

3.011 Protection of higher plant from air pollution and acid rain by treatment with exogenous scavenging of reactive oxygen species.

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Abstract:

Air pollution significantly affects to physiological status and growth rate of higher plant. Ozone causes oxidative stress to plant and reduce photosynthetic activity. Acid rain damage cell walls of plant leaves. Protection of higher plant from air pollution and acid rain is important task but effective methods and skills for the plant protection have not been proposed so far. In this study we examined and developed methodology to protect plant from air pollution and acid rain by the use of exogenous scavengers of reactive oxygen species (ROS). We fumigated and exposed various air pollutants and acid mist to higher plant in greenhouse, with and without treatment with exogenous ROS scavengers such as mannitol, catechin, SOD and catalase. Mannitol has high reaction rate with OH radical, a most powerful ROS, as ascorbic acid does. After several months-fumigation and treatments with ozone, polycyclic aromatic hydrocarbons (PAHs) and sulfuric acid with the ROS scavengers, photosynthetic activities, visible injury and growth rates of leaves of trees and agricultural crops were measured and compared with the control treatment. The results showed that mannitol was most effective to mitigate the plant damage of plant by ozone, PAHs and sulfuric acid, whereas other ROS scavengers were also moderately effective. Mitigation mechanism of plant damage by the treatment with mannitol was not clarified yet in this study but this compound may act as an anti-oxidant through exogenous applications and eventually protect plant from air pollution and acid rain.