

6. SUMMARY

The following conclusions are drawn from the present investigation

- Application of exogenous ABA confers a significant degree of tolerance to salinity and chilling stress in rice seedlings. ABA application leads to a better membrane integrity under severe freeze stress and enhances the survivability of rice seedlings.
- Accumulation of free proline in response to exogenous ABA correlates well with an improved salinity and cold tolerance in rice seedlings. The stress tolerant cultivars preferentially accumulated higher amounts of proline in shoots in comparison to sensitive cultivar tested.
- A simple and reliable procedure was developed to test the effect of ABA on stress tolerance using the etiolated rice seedlings as an experimental system.
- Stress tolerant rice cultivars show greater resistance to injury upon exposure to salinity and osmotic stress. Further, salinity stress inflicts a greater damage to the leaf discs than the osmotic stress mediated by PEG. Injury index therefore is a measure to demarcate the stress tolerant cultivars from the sensitive ones.
- Accumulation of different stress responsive polypeptides [15 kDa, RAB, 18 kDa (pcC 6-19, immunologically related to a desiccation tolerant protein from *Cratogeomys mollis*), 23 kDa (related to RAB), and 34 kDa (aldose reductase related protein)] in response to exogenous ABA correlates well with improved stress tolerance observed in rice seedlings.
- A 34 kDa polypeptide immunologically related to aldose reductase, (an enzyme involved in the sorbitol biosynthesis) is responsive to ABA and osmotic stresses in rice. The activity of aldose reductase is enhanced upon treatment with ABA.
- A 18 kDa polypeptide was identified in rice that is immunologically related to desiccation-responsive polypeptide (encoded by pcC 6-19) from African resurrection plant, denoting the conserved biochemical responses towards stress tolerance process.
- A 55 kDa polypeptide was identified in ABA-treated roots which is phosphorylated *in vitro*.

- **Proline** stabilizes and maintains the functional status of target proteins somewhat analogous to chaperones through offering hydrophobic micro environment. Maintenance of secondary structure of target proteins was reflected in various spectroscopic studies.
- **Proline/betaine** destabilize the DNA helix and reduce the effect of salts and **spermidine** on the helical stability.
- Proline makes the double helix resistant to DNase 1 digestion and sensitive to **S1** nuclease digestion.
- Proline or betaine do not intercalate the DNA as evidenced from the topoisomerase 1 assay.
- Localized destabilization of helical structure could be possible in the presence of high internal concentrations of proline/betaine under specialized stress adaptive conditions.
- Betaine and proline could constitute some of the biological choices to counteract the effect of salts and cations on DNA stability.