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Effect of salts on seed germination and seedling growth of *Pentatropis nivalis* (J.F.Gmel.) D.V. Field & J. R. I. Wood

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ABSTRACT

Effect of various concentration of (0.5, 1, 1.5, 2%) Nacl, $Cacl_2$, $MgSO_4$ and K_2SO_4 on seed germination of *Pentatropis nivalis* showed variation 90 to 99% seed germination in distilled water (Control) but germination was observed in 0.5 to 2 percent chloride and sulphur salts which range from 5 to 85 percent. The decreased germination occurs due to low osmotic or toxic effects of ions. The higher germination percent in two form of various concentration of chloride and sulphur indicate the salinity tolerate capacity at germination level. Thus it is clear that the seed here less sensitive to Nacl, $Cacl_2$, $MgSO_4$ and K_2SO_4.

Key words: *Chloride, Germination, Pentatropis nivalis, Seed, and Sulphur*

Introduction

In 21st Century salinity problem is the biggest challenge for us. Salinity occur in both ways like natural and man –made condition (Rajabi Dehavi *et al.*, 2020) Observed that the main effect of salinity that reduced the seed germination percentage, germination index, seedling shoot length and root length of sorghum. There are many abiotic stresses that affect all the agriculture production but salinity is one of the them, Salinity affect the majority of plant species, Salinity occurs due to day by day there is increasing in the agricultural practices (Zhu, 2001).

Halophyte growing in Indian cost out of that mostly used as cattle feed and human feed, However only little information is available about the seed and seedling biology, There is also little data available on RET of such useful halophytes further recorded information on comparative effects of various salts concentration and its recovery on seed germination would indicate the osmotic or toxic effect

Khot, (2003) studied that notable information available on adverse effect of salts on seed germination on halophytes, But it explain that potential ability of halophytic plant to tolerate various concentration of chloride and sulphur salts.

Pentatropis nivalis plant also worked as a phytoremediator another interesting things is that there are many uses of *Pentatropis nivalis* curing inflammation, leucoderma, piles and gonorrhoea, (Babre *et al.*, 2020). Based upon the review of literature finding that *P. Nivalis* possesses good antioxidant property (Babre *et al.*, 2020). Effects of NaCl and seawater on *Chenopodium quinoa* seed germination shows that seawater delayed seed germination in comparison to NaCl solution (Brakez *et al.*, 2014). Loss of halophyte diversity and mere data on effect of various salt on growth and germination of halophyte growing on man-made saline soil prompted us to consider this piece of work.

About study plant

P. nivalis widely distributed the different part of the world like southern margin of Sahara to Sengal, Tanzania, in North East Kenya, Arabian Peninsula, Madagascar, Pakistan and Western India. In Maharashtra state Beed, Jalana, Ahmednagar, Mumbai city district, Mumbai suburban, Thane and Pune districts *P. nivalis* distributed.

Pentatropis nivalis (J.F.Gmel.) D.V. Field & J.R.I. Wood Perennial twining undershrub, stem terete, pubsent when young. Leaves opposite, ovate, oblong to oblong, rounded at base acute and often mucronate apex, flowers in lateral few flowered umbellate cymes, flower bisexual, penducle terete, bracts subulate, peduncle teret, bacts subulate, pedicel filiform. Calyx split almost to the base.Sepals ovate lanceolate, corolla rotate pubeulous within glabrous outside, yellowish green, often with recurved margin. Corona of 5, laterally compressed lobes, pollinia ovoid, pendulous, follicles lanceolate, glabrous, seed broadly ovate, predominetly margined, silky white.

Flowers and fruit occure in *Pentatropis nivalis* in September to march. Locality mainly in Baramati tehsil villages named Mudhale, Sonkaswadi and Waghalwadi, found in associate with *Acacia juliflora* (Bhagat, 2008). White milkweed is native to Tropical Africa, Madagascar and Egypt to India and commonly called as white milkweed and belongs to family Asclepiadaceae.

Materials and Methods

Mature fruits of *Pentatropis nivalis* seed were collected from manmade saline soil from Songaon, Medad, Mekhali and Bharanpur, Tal-Baramati Dist –Pune, (MS) India. The geographical location of this tahsil is 18° 2′ 44″ N to 18° 23′ 19″ North latitudes and 74° 13′ 8″ E to 74° 42′ 47″ East longitudes. The total geographical area (TGA) of the tahsil is 1382 sq.km and seed were separated from fruits and selected for uniform size, shape and color, Seed were germinated in Petridish having diameter 9 mm lined with wet filter paper and three replicants of each 0.5,1, 1.5 and 2 per cent concentration of NaCl, $CaCl_2$, $MgSO_4$ and K_2SO_4 were maintained, keeping control for comparison, After 15 –days the ungerminated seed from salt solutions were transferred to distilled water considered as recovery. Thus total germination was recorded after 30 days and data was subjected to statistical analysis.

