

SOIL FERTILITY STATUS OF GUDAMALANI TALUKA OF BARMER DISTRICT OF RAJASTHAN

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Abstract: Within a soil, nutrient variability exists depending upon the hydrological properties of the soil and cropping system. In the present study 53 soil samples were collected from 9 gram panchayats and were analysed. The soil samples were collected from Pearlmillet-Cumin cropping sequence. Analysis of soil samples revealed that 100 per cent soil samples were deficient in available nitrogen and organic matter content, while all samples were medium range in P and K, respectively. Among the micronutrients tested copper and manganese were in sufficient range while iron and zinc were deficient in soil.

Keywords: Soil fertility, Nitrogen, Phosphorus, Organic matter, Micronutrients, Analysis

INTRODUCTION

The soil fertility is one of the important factors controlling yields of the crops. Soil characterization in relation to fertility status of soil of an area is an important aspect for sustainable agriculture production. Due to use of imbalanced and inadequate fertilizers, the response of chemical fertilizer has declined tremendously under intensive agriculture. Recent diagnostic survey indicates that in many areas, farmers use higher than recommended dose of fertilizers, especially nitrogenous fertilizer to maintain the crop productivity at optimum levels attained earlier. This is an indication of decline in factor productivity. Under irrigated ecosystem, nutrient replenishment through fertilizers and manures remain far below than the crop removal, thus causing the mining of native nutrient reserves. As a result, the deficiencies are so intense and severe that visual symptoms are often observed in major crops. The crop productivity is becoming stagnant and therefore in order to give a boost, use of balanced inorganic fertilizers, organic source of nutrients such as farm yard manure, compost, green manure, crop residue incorporation, use of industrial waste and bio-fertilizer has become inevitable. However, variation in the nutrients supply is a natural phenomenon and varies at different locations depending upon the hydrological properties of the soil and the cropping system followed in that area. Hence, different locations require different management practices to sustain crop productivity and for this, complete information about the nutrient status is important. Therefore, the present study was undertaken to assess the nutrient status of soils of Barmer district of Rajasthan.

MATERIALS AND METHODS

The district Barmer is located between 24⁰58' to 26⁰32'N Latitudes and 70⁰05' to 72⁰52' E Longitudes.

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It is surrounded by district Jaisalmer in north, Pali and Jodhpur in east, Pakistan border in west and Jalore in south. The height from sea level 277 m., the study area covers Gudamalani Tehsil of Barmer district. Soil samples of 0-15cm depth were collected from 53 sites covering 9 gram panchayats. Collected soil samples were air dried under shade, crushed gently with a wooden roller and passed through 2.0 mm sieve to obtain a uniform representative sample. Samples were properly labeled with the aluminum tag and stored in polythene bags for analysis. The processed soil samples were analyzed by standard methods for pH and electrical conductivity (1:2 soil water suspensions), organic carbon (Walkley and Black, 1934), available nitrogen (Subbiah and Asija, 1956), available phosphorus (Olsen *et al.*, 1954), available potassium (Jackson, 1973), available sulphure (0.15 % CaCl₂) and available micronutrients (Fe, Mn, Zn and Cu) after extracted by diethylene triamine penta acetic acid (DTPA) solution (0.005M) DTPA + 0.01M CaCl₂ + 0.1M triethanolamine, pH 7.3 as outlined by Lindsay and Norvell (1978).

RESULTS AND DISCUSSION

The soil samples were collected from the villages where pearlmillet-cumin cropping system was followed. Farmers usually apply N @ 80-100 kg ha⁻¹ along with P @ 40-50 kg ha⁻¹ and K @ 30 kg ha⁻¹. Zinc application was done by 85 per cent the farmers and compost application was done by 45 per cent of farmers, while green manuring was practiced by 2 per cent farmers and bio fertilizers use was not prevalent. 84 per cent of the farmers reported increase in fertilizers use to harvest same amount of crop.

Chemical Properties

It was observed that soil pH varied from 8.3 to 9.71 with an average of 9.06. According to classification of soil reaction, all samples were alkaline. The minimum value of pH 8.3 was observed in Chhotu

and Maximum value of pH 9.71 was observed in Devro ki dhani (Table 1). The relatively high pH of soils might be due to the presence of high degree of base saturation. The electrical conductivity of the soil varied from 0.43 to 0.91 dSm⁻¹ with an average of 0.64 dSm⁻¹.

Organic Matter Content

The organic carbon content of the soil varied from 0.19 to 0.25 per cent. The organic carbon content was low (<0.50%) in soil samples (Table1). High temperature and more tillage practice in the soil increases the rate of oxidation of organic matter resulting reduction of organic carbon content.

