

8. SUMMARY

- The results proved that the catalase isozymes in maize are inhibited in different ways and to different extents by salicylic acid, suggesting that the two types of inhibition may have different mechanisms. The catalase1 isoenzyme was inhibited non-competitively, while catalase2 was inhibited competitively and to a smaller extent by salicylic acid. The effect of salicylic acid may be tissue-specific.
- Like salicylic acid, benzoic acid, acetyl-salicylic acid and o-hydroxycinnamic acid also inhibited the activity of catalase1 to a considerable extent and that of catalase2 to a lesser extent, while p-hydroxybenzoic acid inhibited both isoenzymes competitively and to a slight extent. Among the compounds studied, those which greatly inhibited the catalase1 activity were able to improve the chilling tolerance of maize. The catalase1 enzyme may play a role in the induction of chilling tolerance.
- Catalase was competitively but mildly inhibited by all the compounds studied; this could correspond with the peroxidative pathway of inhibition.
- In chilling-tolerant maize genotypes salicylic acid caused a substantial inhibition of catalase activity in all cases.
- The intensity of alternative respiration in maize roots increased as the result of treatment with both salicylic acid and hydrogen peroxide. At low temperature the ratio of alternative respiration increased in chilling-tolerant genotypes, while no change was observed in chilling-sensitive plants.
- Salicylic acid did not improve the stress tolerance of wheat: it reduced the freezing tolerance of the winter wheat Cheyenne and the drought tolerance of the spring wheat Chinese Spring, despite an increase in the activity of the guaiacol peroxidase and ascorbate peroxidase enzymes.
- The ability of p-hydroxybenzoic acid to increase abiotic stress tolerance was demonstrated for the first time: this compound improved the drought tolerance of Cheyenne and the freezing tolerance of Chinese Spring. The freezing tolerance of Cheyenne was found to increase as the result of drought stress, and this effect was further enhanced by p-hydroxybenzoic acid.
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- Investigations on vernalisation indicated that although, like vernalisation, treatment with 5-azacytidine reduced the level of DNA methylation, it was unable to induce flowering in the wheat variety Mv 15.