ABSTRACT

Heavy metals abundance in the environment increases via natural and anthropogenic processes, mainly mining and industrial activities. Spoil mine substrates of the Sokolovsko Region characteristic by high heavy metal contents are recultivated by tree planting, e.g. of Scots pine (*Pinus sylvestris* L.*)*. The diploma thesis is a part of a larger project aimed on interpretation of hyperspectral remote sensing data for monitoring of vegetation physiological state. That is why it is focused on non-specific indicators of stress by heavy metals, which can be detected by foliage spectral analyses.

The experimental part of thesis comprises 1) field research on *P. sylvestris* needles and 2) model pot experiments on tobacco plants. Field research was accomplished in 2009 and 2010 on one control locality and three spoil mine banks localities with different heavy metal soil contents (Hg, As and Cu). Photosynthetic pigments', phenolic compounds'and lignin contents were determined spectrophotometrically.

Model pot experiments with tobacco plants (*Nicotiana tabacum cv. Samsun*) - pilot experiment and experiments 1 and 2 using the spoil mine substrates in 2011 and experiment 3 in 2012 also included treatments with different mercury concentration in irrigation (10 and 15 ppm $HgCl_2$). Gasometric measurements (net photosynthesis, transpiration rate and stomatal conductance) were conducted in addition to the analyses of the above biochemic parameteres.

Contents of phenolic compounds in pine needles were least dependent on substrate toxicity, lignin content showed variability dependent on locality. The Lítov locality was the most affected and pine physiological state was the worst there. Content of photosynthetic pigments appears to be the most suitable indicator for evaluation of physiological state of pine.

Pot experiments showed no differences in total content of soluble phenolic compounds in dependence on presence of heavy metals in substrate. Sensitive parameter appears to be photosynthetic contents. Plants treated by $HgCl_2$ exhibited trends of lowered stomatal conductance and transpiration rate.

KEY WORDS

Heavy metals, As, Hg, spoil mine substrate, phenolic compounds, lignin, photosynthetic pigments, transpiration, Scots pine (Pinus sylvestris), tobacco (Nicotiana tabacum cv. Samsun)