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USE OF BRACKISH WATER IN RAISING CHILLIES IN RED SOIL

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ABSTRACT

Field experiments were conducted in the red soil of Agricultural Research Station, Kovilpatti with chillies (var.K2) in raised bed, under brackish water irrigation (EC 5.1 dSm^{-1}) revealed that the application of gypsum to irrigation water (@ 1 t/ha) increased the dry pod yield significantly.

KEY WORDS : Red soil, Raised bed, Chillies, Brackish Water, Gypsum.

The water intended for irrigation must be free from excess soluble salts and concentration of specific chemical substances which may be hazardless to soil environment. The concentration and composition of dissolved salts in the water decides its suitability for irrigation. Salts affect the plants by increasing the osmotic pressure making the plant to exert more energy to absorb the soil water (Wilcox and Durum, 1967). The water samples were collected at random from open wells in different blocks of Kovilpatti Taluk used for irrigation which revealed that 60 per cent of the water samples were unfit for irrigation, 30 per cent suitable for raising tolerant crops like ragi and cotton and the remaining 10 per cent is fit for cultivation of all crops. Hence, a study was carried out to find out the effect of brackish water on the yield of chillies.

MATERIALS AND METHODS

Field experiments were conducted in a split plot design replicated thrice, in the red soil of Agricultural Research Station, Kovilpatti during 1990-91, 1991-92 and 1992-93 with the following treatments.

Main plot treatments

Bed method (M_1)
Raised bed (M_2)
Ridges and furrows (M_3)
Paired rows (M_4)

Sub plot treatments

Controls (S_1)
Gypsum treatment to soil (as per GR) (S_2
Pig manure compost @ 5 t ha^{-1} (S_3)
Green leaf manure @ 5 t ha^{-1} (S_4)

Table 1. Dry pod yield of chillies (kg/ha)

Treatments	1990-91	1991-92	1992-93
M_1S_1	506	270	347
M_1S_2	615	683	613
M_1S_3	702	528	432
M_1S_4	685	408	541
M_1S_5	746	742	875
M_1S_6	650	1345	1412
M_2S_1	612	330	432
M_2S_2	572	783	681
M_2S_3	550	628	654
M_2S_4	595	438	412
M_2S_5	602	670	952
M_2S_6	750	1362	1492
M_3S_1	475	408	249
M_3S_2	502	658	712
M_3S_3	550	687	594
M_3S_4	540	475	315
M_3S_5	596	687	790
M_3S_6	612	1245	1315
M_4S_1	457	412	395
M_4S_2	550	733	590
M_4S_3	681	537	605
M_4S_4	615	612	541
M_4S_5	702	615	754
M_4S_6	602	1013	1255
CD at 5%			
Method	50	62	58
Amendment	45	81	85
Amendment at Method	90	163	171
Method at Amendment	96	161	166

Note : M_1 - Bed method; M_2 - Raised bed;
M_3 - Ridges and furrows; M_4 - Paired rows; S_1 - Control;
S_2 - Application of gypsum in soil;
S_3 - Pig manure compost @ 5 t ha^{-1};
S_4 - Green leaf manure @ 5 t ha^{-1};
S_5 - Enriched farm yard manure @ 750 kg ha^{-1};
S_6 - Gypsum to irrigation water @ 1 t ha^{-1}

Enriched farmyard manure @ 750 kg ha.$_1$ (S_5)
Gypsum to irrigation water @ 1 t ha^{-1} (S_6)

The soil, plant and water samples were analysed by adopting standard procedures. The experimental soil had pH 7.1, EC 1.2 dSm$_{-1}$, $KMNO_4$-N, 110 kg ha^{-1}, Olsen's-p, 5 kg ha^{-1}, and K 320 kg ha^{-1}

Table 2. Characteristics of well water used for irrigation

Property	Content
pH	7.9
EC (dSm^{-1})	5.1
Cations (mmol L^{-1})	
Ca	33.4
Mg	20.2
Na	10.9
K	0.4
Anions (mmol L^{-1})	
CO_3	Nil
HCO_3	4.8
Cl_2	60.4
SO_4	0.64

