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Effect of various Chloride and Sulphate salt concentrations on seed germination of *Trianthema portulacastrum* L. growing on man –made saline soil from Baramati (Dist. Pune) (M.S.) India.

B.S Mali*, S.A. Palve and P.A. Sholar

P.G. Research Center, Department of Botany, Tuljaram Chaturchand College of Art, Science and Commerce, Baramati (M.S.) India

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ABSTRACT

The present study was undertaken to investigate the osmotic and toxic effect of 0 to 2.5 percent chloride (NaCl, KCl and $CaCl_2$) and sulphate salt (Na_2SO_4, $CaSO_4$ and $MgSO_4$) on seed germination of *Trianthema portulacastrum* L. at room temperature. Maximum germination (99 percent) was recorded in controlled condition (distilled water). However, germination was adversely affected in various sulphate and chloride salt concentrations. Furthermore, it was observed that the seeds were more sensitive to chloride salts than sulphate salts. However, maximum seed recovery in chloride salts (2 to 45 percent) as compared to seeds germinated in sulphate (0 to 8 percent)was recorded except in Na_2SO_4. Such observation indicates maximum osmotic or toxic effect in chloride salt treated seeds than sulphate salts treated seeds.

Key words: Trianthema portulacastrum L., Seed germination, Chloride and Sulphate salt, Osmotic and toxic effect.

Introduction

The survival of halophytic plant species in natural conditions depend upon its ability to reproduce under salt-stressed condition. Seed germination and seedling emergence process are critical to the survival of plant in salt-affected soils. Moreover, germination of halophytic seeds takes place when salinity of the surface layer of saline habitats is reduced after in pricipitation in rainy season (Ungar, 1976). Many researchers worked on the capacity of halophytic species to with standsalt concentration at germination stage varies from species to species and effect of various factors such as salinity, temperature, light, water logging which impairs the process of germination under such conditions. Thus lacuna is still wider for salt tolerant species growing on man-made salt-affected soils in India. Above information prompted us to study the effect of various concentrations of chloride and sulphate salts on seed germination of *Trianthema portulacastrum* L. growing on man-made salt affected soil from Kanheri near Baramati Dist-Pune (M.S.) India.

Investigation on effect of various salt concentration on seed germination would gives idea about maximum limit at which seed can tolerate individual salt stress and germinate succesfully. This findings in turn would help for recommendation of study plant for reclamation of saline soil. Likewise, considerable information is available on osmotic and toxic effect of individual salt on seed germination in *Amaranthus spinosus* (Mali *et al.*, 2011) but no

*Corresponding author's email: bhagawanmali10@gmail.com

any comparative trend of effect of various sulphate and chloride salt has been found .

The main aim of this investigation was to study effect of three chloride (NaCl, KCl and $CaCl_2$) and three sulphate (Na_2SO_4, $MgSO_4$ and $CaSO_4$) salts on the seed germination of *Trianthema portulacastrum* L.

Materials and Methods

About Plant

Trianthema portulacastrum L belongs to Aizoaceaefamily which is fastgrowing, succulent annual herb with dark green leaves plant. Itis indigenous to South Africa, but widely distributed in India, Pakistan, Sri Lanka, West Asia, Africa, and America (Saeed *et al.*, 2010). It's distribution also reported in crop growing field as a weed. It was also seen in sugarcanesupporting soils. It has a capacity to tolerate salinity.

Germination Test

The effect of various concentration of salt on seed germination of T. *portulacastrum* L. was carried out at P.G. Research center, Department of Botany, Tuljaram chaturchand college of Art, Science and Commerce, Baramati during academic year 2017-18. Mature seeds of *Trianthema portulacastrum* L. were collected from Kanheri near Baramati Dist-Pune (M.S.) India. Seeds were selected for healthy, uniform size, shape and colour. Seeds were soaked in open beaker of 100 mL capacity containing hot distilled water (50°C) for 12 hours. After soaking 25 seeds were germinated in each petridish lined with moistend blotting paper and three replicates were maintained for each concentration of salt. Five concentration of NaCl, KCl , $MgCl_2$, $MgSO_4$, Na_2SO_4 and $CaSO_4$, i.e. 0.5, 1.0, 1.5, 2.0 and 2.5 percent of each were used and compared with seed germination in control (D.W.) condition. After 15 days the ungerminated seeds in salt concentration were transferred to distilled water and additional germination thereafter was considered as recovery.

