BOOK OF ABSTRACTS

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"Agrosym 2023"

Jahorina, October 05-08, 2023

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CLIMATE CHARACTERISTICS OF EASTERN SERBIA AS A BASIS FOR CLIMATE VEGETATION CLASSIFICATION OF CLIMATE

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Abstract

The paper presents characteristics of eastern Serbia climate based on data collected at four main meteorological (Crni Vrh, Negotin, Niš and Zaječar) and two climatological stations (Knjaževac and Sokobanja) over 30 years of climate measurements (1981-2010). To analyse general climatic conditions, monthly, seasonal and annual values of air temperature and precipitation regimes are shown. For a better understanding of climate and climate-vegetation classification, the following climate indices were processed: Lang's rain factor as the basis for climate-vegetation classification of climate, pluviometric hazard, De Mortonne's index of aridity, Köerner's thermodrome coefficient and Ellenberg's climate coefficient. The geographical climate-vegetation classification is based on Walter's climate diagram, the Thornthwaite classification system and UNEP. Lang's bioclimatic classification indicates that Crni Vrh is the most humid, and Niš the most arid. According to Thornthwaite, the research area is dominated by the dry subhumid climate, C1 type. According to the UNEP classification, the entire study area has a humid climate. The values of Ellenberg's climate coefficient indicate the zone of oak forests with the characteristics of a dry climate at all stations, except the Crni Crh station which is in the zone of beech forests and has a humid climate. According to De Mortonne's index of aridity, exorheism prevails in the study area. Köerner's thermodrome coefficient shows that Niš weather station has a moderate continental climate, Crni Vrh a low continental or mountain climate, and other stations show pronounced continentality. Based on Walter's climate diagrams, we can conclude that the research area has a continental climate.

Keywords: *eastern Serbia, climate type, climate characteristics.*

TAXONOMY AND PHYTOGEOGRAPHY ANALYSIS OF MEDICINAL PLANTS AT THE AREA OF NATURE MONUMENT "ŠUMA KOŠUTNJAK"

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Abstract

The study was carried out during two consecutive growing seasons (2020-2021) with the aim to record medicinal plants at the area of protected nature monument "Šuma Košutnjak". Based on field research, together with numerous references, there was established presence of total of 147 medicinal plants at the whole researched locality. After the plants were determined, taxonomy and phytogeography analyses of collected material were performed. As for taxonomy, the most distributed families are *Rosaceae* (10.88 %) and *Lamiaceae* (9.52 %), while *Fabaceae* (5.44%) and *Asteraceae* (5.44%) are a bit less present. In the phytogeography analysis participation of different life forms and floral elements was determined. Among life forms the most common are hemicryptophytes (40.14%), then phanerophytes (24.49%) and therophytes (11.56%). The most dominant floral elements are Eurasian (20.41%), submideuropean (17.69%), mideuropean (12.24%) and submediterranean (11.56%). It should be noted that some species, according to destructive human effect, are very endangered due to low rate of their natural regeneration. Therefore it is needed to conduct protective measures in order to conserve gene pool of these species. If we want to obtain reliable information about the number and presence of medicinal plants at this area, it is necessary to perform detailed monitoring which would include several consecutive growing seasons.

Key words: *NM "Šuma Košutnjak", medicinal plants, taxonomy, phytogeography.*

PREVIEW OF MEDICINAL PLANTS WITHIN LOWLAND PEDUNCULATE OAK FORESTS AND THEIR USEFUL PROPERTIES

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Abstract

The study related to medicinal plants was carried out at the area of Gornji Srem within three management units: MU „Blata-Malovanci" (forest type *Carpino-Fraxino-Quercetum roboris caricetosum remotae*), MU „Raškovica-Smogvica" (forest type *Fraxino-Quercetum roboris aceretosum*) and MU „Vinična-Žeravinac Puk" (forest type *Carpino-Fraxino-Quercetum roboris caricetosum remotae*). At the area of Gornji Srem in the middle of 30's last century protective embankment was built which eliminated flooding influence. As a result, vegetation is supplied with water mainly from groundwater and precipitation. There were recorded 139 medicinal plants that originate from 43 families. The aim of the paper is to determine useful properties of medicinal plants. The analysis of mentioned features of medicinal plants was conducted according to generally accepted methodology (Ranđelović et al., 2002) that all medicinal herbal drugs classified into 14 groups. Based on obtained results, the largest number of medicinal plants act on the digestive organs and cardiovascular system, and then follow drugs that treat problems with the skin, excretory and respiratory organs. Only one herb belongs to the category of antihistamines, while phytoncide herbs, galactose and drugs for improving the flavour and taste of various medicines have two representatives each. It should be noted that certain medicinal taxa have a wide range of useful properties and simultaneously treat several different health problems.

