZnO NP concentrations noticeably prevented nitrate removal. Phosphorus removal decreased with even a low concentration of ZnO NPs Finally, the concentration of biomass increased under both ZnO NP concentrations.

BACTERIAL CELLULOSE: A SUSTAINABLE SOLUTION FOR NEXT-GENERATION TEXTILES AND VEGAN LEATHER

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The growing interest in sustainable materials has increased the focus on developing resources from renewable systems, especially through biological processes. Bacterial cellulose (BC) is a promising biomaterial recognized for its renewable, biodegradable, and eco-friendly properties. It is gaining attention across industries such as food, pharmaceuticals, materials science, and textiles. In the fashion industry, BC biofabrication offers an innovative approach to creating sustainable textiles and vegan leather.

This poster highlights BC's role in advancing sustainable materials, addressing challenges like low yields, strain instability, and high production costs, and discussing new biofabrication techniques to overcome these issues. Recent efforts aim to improve the thickness, consistency, and strength of BC layers by optimizing environmental and nutritional conditions during *Komagataeibacter* cultivation. Innovations in synthetic biology and genetic engineering are also contributing to more efficient BC production, strengthening its potential in sustainable fashion. Additionally, understanding the interactions between microbial strains and their growth environments has opened new possibilities for enhancing BC quality and scalability. This presentation provides an overview of three main areas: (1) the applications of bacterial cellulose across various industries, (2) biofabrication techniques for producing vegan leather, and (3) recent innovations and patents that utilize BC as a sustainable biomaterial for industrial use. It also emphasizes the importance of continuous research and technological advancements to ensure BC's future role as a key material in sustainable development.

BACTERIAL CELLULOSE: FROM BIOFABRICATION TO APPLICATIONS IN SUSTAINABLE FASHION AND VEGAN LEATHER

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The rising demand for sustainable materials has led to a significant focus on developing resources from renewable systems, particularly through the integration of biological processes. Bacterial cellulose (BC) has emerged as a highly promising biomaterial, gaining attention across multiple industries, such as food, pharmaceuticals, materials science, and textiles, due to its renewable, biodegradable, and eco-friendly characteristics. Within the fashion industry, bacterial cellulose (BC) biofabrication presents a groundbreaking method for producing sustainable textiles and vegan leather. This systematic review emphasizes BC's pivotal role in advancing sustainable materials, addressing challenges like low yields, strain instability, and high production costs, and exploring innovative biofabrication techniques to overcome these barriers. Current advancements aim to enhance the thickness, uniformity, and mechanical properties of BC layers by optimizing the environmental and nutritional conditions during *Komagataeibacter* cultivation and leveraging co-culturing methods. Furthermore, recent innovations in synthetic biology and genetic engineering have opened new avenues for improving BC biosynthesis, making it a viable solution for the sustainable fashion industry. This review explores three core topics: (1) bacterial cellulose and its applications, (2) the biofabrication of BC for vegan leather, and (3) emerging innovations and patents utilizing bacterial cellulose as a sustainable industrial biomaterial.

ENTREPRENEURSHIP – AN OPPORTUNITY FOR THE SUSTAINABLE DEVELOPMENT OF RURAL COMMUNITIES

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Entrepreneurship plays a crucial role in the development of the national economy, stimulating innovation, creating jobs and contributing to economic growth. The development of entrepreneurial activity is of major importance in boosting the national economy, offering numerous benefits, from job creation and stimulating innovation to promoting regional development and business internationalization. Government policies to support entrepreneurship can amplify these positive effects, contributing to sustainable economic growth. Entrepreneurship can become a driver of sustainable development in rural communities, turning challenges into opportunities and creating a resilient economic ecosystem. With adequate support and favorable public policies, rural entrepreneurs can contribute to economic growth, the preservation of traditions, and the protection of the environment. This paper aims to provide a current radiography of the Romanian SME sector, offering comparisons at European level. In this regard official statistics from national sources , as well as Eurostat statistics or benchmarks from other international and national analyses, were used . In the future additional efforts will be needed to create and ret ain the population, given the demographic trends and the impact of the green and digital transitions on the labour market. . The sustainable development of rural communities is a global challenge, considering current trends of accelerated urbanization, depopulation of villages, and limited access to economic resources and infrastructure. In this context, rural entrepreneurship can play a crucial role in revitalizing these communities by generating jobs, driving economic growth, and ensuring better utilization of local resources.

