

CATEGORIZATION AND RECLAMATION OF SALT AFFECTED SOILS OF D.I.KHAN

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Sixty six soil samples were collected from the salt affected areas of D.I. Khan. Total soluble salts, pH and gypsum requirements were determined for the categorisation of these soils regarding their salinity status.

Out of these soil samples, 45 samples were found to be saline, 12 saline-sodic and 9 as sodic soils. Recommendations were made for their reclamation and management.

INTRODUCTION

The accumulation of salts is a serious problem in the arid and semi-arid regions throughout the world. In the arid climate, annual precipitation is less than evaporation and leaching of salts is incomplete. These regions are characterised by salt affected soils. Such soils are commonly found in D.I. Khan.

The problem of water-logging, salinity and alkalinity is one of the burning problems of country, as about one lac acres of land is deteriorating by the menace annually. It is estimated that about 70 lac acres of land is seriously affected and patches have appeared on about 11½ lac acres.

The salts in the upper part of the soil profile, which impart agricultural productivity, derive from different sources.

- i) Salts existing in the soil before the irrigation era.
- ii) Salts left as a residue in the upper layers of the soil from the evaporation of the irrigation water.
- iii) Salt residue from the evaporation of ground water in areas where the water table is near the ground surface.

In D.I. Khan, the salinity is mostly due to the accumulation effect of the salt deposition resulting from the occurrence of floods, high water table caused by seepage from Paharpur Canal and the poor quality of tube-wells' irrigation water. Khan *et al.* [1] reported that the salt content in D.I. Khan may range from 0.11 per cent to 1.73 per cent. Saline and salinealkali soils have been observed by the soil survey staff [3]. Salinity has been affected in irrigated areas through excess moisture. They have recommended heavy irrigations within a few cropping seasons to get

rid of the soluble salts and addition of small amounts (about one ton/acre) of gypsum and heavy irrigations for the reclamation of saline-sodic and sodic soils. Khan [2] reported that the salt affected soils are generally saline-sodic and need gypsum application ranging from 5 tons to 25 tons per acre depending upon the severity of the problem.

Keeping in view the importance of salinity – alkalinity problem, this project was undertaken to classify the salt affected soils of D.I. Khan and recommend reclamation and control measures for such problem soils.

MATERIALS AND METHODS

Sixty six soil sample were collected from the salt affected areas of D.I. Khan. Each samples was collected at a depth of 20 cm. The samples were air-dried, ground and passed through 2 mm sieve for different analysis.

Total soluble salts, gypsum requirements and pH values were determined with the methods given in USDA Hand Book 60 [4] and the soils were classified according to the criteria given in this book.

RESULTS AND DISCUSSION

The soil samples collected from different areas of D.I. Khan were analysed from the salinity point of view. Total soluble salts, pH and gypsum requirement of these soils have been given in Table 1.

Total soluble salts ranged widely from 0.16 to 5.44 per cent, and pH ranged from 7.4 to 8.6. Twenty one samples out of a total of 66 required gypsum for their reclamation in the range of 0.688 to 9.632 tons per acre.

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Table 1. Some characteristics of salt-affected soils of D.I. Khan.

Sr. No.	Place	T.S.S. (%)	pH	G.R. tons/acre.
1.	Mandhra	4.48	7.4	Nil
2.	Mandhra	3.2	7.5	Nil
3.	Mandhra	3.2	7.6	Nil
4.	Mandhra	4.48	7.5	Nil
5.	Mandhra	1.53	7.7	Nil
6.	Mandhra	1.53	7.8	Nil
7.	Mandhra	3.2	7.65	Nil
8.	Mandhra	2.88	7.7	Nil
9.	Mandhra	4.64	7.5	Nil
10.	Girsal	1.28	7.65	Nil
11.	Girsal	4.16	7.5	Nil
12.	Girsal	3.52	7.6	Nil
13.	Girsal	1.6	7.65	Nil
14.	Girsal	0.388	7.8	6.192
15.	Girsal	1.088	7.7	Nil
16.	Girsal	0.96	7.8	Nil
17.	Girsal	1.76	7.6	Nil
18.	Kotjai	1.088	7.8	Nil
19.	Kotjai	2.528	7.6	Nil
20.	Kotjai	0.384	7.5	Nil
21.	Kotjai	0.864	8.6	1.376
22.	Lar	0.16	8.0	2.752
23.	Shorkot	3.2	7.6	Nil
24.	Shorkot	0.576	8.2	2.752
25.	Shorkot	0.80	8.4	1.37
26.	Shorkot	0.928	7.8	6.88
27.	Shorkot	0.192	8.4	4.816
28.	Khokar	4.8	7.6	Nil
29.	Khokar	0.416	7.8	Nil
30.	Khokar	0.192	8.8	5.504
31.	Khokar	0.144	7.9	9.632
32.	Rakh Bibi	2.4	7.7	Nil
33.	Shala	3.2	7.6	Nil
34.	Lunda Sharif	1.024	7.6	Nil
35.	Qayyum Nagar	1.92	7.7	Nil
36.	Qaim Shah	1.28	7.7	Nil
37.	Sheikh Yousaf	2.88	7.6	Nil
38.	Paharpur	0.864	7.7	Nil
39.	Paharpur	0.928	7.8	Nil
40.	Paharpur	2.88	7.7	Nil
41.	Paharpur	0.16	7.9	4.816
42.	Jara	0.288	8.1	2.752
43.	Jara	0.528	7.9	4.816
44.	Jara	0.704	8.7	3.44
45.	Ramak	3.0	7.7	Nil
46.	Ramak	0.16	8.0	9.00
47.	Ramak	5.44	7.5	Nil
48.	Ramak	0.896	7.8	Nil
49.	Ramak	2.72	7.5	Nil
50.	Kathgarh	0.48	7.9	Nil
51.	Kathgarh	0.512	9.2	5.504
52.	Kathgarh	0.192	8.5	1.376
53.	Zindani	0.288	8.0	2.064
54.	Zindani	0.192	7.9	6.192
55.	Zindani	0.488	8.0	8.944
56.	Kurai	0.57	7.7	Nil
57.	Kurai	0.57	7.7	Nil
58.	Kurai	5.44	7.6	Nil
59.	Kurai	1.216	7.4	0.688
60.	Paroa	1.6	7.8	Nil
61.	Paroa	1.216	7.7	Nil
62.	Paroa	0.992	7.9	Nil
63.	Paroa	0.448	7.9	Nil
64.	Paroa	1.024	7.6	Nil
65.	Muryali	1.632	7.5	Nil
66.	Muryali	1.632	7.7	Nil

