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Changes of MDA level and O_2 scavenging enzyme activities in wheat varieties as a result of PEG treatment

István Király*, Pálma Czövek

Department of Plant Physiology, Eötvös Loránd University, Budapest, Hungary

ABSTRACT The malondialdehyde (MDA) level and the changes of the activity of superoxide dismutases, and peroxidases of two drought resistant *Triticum aestivum* genotypes and one with high crossing efficiency (Mv9Kr1) were studied under the effect of osmotic stress brought about by PEG in the nutrient solution. There were characteristic differences among the varieties examined in inducible enzymatic activities and maliondialdehyde production reflecting different mechanisms in its stress induced reactions. **Acta Biol Szeged 46(3-4):105-106 (2002)**

KEY WORDS

uperoxide dismutase
peroxidase
stress tolerance
osmotic stress
wheat
malondyaldehide

Drought stress is an important environmental factor in the agricultural productivity of Hungary. The introduction of new varieties with high genetic value and drought stress tolerance is of crucial interest in wheat breading. When estimating stress tolerance the changes of the activity of the O_2 scavenging system during stress treatment and the malondi-aldehyde level resulted from lipid peroxidative membrane damage may be observed and compared (Bradford et al. 1982). Different isoforms of SOD (superoxide dismutase) are expressed as a result of stress treatment and the resulting oxidative burst in different compartments of the plant cell (Jewett et al. 1993). MnSOD or FeSOD activities are changing in a first time, as the reactive oxygen species (ROS) are generated in the chloroplast. When long term stress treatments are to be scavenged the CuZnSOD isoforms will also be activated in the cytoplasm. On a second level of ROS elimination peroxidases eliminate hydrogen peroxide produced by SOD isoforms. Even a relatively low malondialdehyde level in stress treated plant leaves marks membrane damages. The aim of the present work was to find correlations between the stress tolerance of the above wheat varieties and its O_2 scavenging capacity.

Materials and Methods

Plant material: two drought resistant *Triticum aestivum* genotypes (Kobomugi, Sakha) and one with high crossing efficiency (Mv9Kr1) were studied.

Growth conditions and treatments. Plants were grown on modified Hoagland solution in growth chamber (Conviron, Ontario, Canada) under 12/12 h light (200 $\mu Em^{-2}s^{-1}$)/dark (20/18ºC and 70/75% RH) period. Osmotic stress treatment started after introducing 12 m/m% PEG into the nutrient solution of three week old seedlings. PEG concentration was weekly increased stepwise to 15, 18, and 21 m/m%, after which the treated plants had a recovery period of one week in the absence of PEG before harvestimg.

PAGE, activity staining, and MDA measurement Superoxide dismutases activity was estimated by activity staining on 8% native PAGE by the modified method of Beauchamp and Fridovich (1971). Protein content was calculated by the Bradford s method (Bradford 1976). MDA was measured as in Shah et al. (2001).

Results and Discussion

In each wheat variety the level of MDA changed with the age and also with PEG treatment (see Fig. 1). Among the SOD isoforms the Mn/FeSOD activity is increasing with the age and also with the osmotic stress, however the MnSOD/CuZn SOD rate is decreasing in relation to the PEG treatment A predominant CuZnSOD activity and very few Mn/FeSOD staining may be observed at the highest PEG concentrations. It seems, that the reduction of the Mn/FeSOD activity located in the chloroplast is in correlation with the osmotic stress tolerance of the wheat varieties invvestigated in this study.

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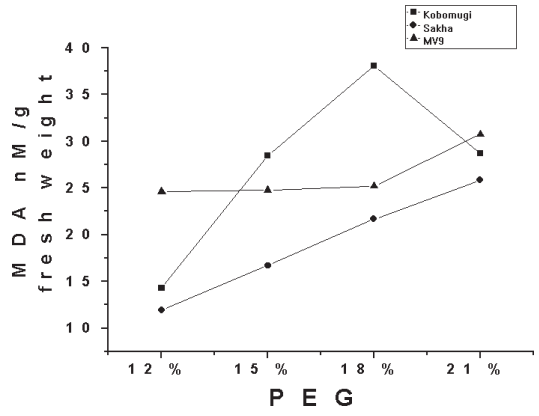

Figure 1. The effect of PEG treatment on the MDA content of wheat leaves.

*Corresponding author. E-mail: ikiraly@ludens.elte.hu

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