

Determining the phytotoxicity of rubber granulate from waste tires

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The annually increasing global production of tires ranges around 1 billion and the number of waste tires is growing too. A question comes to the fore how to handle the waste to prevent environmental risks. The most advanced recycling facilities can process waste tires by sophisticated methods leading to their further use. One of products is a so-called rubber granulate which enjoys great interest of gardeners who use it instead organic mulch. In relation with this research, phytotoxicity of rubber granulate made from waste tires was studied in laboratory conditions using a test kit (Phytotoxkit™) for the determination of inhibitory/stimulating effect. The testing was made on the reference soil and tested seeds were the seeds of white mustard (*Sinapis alba* L). The granulate was applied onto the soil at rates of 5%, 10%, 25%, 50% and 75%. Research results demonstrated the inhibition of *Sinapis alba* L. seeds already from the rate of 5%, i.e. 6.50%. In the other rates, the inhibition ranged between 26.37% and 62.36%. The granulate is therefore considered phytotoxic and should not be used on the soil.

Keywords: white mustard, reference mixture soil, Phytotoxkit™, mulch, environmental risks

Analysis of awareness of the implementation of agricultural production in Czech Republic

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The aim of the work was to monitor the awareness of specific age groups in the implementation of agricultural production in the Czech Republic. The main topics were issues related to land, farming methods, primary crop production, animal production and economic aspects of the agricultural sector in relation to the awareness of respondents. For the intergenerational comparison of the monitored aspects, four age groups were created, whose answers were compared and evaluated with each other. Based on the respondents' answers, it was found that awareness of less complex questions that do not require prior knowledge is relatively good among respondents. Ignorance of agricultural production has manifested itself mainly in questions concerning farming methods, control bodies, the impact of cultivated crops on the soil or in connection with the cultivation of GMO crops. For these issues, the intergenerational impact was also relatively negligible. In the overall comparison, we can say that the younger group of respondents is more demanding when choosing food, especially the origin and quality of the product. Answers to questions about organic farming were also often far removed from the legislative requirements for the sector. This is especially true for the older group of respondents.

Keywords: agriculture, farming methods, problem aspects

Historical and contemporary endangered wetland species of the southeastern part of the Bohemian-Moravian Highlands

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Wetlands are among the most endangered ecosystems in Central Europe. Therefore, large number of wetland organisms are endangered at the same time. Frequency of 94 red-list species were evaluated in the studied area of the south-eastern part of the Bohemian-Moravian Highlands. Historical data were taken from literature, botanical surveys, and databases. Recent occurrences are the result of the own field survey. Almost half of the evaluated species are recently considered as disappeared, or extinct in the area. *Carex lasiocarpa* and *Pedicularis palustris* are plants of high conservancy importance and at the same time belongs to recently missing species, with high probability of extinction, in the studied region. *Drosera rotundifolia* survives only at one locality. Prevailing decreasing number of species localities is associated mainly with the loss of suitable low-productive aquatic and wetland habitats. The study points to the continuing negative trend of reducing the occurrence of most of the evaluated endangered species and the related degradation of natural habitats in the selected area.

Keywords: degradation of habitats, nature protection, plant survey, species extinction

Integrated national-scale assessment of climate change impacts on agriculture: the case of the Czech Republic

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In recent years, investigating climate change impacts in the agricultural sector at the national level has become a priority for adaptation decision-making. Most of these studies quantify the impacts of biophysical effects and often ignore the cross-sectoral interactions and economic effects on relative competitiveness, international trade, global food supply, and food prices for the Czech Republic. Ignoring future productivity changes globally under climate change scenarios can underestimate or overestimate climate change impacts at the national level. Here, we use GLOBIOM-CZE, a global economic model, as part of a climate change impact assessment framework to evaluate the impacts on the Czech agricultural sector in terms of environmental and economic indicators. By comparing with the baseline, the ensemble of scenarios suggests a decrease in crop area and production while increasing grassland, positively affecting livestock production by mid-century. Corn and barley show the most adverse response in production and area, while rapeseed increases under scenario RCP 8.5 with CO₂ fertilization effect. Livestock products production is projected to increase, especially bovine meat and milk, as within RCP 8.5, no constraints are placed on growing greenhouse gas emissions.

Keywords: climate change impacts, Czech agriculture, global assessment model

Optimization of ATS system for pollutants removing

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Industrialization increases use of emerging contaminants which contribute significantly to water pollution. This critical problem attract considerable public attention, hence appropriate technology is needed. Various microorganisms such as algae, cyanobacteria, fungi, yeast and bacteria can be used under certain conditions as ecological and low cost alternative method. One of the options, typically with dominance of some algal taxa, that can improve natural wastewater treatment processes is an algal turf scrubber (ATS) technology. It is an ecologically algae-based system characterized by a broad and dynamic non-specific consortia with various advantages compared to conventional ones. This work focused on optimazing the initiation, formation and maintaining of microbial consortia. Amaranth (azo dye) was chosen as the test pollutant. Results indicate the potential of the ATS system for removal of azo dye amaranth in concentration 20 mg/l.

