Pak. J. Agri. Sci,
26 (3) 313, 1989

EFFICIENCY OF GYPSIUM GRADES AND QUALITY OF LEACHING WATER FOR RECLAIMING A SALINE-SODIC SOIl. n, CHEMICAL IMPROVEMENT OF SOIL

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Gypmsum grades (5-16, 16-25, 25-60, 60-100, >100 mesh) @ 100 %. GR of 15 cm *soil* column and four synthetic waters (EC 0.6 +. SAR 6; E5 1.0 + SAR 12; EC 2.0 + SAR 18; EC 4.0 dS m + SAR 30), in *all possible* combinations, were tested for reclaiming a *loamy clay* saline-sodic soil in a liiboratory experiment. The results *indicated* that the dissolation _9.f gypsum grades varied only by *less* than *1* me *1* in *all* the synthetic waters. The reduction in EC and SAR increased as the gypsum fineness in1:reased and/or brackishness of water decreased. The pH was decreased by coarser grades more than tha t with the finer ones, whereas the increasing brackishness of waters caused progressively *lower* decrease in pH

INTRODUCTION

The method for reclamation of salt-affected soils depends upon the Source and nature of soluble as *well* as exchangeable ions; *physical,* chemical and mineralogical properties; presence of lime or gypsum in *soil,* cost and the availability of both the Ca-source and irrigation water.

Being cheaper and *easily* available, gypsum is preferred .for *soil* reclamation. The fineness to *which* gypsum must be ground is a matter of economic consideration, thoough the finer grades may ime'i0ve a soil ealier, Low solubility of gymsum, i.e. 25-30 me *1* *(Bresler ~ al. 1982)* discourages the use of coarse particles while the excess of sodium in sodic soils favours the use of coarse grades (Keren & Shainberg, 1981).

The low hydraulic conductivity of a sodic/saline-sodic soil can be maintained or increased, irrespective of sodium saturation, by using sufficiently concentrated salt-solutions (Muhammed et al., 1969). Since most of the ground waters in the Punjab (75 % of the existing discharge of wells) are saline, saline-sodic or sodic in nature (Malik et al., 1984), it was planned to explore the possibilities to utilize these waters for leaching during reclamation of a saline-sodic soil being treated with different gypsum grades.

MATERIALS AND METHODS

A bulk sample from surface 30 cm layer of the Gandhra soil series (loamy clay in texture, EC = 14 dS m^{-1}, SAR = 59, pH = 9.1) was collected, sun-dried, ground and passed through a 2 mm sieve. A 30 cm high columns each with 2400 g soil were prepared in 72 PVC Pipes (45 x 8.75 cm) with a uniform bulk density of 1.33 Mg m^{-3}. Gypsum @ 100 % GR per 15 cm layer was mixed with the surface 15 cm before processing the pipes for uniform bulk density. This was achieved by vertically dropping the pipes four times from a height of 5 cm. The pipes were leached with 90 cm of synthetic waters under continuous submergence at 26 ± 2°C. The pipes were arranged in completely randomized design with three replications at a uniform height from floor. After the termination of the experiment, each soil column was divided into two equal depths, i.e., 0-15 and 15-30 cm. These samples were analysed by the methods of the U.S. Salinity Lab. Staff (1954).

Size Limit Of Gypsum Particles

GO	= No gypsum	G_1	= 5-16 mesh;
G_2	= 16-25 mesh ;	G_3	= 25-60 mesh;
G_4	= 60-100 mesh;	G_5	= > 100 mesh.

Synthetic Waters

Different synthetic waters were pepared by using NaCl, Na2S~(j.' $CaCl_2.2H_2O$ and $MgSO_4.7H_2O$ salts where Ca:Mg::4: I, ana cr:$qfl...:: r:r ratios were _rr~Yljained alongwith the following EC (dS m -) and SAR (rnrnol 1) levels.

W1 = EC 0.6 + SAR 6; W_2 = EC 1.0 + SAR 12;

W3 = EC 2.0 + SAR 18; W4 = EC 4.0 + SAR 30.

RESULTS AND DISCUSSION

The dissolution of gypsum grades was determined by shaking a known weight (5g) of each grade in 100 ml of each synthetic water on a wrist action shaker for 30 minutes at 20°C. The concentration of Ca + Mg in !¥trate was recorded to be 26.43, 26.27, 26.15 and 26.06 me I , respectively in W_1, W2.' W3 and W4' while that for the gypsum grades G , G_2, G , G ana ~15 was, respectively 25.94, 26.09, 26.21, 2~.36 and 316.5g me I • The differences due to synthetic water composition as well as due to size of gypsum particles were significant, though the variation in Ca + Mg concentration was less than 1 me 1 •

Soil EC_e

A maxmimum significant decrease in EC occurred with W_1, followed by W2' ~3 and W4 (Table 1). R~latively higher ac with W_2, ~] and W_4' though safe for most of agricultural cro~s (Mass, 1~rn, may be due to progressive higher EC + SAR of waters used for leaching. All the waters decreased EC more from the upper soil layers than from the lower ones, the eefficiency of waters remained of the same order as above. These differences appear to be due to higher water potential being useful to dissolve and carry the salts downward more from the upper than the lower layers. As the water passed through the soil, it became loaded with salts, resulting in decreased carrying power and hence less removal of salts.

The gypsum grades as well as th~lleaching alone (control) lowered the EC Ito less than 4 dS m except the GL where it was 4.16 dS ~ . However, the treatments differed satlstically and, in general, the finer gypsum grades decreased the EC more than the coarser ones. Similar results were reported by

Table 1. [illegible]

	c_1		c_2		c_3		c_4	
	b_1	b_2	b_1	b_2	b_1	b_2	b_1	b_2
a_0	3.20	3.33	3.15	3.52	3.73	3.88	4.57	4.75
a_1	[illegible]	3.18	3.75	3.15	4.10	4.37	4.13	4.18
a_2	3.15	3.43	3.53	3.65	3.87	4.08	4.62	4.73
a_3	3.20	3.30	3.38	3.48	3.70	3.85	4.33	4.50
a_4	3.03	3.13	3.15	3.25	3.52	3.12	4.18	4.30
a_5	2.82	2.90	3.00	3.12	3.23	3.40	4.03	4.08
[illegible]	3.20	3.30	3.36	3.48	3.71	3.15	4.43	4.56
[illegible]	3.25 a		3.42 b		3.78 c		4.50 d	

[illegible]

b_1	b_2
3.18 c	1.80 d

SE: [illegible] = 0.022**, [illegible] = 0.05**, [illegible] = 0.045**

[illegible]

[illegible]

	[illegible]		[illegible]		[illegible]		[illegible]	
	Cl	Cl	Cl	Cl	Cl	Cl	Cl	Cl
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]			Cl [illegible]				Cl [illegible]	

[illegible]

Table [illegible]

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gypsum particles having range of size distribution (16-25 mesh) when saline-sodic water is available, can be used successfully for timely reclamation of native soils, where a variety of agricultural crops can be grown.

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