INVESTIGATING THE EFFICIENCY OF WHEY DIAFILTRATION WITH VARIOUS ANALYTICAL METHODS

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As a by-product of the dairy industry, whey contains valuable protein fractions, whose utilization is increasingly important. Ultrafiltration/diafiltration (*UF/DF*) is an effective membrane technology for the concentration and purification of whey proteins, allowing selective enrichment of proteins relative to other components. Determining optimal filtration parameters and thoroughly analyzing fraction compositions are crucial for process efficiency. Our experiments aim to analyz e the filtration and purification efficiency of *UF/DF* using various analytical methods. In preliminary experiments, the contents of raw whey were analytically determined. In the initial filtration step, whey proteins were concentrated via *UF* (with a 10 kDa *PES* membrane), followed by more steps *DF* of the recovered retentate. During *DF*, distilled water was added to the concentrate and the volume reduction ratio values (*VRR*=3) were adjusted to the *UF* stage. After the different filtration steps, we analyzed the fractions using the same analytical methods and compared the compositional changes with the dielectric properties of the samples. Results of this study provided a comprehensive overview of the component distribution during *UF* and *DF* of whey, with a particular focus on increasing protein concentration possibilities. In addition, by monitoring changes in dielectric behaviour, we were investigating a possible new method for monitoring the filtration process. Our results may contribute to the optimisation of membrane technology processes and the development of final products with high protein content. Moreover, in order to reduce membrane fouling, we are also investigating the incorporation of a 3D printed turbulence promoter to improve *UF* filtration efficiency.

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INVESTIGATION OF CEC TOLERANCE OF BIOCONTROL BACTERIAL ISOLATES

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Contaminants of Emerging Concern (CECs) are chemicals and toxic materials detected in water bodies that may pose ecological or human health impacts and are not yet regulated. This study evaluated the tolerance of various biocontrol bacterial isolates to a mixture of common pharmaceutical residues and pesticides (CEC mix), including diclofenac sodium, bezafibrate, losartan, furosemide, carbamazepine, propranolol, ranitidine hydrochloride, atenolol, famotidine, sotalol hydrochloride, acetaminophen, hydrochlorothiazide, salbutamol, omethoate, trichlorfon, dimethoate, acetamiprid, phosphamidon, carbofuran, carbaryl, methidathion, linuron, malathion, ethoprophos, tebuconazole, propiconazole, methamidophos, imazalil, and diazinon. Six isolates were tested, including strains applicable as soil inoculants, foliar biocontrol agents, and strains suitable for industrial mushroom cultivation. These isolates represented the genera *Bacillus*, *Pseudomonas*, and *Arthrobacter*. CEC tolerance was assessed in microplates using a microdilution method, with concentrations ranging from 0.5 µg/ml to 0.003125 µg/ml. Tolerance levels were determined based on OD_{620} measurements after 24 to 48 hours of incubation. All tested strains exhibited tolerance to CECs, although the degree of tolerance varied among isolates. Among the tested strains, the SZMC 25872 *Pseudomonas resinovorans* isolate exhibited the highest level of CEC tolerance. Current investigations focus on evaluating pharmaceutical and pesticide tolerance separately. Future work will involve applying analytical methods to assess the degradation capabilities of the isolates for pharmaceuticals and pesticides.

