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chlorophyll fluorescence, P700 photo-oxidation measurements and pigment analysis were used. Metal uptake was studied by gamma-radiography.
Results: The results revealed that the cadmium treatment leads to: (i) an inhibition of the plant growth, especially roots; (ii) a decrease in the pigment content (chlorophylls and carotenoids) in the leaves; (iii) altered rate of the photosynthesis; (iv) formation of H_2O_2 and lipid peroxidation, (v) a decrease in the efficiency of far-red light-induced P700 photo-oxidation and a delay of the cyclic electron flow around photosystem I. The metal uptake rate was influenced by nutrition availability.
Conclusion: Data revealed a strong influence of cadmium stress on most studied parameters in dependence on the nitrogen concentration in the media. The observed effects were stronger in the old variety *Slomer* in comparison to the modern one *Katya*.

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Keywords: Nitrogen levels, cadmium stress, chlorophyll fluorescence, photosynthetic apparatus, wheat

P03_04

Triterpenoids and phytosterols in *Inula ensifolia* L.

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The aim of this study was to investigate chemical constituents in the aerial parts of *Inula ensifolia* L., one of the species of genus *Inula* distributed in Bulgaria.
Materials and Methods: Aerial parts of the plant were collected in 2016 from Slavyanka Mt. Air-dried and ground plant material was extracted with chloroform at room temperature. After evaporation of the solvent, the resulting extract was subjected on CC (Silica gel) using hexane: ethyl acetate mixtures with increasing polarity as eluent. Identification of the compounds was achieved by GC/MS, ^{1}H NMR and TLC comparison with authentic standards.
Results: Chloroform extract obtained from aerial parts of *Inula ensifolia* was separated by CC on Silica gel and the obtained subfractions were analyzed by GC/MS and/or ^{1}H NMR. Campesterol, stigmasterol, β- sitosterol, α- and β-amyrin, lupeol , taraxasterol and ψ-taraxasterol, and the corresponding 3-O-acetates and 3-O-palmitates were identified by comparison their mass spectra with literature data. In addition, 3-*O*-palmitates of 16*β*-hydroxylupeol, 16β-hydroxy-β-amyrin, faradiol and arnidiol were detected in the studied extract. Structure elucidation of these esters was further confirmed by acid hydrolysis, separation and characterization of the triterpene alcohols and diols by GC/MS and/or by comparison with authentic samples. The presence of palmitic acid was proven by GC/MS after methylation.
Conclusion: All of the triterpenoid components are now reported for the first time in the investigated plant.

Acknowlegement: This work was supported by the National Science Fund, Ministry of Education and Science, Bulgaria, project DN 09/11.

Keywords: *Inula ensifolia* L.; triterpenoids; phytosterols; 3-O-palmitates.

P03_08

Canopy effects on the distribution of *Goodyera repens* (Orchidaceae) – preliminary results from hemispherical imaging analysis

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Aim: *Goodyera repens (L.) R. Brown* is small sciophilous relict boreal orchid found only in century old forests. Because of its peculiar biology and environmental requirements it's among the most threatened vascular plants in Bulgaria due to various threats as deforestration and others. The study aimed to explore and evaluate canopy effects on the species distribution in Mt. Rhodopes.
Materials and methods: Exploration and investigation of few populations of the orchid *Goodyera repens* in Mt. Rhodopes region, Bulgaria was done from 2013 till 2018. Geospatial data were recorded and hemispherical photographs were collected and analyzed for evaluation of canopy effects on their distribution.
Results and discussion: The results show that more open areas with the index of canopy closure less than 65% are less favorable for the species distribution. It was also found that in inhabited by the species areas where the canopy closure index has dropped below 40% due to canopy destructive processes and activities have some detrimental and suppressive effects upon the existed or existing species population.
It is known that many shade-tolerant/sciophilous plants have adapted their photosynthetic apparatus to the changed light spectrum of the solar irradiation at the understorey microenvironment to utilize more efficiently the reduced amount of the available light. And also have less efficient protection from the shorter wavelength solar radiation. The disturbance of these adaptations and photoreceptor systems may explain to some extend the observed trends. However further research is needed to determine the precise underlying physiological and molecular mechanisms and processes.

Key words: *Goodyera repens*, hemispherical imaging analysis, canopy effects, orchids.

P03_09

Effect of vitamins and plant growth regulators treatments on caffeoylquinic acids in *Inula britannica* shoot cultures

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The **aim** of the present work was to elaborate the effect of tissue culture media optimization on the production of different caffeoylquinic acid (CQA) derivatives in a model system of shoot cultures of the medicinal plant *Inula britannica*.
For this purpose the combined effect of Murashige and Skoog (MS) vs. Gamborg (G5) vitamin supplementations with low (0.2 mg/l) and high (0.7 mg/l) concentrations of benzyl adenine (BA), applied alone or in combination with 0.1 mg/l naphthylacetic acid (NAA) were studied. The content of caffeoylquinic acids was studied by means of HPLC analysis of the methanol extract of the plant material.

The different vitamin supplementations affected differentially the content of total CQAs in relation to the plant growth regulators (PGR) applied. Thus, while in the PGR-free control and in media, in which BA was applied alone, MS vitamins stimulated CQA production. On the contrary, application of NAA in combination with BA reversed this dependency. In all treatments chlorogenic and 3,5-dicaffeoylquinic acid were the predominant components. The 0.2 mg/l BA supplementation was most favorable in stimulation of 3,4-dicaffeoylquinic acid in both vitamin supplementations. MS vitamins favored the production of 1,5- and 4,5- dicaffeoylquinic acid in the PGR-free control and media, supplemented with BA.
Recent studies reveal the potential of the 3,5- and 1,5- dicaffeoylquinic acids in the treatment of neurodegenerative diseases. The obtained results are of interest in understanding the factors affecting the biotechnological delivery of selected CQA-derivatives with pharmacological potential in *in vitro* culture model system of *Inula britannica.*

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Keywords: *Inula britannica* shoot cultures, Caffeoylquinic acids, plant growth regulators, vitamin supplementation.

P03_10

Content of heavy metals and toxic elements in the soils from the park zone of Nature Monument "Mladezhki Halm" (Plovdiv, Bulgaria)

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Natural Monument "Mladezhki Halm" is situated in the real center of Plovdiv (Bulgaria) and is one of its most easily recognized symbols. Situated along one of the main road arteries in Plovdiv (Hristo Botev Boul.), The protected area is subjected both to the strong impact of the automobile traffic and anthropogenic pressure.
Aim: Urban soils are well-known as a suitable matrix for assessment of the anthropogenic load, so we aimed to analyze the content of some heavy metals and toxic elements in the soils of the park zone of the hill.
Material and methods: Soil samples are taken in June 2017 from south and west park zone of the hill along a pollution gradient using the transect method. Transects have begun from the road and samples were collected at the 7.5 m, 25 m, and 50 m distance, on the depth of 0-20 cm. Soil physico-chemical properties and content of toxic elements were analyzed following standard procedures.
Results: Cluster analysis of soil contamination showed some different relationships between heavy metals and toxic elements in the two investigated park zones.
Conclusion: The studied soils from the eastern and western park areas of the Natural monument "Mladezhki Halm" have different characteristics that are probably due to the complex impact of natural and anthropogenic factors. In the soils from the western side of the hill, the content of vanadium, manganese, chromium, copper, zinc and lead is noticeably reduced, leaving from Hristo Botev Boul. and reaching the middle of the park zone.

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Keywords: urban soils, heavy metals, toxic elements, pollution