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"STUDIES ON SALT AFFECTED SOILS OF KRISHNAGIRI RESERVOIR PROJECT AREA - DHARMAPURI DISTRICT"

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The soil problem which is a major factor limiting the crop productivity in Krishnagiri Reservoir Project ayacut area of Dharmapuri District was investigated. The results of the study showed that the soil is loamy to sandy loam in texture. The EC ranged from 0.29 to 4.3 m. mhos/cm and pH from 8 3 to 10.2. Exchangeable sodium percentage (ESP) varied from 18 9 to 41.1. The organic carbon content in all the locations are found to be low. The available N status is low while P is low to medium and K medium to high. The estimated gypsum requirement for reclamation ranged from 5 0 to 13 0 t/ha. The ESP of the soil has a significant positive correlation with pH (0.415); finer fraction (0 720**) and gypsum requirement (0.771**). The soils in the villages of the ayacut area are grouped into three categories based on pH and ESP and gypsum requirements are given for reclamation.

Salt affected soils occur naturally in arid and semiarid regions. The nature of the soil problem varies from region to region depending on climate, soil type and rainfall. Past experience in the implementation of new irrigation projects also showed that there is development of poor drainage and subsequently accumulation of salts resulting in soil ill health and loss of productivity. In Krishnagiri Reservoir project which is fed by the River south pennaiyar with an ayacut area of about 4000 ha had the problem of soil salinity and alkalinity. In view of the above facts a detailed Investigation was taken up and the results are presented and discussed in this paper.

MATERIALS AND METHODS :

The Krishnagiri Reservoir project area was surveyed and profile soil samples were collected upto a depth of 70 cm. One profile sample approximately for every 0 acres of land was taken for detailed investigation. The physico-chemical properties of the samples were analysed (piper; 1966) along with the gypsum requiement (Schoonover 1952).

RESULTS AND DISCUSSION :

The results of soil analysis are presented in the Tables 1 to 3.

1. *Soil texture*: The mean fine fraction (clay+silt) in the different location ranged from 41.1 to 56 2 (Table 2) and the send fractions varied from 41.7 to 54.9. The texture of the soil ranged from loamy to sandy loam.

2. *Soil salinity and distribution of salts* :

The electrical conductivity (EC)

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Table I Soil Salinity/Alkalnity Status - K. R. P. Ayacut Area (Mean Values)

	Villages	Depth (cm)	pH	EC (m. mhos/ cm)	Gypsum requirement	Exchangeable sodium percentage (ESP)	Cation exchange capacity (CEC) me/ 100 gm soil
1	Mohammed Ghouse tank catchment area (3)	0-15	9 4	1.20	10.5	36 6	36.4
		15-70	9.8	0 50			
2	Mohammed Ghouse tank to dam roada rea (4)	0-15	9.2	0.70	8.0	33 7	31 8
		15-70	8.9	0.70			
3	Dam road to Kaveripattinam (16)	0-15	9.2	0.75	11.9	37.2	31.6
		15-70	8.9	0.48			
4	Orchard to Malayandahalli (8)	0-15	9.0	0.85	8.8	35 8	31.5
		15-70	8 8	0.47			
5	Malayandahalli to Velampatti (3)	0-15	8.9	0.68	7.5	31.0	27.2
		15-70	8.6	0.53			
6	Ramapuram (5)	0-15	9.1	0.44	8.4	25:1	24.1
		15-70	8.9	0.62			
7	Chavalur (2)	0-15	9.7	0.54	12 5	41.1	37 6
		15 70	10.2	0.30			
8	Kaveripattinam to Paiyur (4)	0-15	8.7	0.49	6 2	23 0	28.6
		15-70	9.1	0.37			
9	Paiyur to Mancikanoor (2)	0-15	8.5	0.36	5.0	18.9	21.6
		15-70	8.8	0.43			
10	Keelpaiyur (1)	0-15	8.6	0.43	7.5	24 9	21.6
		15-70	8.7	0.35			
11	Periathallipatti (3)	0-15	8.3	0 38	7.2	30.4	31.9
		15-70	8.0	0 29			
12	Periathallipatti (1)	0-15	8.3	4.30	6.8	21.1	26.4
		15-70	8.7	2.80			
13	Periathallipatti (1)	0-15	9.2	3.70	10.2	36 4	34.4
		15-70	8.5	3.20			
14	Chinnathallipatti (3)	0-15	9.1	0.54	7.4	28 0	26 6
		15-70	9.4	0.86			
15	Baleguli tank (1)	0-15	9.4	0.65	9.7	36 9	32 0
		15-70	9.0	0.41			
16	Seprathankottai (3)	0-15	9.2	1.00	10.1	35 0	34 6
		15-70	9.2	1.00			
17	Penneswaramadam (1)	0-15	8.8	0.69	8.7	34.6	30.9
		15-70	8.5	0.38			
18	Keel chavalur (2)	0-15	8.7	0.75	10.2	34 6	31 2
		15-70	8.8	0.55			
19	Moolika Chavalur (1)	0-15	8.9	0.96	13.0	38.2	36.0
		15-07	9.3	0.56			

