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Effect of Sodic Water and Soil on the Growth Yield of Sugarbeet (Beta Vulgaris)

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Abstract: *Consistent use of high RSC water may deteriorate the physical properties of soil and increases pH and SAR of soil. Continuous use may reduce germination / the establishment of seedling, retards plant growth and leads to a significant reduction in yield. Therefore, a field experiment in microplots was displayed at research plot in St. John's College, Agra to study the effect of sodic water on the growth yield of sugarbeet. The soil of the field is mostly alluvial in nature. The sugarbeet crop was sown in the winter season in 2008-09 and 2009-10. The experiment was conducted in Two Factorial Design having 36 treatments. The different doses of gypsum as a chemical ameliorant along with 3 treatment of sodic water was used. The varying levels of gypsum were used before sowing the test crop. The application of sodic water was used at various intervals as per the need of the crop. So to improve the quality of crop and increase the production of the crop a chemical amendment gypsum was used. The response of gypsum treatment was found more effective in first year crop in comparison of second year crop and the gypsum also showed better response on growth parameters as well as on soil properties. Amendment like gypsum exhibited positive effect the crop yield*.

Keywords: *RSC, sodic, saline, sugarbeet, water quality*

I. Introduction

Soil amendments are materials, such as gypsum that directly supply soluble calcium for the replacement of exchangeable sodium, or other substances, such as sulphuric acid and sulphur, that indirectly through chemical or biological action, make the relatively insoluble calcium carbonate commonly found in sodic soils, available for replacement of sodium. This kind and quantity of a chemical amendment to be used for replacement of exchangeable sodium in the soils depend on the soil characteristics including the extent of soil deterioration, desired level of soil improvement including crops intended to be grown and economic considerations. **Singh et al. (1980)** reported the effect of soil sodicity on the yield and growth characters of cow pea grown for fodder which were in reverse trends. **Singh and Abrol (1983)** found the delayed germination in pea (Pisum sativum L.) when ESP of the soil was more than 10.8. **Chauhan et al. (1989**) have also recorded that RSC rich irrigation water declined the plant height, number of branches and number of tillers per plant in berseem. **Chauhan and Kumar (1993)** recorded that the increasing levels of RSC in irrigation significantly decreased seed and straw yield. **Prasad et al. (1998)** result that the irrigation with 5 mel^{-1} SAR levels is not very detrimental and its impact can be minimized incorporating 10gha^{-1} pyrites in soil. At such sodicity stress the black gram crop can be successfully grown.

Table -1: Effect of Sodic water with gypsum on the plant height in sugarbeet

2008-09

Treatments	**(45 DAS)**	**(60 DAS)**	**(75 DAS)**
Gyp			
G0	20.40	34.51	37.39
G1	21.90	35.20	39.94
G2	22.69	34.42	41.94
G3	22.96	35.76	43.20
SE.m	0.80	2.61	2.11
CD at 5%	1.64	5.38	4.35
RSC			
R0	21.28	37.23	40.43
R1	23.89	39.18	43.10
R2	20.79	28.52	38.33
SE.m	0.69	2.26	1.82
CD at 5%	1.42	4.66	3.76

2009-10

Treatments	**(45 DAS)**	**(60 DAS)**	**(75 DAS)**
Gyp			
G0	19.40	20.87	22.88
G1	17.87	19.73	22.47
G2	19.70	21.91	23.93
G3	21.31	22.22	24.10
SE.m	3.05	2.97	3.07
CD at 5%	6.30	6.12	6.34
RSC			
R0	19.45	22.05	23.80
R1	21.08	21.56	23.13
R2	18.18	19.94	23.10
SE.m	2.64	2.57	2.66
CD at 5%	5.46	5.30	5.49

Table -2 : Effect of varying levels of gypsum and RSC water on number of leaves of sugarbeet crop after 45, 60 and 75 DAS in 2008-08 and 2009-10

	No.of leaves 2008-09			**No.of leaves 2008-09**		
Treatments	**45 DAS**	**60 DAS**	**75 DAS**	**45 DAS**	**60 DAS**	**75 DAS**
Gyp						
G0	13.50	13.50	13.05	12.90	12.67	12.66
G1	14.57	14.43	13.69	14.13	14.27	13.92
G2	14.56	14.19	14.01	12.77	12.87	12.66
G3	14.83	15.01	15.13	13.90	14.33	14.52
SE.m	0.37	0.41	0.28	0.62	0.32	0.50
CD at 5%	0.76	0.84	0.57	1.29	0.66	1.02
RSC						
R0	14.36	14.23	13.67	13.18	13.20	13.13
R1	14.46	14.57	14.60	14.08	14.23	14.13
R2	14.28	14.06	13.64	13.03	13.18	13.06
SE.m	0.32	0.35	0.24	0.54	0.28	0.43
CD at 5%	0.66	0.73	0.50	1.11	0.57	0.89

II. Materials and Method

A field experiment was conducted at research plot of Department of Chemistry, St. John's College, Agra, to study the effect sodic water on the growth yield of plant. The soil of the field is mostly alluvial in nature, having low clay percentage and high sand percentage. The RSC waters were prepared by dissolving the CO_3^{--} and HCO_3^{-} salts of sodium in best available water. In the present study, growth characters like plant height and number of leaves were recorded at 45, 60 and 75 DAS in 2008-09 and 2009-10. The data displayed in Table 1, 2 and Table-3 along with statistical interpretation.