Keywords: algal turf scrubber, azo dye, amaranth, non-specific consortia

Variation of glomalin content in the Czech soils and the relationships to the chemical soil characteristics and climatic regions

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Glomalin is being investigated as a substance that improves soil quality, the resistance of soil aggregates and play a role in carbon sequestration. This study is the first nationwide survey of the glomalin content in the soil. Soil samples were collected from 181 locations in the Czech Republic to describe the variability of glomalin content in the soils of the Czech Republic and its dependence on soil chemical properties and climatic area. Sodium citrate buffer was used to extract easily extractable glomalin (EEG), and the glomalin concentration was determined spectrophotometrically. The soil glomalin content correlates most with the ratio of humic and fulvic acids. Moreover, the interrelation between glomalin content and climatic regions was also observed. The content of glomalin decreases from the warmest regions to the coldest. We also compared the glomalin content among different soil types groups and found out that the lowest glomalin content was found in Entic Podzols and Gleysols. On the contrary, the highest glomalin content was found in Vertisols, Phaeozems and Luvisols.

Keywords: glomalin, humic and fulvic acids, climatic regions, soil types

Analysis of small forest catchments evapotranspiration determined by precipitation/runoff measurements, remote sensing model DisALEXI and water balance model SoilClim

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The below-average precipitation combined with above-average temperature during the period 2015–2019 showed high susceptibility of the Czech landscape to drought stress. This particular drought caused significant economics losses in the forestry, agricultural and water management sectors. Because the climate models predict recurrence of drought period with increasing intensity and frequency, accurate knowledge of individual ecosystems evapotranspiration is needed to develop suitable adaptation to climate change. This contribution detects the evapotranspiration determined by precipitation/runoff measurements, diagnostic remote sensing model DisALEXI and semi-empirical model SoilClim in small forest (mostly Norway spruce) catchments areas (GEOMON network). Based on altitudinal gradient analysis (470–942 m), two of the three applied methods (DisALEXI and SoilClim models) confirm the previously accepted hypothesis, that at low elevation the evapotranspiration is limited by precipitation while at higher altitudes by available energy. Moreover, these two models identify the break point where evapotranspiration reaches maximum values and the altitude where evapotranspiration begins to be limited by a lack of available energy (DisALEXI at 758 m, SoilClim at 685 m). However, the DisALEXI model as the only one that best captures the relationship between evapotranspiration, precipitation and altitude. This analysis can be useful for detection suitable conditions for sustainable spruce forest management.

Keywords: evapotranspiration, climate changes, remote sensing, water balance, catchment

Biomass production and high heating value aspects of selected energy grasses under different types of fertilization

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The adverse effects and limited reserves of fossil fuels have given the green light to the rise of renewable energy. In central Europe, biomass is ranked among the most promising renewable energy resources. In the Czech Republic specifically, areas with oilseed rape and maize are expanding rapidly. However, perennial energy grasses such as tall wheatgrass (*Elymus elongatus* subsp. Ponticus cv. Szarvasi-1) and reed canary grass (*Phalaris arundinacea* L. cv. Chrastava) are supposed to be good and environmentally friendly alternatives. This contribution presents the results of a long-term experiment focused on the cultivation of grass species, tall wheatgrass (*Elymus elongatus* subsp. Ponticus cv. Szarvasi-1), and reed canary grass (*Phalaris arundinacea* L. cv. Chrastava), using different fertilization regimes (Control, Mineral, Digestate). The biomass production potentials were monitored, elementary analysis of dry phytomass was performed, and a higher heating value was calculated after spring harvests. Afterward, the energy gain was determined for all variants. Higher yields and higher heating values were found in tall wheatgrass. The biomass yield of the monitored variants ranged from 3.7t / ha to 8.1t / ha, and the energy gain ranged from 63.9 to 148.0 GJ/ha.

Keywords: grasses, fertilization, biomass, energy gain

Hydropysical parameters of alluvial soil in the floodplain forest at Dyje river

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Long-term monitoring of Gleyic Fluvisol at the locality Lednice (2019-2021) is aimed at the evaluation of hydrophysical, physical, and chemical properties. Besides soil moisture, porosity, hydrolimits, soil reaction, nutrients, and humus content, the groundwater table, and monthly precipitation are measured. Standard analytical methods were applied for basic soil properties determination. The importance of the revitalization measures and their effect on soil properties is discussed. Obtained results were evaluated by one-way ANOVA analysis and t-test (software STATISTICA 12.0, StatSoft Inc., Tulsa, Oklahoma, USA). Finally, the soil properties were affected by the revitalization measures and subsequently, some recommendations and protective measures were recommended to reduce the impact of drought on the floodplain forest ecosystem.

Keywords: Gleyic Fluvisol, Forest ecosystem, Water Regime, Groundwater Table