Key words: *Gornji Srem, useful properties, lowland pedunculate oak forests, phytotherapy.*

SEASONAL DYNAMICS OF INSECT COMMUNITIES AND THREE MAJOR PESTS IN FRUŠKA GORA NATIONAL PARK (SERBIA)

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Abstract

Insects are highly responsive to changing environmental conditions, particularly climate, which can significantly impact their species composition and abundance. By studying the seasonal dynamics of insect communities, we can contribute to understanding their population status and ecosystem health, adapting pest management measures, and promoting conservation efforts. This study aimed to investigate the temporal variation in insect community composition, the relationship between insect families and meteorological parameters, and the variation in species abundance of the three most abundant pests; *Oulema melanopus* (L.), (Coleoptera: Chrysomelidae), *Melanotus punctolineatus* (Pelerin), (Coleoptera: Elateridae), and *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae). Insects were collected using Malaise traps, while meteorological parameters were measured by an automated meteorological field station in the forest of the Fruška gora National Park, Serbia. A total of 124 insect species, 114 genera, and 78 families were identified. The highest number of species was recorded in June (35.5%), followed by May (34.7%), and August (31.5%). The lowest number of species was recorded in September (17%), and April (8%). Species richness increased with temperature, with peaks in May and June, followed by July and August. No significant correlation was found between species richness and air humidity. The highest abundance of insect pests was recorded for *Oulema melanopus*, *Melanotus punctolineatus*, and *Harmonia axyridis*, with the most individuals recorded in July. Forests may possibly serve as overwintering sites for common insect pests, providing them with alternative food sources.

Keywords: *Insect community, Insect pests, Seasonal variation, Species richness, Meteorological parameters.*

FLORISTIC AND ECOLOGICAL ANALYSIS OF BLACK PINE FORESTS (*Pinus nigra* Arn.) ON WESTERN BALKAN SERPENTINITES

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Abstract

Black pine forests of the Western Balkans constitute a significant complex of azonally and orographically–edaphycally conditioned forests on the ophiolitic massifs in Bosnia and Herzegovina (B&H), Serbia, North Macedonia and Albania. They mainly exist on series of soils on serpentinites - from eutric humus-siliceous to brown soil and pseudogley. In terms of floristic composition, these forests exhibit great similarities, but also significant differences. Forests of black pine on the territory of B&H, which belongs to Illyrian floral province, grow in humid conditions with higher precipitation compared to other countries in the region, which results in larger numbers of mesophillic species. Black pine forests in Serbia belong to transitional Illyrian-Moesian and Moesian province and grow in continental climate with lower precipitation, which tends to further decline towards the East, hence the black pine forests in Central Serbia are more xerophillic with larger presence of sub-Mediterranean species. North Macedonia has even lower precipitation and more prominent influence of Moesian province and Aegean Sea, which results in species from those areas being dominant, while Illyrian species are absent. Black pine forests in Albania belong to the Mediterranean climate, however, in the mountain zone some climatic parameters tend to become more continental. From the ecological point of view, the Albanian black pine communities are in an intermediate position between the typical Mediterranean litoral pines and European or continental ones. Within the natural distribution range, species composition of black pine forests on serpentinite strongly reflects a west-east biogeographical division related to climatic differences.

