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THE INFLUENCE OF SODIUM STRESS (ABIOTIC) ON NITRATE REDUCTASE (NR) ACTIVITY IN *Cenchrus Setigerus*-76 PLANT GROWN *in Vivo*

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ABSTRACT

Nitrate reductase which is involved in reduction of NO_3^- to NO_2^- is known to be highly sensitive to all types of stresses, Particularly salt osmotic stress change in enzymatic activities in *Cenchrus setigerus* -76 grown in different sodium salt under normal condition were studie. For *In vivo* studies seeds were sown in earthenware pots. After two weeks of seedlings growth thinning was done and five to six plants of uniform size were selected in each pot. Three weeks old plants were treated with different concentration of NaCl, Na_2SO_4 and NaF. Nitrate reductase activity increased in NaCl, Na_2SO_4 treated normal grown *Cenchrus setigerus* plants at pre flowering stage while decrease at post flowering stage, decreased NR activity was noticed at 10^{-1}M concentration of NaCl and Na_2SO_4 at pre flowering stage. On the other hand NaF decreased NR activity in both the stages.

Key words : Nitrate reductase, *Cenchrus setigerus* -76, NaCl, Na_2SO_4 and NaF.

INTRODUCTION

Deserts soils often have high salt concentration. In addition, the increasing use of water of poor quality, as well as increasing use of water sources are leading to gradual soil salinization. Sodium salts particularly sodium chloride comprises major portions of saline soils. In acid soils, fluorids commonly occurs in soluble forms such as NaF, KF or HF but when present in an insoluble form, they remain firmly fixed by line and clay (Treshow, 1970). Nitrate, taken up by NO_3^- transporters, is reduced to ammonium by the sequential reaction of nitrate reductase (NR, EC 1.6.6.1) in the cytosol and nitrite reductase (NR, EC 1.6.6.4) in the plastids/chloroplasts. Ammonium derived from the primary nitrate reduction as well as other metabolic pathways, Deserts plants are exposed simultaneously to both salt as well as evaporative water stress. The two osmotic quantities, salt and water are independent since addition of a salt to water lowers its potential (Levitt. 1980). osmotic Salt water in the root zone induces osmotic changes and interferes with nutrient uptake (Cornillon and Palloix, 1997; Halperin et al., 2003). Salt accumulated in the plants may inactivate plant enzymes (Flores et al., 2000) and

disrupt osmotic adjustment at the level of cytosol and vacuoles (Apse et al., 1999). NaCl stress decreased plant growth and inhibited the nitrate reduction and ammonium assimilation after 10 d of treatment (Debouba et al., 2006). It has been reported that NR activity increased by addition of NaCl in *Suaeda Maritima* (Boucaud, 1972). Salination promoted the activity of nitrate reductose in *Phoseolous aureus* (Misra and Dwivedi, 1990). *Panicum antidotale* (Ahmed and Sankhla, 1979). The aim of this study was to assess the effect of sodium salts (NaCl, Na_2SO_4, NaF) on the nitrate reductose activity on *Cenchrus setigesus*-76 in *invivo* condition.

MATERIAL AND METHODS

For in *vivo* studies seeds were sown in earthenware pots; pots were filled with a mixture of garden soil and goat manure in the ratio of 3:1. After two weeks of seedlings growth, thinning was done and five to six plants of uniform size were selected in each pot. Different concentrations of salts were given to 3 week old plants. Pots treated with water served as controls. For pre-flowering stage subsequent three treatments were given at an interval of 4 days. After the emergence of inflorescences the spikes, plants were given fourth treatment (post-flowering stage) in the same manner as that of the pre-flowering stage. Leaf samples were collected after 4 days of the third treatment for biochemical analysis of pre-flowering stage and similarly leaves were collected after four days of the fourth treatment for biochemical analysis of post-flowering stage.

The supernatant was dialysed and used for the estimation of Nitrate reeducates assay (Wray and Filner's) 1970.

RESULTS AND DISCUSSION

The observation is presented in Table-1. Results of the present study show that Nitrate reductase activity increased in NaCl, Na_2SO_4 and $CaCl_2$ treated normal grown *C.Setigerus* Plants at pre flowering stage while decrease at post flowering stage. On the other hand, NaF decreased NR activity in both the stages. Increased salinity reduced NR activity in *Brassica juncea* (Sharma *et al.*,1909). Isoosmotic levels of NaCl had more detrimental effects on nitrate reductose activity specially at ear emergency stage in wheat (Sharma and Garg, 1983). Salination promoted the activity of nitrate reductase in *Phaseolus aureus* (Sankhla and Huber, 1975) in contrast NR was increased with increasing salt concentration in *C.dactylon and Veteveria zizanioidis* grass (Mane etal 2011). NR is also reported to be inhibited in lentil, pea and cheak pea (Khan MG etal. 1994)by saline stress. (Rakova *et al.,* 1978, Hever, 1979; Lal and Bharadwaj, 1987). NR activity increased with respect to

control as well as increasing concentration of NaCl and Na_2SO_4 at pre flowering stage. Contrast, plants treated with NaCl and Na_2SO_4 showed reverse effect at post flowering stages. NaF, in general, suppressed the NR activity at pre as well as post flowering stages of *C.Setigerus*. Thus, the present study reveals an increase in NR activity, when treated with different concentration of NaCl and Na_2SO_4 in pre flowering stage, in contrast, decreased at post flowering stage of normally grown *C. Setigerus* plants. NR activity was inhibited by NaF treatment, similarly, the salt stress resulted in a decrease of NO_3^- concentrations in the leaves after 3 days of the NaCl treatment, in Solanum lycopersicum seedlings(Mohamed Deboubai et al., 2007) This may further be proved to be a useful step in using these techniques for further studies.

Table 1. Effect of salts on NR activity in *Cenchrus setigerus*-76 plants grown *invivo*.

Treatments	NR activity (MM/Mg protein/Min)	
	Pre flowering	Post flowering
Control	5.30 ± 0.149	8.23 ± 0.110
NaCl 10^{-3} M	7.78 ± 0.065	3.70± 0.030
10^{-2}M	15.87 ± 0.129	4.14 ± 0.124
10^{-1} M	13.00 ± 0.065	5.36 ± 0.109
Na_2SO_4 10^{-3} M	3.74 ± 0.088	4.99 ± 0.071
10^{-2} M	10.74 + 0.069	5.34 ± 0.133
10^{-1} M	6.18 ± 0.051	4.02 ± 0.096
NaF 10^{-3} M	4.17 ± 0.818	4.10 ± 0.045
10^{-2} M	3.99 ± 0.111	3.59 ± 0.114
10^{-1} M	5.97 ± 0.124	1.95 ± 0.089

± Values x 10^3 represent SD
NS – Not significant

* Significant at 5% P only
All other values significant at 1%

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