Two- way analysis of variance (ANOVA) was applied to find out the critical difference at 5% on the plant height of sugarbeet crop with the help of software SIGMA STAT 3.5.

III. Results and Discussion

A study of Table-1 and 2 reveals that higher concentration of RSC water about $15mel^{-1}$ declined the plant height non significantly at the 45 DAS. The data given in Table 1 further indicates that 75g/plot gypsum application increased the plant height after 45 DAS It is also to be noted that the plant height increased non significantly at both next two DAS. The RSC @ $15mel^{-1}$ adversely affected the plant height. The reduction may be ascribed due to adverse effect of Na ions on plants. These results are in agreement with the **Ravankar et al. (2005), Swarup and Yaduvanshi (2004)** who also recorded that the RSC rich irrigation water, declined the plant height to a great extent. **Singh et al. (2005)** also noted reduction in plant height with increased level of RSC levels in irrigation water. **Sisodia et al. (2010)** also observed the same findings. It is obvious from the data presented in Table -3 pertaining to the number of leaves clearly indicates that no particular effect of high RSC could be observed on the number of leaves except in case of R1 and G3 treatment could be visualized which showed higher number of leaves at various stages in both the session. A marked decline in the number of leaves could be noted due to ill effect of RSC water in sugarbeet crops. These results also confirmed the findings of **Almodares and Sharif (2007).**

The plant height of sugar beet decreased significantly with increasing levels of RSC and gypsum did not show appreciable performance in case of plant height. The quality of irrigation water with regards to higher levels of RSC caused a significant reduction in plant height as compared to lower levels of RSC. However, the ameliorant application with respect to gypsum levels increased significantly the plant height. The plant height

reduced significantly over control with increasing levels of RSC in irrigation above concentration of $15mel^{-1}$ but incorporation of successive levels of gypsum from 0-75g/plot increase the plant height over control. In the second year, plant height increased slightly but reduced significantly in other treatments irrigated with higher concentration of RSC water. A significant effect of gypsum and RSC was found significant in 2008-09 after 45 and 60 DAS. The interaction of RSC and gypsum influenced the significant effect on the growth parameters of plant harvest stage in both the session.

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References

[1]. **Almodares A. and Sharif M.E. (2007)** Effect of irrigation water qualities on biomass and sugar contents of sugarbeet and sweet sorghum cultivers. Journal of Env. Biology. 28 (2) 213 – 218.

[2]. **Chauhan R.P.S., Chauhan C.P.S., Dixit H.C. (1989)** Effect of residual sodium carbonate in irrigation water on yield and chemical composition of Berseem J. Indian Soc. Sci 37: 431- 432

[3]. **Chauhan,R.P.S., Kumar S. (1993)** Effect of rsc in irrigation water on soil properties and yield of gram (Cicer arietium), pea (Pisum sativum) and lentil (Lens calinaries) Indian J. Agric. Sci 63(12) : 821-824.

[4]. **Prasad F.M., Singh K., Verma MM, Yadav M S (1998)** Role of chemical amendments in minimizing the adverse effect of RSC irrigation water on rhizobium treated and untreated black gram (Vigna munga). Proceeding of National Symposium pp 238-242

[5]. **Ravankar H.N., Gajbhiye N.N. and Sarap P.A. (2005)** Effect of organic manures and inorganic fertilizers on yield and availability of nutrients under sorghum - wheat sequence. Indian Journal of Agric. Research.39 (2): 142-145.

[6]. **Singh D.V, Sharma D.C. and Prasad S.N.(1980)** The effect of different amendment on the physical properties of sodic soil and yield of wheat. Curr. Agric 4(2-2) : 47-50.

[7]. **Singh P.K., Pal B., Pandey M., and Singh A.K. (2005)** Effect of irrigation water containing RSC on the yield, chemical composition and uptake of nutrients by periwinkle leaves. Indian Journal of Agric. Research.39 (2): 116-121.

[8]. **Singh S.B., Abrol I.P. (1986)** Effect of soil sodicity on growth yield and chemical composition of soyabean, J Indian soc Soil sci 34: 568-571

[9]. **Sisodia R.S., Manoj Pandey and Anil Pal (2010**) Response of Oat to FYM under sodic water irrigation. Ann. P. I. soil 12(2): 86 – 88.

[10]. **Swarup A. and Yaduvanshi N.P.S. (2004)** Integrated nutrients managements for sustainability of rice – wheat system on reclaimation alkali lands. Indian farming 31-36.