

## EFFECT OF HEAVY METALS ON METABOLOME OF *PINUS SYLVESTRIS* (PINACEAE)

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The effect of Cu, Ni and Cd on the metabolome of *Pinus sylvestris* was studied under experimental conditions, using gas chromatography-mass-spectrometry. Changes in the structure of the metabolic network of plants were detected on the 6th day after exposure to metals, 3–6 days before the manifestation of visual symptoms of toxicity. In this case, the control group of plants showed differences at the level of the metabolome earlier, and the specific effect of individual metals on the plant metabolome was noticeable only on the 9th day. Both factors (the nature of the metal and its concentration) make an equal contribution to the clustering of plant metabolomes. The responses of plants to the action of metals, manifested in changes in the concentrations of individual metabolites, differ significantly depending on the applied concentration of metals (1 or 5 mM) and on the nature of the metals: the features of the influence of Cd and Cu are manifested mainly in a similar way, while the effect of Ni is often different. The visualized dynamic changes in the metabolic matrix of plants are mainly not caused by a set of certain compounds, but are a manifestation of a change in its correlation structure.

*Keywords:* *Pinus sylvestris*, heavy metals, metabolome, stress, toxicity, adaptation

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