Key words: *Pinus nigra, serpentinite, floristic composition, Western Balkan.*

COMPARATIVE ANALYSIS OF THE CONDITION OF A STAND BEFORE AND AFTER CARRYING OUT ICE BREAKAGE REMEDIAL MEASURES IN THE AREA OF RTANJ MOUNTAIN IN SERBIA

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Abstract

The analysis of the condition of a stand before and after carrying out ice breakage remedial measures in the area of Rtanj mountain is presented in this paper. The stand has been defined phytocoenologically as the mountainous beech forest (*Fagetum moesiacae montanum*) on different brown soils. It is situated at the altitude between 500 m and 820 m, on a very steep slope (16º-20º). Remedial measures have been carried out on several occasions whereby heavily damaged trees were removed with a tendency to preserve the parent stand canopy as much as possible. Before the damage occurred, there had been 434 trees per ha, basal area and volume had amounted to 31.0 m^2/ha and 305 m^3/ha, respectively. Stand mean diameter had amounted to 28 cm, while mean height had amounted to 20.2 m. After removing heavily damaged trees, the number of trees per ha declined to 200, basal area amounts to 13.56 m^2/ha, while volume was 122.68 m^3/ha. Stand mean diameter amounted to 29.4 cm, while mean height was 17.8 m. The biggest differences in the reduction of the number of trees, basal area and volume note in diameter class 27.5 cm. Irregular diameter and height structure are consequences of removal of damaged trees in all diameter degrees.

Keywords: *Remedial Measures, Ice Breaks, Beech, Rtanj*.

CHARACTERISTICS OF LOWER NON-AGRICULTURAL SOILS IN THE NORTH BANAT REGION, MUNICIPALITY OF KIKINDA AND POSSIBILITIES FOR THEIR AFFORESTATION

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Abstract

This paper presents the results of research in the lower parts of lowland non-agricultural area in the Forest management unit ,,Kikinda" on territory of municipality of Kikinda. According to Development plan of city Kikinda around 90% of territory (70.433 ha) is used as agricultural land. The aim of this research was to analyze soil characteristics of lower non-agricultural land and its possibility for afforestation. In research area, the morphology of four pedological profiles was described together with standard physical and chemical analyzes from each pedologic horizon. Soil type was determined as haplic gleysol. Groundwater was found in two profiles at 60 and 70cm depth. Particle size distribution of the haplic gleysols indicates that total clay has higher share then total sand. Based on obtained results, the most dominant texture class in this type of soil was loam. $CaCO_3$ content in soils varied between profiles while pH values ranged from 7.61 to 9.53. Humus content varied from 1.63 to 4.29% in surface Aa horizon. Based on ecological conditions such as high level of groundwater, together with examined soil properties, this area is convenient for establishment of hardwood forests, primary formed of pedunculate oak (*Quercus robur*) and narrow-leaved ash (*Fraxinus angustifolia*). The most limited characteristic of these soils is low physiologically active profile depth which proves there can not be estabilished highly producive hardwood forests. Considering the current forest percentage of area raising forests on these soils, with protective purpose, have multifunctional value.

Key words: *Lower non-agricultural soil, Haplic gleysol, North Banat, Afforestation.*

SYSTEM MONITORING OF THE CROWN CONDITION ON ICP FORESTS SAMPLE PLOTS LEVEL I IN SERBIA WITH A SPECIAL VIEW OF BIOTIC DAMAGE ON PLOTS WITH OAK AS THE EDIFIER

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Abstract

Monitoring of plant diseases and pests represents the key element of the environmental policy, without which the standards for forests and the environment cannot be applied. Data processing and reporting inevitably follow the uniform methodologies designed in accordance with international standards. The main objective of monitoring the crown condition is provision of a periodic insight into spatial and time variations of the forest condition, relative to anthropogenic and natural stress factors in the European and national systematic networks of wide-range observation. The paper demonstrates that the database in which sample plots Level I data are collected may be used in segments, which enables the search according to tree species, diseases, pests, periods, etc. The data from the base related to specific tree species and population density of major diseases and pests, as well as other types of damage of mechanical and abiotic origin (within certain periods - time series), open broad possibilities in practical application of the research. The paper presents monitoring of biotic damage agents, some of which are quite dangerous and significant, while the most common are harmful insects – 13.7% total on all deciduous trees. Among the oak species the most endangered is Sessile oak (with 31.9% damage). The damages caused by fungi rank second and are most frequently present on coniferous trees (11.0%), whereas among the deciduous species Sessile oak is once again the most endangered (6.9%). Damages caused by anthropogenic and abiotic agents – fire, frost, local pollution, etc., are far less significant.

