J Indian Bot Soc 66 124 -12 6;

Salinity Induced Changes In Amylase Activity During Germination And Early Seedling Growth Of Pearl Millet *Pennisetum typhoides* S & H)

M. P. Reddy* and A. B. Vora

*Scientist, Phytosalinity Discipline, Central Salt and Marine Chemicals Research Institute, Bhavnagar 364 002

Department of Botany, University School of Sciences, Gujrat University, Ahmedabed - 380 009

(Accepted December, 1985)

Seed of *Pennisetum typoides* suspended in saline solution displayed reduced amylase activity.

Salinity has been reported to decrease germination, early seedling growth, release of reducing sugars and synthesis of amylase in wheat (Sarin & Narayanan, 1968). However El-Fouly & Jung (1972), reported more amylase activity in wheat seedlings grown under saline condition. Sheoran (1980) found that salinity decreased amylase activity in cotyledons but increased in embryo axis of mung bean. In view of these reports, the present investigation on amylase activity of pearl millet seedlings grown under NaCl stress was undertaken.

Uniform seeds of pearl millet *Pennisetum typhoides* S & H, C V B.J. 104) were surface sterilized with 0.1% $HgCl_2$ for 2 to 3 minutes, washed thoroughly and 25 seeds sown per petri dish (15 cm) fitted with monol-x-1 filter paper. Salinity was induced by adding known volume of aqueous solution of NaCl 10mM, 20mM or 50mM. Experiment was carried out at room temperature (28+2°C) up to 72 h of germination. Sampling was carried out at 8, 12, 24, 36, 48 and 72 h after sowing for amylase activity employing the Iodine method (Wilson, 1971)

Weighed samples were homogenized in cold distilled water in prechilled motar and pestle. The homogenate was centrifuged and the supernatant used as an enzyme source.

$CaCl_2$ (20 mM) solution was added to one portion of enzyme preparation. Samples were heated in water bath at 70°C for 4 min chilled and assayed for α - amylase activity. Disodium EDTA (50 mM) solution was added to the remaining unheated enzyme. The samples were stored at 4°C for 48 h before they were assayed for β amylase activity. The reaction mixture for both α and β amylases contained 1 ml enzyme prepartion and 1 ml of 1% starch solution (prepared in acetate buffer pH 5.5). The reaction was stopped by adding 6 ml of iodine solution (2.5 gr of I_2 and 25 gr of KI in 1 l of 0.05 N HCl). Absorbance was read at 600 nm.

Protein in the crude homogenate was determined by the method of Lowry *et al.*, (1951).

Results presented in Table-1 indicate that the specific activities of α and β amylases increased with the time in endosperm and embryo axis. Endosperm showed more activity in control seedlings compared to the NaCl stressed seedlings. In contrast, an increase in the activity was observed in the embryonal axis of NaCl treated seedlings.

α amylase showed a gradual increase with time. But in all NaCl treatments, decrease in α amylase activity was recorded compared to the

Table 1 Effect of Salinity on the specific activity of α and β amylases in endosperm and embryonal axis of pearl millet during germination and early seedling growth after 8, 12, 24, 36, 48 and 72 hours (The data represents an average of three replicates).

Treatment (mM)	Endosperm						Embryonal axis			
	mg^{-1} starch hydrolized/mg^{-1} protein/minute									
	8h	12h	24h	36h	48h	72h	24h	36h	48h	76h
	α – amylase activity									
Control	0.14	0.40	0.85	1.22	1.94	2.33	1.06	0.54	1.35	0.64
NaCl										
10	0.13	0.56	0.62	1.22	1.47	2.13	0.63	0.27	1.32	0.84
20	0.09	0.52	0.95	1.27	1.40	2.06	0.88	0.52	1.40	0.98
50	0.14	0.56	0.88	1.11	2.23	1.75	1.28	0.81	1.70	1.24
	β – amylase activity									
Control	0.06	0.17	0.88	1.73	1.92	2.20	0.38	0.28	0.24	0.83
NaCl										
10	0.01	0.09	0.54	1.57	1.30	1.65	0.39	0.16	0.22	0.93
20	0.03	0.20	0.65	1.43	1.43	2.52	0.25	0.17	0.10	0.83
50	0.03	0.27	0.61	1.14	1.96	1.38	0.22	0.10	0.51	0.64

control. In contrast to endosperm, embryonal axis showed a fluctuating trend.

Dixon & Webb (1957) reported that NaCl stimulates amylase activity in low concentrations (5 to 40 mM). The increase in α-amylase activity was recorded in the seedlings of wheat grown under saline conditions (El-Fouly & Jung, 1972). High concentrations of NaCl caused a decrease in amylase activity (Sarin & Narayanan, 1968). The reduction in amylase activity in endosperm and its increase in embryonal axis may be attributed to the lowered synthesis of amylase.

ACKNOWLEDGEMENT - The award of fellowship to M.P. Reddy by the Council of Scientific and Industrial Research is gratefully acknowledged.

REFERENCES

DIXON M & E C WEBB 1957 "Enzymes" Longmans, London.

EL-FOULY M M & J JUNG 1972 Enzyme activity in wheat seedlings grown under different NaCl salinity levels and their interactions with growth regulators, *Biochem Phys Pflanzen*, **163** 492-498.

LOWRY O H, N J ROSEBROUGH, A L FARR & R J RANDALL 1951 Protein measurement with folin-phenol reagent *J Biol Chem* **193** 265 - 275.

SARIN M N & A NARAYANAN 1968 Effect of soil salinity and growth regulators in germination and seedling metabolism of wheat *Physiol Plant* **21** 1201 - 1209.

SHEORAN I S 1980 Changes in amylase during germination and early seedling growth of mung bean (*Vigna radita* L. Wulszke) under different salts *Indian J Plant Physiol* **23** 169-173.

WILSON A M 1971 Amylase synthesis and stability in creasted wheat grass seeds at low water potentials *Plant Physiol* **48** 541-546.