Soil Fertility Status of Rampur District of Uttar Pradesh

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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 209 soil samples were collected from 21 gram panchayats and were analysed. The soil samples were collected from rice-wheat cropping sequence. Analysis of soil samples revealed that 82 per cent samples were medium in organic matter content, 100 per cent soil samples were deficient in available nitrogen, while 92 per cent P and 100 per cent K samples were in medium range respectively. Among the micronutrients tested copper and iron were in sufficient range while manganese and zinc were deficient in soil.

Key Words: 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 Rampur district of Uttar Pradesh.

MATERIALS AND METHODS

The district Rampur is located between 79°05' E and latitude 28°48' N. It is surrounded by district Udham Singh Nagar in north, Bareilly in east, Moradabad in west and Badaun in south. The height from sea level is 190.2 m. in north and 166.4 m. in south. The study area covers Milak Tehsil of Rampur district. Soil samples of 0-15 cm depth were collected from 209 sites covering 21 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

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Asija, 1956), available phosphorus (Olsen *et al,*1954), available potassium (Jackson, 1973) and available micronutrients (Fe, Mn, Zn and Cu) after extracted by diethylene triamine penta acetic acid (DTPA) solution (0.005M) DTPA + 0.01M $CaCl_2$ +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 rice-wheat cropping system was followed. Farmers usually apply N @ 150-200 kg ha^{-1} along with P @ 40-50 kg ha^{-1} and K @ 40 kg ha^{-1}. Zinc application in rice was done by all the farmers and compost application was done by 45 per cent of farmers, while green manuring was practiced by 12 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 7.2 to 8.2 with an average of 7.8. According to classification of soil reaction, 23 samples were normal (7.2 to 7.3), 49 samples were mildly alkaline (pH 7.4 to 7.8) and 123 samples were moderately alkaline (7.9 to 8.2). The minimum value of pH 7.2 was observed in Durgapur and Maximum value of pH 8.2 was observed in Nangla Udai, Nipanya and Kamrudeen Nagar villages (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 0.190to 0.545dSm^{-1}.

Organic Matter Content

The organic carbon content of the soil varied from 3.4 to 6.8 g kg^{-1} soil. The organic carbon content was low (<0.50%) in 1.8 %, medium (0.5 to 0.75%) in 82 % 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 and K Content

The available N content varied from 155.58 to 252.79 kg ha^{-1} with an average value of 220.09

Table 1: Soil properties (weighted mean) of Rampur district of Uttar Pradesh.

Sr.No.	Name of village	No of samples collected	pH	EC (dSm^{-1})	OC (g kg^{-1})	Available N (kg ha^{-1})	Available P$_2$O$_5$ (kg ha^{-1})	Available K$_2$O (kg ha^{-1})
1	Duganpur	15	7.2	0.357	5.6	190.46	28.16	187.39
2	Narkhera	7	7.9	0.376	5.4	217.92	32.86	198.04
3	Naglaudai	6	8.2	0.388	6.8	252.79	42.84	237.90
4	Nankar	15	8.0	0.215	5.2	207.76	45.31	238.26
5	Pagamberpur	13	7.9	0.366	6.4	245.34	35.40	223.12
6	Brijpur	12	7.8	0.416	5.3	216.16	31.16	205.98
7	Sayeednagar	15	8.0	0.436	6.3	240.42	40.83	241.52
8	Nipanya	8	8.2	0.241	5.5	221.09	38.88	178.10
9	Jadopur	15	8.0	0.290	6.6	232.60	43.87	220.62
10	Kamrudeen Nagar	15	8.2	0.396	6.6	247.88	51.61	263.70
11	Shankarpur	10	7.8	0.340	4.8	207.21	27.34	200.76
12	Niyamatnagar	15	8.0	0.339	4.5	189.80	34.80	171.69
13	Maghhra Brijpur	6	7.8	0.421	3.4	155.58	25.09	168.51
14	Maghhra	11	7.9	0.455	6.5	248.36	40.78	198.10
15	Dhamora	8	7.4	0.292	5.5	223.25	29.79	220.27
16	Haraiya	8	7.3	0.190	5.7	222.90	39.98	218.06
17	Himmatganj	5	8.1	0.257	6.2	234.45	36.25	267.60
18	Imratpur	5	8.0	0.424	5.1	209.15	40.23	226.2
19	Kamora	7	7.8	0.374	6.3	243.07	46.21	207.30
20	Daniyapur	6	7.4	0.545	5.4	213.54	38.33	193.93
21	Mankara	7	7.6	0.440	4.6	202.17	27.7	209.67
		Mean	7.8	0.359	5.6	220.09	37.02	213.22