Key words: *sample plot, forest condition, biotic damage.*

UNVEILING THE DRIVERS OF FARM STRUCTURE CHANGES IN SERBIA

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Abstract

The farm structure changes are an ongoing process in all agricultural regions. It includes farms exit, entrance and change of particular type of farming. Direction is same, total number of farms is decreasing, while an average farm size measured in utilised agricultural area (UAA) or livestock units (LU) is increasing. The speed of changes depends on endogen and exogen drivers. In the group of endogen drivers, the most important are aging of farmer population, existence of successor, and profitability of the farm type. Drivers from outside of farm are availability of alternative jobs, accessibility of new farm production technologies, agricultural policy measures, consumer preferences, etc. Availability of data shapes conceptual framework in this research focused to unveil the influence of farm economic factors as a driver of farm structure changes. This hypothesis is tested on regional level, separating findings for lowland and highland areas, based on data from Serbian Agricultural Census 2012 and Farm structure survey 2018, supported by Farm Accountancy Data Network (FADN) data. The results revealed that changes in number of specialised types of farms are consequence of achieved net farm income in successive years. The most likely strongest driver of farm structure change at the current stage are demographic factors, but luck of individual data disables further analysis.

Keywords: *Farm type, Farm structure, FADN, Profitability, Serbia.*

BACTERIAL TREATMENT IMPACT ON ONE-YEAR-OLD SESSILE OAK (*QUERCUS PETRAEA* (MATT.) LIEBL) SEEDLINGS OF THREE SERBIAN PROVENANCES

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Abstract

Plant growth-promoting bacteria support plant health, development and functioning throughout their life without negative environmental side effects. Their application in the forestry sector is not examined enough. Sessile oak is one of the most valuable forest species in the Serbian forest fond. This research studied the effect of *Viridibacillus arvi* and *Pseudomonas koreensis* on the height and root collar diameter of one-year-old sessile oak seedlings. The results indicate no significant improvements in plant height and root collar diameter as a consequence of bacterial treatment. However, there were notable differences between plants of different provenances. Further research needs to be conducted in order to verify obtained results and get more detailed information on plant-bacteria relations.

Keywords: *bacteria, sessile oak, seedlings, provenances, Serbia.*

EDAPHIC CHARACTERISTICS OF THE PARK IN THE ŠARENGRAD AREA IN NOVI SAD IN SERBIA

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Abstract

The paper investigated the soil in the area of the park in Šarengrad in Novi Sad. The park is located in the area of the Novo Naselje district, extends in the southwest-northeast direction, on an area of 1 hectare and contains deciduous and coniferous tree species and various ornamental shrubs. Four pedological profiles were opened in the area of the park, their external and internal morphology was described and the physical and chemical properties of the soil were determined. On the investigated soil, a large anthropogenic influence is visible in the description of the inner morphology of the pedological profiles, i.e. the surface horizon up to 10 cm depth was completely changed by filling in fertile humus soil, while the deeper horizon from 10 to 150 cm depth was also under anthropogenic influence. The analysis of the granulometric composition of the soil shows that the texture classes sandy loam, loam and clayey loam dominate in the surface horizon, while the texture classes in the deeper horizon are sandy loam and sandy clay loam. The chemical properties of the soil studied show an average $CaCO_3$ content of 5.07 to 8.94%, i.e. the soil is carbonate. The active acidity has a pH of 8.23 to 8.44, i.e. it is a medium to strongly alkaline soil. The humus content averages between 1.53 and 2.52% and it is a weak to moderately humic soil. In terms of nutrient content, it is moderately to well supplied with total nitrogen and poorly supplied with readily available phosphorus and potassium. As this is a park area where the vitality of the existing trees must be maintained, it is necessary to improve the physical and chemical properties of the soil to some extent, taking into account the compaction of the deeper horizon, which is a limiting factor for the development of the root system. In the case of the soil studied, it is necessary to improve the water-air balance of the soil through agrotechnical measures, to introduce an irrigation system and to enrich the soil with nutrients by applying mineral fertilisers with a high phosphorus and potassium content. When replanting and replacing withered seedlings, it is necessary to replace the soil at a greater depth to allow unhindered development of the tree roots, i.e. to replace the existing soil with fertile soil with favourable water and air properties.

