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Determine Salinity/ Sodicity Status of the Farm Land and Classify the Salt- Affected soil into Various Classes at Main Experiment Farm of ND University Faizabad

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Abstract: ***An intensive survey was carried out during 2012-13 to characterize the salt-affected soils. In spite of surface and sub-surface and sub-surface samples study was also undertaken at four sites representing various land uses. The pH of the soils ranged from 8.21 to 10.12, electrical conductivity (EC) from 0.12 to 5.40 dSm1, exchangeable percentage (ESP) from 21.33 to 75.54 and sodium adsorption ratio (SAR)from 9.50 to 88.0. The available soil nutrients viz. n, P and K ranged from 93 to 223, 7.9 to 12.0 and 135 to 230 kg ha 1 , respectively. Sodium was the dominant cation in these soils. The pH, EC and soluble cations were higher in surface layers and decreased down with the depth of profile. Soluble cations and anions and exchangeable cations in the surface soil were higher in barren soil, but slightly decreased in subsurface soils. Bicarbonate content was relatively higher in the saturation extract. The pH, EC, ESP and SAR contents found lower in soils under cultivation and increasing trend was noted in soils under plantation, soils under reclamation and barren land.***

Keyword: Salt affected soil, under cultivated land, under reclamation land, under plantation land, Barrenland.

1. Introduction

Salt affected soils are wide spread in northern part of the country. These soils occur in arid and semiarid regions, where loss of moisture due to evaporation is higher than precipitation, resulting in accumulation of chloride, carbonate and bicarbonate of sodium, potassium and magnesium. In India these soil occupy nearly 8.58 m ha area with impaired productivity. A sizable area of 15% salt affected soils of the country occurs in UP mainly Faizabad, Pratapgarh, Janupur and Sultanpur districts. Salt affected soils pose many limitations to crop growth by way of the toxic effect of sodicity and certain nutrients element as well as poor fertility due to restriction availability of certain major and micro nutrients. These soils being formed under the influence of the high exchangeable sodium salts, which in presence of calcium carbonate imparts thesoils high pH, poor physicochemical condition due to dispersing action of exchangeable sodium affecting soil air and water permeability. Beside the reclamation of salt affected soils their nutrient management is of critical importance for targeted yields. During reclamation of such soils,addition of amendments, leaching and drainage result in impoverishment of nutrient in the se soils.The investigation was carried out at Main Experimentation Station (MES) of ND University of Agriculture & Technology, Kumarganj, Faizabad (U.P.). The farm is worst affected by salt infestation and has an area of 76.0 hectares. These soils if reclaimed will contribute a major share to the research on different crops. It is possible only when one knows the nature and degree of deterioration of salt-affected soils of the farm. The present study was under taken to characterize salt-affected soils to provide necessary information for present and future activities of reclamation.An intensive soil survey was carried out of characterize the salt-affected soils Main Experiment Station. The morphological features, physiography, relief and drainage conditions were recorded. On the basis of land use, the soils were categorised into soil under cultivation, soil under reclamation, soil under plantation and barren soil. Random sampling was adopted for collect 20 soil samples from all the four categories identified. A total 80 soil samples were collected from 0-15 cm and 15-30 cm depth representing each categories (20 samples from each category). Four soil profiles (one from each category) were exposed and examined. The samples were collected from different depths for detailed study in laboratory. Soil samples were analysed by the procedures of Richards (1954), Piper (1966) and Jackson (1967).The topography of the soils MES is mostly uneven. The barren soils have white to dark brown colour. The surface is well drained with extremely poor permeability. The water table fluctuated between 2.0 to 6.5 meters depth.

2. Materials and Methods

The present investigation was conducted during 2012-13 at Main Experiment station (MES) of NDU of Agric& Tech, Faizabad located at an altitude of 113 metresabove mean sea level and in intersected by $27^{o}5'$ N altitude and $81^{o}2'$ E longitude. On the basis of land use, the soils were categorised into soil under cultivation, soil under reclamation, soil under reclamation, soil under plantation and barren soil. Random sampling was adopted for collect 20 soil samples from all the four categories identified. Atotal 80 soil samples were collected from 0-15 cm, 15-30 cm, 30-45 cm, 45-60 cm and 60-100 cm depth representing each categories(20 samples from each category). The samples were collected from different depths for depths for detailed study in laboratory. Soil samples were analysed for pH, EC,

ESP, SAR, available nitrogen, available phosphorus and available potassium using standard procedure.