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INVESTIGATION OF PHOSPHORUS CYCLE DYNAMICS IN A SEWAGE SLUDGE COMPOST EXPERIMENT

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The increasing price of mineral fertilizers and the depletion of global rock phosphate reserves make the search for sustainable alternatives imperative. Sewage sludge compost (SSC) can serve as a low-cost phosphorus source. SSC not only serves as a P source but also improves soil physical, chemical and biological properties. This study aims to examine the long-term effects of regular SSC application on certain elements of the phosphorus cycle in a small-plot experiment established in 2003 in Nyíregyháza on Arenosol soil. The experiment consists of four treatments (0, 9, 18, 27 t ha^{-1} SSC), incorporated into the soil every three years. The results showed that higher available phosphorus levels compared to the control plot resulted in greater biomass production and more efficient phosphorus utilization in rye. Acid and alkaline phosphatase activity also influenced the forms of available phosphorus in the soil. Principal component analysis revealed that total phosphorus, ammonium lactate-extractable P_2O_5, and acid phosphatase were the key factors distinguishing the SSC treatments. Regular SSC application is shown to be a sustainable strategy which contributes to soil fertility and highlights the contribution to not only total but also plant-available phosphorus, while emphasizing the crucial role of soil microorganisms in nutrient management. SSC can reduce the dependence on mineral phosphorus fertilizers.

PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF IMPORTED DAIRY COWS UNDER SAHARAN CLIMATIC CONDITIONS IN ALGERIA: CASE OF GHARDAÏA PROVINCE

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This study aims to evaluate the productive and reproductive performance of 111 dairy cows from five European breeds (Black Holstein, Red Holstein, Montbéliarde, Fleckvieh, and Brown Swiss), raised in arid regions by analyzing the effects of extreme climatic conditions on their zootechnical performance. The research was conducted during the spring and summer seasons on a private farm located in Ghardaïa (Algeria), a typically Saharan area characterized by a hot and dry climate. Weekly milk yield was monitored individually, and milk composition (fat and protein content) was determined using a Lactoscan analyzer. Reproductive data were extracted from a computerized herd management system, allowing the calculation of several fertility parameters: calving to first insemination interval, conception delay, calving interval; and fecundity indicators: success rate at first artificial insemination (SRAI1) or at first natural service (SRNS1), percentage of cows with three or more inseminations, and the average number of inseminations per conception. Climatic data (ambient temperature and relative humidity) were retrieved from the NASA POWER database to calculate the temperature-humidity index (THI), using the National Research Council (1971) formula. All data were processed using Statistica software for statistical analysis. The distributed rations allowed for an average milk yield of 7709.24 ± 1435.46 kg per lactation, reflecting a generally adequate nutritional management despite unfavorable climatic conditions. However, the fat/protein ratio, estimated at 1.01, falls below the reference range (typically between 1.2 and 1.5), which may be an early indicator of subacute ruminal acidosis (SARA). From a reproductive perspective, natural service resulted in a significantly shorter conception delay compared to artificial insemination (80.5 vs. 158 days), although the success rates remained low (SRNS1 = 44%, SRAI1 = 17%), suggesting a likely impairment of reproductive functions under heat stress. THI analysis identified three stress classes: mild (THI = 60 ± 7.19), moderate (THI = 74.67 ± 1.07), and severe (THI = 83.74 ± 2.77). Increased THI was associated with a significant decline in milk production and milk solids content, as well as deterioration of reproductive parameters and an increase in respiratory rate ($p < 0.05$), indicating a marked physiological impact of thermal stress. During moderate thermal stress periods (THI = 73.1), the Brown Swiss breed demonstrated superior thermal resilience, with a significantly lower respiratory rate compared to Holsteins (37.0 ± 3.1 vs. 57.3 ± 5.2 breaths/min, respectively), highlighting its ability to maintain physiological functions in a harsh environment. These results suggest that selecting heat-tolerant breeds, such as the Brown Swiss, represents a relevant strategy to safeguard dairy production in arid zones. This study highlights the physiological limitations of imported breeds under thermal stress and emphasizes the need for integrated approaches (genetic selection, herd management, and environmental control) to mitigate the effects of climate change on dairy systems. Further research, conducted on larger animal populations, is needed to validate these observations and support the development of effective adaptation strategies for livestock systems facing future climate uncertainties.