Key words: *Anthropogenic soil, City park, Land change, Novi Sad.*

POSSIBILITIES OF AFORESTATION OF HUMOGLEY SOIL IN THE CENTRAL BANAT AREA IN SERBIA

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Abstract

The paper shows the physical and chemical properties of humogley and the possibilities of growing forests on this soil. The study was carried out in the geographical area of the middle Banat in the province of Vojvodina, Republic of Serbia. The survey covered the atar of the village of Torda, i.e. areas not used for agricultural production, so that they can be used for the survey of forest areas. The soil type identified is humogley. The granulometric composition of the investigated pedological profiles shows the largest proportion of clay fraction, ranging on average from 43.22 to 46.60%. The average content of total sand ranged from 33.77 to 44.20%, and the content of total clay ranged from 55.80 to 66.23%. The texture classes of the studied soils are: clay and sandy clay. The $CaCO_3$ content of these soils ranged from 12.69 and 13.31%, which classifies them as highly carbonated soils. The pH values increase with depth and averaged between 8.86 and 9.57, classifying them as strongly to very alkaline soils. The humus content in the surface humus horizon ranges from 2.38 to 3.51%, i.e. in the moderately humic soil class. The nutrient content shows that the studied soils are well supplied with total nitrogen and moderately supplied with readily available phosphorus and potassium. These heavy humogley soils certainly have the potential for afforestation, and from the autochthonous tree species it would be advisable to undertake afforestation with oak (*Quercus robur* L.) by sowing or planting seedlings.

Keywords: *Humogley, Granulometric composition, Afforestation, Quercus robur.*

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CHARACTERISTICS OF THE SOIL LANDFILL AND POSSIBILITIES OF GROWING POPLAR AND WILLOW

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Abstract

The paper shows the characteristics of the soil from landfills and the possibilities of growing poplars and willows on such lands. For research, certain amounts of soil were taken from landfills in the area of Belgrade and Novi Sad, as well as natural soil where these species occur, which is used as a control soil. After preparation, the soil was placed in containers and brought into the closed space of the greenhouse under controlled conditions of temperature and air humidity in order to grow various clones of poplars and willows. According to the granulometric composition of the soil, it can be concluded that it is a natural soil with a noticeably higher content of total sand, and textural classes: sand to loamy sand. Soils taken from landfills have an increased proportion of total clay, so the textural classes of these soils range from clay loam to loam. The chemical composition of the examined soil indicates that the humus content of the natural soil is low, while the landfill soil has more organic matter. All three soils that are tested will be used for growing plants of various clones of American black poplars (*Populus deltoides* Bartr.), Euroamerican poplars (*Populus x euramericana* /Dode/ Guinier) as well as clones of white willow (*Salix alba* L.). The obtained results will show which poplar and willow clones are the most acceptable for afforestation of landfill soils.

Keywords: *Soil, Landfill, Poplars, Willows.*

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PLANTS AS INDICATORS OF SITE CONDITIONS IN MIXED FORESTS OF SESSILE OAK AND HORNBEAM IN THE AREA OF KOSMAJ MOUNTAIN IN SERBIA

