ESTIMATION OF THE HEALTH STATUS OF CONIFEROUS TREES IN URBAN AND PERIURBAN AREAS

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It has been recognized for a long time that winter dormancy phenomena in trees are very complex. Their regulation involves a large number of phytohormones, enzymes and metabolites. Temperature is not the only factor that causes initiation and cessation of dormancy, other factors are photoperiod, nutrition, water, an array of chemicals, and shock treatments. Environmental conditions in urban and periurban areas can be extremely challenging for coniferous species. This research aims towards a better understanding of responses of the Scots pine (Pinus sylvestris L.) and the Siberian spruce (Pícea obováta Ledeb.) to air pollution stress in urban and semi-urban conditions of Eastern Siberia, with a focus on their photosynthetic activity. The research program included collection of needle samples in polluted and unpolluted areas, with further comparison of the morphometric characteristics, concentrations of metals and inorganic anions associated with location-specific air pollution, chlorophyll concentrations, photosynthetic activity (quantified by delayed fluorescence).

Our research demonstrated that the strategies used by P. sylvestris and P. obovata to deal with air pollution are different. In response to high levels of air pollution, P. obovata increases levels of photosynthetic pigments in young needles and accelerates needle ageing. In contrast, P. sylvestris accumulates toxic substances only in some needles (of unidentified age group), which are quickly yellowing and shedding, while other needles, equally representing all the age groups, are able to maintain photosynthetic function.

In climate conditions of Southern Siberia, disturbance of winter dormancy under air pollution stress represents a major threat to the health status of coniferous trees. Our ABAand R2 data demonstrate that regardles the age of needles, the depth of winter dormancy of both species correlates air pollution levels, and trees growing in industrial areas are easier to release from dormancy and to be affected by late winter or spring frost. Due to its physiological features, P. sylvestris is more resilient than P. obovata, and therefore represents a better choice for urban forestry projects.

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