

Mitigating the effects of copper phytotoxicity with the foliar application of salicylic acid

Łagodzenie skutków fitotoksyczności miedzi za pomocą dolistnej aplikacji kwasu salicylowego

Jakub Topolski

Institute of Soil Science and Plant Cultivation

e-mail: j.topolski@iung.wroclaw.pl

Plants have evolved different kinds of defense systems against the impact of toxic heavy metals present in their living environment. The mechanism of detoxification of metals in plants involves the exclusion of toxicity from the metabolic processes by complexing and deposition in the cytoplasm, vacuoles or apoplast. The compounds forming complexes with metals are, among others phenolic acids where salicylic acid is the one which exhibits a broad spectrum of defensive action. The aim of the study was to examine the possibility of increasing the tolerance of grass on the stress caused by the excess of Cu in soil by foliar application of salicylic acid. The research was carried out by doing pot experiment using a model of soils contaminated with copper at doses Cu – 0 ppm, Cu1 – 100 ppm and Cu2 – 200 ppm. In the experiment two grass species often grown in the areas devastated by industry: tall fescue, *Festuca arundinacea*, and red fescue, *Festuca rubra* were used. The experiment was repeated 6 times in two versions: one with the application of salicylic acid and second one without salicylic acid. Grass was grown in 2 kg pots filled with light soil. The model soil contamination was carried out by thorough mixing the soil with the solution of copper sulfate in precisely defined concentration. During the vegetation a salicylic acid was foliarly administered by spraying in two periods, first time - three weeks after germination and second time two weeks after the first application of salicylic acid. The cultivation was carried out for two months. In the course of growing a visual assessment of the influence of salicylic acid on the growth of grasses was checked and at the end of cultivation the crop of green mass, dry weight, above ground parts biomass and the root mass were determined.

The positive effects of foliar application of salicylic acid were found showing the growth of aboveground biomass of the plant and its root mass. Generally, the growth of root biomass was larger than the growth of above ground parts. Depending on the type of grass and the degree of soil contamination with copper, foliar application of salicylic acid resulted in the increase in root mass within 31–60% as compared to the same subjects which were not treated with grass spraying. The increase in yield of dry weight of above ground parts of the grass was approximately by 15% in the Cu1 objects while in Cu2 it was about 30%.