RESULTS AND DISCUSSION

The method of raising chillies, and the effect of application of gypsum, pig manure compost, green leaf manure, farmyard manure, on dry pod yield of chillies is presented in Table 1 which indicates that dry pod yield of chillies was significantly influenced by raising chillies in raised bed and gypsification of water (@1 t/ha). Gupta and Abichandani (1977) advocated the application of gypsum in the surface of the soil during the months of May and June for effective desalinisation of the soils irrigated with high EC waters. But Prasad and Paliwal (1976) reported better results with gypsum applied in irrigation water than when applied in soil. Gypsum application increases Ca : Mg ratio irrigation water and Ca: Na ratio in exchange complex which resulted in better growth. Generally red soils are ususally deficient in calcium, nitrogen, and phosphorous. Calcium is supplied to the soil naturally by irrigation water, which was reflected in the yield. To supply calcium to soil, a gunny bag of gympsum (@ 1 t/ha) was also placed in the irrigation system.

The high Cl_2 content enhanced the EC in irrigation water (Table 2) Chloride salts are more harmful than sulphates. Chloride has not received much attention in evaluating the quality of irrigation water mainly because they do not affect the physical properties of the soil and are adsorbed little if any on the soil complex and thus move readily with the soil water.

Table 3. N,P and K content in the post harvest soils and their uptake (kg ha^{-1}) (Pooled treatment mead 1990-93)

Treatments	Content			Uptake		
	N	P	K	N	P	K
M_1S_1	94	6.8	248	19.7	7.0	11.7
M_1S_2	105	7.5	258	25.4	8.0	16.2
M_1S_3	70	7.4	280	26.9	7.8	15.5\9
M_1S_4	93	7.7	246	26.1	9.7	15.5
M_1S_5	28	7.4	302	31.5	10.4	21.6
M_1S_6	110	9.4	283	40.3	13.4	22.2
M_2S_1	121	7.1	272	33.2	9.1	10.8
M_2S_2	116	8.4	280	32.1	11.3	15.1
M_2S_3	122	7.5	309	31.1	11.5	15.0
M_2S_4	110	7.7	290	29.9	11.0	19.1
M_2S_5	123	7.9	294	33.2	12.8	15.5
M_2S_6	131	9.0	309	44.2	15.3	25.2
M_3S_1	108	6.9	271	22.9	8.6	10.5
M_3S_2	104	7.9	283	26.2	8.8	15.1
M_3S_3	119	8.0	300	26.0	11.3	18.3
M_3S_4	120	8.7	301	30.8	11.1	18.1
M_3S_5	109	8.1	289	32.8	12.9	21.4
M_3S_6	88	8.3	287	41.5	14.9	29.8
M_4S_1	115	8.4	310	23.6	9.7	11.7
M_4S_2	110	7.4	273	27.5	9.9	18.3
M_4S_3	116	7.5	272	25.0	12.9	18.5
M_4S_4	112	7.9	264	32.2	12.9	19.9
M_4S_5	102	7.9	269	32.2	11.3	19.7
M_4S_6	124	8.9	288	40.9	15.1	25.0

M_1 - Bed method; M_2 - Raised bed; M_3 - Ridges and furrows; M_4 - Paired rows; S_1 - Control; S_2 - Application of gypsum in soil; S_3 - Pig manure compost @ 5 t ha^{-1}; S_4 - Green leaf manure @ 5 t ha^{-1}; S_5 - Enriched farm yard manure @ 750 kg ha^{-1}; S_6 - Gypsum to irrigation water @ 1 t ha^{-1}

Higher value of available N,P,K was registered where chillies were grown in raised bed with gypsification water (Table 3).

Results pertaining to the effect of brackish water and application of various amendments to the soil and water on soil fertility status, and uptake of nutrients showed that there was no significant change in fertility as well as uptake (Table 3). Table 2 showed that the application of gypsum in the irrigation water has significant influence on the yield.

From the above study, it could be concluded that wherever the brackish water is the only source of irrigation for red soil for raising irrigated chillies, application of gypsum @ 1 t/ha in the irrigation water and raising chillies in raised bed can be advocated for getting higher yield.

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