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Gibberellic Acid and Dwarfism Effects on Growth and Apoplastic Peroxidase Activity in Maize (Zea Mays L.) Leaf Blades

Peroxidase activity in the elongation and secondary cell wall deposition zones of the expanding second leaf blade of the maize inbred line B73 was compared with peroxidase activity in leaves modified through the application of gibberellic acid (GA3) and with leaves of the dwarf mutant D8, a near-isogenic line of B73 unresponsive to gibberellins. Although the length of the elongation zone differed among dwarf, control and GA3-treated plants, the peak in apoplastic peroxidase activity was consistently associated with an abrupt deceleration in epidermal cell elongation rate. Similarly, the appearance of slow-moving anionic peroxidases with pIs 5.6 and 5.7 was consistently associated with growth cessation for all three treatments. In gibberellic acid-treated plants the secretion or activation of these anionic peroxidases was postponed to a position more distal to the ligule, but in dwarf plants their secretion or activation was shifted to a position more proximal to the ligule. An increase in apoplastic peroxidase activity in the region of maturation also occurred, and was higher in dwarf and lower in GA3-treated plants. The secretion of pI 5.6 and 5.7 peroxidases at the distal end of the elongation zone in dwarf, control, and GA3-treated plants strongly suggests their participation in lignification. An isoenzyme with pI 7.0 was seen in the elongation zone of all three treatments but its activity decreased in the region of maturation. This isoenzyme and a pI 4.6 isoenzyme were likely dominant in the apoplastic peroxidase activity that peaked in the elongation zone, and may therefore be involved in cell wall polysaccharide cross-linking.

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The Acidic Guaicol Peroxidase and Ascorbate Peroxidase Responses Modified by Salt Stress in Two Cultivars of Foxtail Millet (Setaria Italica L.) Differed in Salt Tolerance

The effect of NaCl on the growth rate, the Na+ content, the lipid peroxidation and the enzymatic activity of the guaiacol and ascorbate peroxidase was analysed in 5-day-old seedlings of two genotypes of Setaria italica L. contrasting in salt tolerance. During salinity stress, the tolerant cultivar has lower Na+ concentration, lower amounts of malonaldehyde and higher ascorbate and guaiacol peroxidase activities than the susceptible variety. In particular, the anionic guaiacol peroxidases are induced in the tolerant cultivar on high NaCl concentrations. The anionic guaiacol peroxidases are generally implicated in plant growth and development. However, our results refer to specific isoenzymes possibly involved in the process of plant growth under salinity stress. We have found one acidic guaiacol isoperoxidase with pI 5.5 absent at day 1 and 3 of germination and expressed at the protein level during the 5th day of seedling growth under salinity stress. Furthermore, specific anionic guaiacol peroxidases with pI 4.8, 5.5 and 5.7 occur only in the tolerant cultivar subjected to NaCl stress. The isoenzyme with pI 5.5 having a molecular weight of 27 kDa was partially purified and characterized and was found to be thermostable. Presently, we are interested to analyse salt stress-specific regulation processes on both the RNA and protein level. First results were obtained for the ascorbate peroxidase. The amount of transcript, the steady state level of the protein and its enzymatic activity was measured for the tolerant and the sensitive cultivar under salt stress as well as control conditions. Comparison of the results will be presented in this poster. All together, these results provide insights into physiological and biochemical responses of the ascorbate peroxidase and some of the anionic guaicol peroxidases within a tolerant foxtail millet cultivar under salt stress.