NB : Figures in parenthesis indicate the number of samples collected.

of the soil was less than 1 almost in all the places studied. The plough layer soil (0-15 cm) generally has higher EC compared to lower depth (15-70 cm). So in these soils the soluble salts are less and generally confined to the upper layers and it decreases with depth.

3. *soil reaction :*

The pH of the soil varied from 8.3 to 10.2 (Table. 1) There is not appreciable variation in the soil pH between surface and sub surface soil In the surface soil. In 67 per cent of the locations the pH ranged from 8 5 to 9.5, while in 20 per cent it was more than 9.5 (Table. 3) indicating that majority of the area is affected by soil alkalinity.

4. *Cation exchange capacity and Exchangeble sodium percentage :*

The cation exchange capacity of the soil ranged from 21.6 to 37.6 me/100 gm soil. (Table. 1). The ex-

Table 2. Soil Fertility status and mechanical composition - Krishnagiri reservoir project ayacut area (mean values)

Villages	Coarse fraction [%]	Fine fraction [%]	Available nutrient status [kg/ha] N	P	K	Organic carbon (%)
1. Mohammed Ghouse tank catchment area (3)	54.7	42.0	210	17.0	206	0.12
2. Mohammed Ghouse tank to Dam road (4)	52.4	45.1	269	21.0	227	0.17
3. Dam road to Kaveripattinam (16)	43.3	53.1	263	19.3	212	0.18
4. Orchard th Malyandahalli (8)	43.1	53.8	255	20.3	198	0.18
5. Malayandahalli to Velampatti (3)	45.3	48.6	250	17.5	224	0.22
6. Ramapuram (5)	53.3	43.8	257	18.3	276	0.18
7. Chavalur (2)	41.8	55.0	273	20.0	193	0.11
8. Kaveripattinam to Paiyur [4]	52.5	44.0	227	14.4	251	0.19
9. Paiyur to Manickanoor [2]	54.0	41.1	260	10.0	193	0.25
10. Keelpaiyur [1]	55.2	41.7	235	15.0	200	0.20
11. Periathallipatti [3]	44.2	53.2	249	18.3	268	0.30
12. Periathallipatti [1]	52.9	45.0	254	17.5	276	0.32
13. Periathallipatti [1]	43.5	54.4	258	21.3	262	0.24
14. Chinanthallipatti [3]	48.1	48.9	270	20.8	230	0.19
15. Baleguli tank [1]	44.2	53.9	365	18.8	300	0.22
16. Seprathankottai [2]	42.9	55.1	265	21.3	563	0.24
17. Penneswaramadam [3]	43.6	54.1	255	19.1	239	0.24
18. Keel chavulur [2]	43.6	53.8	265	18.8	302	0.19
19. Mootika chavulur [1]	41.7	56.2	263	20.0	262	0.18

Table. 3 Summary and results of K. R. P. soils (0-15 cm)

EC (m. mhos/cm)		pH		ESP		Organic carbon (%)		Available N (kg/ha)		Available P (kg/ha)		Available K (kg/ha)	
Group	(%)	Group	(%)	Group	(%)	Rating	(%)	Rating	(%)	Rating	(%)	Rating	(%)
Below 1	76	Below 8.5	13	15-25	18	Below	0.5	100	0 280	95	0-11	3	0-118	—
1-2	18	8.5 — 9.5	67	25-35	37	0.5 —	0 75	—	280-450	5	11-22	97	118-280	90
2-4.3	6	Above 9.6	70	Above 35	45	Above	0 75	—	Above 450	-	Above 22	-	Above 280	10

N.B. % total number of locations soil sampling done.

changeable sodium percentage (ESP) recorded was more than the critical limit of 15 and the mean values in the Krishnagiri Reservoir Project ayacut area ranged from 18.9 to 41.1. So the soils of this region are charaacterised by less soluble salts and high amounts of exchangeable Na. The soils of chavulur village recorded the highest ESP value of 41.1 followed by Dam road area (37.1). So this high ESP had decreased the availability of moisture causing reduction in the yield of crop (Sandhu *et. al.,* 1980 and singh *et. al.,* 1980). The reduction in yield was also due to the combined effect of poor soil physical condition, accumulation of Na in toxic quantity, deficiency of Ca and nutrient imbalance as reported by, Verma and Abrol (1980). The ESP was found to be positively correlated with pH (r = 0. 415**) and finer fraction (0. 720**). Similar observation was also recorded by Kanwar *et. al.,* (1963) and Verma and Abrol (1980) in the soils of Karnal district and Indogangetic plains respectively.

