Stress tolerance in auxin heterotrophic and autotrophic tobacco tissue cultures

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ABSTRACT The natures of the stress tolerance of auxin autotrophic and heterotrophic tobacco calli were compared. 50 mM NaCl did not inhibit the growth of auxin autotrophic calli and they exhibited a lower level of peroxidase secretion into the media than that of heterotrophic cultures. The ascorbate peroxidase and catalase activities of these lines did not decrease in the presence of stressors. In the second half of the culturing period, the auxin autotrophic tissues expressed a higher GST activity than that of the heterotrophic lines.


How do autotrophic tissues survive higher stress effects? We studied two possible mechanisms. The experiments of Hagége et al. (1996) with sugar beet calli suggested that the auxin autotrophic lines have an enhanced stress tolerance due to their higher activity of enzymes of free radical scavenger systems. Our data are basically similar, but nevertheless differ to a certain extent. The activity of ascorbate peroxidase in the heterotrophic cultures was decreased by treatment with a high concentration (100 mM) of NaCl; at the same time, the activities of auxin autotrophic tissues did not change even in this osmotic medium as compared with the untreated control. The activities of catalase in the two lines exhibited the same tendency.

Under stress conditions, among other functions the GSTs detoxify the cells from many toxic compounds, transporting them into the vacuole. In the second half of the culturing period, when the proliferation of heterotrophic calli has stopped, their GST activity displays a decreasing tendency. The auxin autotrophic cultures expressed the highest GST activity in this growth period.

Thus, the development of auxin autotrophic calli might involve both the function of free radical scavenger systems and detoxification processes by GST.

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References


Hagége D (1996) Habituation in sugar beet plant cells: permanent stress or...
