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Alleviatory effect of phytohormones in relation to osmolytes and antioxidant enzymes in wheat (*Triticum aestivum* L.) seedlings under salinity stress

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SUMMARY

In the present study two wheat genotypes C 306 (salt susceptible) and Raj 3077 (salt tolerant) were germinated in Petri dishes for 12 days. The seeds were presoaked in distilled water or 1 % NaCl or 25 µM GA_3 or 50 µM GA_3 or 100 µM IAA or 200 µM IAA for four hours before sowing and were irrigated with 1 % saline Hoagland's solution, except in control which was irrigated with plain Hoagland's solution. The analyses in shoot tissue were done on 12th day. Salinity caused an increase in chlorophyll proline, soluble sugars, malondialdehyde and activities of superoxide dismutase (SOD), catalase (CAT), peroxidase (POX) and ascorbate peroxidase (APX). Salt tolerant cultivars (Raj 3077) showed higher increase in these biochemical parameters than salt susceptible cultivars (C 306). Both phytohormones, at all concentrations reversed the salinity induced changes in biochemical parameters and antioxidant enzymes. The effect of GA_3 treatments was better than IAA treatments in ameliorating the salinity induced biochemical changes at seedling stage. These results suggest that seed pretreatment with gibberellic acid and indole-3-acetic acid may be effective in alleviating the salinity stress induced detrimental effects in wheat.

Key words : Alleviatory effect, Phytohormones, Osmolytes, Antioxidant enzymes in wheat, Salinity stress.

The seedling stage is the most sensitive stage among all the stages of crop, particularly in wheat (Gelmond, 1978 and Bliss *et al*., 1986). The effect of salinity at seedling stage of wheat ranges from reduction in fresh and dry weight of shoots and roots to the uptake of various nutrients ions (Prakash and Sastry, 1992; Muralia and Sastry, 1994 and Gupta and Sastry, 1998). The different genotypes respond to salinity by accumulation of soluble organic confounds leading to osmotic adjustment.

In recent years various studies have established that water, temperature and salinity stress induced generation of superoxide radical, hydrogen peroxide and hydroxyl radical, as the major cause of stress induced injury experimented at cellular and crop levels (Elstner, 1981). Antioxidant enzymes such as superoxide dismutase, catalase, peroxidase, ascorbate peroxidase and some metabolites like proline, malondialdehyde, soluble sugars etc. have been linked to stress tolerance in various crop plants (Elstner, 1981). Increased in activity of various antioxidant enzymes has been reported by various workers (Karnalik *et al.,* 1999; Sairam and Srivastava, 2002; Sairam *et al.*, 2002; Gehlot *et al.,* 2003; Eyidogan *et al.,* 2003; Khan, 2004 and Sairam *et al.,* 2005). Some of the growth hormones particularly GA_3 and IAA have been reported to ameliorate the effects of salinity in wheat (Madan and Kumar, 1983), maize (Lin, 1985) and rice (Babu, 1981).

The present investigation was, therefore, carried out to estimate the effect of salinity on tolerant and susceptible wheat genotypes and the effect of phytohormone on amelioration of these effects at the seedling stage.

MATERIALS AND METHODS

The experimental material for the present study consisted of one salt susceptible C-306 and one salt tolerant Raj 3077 genotype of wheat (*Triticum aestivum* L). The genotypes were evaluated in six environments *viz*., (i) control, (ii) 1% NaCl stressed, (iii) 25 µM GA_3 pretreated NaCl stressed, (iv) 50 µM GA_3 NaCl dressed, (v) 100 µM IAA pretreated NaCl stressed and (vi) 200 µM pretreated NaCl stressed. The seeds were presoaked for 4 hours and germinated in Petri dish lined with blotting paper. The experiment was replicated thrice. All the Petri dishes were kept in dark for 3 days, later Petri-dishes were exposed to 12/12 hr light and dark in growth chamber maintained at 25ºC ± 2ºC for 12 days experiment duration. All the Petri dishes were irrigated with that of 1% saline Hoagland's solution, except control which was irrigated with plain Hoagland's solution at 3 days interval, after draining out the left over solution, to maintain the uniform salinity. On the 12th day, the seedlings were harvested for the different biochemical investigations. The shoots were

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