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Abstract

The paper presents ecological properties of plant species, occurring in the forest of the sessile oak and hornbeam community (*Querco petraeae-Carpinetum betuli* Rudski 1949. s.l.) in the area of Kosmaj in Serbia. The sessile oak and hornbeam forests in Serbia are conditioned by orographic and edaphic factors, i.e., they occur as extrazonal vegetation and cover significantly smaller areas than in the Illyrian province. In the area of Kosmaj, these forests occur at lower altitudes (300 - 400 m), with eastern to northeastern aspects, and the slope of 15-23°. Differentiation of flora was done according to membership in certain ecological plant groups, according to most significant ecological factors: soil humidity, soil acidity, quantity of nitrogen in the soil, light and temperature. According to the indicator values of plant species, the community of sessile oak and hornbeam is mesophilic in terms of humidity (F – 2.88), neutrophilic-basophilic (R – 3,32) in terms of acidity, mesotrophic in terms of soil nitrogen supply (N – 2,82), semisciophilic regarding light (L – 2,85), and mesothermal in terms of heat (T – 3,39). Indicator values of plants are suitable to indirectly assess environmental conditions and can help to estimate the conditions, for which no measurements are available. Therefore, they can be used as useful indicators in monitoring environmental changes.

Keywords: *Indicator values of plants, sessile oak and hornbeam forests, Serbia.*

LIGHT REGIME IN STAND OF SESSILE OAK AND TURKEY OAK WITH HORNBEAM IN NATIONAL PARK FRUŠKA GORA IN SERBIA

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Abstract

Results of light regime research in a mixed stand of sessile oak and turkey oak with hornbeam in the area of National park "Fruška Gora", are shown in this paper. Researched stand belongs to the most frequent sessile oak forest type (*Quercetum montanum typicum* Čer. et Jov. 1953) on acidic brown and ilimerised acidic brown soil and represents a xerophilous variant of sessile oak forest. The stand is of vegetative origin, 110 years old. Data collection was done in the summer of 2008. The stand on the eastern-southeastern aspect is located at 225 *m* a.s.l, the inclination is 12^{o}, and the canopy is sparse to complete (0.6 to 0.7). The Stationary isohel method was used for the ascertaining stand light regime. An Isohel map was drawn, and the average light intensity and light permeability indices were calculated for the areas between isohels, based on average light intensity values on monitoring spots. In the studied stand, the light intensity is the highest at 12 p.m. when it is 16005.5 Lx, and the average daily light intensity in the stand is 6594.8 Lx. The average value of the permeability coefficient in the stand is 14.71%. The maximum value of the permeability coefficient occurs in the early morning hours (8 a.m.) when it is 21.53% as a consequence of the eastern to southeastern exposure of the stand.

Keywords: *Light regime, Canopy, Sessile oak, Turkey oak, Fruška gora.*

CO_2 EMISSIONS FROM SOIL IN FUTOŠKI PARK, NOVI SAD (SERBIA)

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Abstract

Carbon dioxide emissions from soils are a one of major component of greenhouse gas emissions, as are the main respiratory fluxes from most ecosystems. The purpose of this study was to obtain data on soil CO2 emissions in Futoški Park, Novi Sad. The research area was in Futoški Park and represents two research plots on calcareous fluvisol soil type. The method of CO2 sampling was based on a soil respiration chamber and was conducted in the 2021 and 2022. Sampling of soil CO2 emission was performed at each research plot once in every ten days, with fifth fold repeatability.Differences in soil CO2 emissions were observed during the study period, depending on soil temperature and moisture. In terms of climate, the air temperature in spring months of 2021 and 2022 (March, April, May) were very different. Air temperature in spring of 2022 was for 1.2°C warmer of 2021 and with a less precipitation for 87 mm. This trend was observed in summer of 2022, which was for 0.9°C warmer of 2021 and with a less precipitation for 23 mm. These conditions affected the soil moisture, which ranged from 2,11 to 26.53 % mass. The soil CO2 emissions in Futoški Park on both site was ranged from 0,062 to 17,028 gm-2day-1. The site closer the road had a higher soil CO2 emission. We found unequal effects of temperature and soil moisture on soil CO2 emissions at the sites studied, mainly due to the results of higher antropogenic pressure on the site.

Keywords: *CO_2 emission, soil, Futoški park.*

Acknowledgments: This research is supported by the City of Novi Sad project No.VI-501-2/2022-3в-15.

