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Oxidative stress and antioxidant enzymes in triticale shoots under chloride salinization

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Abstract

We studied alterations in oxidative stress indicators (hydrogen peroxide, superoxide radical, lipid peroxidation – LPO) and alterations in the activity of antioxidant enzymes (catalase, ascorbate peroxidase, guaiacol peroxidase, glutathione reductase) in triticale shoots (Triticosecale) during short-term (0-96 h) sodium chloride stress (120 mM) with statistical methods: principal component analysis (PCA) and cluster analysis. Analysis of alterations in the activity of enzymes with the PCA method does not allow them to be unambiguously included in a single group, despite the fact that they all belong to antioxidant enzymes. The inclusion of oxidative stress indicators in this analysis did not make the picture simpler. Using the cluster analysis method, it can be concluded that under conditions of short-term chloride stress in the shoots of triticale, much more catalase (than other enzymes studied) is associated with the protection of membranes from lipid peroxidation than with the utilization of hydrogen peroxide. This is also reflected by the highest correlation coefficients: catalase – LPO (0.94), catalase – hydrogen peroxide (0.79). The formation of primary clusters between ascorbate peroxidase and glutathione reductase reflect the significance of the association of the ascorbate – glutathione cycle with the processes of utilization of reactive oxygen species (primarily hydrogen peroxide) under experimental conditions. It was also shown that under conditions of short-term chloride stress in the shoots of triticale, guaiacol peroxidase plays the least role in the utilization of hydrogen peroxide. In this case, salt ions again form a single primary cluster, which combines with other clusters at the maximum Euclidean distance in the experiment.

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