Table 1: Physico-chemical characteristics at different depths of profile of salt-affected

Soil Category	*Depth (cm)*	*pHs*	*ECe*	*ESP*	*SAR*	*Available Nutrients (Kg/ha)*		
						N	*P*	*K*
Under cultivated land	0-15	8.21	0.31	21.40	9.56	229	12.0	235
	15-30	8.25	0.24	21.33	10.4	235	10.2	210
	30-45	8.45	0.17	24.35	10.5	180	10.0	190
	45-60	8.46	0.15	32.46	12.3	156	9.5	185
	60-100	8.55	0.12	34.85	13.7	151	9.0	175
Under reclamation land	0-15	9.51	2.35	43.30	43.2	189	10.0	227
	15-30	9.56	2.09	46.51	44.3	175	9.8	203
	30-45	9.66	2.42	46.90	46.2	152	9.4	175
	45-60	9.89	1.78	54.11	52.0	138	9.0	169
	60-100	9.90	1.58	53.30	48.0	99	8.5	145
Under plantation land	0-15	9.20	1.71	74.60	36.0	204	9.5	222
	15-30	9.44	1.05	74.40	37.2	193	9.2	208
	30-45	9.56	0.90	74.71	39.2	162	9.0	170
	45-60	9.80	0.81	60.59	41.3	110	8.8	155
	60-100	9.90	0.63	60.48	56.9	93	8.5	150
Barren land	0-15	10.08	5.40	75.54	88.0	176	8.6	220
	15-30	10.12	3.50	74.18	69.8	163	8.5	176
	30-45	10.04	2.31	72.51	61.8	140	7.9	153
	45-60	9.98	2.01	72.73	59.2	131	7.9	151
	60-100	9.90	1.35	73.64	48.1	115	7.6	130

Table 1 show that pHs of the soils ranged from 8.21 to 10.12, ECe from 0.12 to 5.40 dSm-1, ESP from 21.33 to 75.54 and SAR from 9.56 to 88.0, available N from 93 to 223, P from 7.9 to 12.0 and K from 135 to 230 kg per ha. The values all these parameters decreased with increasing depth in barren soil which indicates that the process of alkalization had started at the surface and proceeded in downward direction. The pHs, ESP and SAR in other category of soils studied, increased with depth which indicates barren of upper surface soil due to reclamation, cultivation and plantation. ECe, available N, P and K decreased with depth in all the four category of soils studied.

Table 2: Correlation coefficient and regression equation

Factor Y	*Correlated*	*Correlation-coefficient*	*Regression equation*
pHs	ESP	0.472	Y=0.0433+(6.7780)X
pHs	SAR	0.420	Y=0.0366+(7.9266)X
pHs	**CO_3^{2-}+ HCO_3^-**	**0.695**	**Y=0.4583+(2.8127)X**
ECe	Cl^-+ SO_4^{2-}	0.423	Y=0.0663+(2.4669)X

This showed higher salinity/alkalinity in the surface layers. Similar trend was also recorded by Prakash *et al.* (1995) in profiles of salt-affected soils of Sultanpur (U.P). On the basis of 80 samples analysis, the pHs was positively correlated with ESP, SAR and (CO_3^{2-}+ HCO_3^-) (r=0.472,0.4209 and 0.695), respectively. Prakash *et al.* (1995) and Abrol*etal.* (1980) also reported positive correlation between pHs vs ESP and pHs vs SAR. The regression equation between then worked out as pHs= 0.0433+(6.7780) ESP, pHs= 0.0366+(7.9266) SAR and pHs= 0.4583+(2.8127) (CO_3^{2-}+ HCO_3^-) (Table 2). On the other hand ECe was positively correlated with (Cl^-+ SO_4^{2-}), (r=0.425). The regression equation between them was worked out as ECe= 0.0663+(2.4669) (Cl^-+ SO_4^{2-}). It is quite evident that the soils of the MES are salt-affected. Sodicity being more in surface soils of barren land which will pose difficulty in reclamation.

3. Results and Discussion

After analysed the collected soils samples show that (**Table 1**) pH of soils ranged from 8.21 to 10.12, ECvaried from 0.12 to 5.40, ESP varied from 21.33 to 75.54, SAR ranged from 9.56 to 88.0 available nitrogen,phosphorus and potassium varied from 93 to 223, 7.9 to 12.0 and 135 to 230 kg ha^1, respectively. The values all these parameters decreased with increasing depth in barren soil which indicates that the process of alkalization had started at the surface and proceeded in downward direction. The pH, ESP and SAR in other category of soils studied, increased with depth which indicates barren of upper surface soil due to reclamation, cultivation and plantation. EC,available N, P and K decreased with depth in all the four category of soils studied. This showed higher salinity/alkakinity in the surface layers. On the basis of 80 samples analysis (Table 2) the pH waspositively correlated with between pHs vs ESP and pHs vs SAR. The regression equation between then worked out as pHs= 0.0433+ (6.7780) ESP, pHs= 0.0366+ (7.9266) SAR and pHs= 0.4583+ (2.8127) (CO_3^{2-}+ HCO_3^-) (Table 2). On the other hand ECe was positively correlated with (Cl^-+ SO_4^{2-}), (r=0.425). The regression equation between them was worked out as ECe= 0.0663+ (2.4669) (Cl^-+ SO_4^{2-}).Sodicity being more surface soils of barren land which will pose difficulty in reclamation.

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