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Indicators of the antioxidant system and oxidative stress of triticale shoots under chloride salinity

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Abstract

Alterations in the activity of antioxidant enzymes (catalase, ascorbate peroxidase, guaiacol peroxidase, glutathione reductase), the content of low molecular weight antioxidants (ascorbic acid, glutathione, and proline), as well as indicators of oxidative stress (hydrogen peroxide, superoxide radical, lipid peroxidation – LPO) in the shoots of triticale (*Triticosecale*) under short-term (0-96 h) sodium chloride stress (120 mM) were studied with statistical methods: principal component analysis (PCA) and cluster analysis. The application of the PCA method did not always lead to definite results that could be unambiguously interpreted from the point of view of modern concepts in the field of plant physiology and biochemistry. At the same time, high values of the correlation coefficients between individual indicators did not at all reflect their biochemical interdependence. The results obtained allow us to conclude that, under conditions of short-term chloride stress in triticale shoots, the more important function of proline is associated, rather, with the maintenance of osmotic pressure inside the cell than with the role of a low-molecular antioxidant. The mutual positive values of the correlation coefficients (with respect to each other) of the activity of catalase, glutathione reductase, LPO, the content of hydrogen peroxide and superoxide indicate the unidirectionality of the detected alterations, which reflect their known biochemical relationship and the need for glutathione reductase to maintain a certain redox-state in plant cells. With cluster analysis it was shown that under conditions of short-term chloride stress in triticale shoots, the studied enzymes (catalase, ascorbate peroxidase, guaiacol peroxidase, and glutathione reductase) play a more significant role in neutralizing of reactive oxygen species, and maintaining the state of membranes, than low molecular weight antioxidants.

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