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Indicators of oxidative stress and antioxidant system of vetch shoots in the light of PCA method

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Abstract

Analysis of the results of a study on the effect of increasing concentrations of nickel chloride in the environment on indicators of oxidative stress and elements of the antioxidant system in vetch shoots with the principal component analysis (PCA) showed that the studied characteristics are grouped into three groups: (1) includes such indicators as the content of hydrogen peroxide, lipid peroxidation and guaiacol peroxidase activity, (2) includes ascorbic acid content and catalase activity, and (3) contains only proline. The use of these data, as well as the values of the correlation coefficients between the corresponding characteristics of the object, made it possible to conclude that guaiacol peroxidase does not play an important role both in the destruction of hydrogen peroxide and in the protection of membrane structures from lipid peroxidation under experimental conditions. At the same time, proline also does not function as an active antioxidant. On the contrary, the presence of ascorbate in vetch shoots is important for reducing (or controlling the formation) of hydrogen peroxide, and catalase ensures the destruction of hydrogen peroxide under experimental conditions. Analysis of the results of alterations in the above-mentioned characteristics of the object, as well as pigments and flavonoids in vetch shoots under conditions of increasing concentrations of nickel chloride in the medium, showed that the picture for analysis became more complicated. Nevertheless, the application of PCA method and correlation analysis showed that in vetch shoots under the influence of increasing concentrations of nickel chloride in the medium ascorbic acid, catalase, chlorophyll, carotenoids (judging by the negative values of the correlation coefficients with hydrogen peroxide and LPO) are important components of biochemical adaptation through participation in the neutralization of hydrogen peroxide and the protection of membranes from lipid peroxidation. At the same time, flavonoids do not play an important role in the protection of membranes under experimental conditions.

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