Available N, P, K and S Content

The available N content varied from 166.33 to 192.62 kg ha⁻¹ with an average value of 180.46 kg ha⁻¹. All soil samples were found to be low (<250 N kg ha⁻¹) in available N. Recommendation of 90 kg N/ha to pearly millet and 30 kg N/ha cumin has been suggested to the farmers along with application of organic material and green manuring because most of the soil nitrogen is in organic form. The available P content varied from 15.57 to 18.38 P₂O₅ kg ha⁻¹ with a mean value of 17.25 P₂O₅ kg ha⁻¹. All soil samples were found to be medium (12.5 to 25 P₂O₅ kg ha⁻¹) category of available phosphorus. In soil more than 50 per cent of phosphorous is present in organic

form, so maintenance of soil organic matter by application of organic materials has been suggested to farmers. The status of available K in the soil ranged from 232.88 to 250.33 K₂O kg ha⁻¹ with an average value of 240.69 K₂O kg ha⁻¹. All samples were medium (125 to 250 K₂O kg ha⁻¹) in K content (Table1). The available S content varied from 8.13 to 8.28 mg kg⁻¹ with a mean value of 8.20 mg kg⁻¹. All soil samples were found to be low (<10 mg kg⁻¹) category of available sulphur.

Micronutrients

The DTPA extractable copper in the surface soil (0-15cm) of 9 gram panchayat varied from 0.24 to 30 mg kg⁻¹ soil. All the observed values were well above the critical limit of 0.20 mg kg⁻¹. Iron content varied from 2.61 to 2.76 mg kg⁻¹ and the critical limit for iron is 4.5 mg kg⁻¹ soil. The DTPA- extractable manganese in surface soil of 9 gram panchayat was found to be sufficient in available manganese and varied from 3.17 to 3.59 mg kg⁻¹ while the critical limit of available manganese in soil is 2.0 mg kg⁻¹. The available Zn in surface soil (0-15 cm) ranged from 0.31 to 40 mg kg⁻¹. According to critical limit 0.6 mg kg⁻¹, all the surface soil samples were deficient in available Zn content (Table 2). Hence application of Mn as zinc sulphate @ 20-25 kg/ha as basal dose has been recommended to the farmers.

Table 1. Soil properties (weighted mean) of Barmer district of Rajasthan.

Sr.No.	Name of village	No of samples collected	EC (dSm ⁻¹)	pH	OC	Available N (kg ha ⁻¹)	Available P ₂ O ₅ (kg ha ⁻¹)	Available K ₂ O (kg ha ⁻¹)	Available S (mg kg ⁻¹)
1.	Chhotu	4	0.91	8.30	0.25	174.35	17.51	236.85	8.14
2.	Nokhara	10	0.84	8.70	0.22	183.37	15.57	243.37	8.17
3.	Bhedana	8	0.71	8.82	0.24	175.55	17.06	242.00	8.14
4.	Malpura	8	0.52	8.58	0.24	166.33	16.92	232.88	8.17
5.	Mithi Beri	5	0.64	8.91	0.24	184.30	17.83	238.52	8.13
6.	Ratnasar	5	0.71	9.54	0.21	192.62	18.06	237.08	8.27
7.	Dhandhalavas	5	0.45	9.66	0.22	181.46	15.64	245.20	8.28
8.	Devro ki Dhani	4	0.43	9.71	0.24	186.03	18.38	250.33	8.26
9.	Ranasar Khurd	4	0.52	9.30	0.19	180.15	18.28	240.00	8.25
Mean		53	0.64	9.06	0.23	180.46	17.25	240.69	8.20

Table 2. DTPA- extractable micronutrients (Cu, Fe, Mn and Zn) status of soil in district Barmer.

Sr.No.	Name of village	No of samples collected	Cu (mg kg ⁻¹)	Fe (mg kg ⁻¹)	Mn (mg kg ⁻¹)	Zn (mg kg ⁻¹)
1.	Chhotu	4	0.28	2.71	3.21	0.31
2.	Nokhara	10	0.24	2.62	3.23	0.34
3.	Bhedana	8	0.25	2.63	3.20	0.36
4.	Malpura	8	0.28	2.66	3.23	0.34
5.	Mithi Beri	5	0.26	2.67	3.17	0.36
6.	Ratnasar	5	0.26	2.61	3.23	0.37
7.	Dhandhalavas	5	0.30	2.72	3.39	0.34
8.	Devro ki Dhani	4	0.27	2.76	3.59	0.40
9.	Ranasar Khurd	4	0.25	2.73	3.41	0.37
Mean		53	0.26	2.68	3.29	0.35

CONCLUSION

The study of soil samples revealed that the soil of Gudamalani Tehsil of Barmer District did not follow a particular pattern due to variation in management practices. Nutrient status regarding to the available macro and micro nutrient in surface soil indicated that soils are low in available nitrogen and sulphure and medium in available phosphorus and potassium. Soils were deficient in micronutrient such as zinc and iron, slightly saline to alkaline in reaction and low to medium in organic carbon content.

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