

SWITCHGRASS AND LUPIN AS PHYTOREMEDIATION CROPS OF CONTAMINATED SOILS

Maksym Kulyk – Doctor of Agricultural Sciences

Maryna Galytskaya – Researcher

Plaksiienko Iryna – Associate Professor, Candidate of Chemical Sciences

Kocherga Anatoly – Associate Professor, Candidate of Agricultural Sciences

Oleg Mishchenko – Associate Professor, Candidate of Agricultural Sciences

Poltava State Agrarian Academy, **Ukraine**

ABSTRACT

Cleaning contaminated soil from heavy metals is a very important issue for Ukraine at present. Soil pollution is considered to be the result of metallurgical and chemical industries, as well as the irrational application of chemical plant protection. The goal of the studies was investigation of effectiveness of phytoremediation with co-cultivation of herbaceous plants as one of decontamination methods.

An innovative method of cleaning soil from heavy metal contamination using a combination of switchgrass and perennial lupin as phytoremediation crops was developed. The germination of the studied crops was established in laboratory conditions in comparison with the test-crop (cutting lettuce) depending on the concentration of heavy metals in the soil. Laboratory tests were conducted in the Certified Laboratory of Agroecological Monitoring at Poltava State Agrarian Academy. The content of heavy metals in the soil was determined by thin-layer chromatography method, 28 soil samples were taken four times by the envelope method. The laboratory studies of soil purification with an employment of energy crops and legumes were complemented with a long-term field experiment. This long-term field experiment was conducted on the land sites contaminated by heavy metals in the city of Poltava during 2012-2018.

The cultivation of switchgrass and lupin on marginal and contaminated soil entailed a decrease in the content of heavy metals in the soil in the long-term process of cultivation of a mono-crop. Herewith, cultivation of lupin for 1-3 years (until its disappearance in the phytocenosis) not only resulted in reduction in the concentration of heavy metals in the soil, but also served as a bioherbicide screen. The following positive effects of co-cultivation of switchgrass with legumes were discovered: phytoremediation (reduction in heavy metals content in soil), additional supply of the main component of co-sowing (switchgrass plants) with biological nitrogen and an ecological method of weed control (bioherbicide screen) usage.

Keywords: soil cleaning; heavy metals; phytoremediation