Results and Discussion

Each value represents mean ± SEM of three replications. The result mentioned in Table 1 showed that maximum seed germination 95% in distilled water (Mali *et al.,* 2015) showed that *Pentatropis nivalis* had highest seed germination percentage in distilled water. *Chenopodium glaucum* seed germination good in nonsaline controls, If there is increased salinity inhibit the seed germination (Duan *et al.,* 2004).

Result in table 1 result observes that germination after 15 days, At 0.5% NaCl treatment germination percentage 85% at highest 2% NaCl treatment observed 5% germination, Also in $CaCl_2$ 0.5% treatment 90% germination observed at 2% there is 15 % germination.

In K_2SO_4 treatment at 0.5 % treatment there is 85% germination observed and at 2% treatment 75% germination observed. In $MgSO_4$ 0.5% treatment 80% germination observed and at 2% treatment 65% germination observed.

As mentioned in this experiment, maximum germination was recorded in distilled water and the process noticeable decreased in higher concentrations of salinity. Furthermore, ungerminated seeds of *Pentatropis nivalis* showed highest range of recovery when transferred to distilled water. However, our investigation indicate greater degree of osmotic and toxic effect of chloride than that of sulphates on seeds germination in *Pentatropis nivalis.*

Overall it indicate that at NaCl and $CaCl_2$ salt treatment increase the concentration of salt there is decrease germination percentage. In $MgSO_4$ and K_2SO_4 there is no effect on seed germination from lower to higher concentration of salt treatment.

Increased the concentration of salt there is decreased shoot and root length, Overall seedling length get decreased increased the concentration of salt.

(Liu *et al.,* 2006) observed that Suaeda salsa and *A. centralasiatica* are highly salt tolerant halophyte species where *S. salsa* is more salt tolerant than *A. centralasiatica*.

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Table 1. Effect of various salts concentration on seed germination of *Pentatropis nivalis* (%).

Treatment	Germination % After 15 days	Treatment	Recovery % After 15 day	Total %
00	95± 0.3	NaCl	0	95
0.5	85 ±1.5		5±0.48	90
1	50 ±0.7		30±0.669	80
1.5	15± 0.88		45±0.85	60
2	5± 0.70		55±3.32	60
0.5	90±0.35	$CaCl_2$	5±0	95
1	85±1.17		0	85
1.5	15±0.57		65±1.78	85
2	15±1.19		65±0.03	85
0.5	85±0.88	K_2SO_4	0	80
1	85±1.001		0	75
1.5	90±0.63		5±0	80
2	75±1.65		5±0.37	70
0.5	80±1.4	$MgSO_4$	0	80
1	75±0.8		0	75
1.5	80±0.85		5±0	80
2	60±1.49		5±0.37	70

Each value represents mean ± SEM of three replications.

Table 2. Effect of various salt concentrations on the growth of seedling of *Pentatropis nivalis*

Conc %	NaCl			$CaCl_2$			K_2SO_4			$MgSO_4$		
	Shoot length	Root lenght	Seedling length	Shoot length	Root lenght	Seedling length	Shoot length	Root lenght	Seedling length	Shoot length	Root lenght	Seedling lenght
0	4.9±0.98	5±0.2	9.9	4.9±0.9	5±0.2	9.9	4.9±0.9	5±0.289	9.9	4.9±0.9	5±0.28	9.9
0.5	3.7±0.37	3.1±0.7	6.8	4.6±0.6	3.2±0.7	6.08	4±0.4	3±0	7	4.6±0.2	2.5±0.8	7.1
1	2.1±0.43	1.16±0.1	3.26	4.3±0.1	3.3±0.3	7.6	4.6±0.1	2.8±0.416	7.4	5.2±0.5	2.3±0.6	5.5
1.5	1.3±0.38	0.13±0.0	1.43	1.4±0.0	1.53±0.2	2.93	4.3±0.1	2.1±0.66	6.4	4.3±0.6	2.6±0.6	6.9
2	0.26±0.142	0.1±0.0	0.36	1.3±0.3	0.6±0.4	1.9	2.8±0.4	2.3±0.86	5.1	4.8±0.23	2.7±0.4	7.5

Conflict of interest

The authors have no conflicts of interest.

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