INFLUENCE OF SEED TREATMENT OF GROWTH REGULATORS ON SOME ENZYME ACTIVITY IN GROUNDNUT UNDER SALINITY

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Abstract

An experiment was conducted to study the effect of growth regulators on IAA oxidase, peroxidase and NRase activities in groundnut under different salinity levels. The results indicated that the treatments of seeds with GA_3 and IAA solutions reduced the activity of IAA oxidase and increased the activity of peroxidase and NRase enzymes. Under high salinity levels (12 dS/m) IAA oxidase activity is more so the growth and development of crop is affected. From the results it is inferred that the seed treatment of GA_3 and IAA overcome the effects of salinity on the activities of enzymes.

Key words: salinity, growth regulators, IAA, GA_3, enzyme activity.

INTRODUCTION

The physiological responses of plants for survival in stressed environment are based on their ability to express the pre-existing defence programme or adaptation, in which plants adjust to the stress. Under stress condition, the adaptive responses are elicited by plants mainly through changes in endogenous levels as well as balances of phyto hormones (Levitt, 1980). The reestablishment of hormonal equilibrium under the new environment probably plays a central role in the survival of plants under stress conditions (Amzallag and Lerner, 1995). However under severe stress condition, plants occasionally fail to express their pre-adaptation and also adaptation ability, probably because of high catabolism accompanied with abnormal activity of hydrolytic enzymes. In this context the present experiment was undertaken to study the effect of seed treatment with growth regulators on the activity of IAA oxidase, peroxidase and NRase enzymes in groundnut under saline condition.

MATERIALS AND METHODS

The experiment was conducted in pots with groundnut (*Arachis hypogaea* L.) (Var: CO2) under different soil salinity levels; EC-0.8 (control), 6 and 12 ds/m. The different salinity levels were created by addition of calculated amount of NaCl to normal soil. Seeds were presoaked for 2 hrs with distilled water (control), GA_3 (100 ppm) and IAA (200 ppm) solutions and sown in pots containing well-prepared soils. Sampling was done at flowering stage. IAA oxidase activity was assayed in leaves by the method of Parthasarathy et al. (1970), Peroxidase activity in leaves was assayed following, the method suggested by Sadasivam and Manickam (1992). NRase activity in leaves was estimated by the method of Nicholas et al. (1976). The experiment was conducted using factorial completely randomized block design with four replications.

Abbreviations used:

IAA: Indole Acetic Acid
GA_3: Gibbrelic Acid
BA: Benzyl Adenine
N: Nitrogen
NRase: Nitrate Reductase
dSm^{-1}: desi Simon per metre

RESULTS AND DISCUSSION

From the results of this experiment, an enhancement in IAA oxidase activity was noticed with increased levels of soil salinity (Table 1). Increase in the enzyme activity was much more at 12 dS/m as compared to 6 dS/m salinity levels was observed earlier in Pea (*Pisum sativum L.*) by Shukla and Baijal, 1977. This might be one of the reasons for salinity induced stunted growth. Hormonal treatments reduced the IAA oxidase activity under both normal and salinity conditions. The IAA treatment was found comparatively more effective in reduction of IAA oxidase activity than GA_3. Similar controlling role of IAA and GA_3 on IAA oxidase activity has also been reported by Law and Hamilton (1984) in dwarf pea. Peroxidase activity showed marginal change at lower salinity level (6 ds/m) in leaves indicating certain level of adjustment by plants to adverse condition. However at higher salinity condition (12 ds/m) the enzyme activity declined significantly in leaves. Treatment of both IAA and GA_3 significantly enhanced the peroxidase activity in leaves. But the effect was more pronounced with GA_3 treatment. Kapchina and Foudouli (1991) also observed that GA_3, IAA or BA enhanced the peroxidase activity, thereby eliminated the adverse effect of salt stress on pea plants. According to Dendsay (1980) the growth regulator

induced acceleration in peroxidase activity was highly dependent on hormone-induced increase in catalytic efficiency rather than increased synthesis of enzyme protein. NRase activity also showed significant reduction at higher salinity level in leaves. Seed treatment with GA_3 and IAA significantly enhanced the NRase activity in leaves. The activity of NRase was more in GA_3 treatment and thereby over come the adverse effect on N-metabolism under saline condition. Enhanced activation of peroxidase due to the application of growth regulator makes the plant to survive under stress condition by scavenging reactive oxygen species. These reactive oxygen species over produced during stress situation will damage cell membrane, nucleic acids and proteins.

From this study, it appears that seed treatment with growth regulators might help the plants in adaptation to salinity by directly substantiating the endogenous content of hormones (Law and Hamilton, 1984) and reducing the oxidative breakdown of compounds by controlling the activity of oxidative enzymes and there by improved the growth and yield attributes under salinity (Zaidi and Singh, 1993).

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Tab. 1.: Effect of growth regulators on some enzyme activity in groundnut under different salinity levels

Treatments	IAA oxidase activity (µg of unoxidised auxin/g/hr)			Peroxidase activity (unit/g/hr)			NRase activity (µg of NO_2 released/g/hr)		
	Salinity (dS/m)			Salinity (dS/m)			Salinity (dS/m)		
	Control	6	12	Control	6	12	Control	6	12
GA_3 (ppm)									
Control	78.9	63.7	46.8	2.85	2.52	1.78	78.3	71.4	63.5
100	84.2	65.7	48.6	3.55	3.34	1.96	90.3	79.4	68.4
200	87.8	71.0	55.1	3.89	3.73	2.28	97.8	87.4	74.1
	T	**S**	**TS**	**T**	**S**	**TS**	**T**	**S**	**TS**
CD(p=0.05)	0.428	0.428	0.741	0.033	0.033	0.058	0.343	0.343	0.595
SEd	0.203	0.203	0.353	0.016	0.016	0.027	0.163	0.163	0.283
IAA (ppm)									
100	84.7	68.7	56.8	2.88	2.59	1.85	81.5	73.3	65.5
200	91.3	84.5	64.3	3.37	3.13	2.19	85.2	75.0	69.8
	T	**S**	**TS**	**T**	**S**	**TS**	**T**	**S**	**TS**
CD(p=0.05)	0.283	0.283	0.491	0.029	0.029	0.051	0.0376	0.376	0.651
SEd	0.135	0.123	0.254	0.014	0.014	0.024	0.179	0.179	0.310