REGENERATIVE AGRICULTURE USING BEEF CATTLE

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In today's agriculture, soil must play a key role, regardless of whether we engage in crop production or livestock farming. The condition of the soil significantly influences the response to adverse weather conditions, whether it involves cash crops or forage crops. We must break away from crop production technologies that have been used for decades in order to preserve and improve soil fertility. However, soil-regenerating and soil-conserving techniques often provoke resistance among farmers, particularly from an economic perspective. Many farmers are reluctant to make the switch due to concerns about potential income reduction. Moreover, in recent years, the profitability of agricultural activities has steadily declined. In our work, we aim to present a best practice. This is a complex crop production and livestock farming system that simultaneously provides a solution for improving soil conditions while also offering additional income-generating potential. A real, long-running no-till arable farming operation is complemented by cover crop cultivation, which provides excellent forage for beef cattle. On this "pasture," rotational grazing is practiced—along with supplementary feeding when necessary—until the next crop production agrotechnical process allows it. In this combined regenerative crop production and livestock farming technology, the presence of animals has a highly beneficial impact on soil conditions. The manure and significant amount of urine deposited on the land create a solid foundation for the next crop cycle. The sale of animals increases the farm's profitability per hectare.

TOMATO POMACE AS A POTENTIAL ALTERNATIVE FEED SOURCE

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This research examines the sustainable utilization of food industry by-products, particularly tomato pomace, as animal feed. By analyzing the global issue of food waste, this study highlights the difference between consumer-level waste and industrial by-products, emphasizing the potential for their reuse. The experiment assessed the preservation potential of tomato pomace with different silage inoculants. Laboratory tests were conducted in micro-silos, where creating an anaerobic environment and ensuring effective compaction played a crucial role in optimizing the fermentation process. Preliminary results indicate that these materials can be effectively preserved through lactic acid fermentation while maintaining their nutritional value, potentially lowering feed costs and promoting a circular economy. This research underscores that the sustainable utilization of food industry by-products not only reduces waste but also provides economic and environmental benefits for livestock farmers.

UNDERSTANDING HUMAN-WILDLIFE CONFLICTS: CAUSES, TRENDS, AND SOLUTIONS IN NAIROBI NATIONAL PARK

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Abstract: Human-wildlife interactions around Nairobi National Park are constantly evolving due to urbanization and population growth. However, there is limited documentation on recent conflict trends, their causes, and mitigation measures. We examined spatio-temporal changes in human-wildlife interactions from 2014 to 2023, comparing past and present trends, evaluating mitigation strategies, assessing shifts in wildlife populations and landscapes. Between October 2024 - January 2025, 15 interviews were conducted with the representatives of the main stakeholder groups, supplemented by Kenyan Wildlife Service (KWS) records. Interviews were coded and analyzed using qualitative content analysis while descriptive statistics was used for KWS data. Findings reveal significant shifts in wildlife populations and conflict dynamics. The number of lions, hyenas, and rhinos have increased, while wildebeest, hartebeest, and Grant's gazelles have declined. Lions were once the main predators, but hyenas and leopards now dominate livestock attacks, and crop damage by primates is the most prevalent issue. Conflict hotspots have moved from Kitengela to Tuala and the Naretunoi Conservancy due to urban expansion. Bushmeat hunting has emerged as a growing threat, and fencing has disrupted migration corridors. Drought in 2022 led to the highest recorded incidents of human-wildlife interactions. Demographic and environmental changes have also influenced interactions. Increased immigration introduced subsistence farming, while the Maasai community has become more sedentary, though livestock rearing remains a key economic activity. Ecological challenges such as overgrazing, pollution, invasive species, and mining persist, further intensifying human-wildlife interactions. These insights are vital for policymakers to support the long-term conservation and management of Nairobi National Park.

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