Gypsum requirement and reclamation :

The estimated gypsum requirement for reclamation of these soils ranged from 5.0 to 13.0 t/ha. A significant positive correlation was observed between ESP and Gypsum requirement (0. 771**). This observation is in confirmity with the earlier work reported by Abrol and Bhumbla (1979) and Verma and Abrol (1980).

The soils of the villages in the entire ayacut area is grouped into the following three categores based on soil pH and ESP.

Category : 1

pH 8.5 and ESP between 15 to 25.

I) Thallipatti, (II) Errahalli, (III) Manickanoor. and (iv) Paiyur.

Category : 2

pH 8.5 to 9 5 and ESP between 25 to 35.

1. Mottur, 2. Pananthoppu, 3. Thimmapuram, 4. Ramapuram, 5. Koviloor, 6. Rothapuram and 7. Penneswaramadam.

Category : 3 pH above 9.5 and ESP above 35.

1. Mohammed Chouse tank catchment area, 2 Sundaekuppam,
3. Malayandahalli 4. Moolikachavalur, 5. Baleguli. and
6. V. Chavulur.

The gypsum requirement for reclaiming the soils ranged from 5.0 to 13.0 t/ha. The study conducted for the reclamation of these soils with paddy as test crop suggested the application of gypsum at 50 per cent of its requirement, along with Farm Yard Manure 15 t/ha and Zn SO_4 30 kg ha, recording an yield of 3700 kg/ha as against 2880 kg/ha in the control plot. Similar beneficial influence of gypsum application along with green manure for increasing the yield of paddy in sodic soil was also reported earlier (Muthuswamy *et. al.*, 1973).

5. *Soil fertility:*

The organic carbon content of the soil ranged from 0.11 to 0 30 per cent (Table 2). Thus these soils are lacking in organic matter which is essential for the maintenance of good soil physical condition. Therefore the liberal addition or organic matter either in the form of farm yard manure (or) green manure (or) pressmud will be very useful. Among the macronutrients the availability of N was limiting in the entire area of the Krishnagiri Reservoir project. Higher ESP and sodic nature of the soil had resulted in poor organic carbon content and available nitrogen status. This corroborated the earlier report of Agarwal and Gupta (1968). The available phosphorus is low to medium while potassium content ranged from medium to high.

The study revealed that the main factors for the low productivity in Krishnagiri Reservoir project area are (1) soil sodicity problem, (2) poor availabilty of macronutrients particularly, N (3) Low organic matter content, (4) Inadequete Zn nutrition as observed in the visual deficiency symptoms. and (5) water stagnation and poor drainage. To increase the productivity of these soils application of gypsum and green manure along with provision of drainage facilities are essential.

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RESPONSE OF COWPEA TO PHOSPHORUS APPLICATION UNDER RAINFED CONDITION

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Effect of three levels of phosphours [0.20 and 40 kg/ha] and two levels of molybdenum [0 and one kg/ha] on yield, production of root nodule and uptake of p were studied for two seasons in cowpea under rainfed condition. The experimental area had low availeble p status. Phosphorus application at 20 kg/ha had consistently registered higher grain yield over control in both seasons whereas Mo applicaiion did not influence the grain yield Root nodule per plant and N content of the nodule did not differ significantly among p and MO levels. Cowpea crop was found to remove 12p kg/ha of which 45 per cent is utilised for grain production. Phosphorus application had increased the available p status of the soil.

Cowpea (vigna unguiculata L) is an important pulse crop grown in Tamil Nadu both for its grain and vegetable purpose. It is mostly grown under unirrigeted condition. This crop seldom receives manuring and hence the yield level is low. Work on the manuring of cowpea is very scanty in Tamil Nadu. Being leguminous crop the influence of the most important fertilizer nutrients phosphorus and Mo were not studied so far in this crop. Hence the present study was under taken to gather information on the influence of P and Mo on grain yield and nutrient uptake.

MATERIALS AND METHODS

Field experiments were conducted for two seasons under rainfed condition with paiyur 1 cowpea. Three levels of phosphorus (0, 20 and 40 kg/ha) and two levels of molybdenum (0 and one kg/ha) were tried. The entire quantity of P as superphosp-

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