SOIL MOISTURE CONDIOTIONS IN SPRING MONTHS IN *QUERCUS PETREAE* FORESTS IN FRUŠKA GORA, AP VOJVODINA, SERBIA

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Abstract

The International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests) is the largest international forest monitoring system. Intensive monitoring (level II) covers 561 plots (as of 2020) in selected forest ecosystems. In Serbia are established 5 intensive monitoring (level II) plots. The paper will show only data for *Quercetum petreae* forests in Fruška Gora, AP Vojvodina, Serbia. In the previous period an increase in extreme events could be observed in spring months. For the past three years, temperatures in March have ranged from cold (2022), to normal (2021) and warm (2023). April was characterized by very cold weather, while May experienced cold (2021) to very warm weather (2022). Precipitation was normal, except for rainy April 2023, and very dry March and May 2022. In past 30-year period the trend in temperature increase was recorded for March and April, and slightly decrease in May ($y = -0.0194x + 56.308$). On other hand for the precipitation was recorded trend for increasing in March and April, and slightly increase in May ($y = 1.3894x - 2713.1$). Soil moisture content (depth 10 cm, 30 cm and 50 cm) show statistically significance difference between 2021 and 2023 year from one side and 2022 year from other side. This difference was most significance on 50 cm depth during last years. Based on this data we have a trend of increasing of deviation of mean monthly temperature and precipitation had a statistically significance difference on soil moisture in *Querqus petreae* forests.

Keywords: *soil moisture, monitoring, Quercus petreae, Fruška gora.*

Acknowledgments: This paper is supported by the Ministry of science, technological development and innovation Project No. 451-03-47/2023-01/200197.

DEMOGRAPHIC OF EMPLOYEES IN PUBLIC FOREST ENTERPRISES AS FACTOR FOR IMPROVEMENT OF FOREST PRODUCT AND SERVICES

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Abstract

Public forest enterprises are required to meet public needs for forest products and services. Some forest products and services must be provided free of charge to society as a whole. From a business perspective, the problem is how to motivate employees to improve products and services when some are provided free of charge. Improvement of product and services is a part of entrepreneurial process known as opportunity recognition and relies inter alia on demographic characteristics. We used attitude approach to describe employees' ability to recognize business opportunity based on demographic characteristics. The improvement of forest products and services results from the proper identification of business opportunities. This research begins with research question whether the demographic characteristics of employees in public forestry enterprises have an impact on improving forest products and services. We conducted a survey to collect employees' attitudes from 4 public forest enterprises in Serbia. The results show that male have more positive entrepreneurial attitudes compared to women. Women give more importance to services such as extension service in private forestry than their male counterparts. Younger employees show more positive entrepreneurial attitudes than older ones. Employees with shorter work experience show more positive entrepreneurial attitudes compared to employees with longer work experience. Positive entrepreneurial attitudes are an important momentum for improving forest products and services. Some of products and services did not recognize as business opportunity.

Keywords: *Entrepreneurship, Public Forest Enterprise, Innovations, Diversification.*

FOOD SECURITY STATUS AND INCOME GENERATION: A CASE STUDY OF AGRISILVICULTURE COMMUNITY GROWERS IN MOPANI DISTRICT, LIMPOPO PROVINCE IN SOUTH AFRICA

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Abstract

Agroforestry is a land use system that includes the use of woody perennial and agricultural crops and animals in combination to achieve beneficial ecological and economical interactions for food, fiber and livestock production. Properly managed agroforestry system provides multiple benefits and contribute to improved food security, livelihoods and income generation. The aim was to determine the status of the agri-silviculture community growers (ACG) in terms of income generation and food security over 2020/21; 2021/22 and 2022/23 growing seasons. The objectives were: (1) to identify and describe the socio economic characteristics of the selected ACG. (2) to determine & compare the 3 year food security status among ACG (3) to determine & compare the 3 year income generation among ACG. A purposive and snowball sampling techniques were used to select 136 ACG and were spread on the 70 ha South African Forestry Company Limited (SAFCOL) land and each ACG was allocated an area of land as follows for production (in m^2): 70ha*10000 m^2 (700 000m^2) of land to the estimated 500 ACG, with each ACG receiving 1400m^2 (700000m^2/500). Quantitative and qualitative designs were used as a questionnaire written in English, stakeholder's discussion and field observations were part of the data collection. The socio economic data was also coded, captured and analysed using Statistical Package for Social Science (SPSS version 21). The results indicated that the ACG' food insecurity was flattened year after year and 100% food security achieved at year 3. In addition, another trend established is that groundnuts quantity increases by +300bags (300*50Kg = 15000Kg) each growing season and groundnuts prices increases by +R100 each growing season. It is concluded that recognizing and tackling the main factors, both socioeconomic and biophysical consideration, that determine participation of farmers in agroforestry are essential for the adoption of agroforestry. Hence, it is recommended that agroforestry practice should be intensified across all SAFCOL plantations as it is contributing to food security, income generation, market access and sustainable communities livelihoods.