These soil samples fall under various categories of salt affected soils as described below:

1. Saline Soils: S.No. 1-13, 15-20, 23,28, 29, 32-40, 45, 47-50, 56-58, 60-63, 65-66 = 45.
2. Saline-Sodic Soils: S.No. 14, 21, 24-26, 42-44, 51, 53, 55, 59 = 12.
3. Sodic Soils: S.No. 22, 27, 30, 31, 41, 46, 52, 54, 64 = 9.

Among the total samples of 66, forty five samples were found to be saline, twelve were saline-sodic and nine were sodic soils. All the soil samples collected from Mandhra area were saline in nature and the total soluble salts ranged from 1.53 to 4.64 per cent, and pH was 7.4 to 7.8 Girsal soils were also saline except one sample which was saline-sodic in nature. Two samples out of six collected from Kot-Jai area were found to be saline-sodic and sodic soils. The others were saline in nature.

Shorkot soils were found to be saline-sodic (3 samples), saline (one sample) and sodic (one sample). Three samples from Khokar were saline in nature and two were sodic soils. All the samples from Rakh Bibi area were saline. One sample out of four collected from Paharpur area was sodic, the remaining as saline. Jara soils were found to be saline-sodic in nature.

All the soil samples from Paroa and Ramak were saline in nature except one sample which was sodic. Zindani samples were saline-sodic and sodic.

RECOMMENDATIONS

The following reclamation measures are suggested for the various categories of above mentioned soils.

Saline Soils. These soils contain excessive water soluble salts which are required to be leached down below the root zone for normal crop production. The magnitude of salt contents vary from low to very high. Divide the area into one kanal plots surrounded by strong bunds. Apply about 6"-8" irrigation water which should be of good quality. As soon as the land comes in 'wattar' condition, plow it up and apply a second dose of 4"-6" irrigation water. In all, 3 irrigations should be applied with intermittent plowing so as to leach down the salts to lower strata. If the reclamation is to start from February or March, then sow Dhinch and burry it as green manure at least 20 days before sowing rice crop. After rice, grow Taramira (Oil seed), Barley or Berseem crop. This rotation may be followed from 2 to 3 years depending on the extent of salt content and then the normal cropping pattern may be followed. If the reclamation is to be started in Rabi season then after 3 irrigations as suggested above, the land may be sown with any of the above mentioned crops.

Saline-Sodic Soils. These soils not only contain excessive water soluble salts but are also infested with high exchangeable sodium. In order to reclaim these soils the

prescribed quantity of gypsum per acre (Table 1) should be applied and mixed with the soil thoroughly before applying 3 initial irrigations. In few cases very high quantity of gypsum is required and it may not be very economical to invest that much money on a large area. It is, therefore, suggested that the total area to be reclaimed should be handled in batches according to availability of water and funds. The gypsum is available at Agriculture Research Station, D.I. Khan. The cropping pattern as suggested under item Saline Soils may be followed.

Sodic Soils. The soils contain low quantity of water soluble salts but contain excessive amounts of exchangeable sodium. These soils like category saline sodic soils need the required quantity of gypsum in order to neutralize the effect of toxic sodium. Broadcast the required quantity of gypsum as given in Table 1 and mix it thoroughly with soil. Apply 3 irrigations and follow the instructions as suggested for Saline Soils.

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