

врахування забруднення ґрунту. Поглинання окремих металів рослинами залежало від природи металу і року росту. Результати показують можливість застосування міскантусу для фітореMediaції військових об'єктів з подальшим виробленням енергетичної біомаси.

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STUDY OF PHYTONEMATODES AS BIOINDICATORS OF SOIL PARAMETERS'  
CHANGES WHILE PRODUCING MISCANTHUS X GIGANTEUS AT THE SOIL  
CONTAMINATED BY HEAVY METALS**

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Community composition and trophic structure of phytoneatodes response rapidly to soil disturbance, in particularly by heavy metals. Hence, this group of organisms may be used as indicators of phytomanagement success. No data is available about using nematode community response to toxic concentrations of heavy metals and changing the soil quality parameters while growing *Miscanthus x giganteus* for biofuel production. Long term study of phytomanagement with *Miscanthus x giganteus* for restoring of abandoned military site and simultaneous biomass production has been conducting since 2015 in Kurakhove, Donetsk regions of Ukraine. 47°58'51.2"N 37°18'03.9"E. The study was to evaluate potential to use soil nematodes as bioindicators of soil changes in response to planting of *Miscanthus x giganteus* at trace metals.

The total heavy metals in the soil were determined by using Renygen- fluorescent analysis using analyzer Expert- 3-L produced in Ukraine. Nematodes were extracted from twenty four samples of typical black soil at depth of 40 cm of rhizosphere of *miscanthus* at the first year old plantations particularly from heavy metals contaminated and non- contaminated sites. Nematodes were isolated by centrifugation of 100 cm<sup>3</sup> of soil samples and from the roots and stems of *miscanthus* using modified Biermann funnel method.

Obtained results indicated that tested soil is heavily polluted by heavy metals. In tested soil the most dangerous pollutants from three classes of contamination are found, particularly: Zn, As, Cd, Pb – 1st class Cr, Ni, Cu – 2 nd classV, Mn, Sr, Ba – 3–rd class

Totally 61 one nematode species were found at all sites. The identified taxa represent five ecological groups Plant- Parasitic (PP)+ Fa >Fungevores (FV)> Bacterivores (BV) > Predators.(OP). Plant parasitic nematodes are represented by 26 species belonging to 15 genuses : *Mononchus*, *Trichodorus*, *Paratrichodorus*, *Longidorus*, *Paralongidorus*, *Xiphinema*, and *Criconemoides*, *Mesocriconema*, *Paratylenchus*, *Bitylenchus*, *Merlinius*, *Sauertylenchus*, *Scutylenchus*, *Helicotylenchus*, *Rotylenchus*. Fungivores are represented by 16 species belonging to genus *Aphelenchoides*, *Aphelenchus*. 8 nematode species from genuses *Cylindrolaimus*, *Cephalobus*, *Rhabditis*, *Plectus*, *Anaplectus* are assigned as bacterivores., *Ditylenchus*, *Tylenchus*, *Coslenchus*, *Filenchus*, *Tylencholaimus*. 11 species belonging to 5 genuses: *Anatonchus*, *Clarkus*, *Mononchus*, *Prionchulus*, *Mylonchulus* were identified as predatory nematodes.in study.

The nematode assemblage in contaminated by heavy metals soil is characterized by low taxonomic diversity: index H '(1.99-2.14), relatively high level of domination C (0-38-0.49), low evenness ( 0.46-0.74) and low maturity index (1,92-1-98). Monitoring of nematodes community and responding to the changes of soil parameters is continuing and will be fixed each 6 month of experiment.

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### **FLORISTIC COMPOSITION AND IMPACT OF ENVIRONMENTAL FACTORS ON HABITATS OF COPPER HEAP PODLIPA (CENTRAL SLOVAKIA)**

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The contribution deals with the analysis of flora and vegetation of copper mine heap Podlipa near Ľubietová village in Central Slovakia in terms of the impact of increased content of selected chemical elements in the soil, especially heavy metals, pH and ecological factors derived from Ellenberg's indicator values and Shannon-Wiener diversity index.

Field research was conducted from June to October 2016.

On the mine heap we identified and evaluated 9 types of biotopes, where we recorded 111 taxa of vascular plants and 58 species of bryophytes. From each biotope a mixed representative soil sample was analyzed using ICP – MS method, in which the contents of 23 chemical elements, especially heavy metals, as well as pH were determined.

By determining the pH of soil samples, which ranged from 4.16 to 5.86, we have found that the entire heap field has sporadically extremely acidic soils that develop on the coarse skeletal debris of the heap itself.

Increased contents, compared to the standards for agricultural land of the Act of the National Council of the Slovak republic no. 220/2004 on the protection and exploitation of agricultural land, had copper, arsenic and cobalt.

Using the multidimensional analysis of ecological data by PC-ORD, we created the dendrogram of similarities of identified habitats that were divided into two clusters. The first cluster was formed by 6 non-forest habitats with tree layer covering of less than 15 % and the second cluster by 3 biotopes with a well-developed tree layer covering at least 50 % of the area. For both clusters by analyzing the synoptic table in the Juice program we determined diagnostic, constant and dominant species.

The dominant species in the first cluster there were the grasses *Agrostis capillaris* and *Agrostis stolonifera*, in the second cluster the trees from tree layer *Pinus sylvestris*, *Picea abies* and *Quercus petraea*. In the Canoco program we have found a positive correlation between forest habitats (cluster 2) and nutrients and humidity, and between non-forest habitats (cluster 1) and light, using Canonical Correspondence Analysis (CCA). In relation to soil chemistry forest habitats were characterized by a negative correlation to the presence of most of the 23 chemical elements representing independent variables, in contrast to non-forest habitats, each of which showed a positive correlation to at least one chemical element.