Key words: *Agri-silviculture Community Growers, Socio Economic, Food Security, Income Generation, South African Forestry Company Limited (SAFCOL), Mopani District, Limpopo Province and South Africa.*

MOLECULAR REGULATION OF SOMATIC EMBRYOGENESIS IN *PINUS PINEA* L.

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Abstract

Somatic embryogenesis (SE) is a process of adventitious regeneration whereby already differentiated somatic plant cells enter a new cell cycle and acquire full capacity to form embryos that can give rise to a complete adult plant. SE is a biotechnological tool that allows large-scale mass propagation of selected material. However, factors affecting the expression of embryogenic capacity, mainly genotype, limit the extensive use of this technology in several forest tree species. The genus *Pinus* is still considered recalcitrant to SE induction. In this work, a global analysis of gene expression in *Pinus pinea* L. genotypes with high or low embryogenic capacity has been performed. The results indicate that numerous regulatory pathways, induced or repressed in a coordinated manner with putative target genes, are significantly modulated during SE induction or repression. In addition, we have measured variations in the expression of genes involved in adult tissue differentiation, as well as in certain transcription factors in masses of lines with low embryogenic capacity and in vegetative organs. These findings could indicate a potential inhibition of cell reprogramming, or an irreversible induction of differentiation processes in these masses, which could be related to a loss of embryogenic competence. Thanks to this study, we hypothesize the role of a group of genes involved in a blocking mechanism leading to SE incompetence. The determination of the molecular bases surrounding the triggering of embryogenic response will allow efficient and accurate selection programs in conifers, and particularly in *Pinus pinea.*

Keywords: *Cellular reprogramming - conifer breeding program - forest species - somatic embryogenesis - totipotency*.

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AWARENESS AND ADOPTION OF SCIENTIFIC AGRICULTURAL PRACTICES IN AGROFORESTRY HOME GARDENS WITH SPECIAL REFERENCE TO WELIGAMA, SRI LANKA

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Abstract

Agroforestry home gardens offer diverse land use systems, but lack of research exploration raises concerns about the adoption of scientific agricultural practices in Asia. This research attempts scientific practices awareness and adoption in agroforestry home gardens, focusing on Weligama Divisional Secretariat (DS), Sri Lanka. Three (03) Grama Niladari (GN) divisions were selected from the DS based on the availability of the highest number of agroforestry home gardens. The primary data were collected from randomly selected 30 households from each GN division (n = 90) by personal interviews through the use of a structured questionnaire. The adoption level was measured by 5 point Likert scale ranging from 1 to 5 with 1=Never, 5= highly adopted and the awareness was measured by 5 point Likert scale ranging from 1 to 5 with 1=Not at all aware, 5= Highly aware. The level of adoption of various scientific practices was calculated using the adoption quotient. Collected data were analyzed using nonparametric statistics. Results revealed that the majority (38.8%) were aware of scientific agricultural practices. The adoption of scientific agricultural practices in agroforestry home gardens are at moderate adoption level in selection of land (52.2%), land management practices for planting area (51.1%), selection of plant materials (48.9%), management of plant protection (66.7%) and maintenance of plants (58.9%). The overall adoption level of households is moderate (65.6%). A significant correlation ($r = 0.595$, $p < 0.01$) was found between scientific agricultural practices in agroforestry home gardens and awareness (Spearman correlation). Trainings and workshops improve awareness and extension programs for household adoption of scientific agricultural practices.

Keywords: *Agroforestry, Awareness, Scientific Practices, Plant Selection, Adoption.*

AUTHOR INDEX