kg ha^{-1}. All soil samples were found to be low (<250 N kg ha^{-1}) in available N. Recommendation of 150 kg N/ha each to rice and wheat 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 25.09 to 51.61 P$_2$O$_5$ kg ha^{-1} with a mean value of 37.02 P$_2$O$_5$ kg ha^{-1}. Ninty two per cent soil samples were found to be in medium (20 to 50 P$_2$O$_5$ kg ha^{-1}) and 8 per cent in high (>50 P$_2$O$_5$ 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 168.5 to 267.6 K$_2$O kg ha^{-1} with an average value of 213.2 K$_2$O kg ha^{-1}. All samples were medium (125 to 300 K$_2$O kg ha^{-1}) in K content (Table1).

Micronutrients

The DTPA extractable copper in the surface soil (0-15cm) of 21 gram panchayat varied from 0.265 to 2.422 mg kg^{-1} soil. All the observed values were well above the critical limit of 0.20 mg kg^{-1}. Iron content varied from 3.212 to 16.925 mg kg^{-1} and the critical limit for iron is 4.5 mg kg^{-1} soil. The DTPA- extractable manganese in surface soil of 12 gram panchayat was found to be deficient in available manganese and varied from 1.701 to 8.351 mg kg^{-1} while the critical limit of available manganese in soil is 1.0 mg kg^{-1}.Hence application of Mn as manganese sulphate @ 5kg/ha as basal dose has been recommended to the farmers.

The available Zn in surface soil (0-15 cm) ranged from 0.423 to 1.923mg kg^{-1} . According to critical limit 0.6 mg kg^{-1}, all the surface soil samples with the exception of Sayeednagar, Dhamora and Daniyapur villages, were sufficient in available Zn content (Table 2).

CONCLUSION

The study of soil samples revealed that the soil of Milak Tehsil of Rampur 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 medium in available phosphorus and potassium. Soils were deficient in micronutrient

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

S.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	Duganpur	15	0.835	16.925	3.550	1.562
2	Narkhera	7	0.854	10.783	2.669	1.631
3	Naglaudai	6	0.265	8.536	3.526	0.820
4	Nankar	15	0.871	13.645	5.524	1.702
5	Pagamberpur	13	0.932	6.155	3.139	1.923
6	Brijpur	12	0.879	6.235	4.153	0.824
7	Sayeednagar	15	0.753	8.572	5.501	0.534
8	Nipanya	8	1.027	3.212	1.926	0.774
9	Jadopur	15	1.321	4.810	2.961	0.831
10	Kamrudeen Nagar	15	2.422	5.639	2.255	1.639
11	Shankarpur	10	2.033	8.211	3.997	1.314
12	Niyamatnagar	15	1.712	4.839	3.217	0.673
13	Maghhra Brijpur	6	0.873	7.620	2.843	0.645
14	Maghhra	11	1.373	3.739	1.701	0.756
15	Dhamora	8	1.223	11.269	5.191	0.423
16	Haraiya	8	0.620	6.383	2.667	0.854
17	Himmatganj	5	1.531	4.035	5.160	0.605
18	Imratpur	5	1.168	4.544	4.617	0.885
19	Kamora	7	0.913	5.619	2.957	1.079
20	Daniyapur	6	0.793	4.985	2.562	0.585
21	Mankara	7	2.041	10.592	8.351	1.735
		Range	**0.265-2.422**	**3.212-16.925**	**1.701-8.351**	**0.423-1.923**

such as zinc and manganese, normal to slightly alkaline in reaction and low to medium in organic carbon content.

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