Results and Discussion

The results mentioned in Table 1 shows maximum seed germination (99%) in distilled water. Smilar results observed by Shaikh *et al.* (2007) while working on seed germinationin *Urochondrasetulosa*. The seeds kept for germination in various salt concentrations showed reduction in germination with increase in salt concentrations. Although 2 to 14 percent seeds germinated in 1 to 2.5 % chloride salts, the seeds treated with 0.5 % $MgCl_2$ showed 46 percent seed germination. Comparatively the sulphate of magnesium and calcium were not toxic at 2.5 percent salts while in Na_2SO_4 at 2.5 percent only 3% seeds germination was observed. It was further observed that recovery in of seeds is subjected to chloride salts and Na_2SO_4 distilled water (0 to 45 %) was greater than for seeds that were kept in $MgSO_4$ and $CaSO_4$ (0 to 8%) (Table 1). Above observations collectively indicated that chloride salts caused greater osmotic effect on seed germination of *T. portulacastrum*. Recovery percentage varying between 2 to 45% for seeds subjected to chloride salts and 10 to 36% for those kept in Na_2SO_4. Again confirmed the ionic effect of these salts were greater than that of $MgSO_4$and $CaSO_4$ (Table 1). As mentioned in this investigation, maximum germination was recorded in distilled water and the process noticeable decreased in higher concentrations of salinity. Furthermore, ungerminated seeds of *T. portulacastrum* showed noticeable range of recovery when transferred to distilled water. Studies on germination in *Arthrocnemum halocenemoids*, *A. lagopoids*, *S. madrasptanus* and *P. nivalis* showed that germination percentage more in distilled water (Malcom, 1964; Bhoite, 1987; Misra, 1990; Mali, 1994; Mali *et al.*, 2015). However,our investigation indicate greater degree of osmotic and toxic effect of chloride than that of sulphates on seeds germination in *T. portulacastrum* and this is enough to answer the question why most of the seeds do not germinate in saline habitats. High degree of recovery of seeds germination has been observed in the species growing in salts affected soils (Sagarkumar, 1987).

Summary and Conclusion

The seeds of *Trianthema portulacastrum* L. are highly sensitive to salinity. Thus species is unable to multiply with help of seeds in natural habitats unless and until salinity is gradually reduced. Though, chloride salts are more adversely affect seeds germination than sulphate salt. No definite trend of adverse effect of six salts could be established. Further more our study indicate that *T. portulacastrum* can be recommended for reclaimation of salt –affected soil but species need to be raised in less than 0.5

Table 1. Effect of various of concentrations of chloride and sulphate salts on germination of *Trianthema portulacastrum* L. Each value represents SEM of three replications.

Percent Treatment (%)	Germination (15 Days)		Recovery (15Days)	Total Germination (30 Days)
		NaCl		
00	99 + 0.57		00	99
0.5	18 + 5.81		36 ±6.11	54
1.0	6 + 1.32		45 + 4.80	51
1.5	3 + 1.32		34 +3.53	37
2.0	10 +3.53		23 + 7.42	33
2.5	6 +1.32		39 + 8.12	45
		KCl		
0.5	27 ± 5.81		8 ±2.31	35
1.0	8 ± 2.31		2 ±8.0	35
1.5	6 ± 1.32		32 ±00	38
2.0	11 ± 7.06		24 ±4.62	35
2.5	3 ± 1.32		28 ±6.93	31
		$MgCl_2$		
0.5	46 ±5.81		00 ±00	46
1.0	14 ±1.32		11 ±1.32	25
1.5	6 ±1.32		39 ±6.12	45
2.0	2 ± 1.32		27 ±7.42	29
2.5	2 ± 1.32		32 ±6.67	34
		Na_2SO_4		
0.5	34 ±1.32		10 ±2.66	44
1.0	10 ±1.32		24 ±8.0	34
1.5	7 ±1.32		32 ±0.00	39
2.0	7 ±1.32		36 ± 4.62	43
2.5	3 ±1.32		32 ±6.93	35
		$MgSO_4$		
0.5	34 ±8.11		3 ±1.32	37
1.0	27 ±11.40		00 ± 00	27
1.5	20 ±6.11		4 ± 2.31	24
2.0	27 ± 7.42		6 ±1.32	33
2.5	14 ±1.32		8 ±2.31	22
		$CaSO_4$		
0.5	45 ±7.47		00 ±00	45
1.0	59 ±9.72		00 ±00	59
1.5	58 ± 1.32		00 ± 00	58
2.0	60 ±2.32		00 ± 00	60
2.5	50 + 3.55		00 + 00	50

percent salt concentration having habitats before transplanting seedlings on to salt affected soil having more salt concentration.

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References

Bhoite, A.S. 1987. *Studies on salt tolerance of Acluoropus lagopoides* L. Ph.D. Thes is Bhavnagar University, Bhavnagar.

Malcom, C.V. 1964. Effect of salt, temperature and seed scarification on germination of two varieties of

Arthrocenemumhalocnemoides. J. Roy. Soc.West Aust. 47 : 72-74.

Mali, B.S. and Telave, A.B. 2011. Effects of salts on germination. of *Amaranthusspinosus L.Bioinfolts.* 8(3) : 312-313.

Mali, B.S., Chape, V.S. and Rajebhosale, N.P. 2015. Salt tolerance at germination of *Pentatropisnivalis* weight and Arn growing in salt affected soils from songaon, Baramati (M.S.) India. *Advances in Plant Sciences.* 28: 93-95.

Mali, B.S. 1994. *Physiological Studies on Salt Tolerance of Forage Halophytes.* Ph.D. Thesis Bhavnagar University, Bhavnagar

Misra.M.(1990). Studies on salt tolerance o *Sporobolusmadraspatanus* Bor.A forage halophyti grass.Ph.D.Thesis Bhavnagar University, Bhavnaga

Saeed, M. *et al.* 2010. Interference of horse purslane (*Trianthema portulacastrum* L.) with maize (*Zea mays* L.) at different densities. *Pakistan J. Bot.* v. 42(1) : 173-179

Sagar Kumar, A. 1987. *Ecophysiologicel Studies on Coastal Vegetation of Saurashtra Coast.* Ph.D.Thesis Bhavnagar University Bhavnagar.

Ungar, I.A. 1978. Halophytes seed germinations. *The Bot. Review.* 44 : 233-264.