

Assessment of nutrient Status of Soils of Katepurna and Kurankhed Blocks of Central Demonstration Farm, Wani-Rambhapur

S. S. Hadole*, M. V. Bhosale*, G. S. Laharia** and S. D. Jadao***

ABSTRACT: Soils of Katepurna and Kurankhed block of Central Demonstration Farm, Wani-Rambhapur were investigated for their chemical properties and nutrient status of surface soils. The exact position of soils sampling site was determined with the help GPS. All the soils under study were slightly alkaline to moderately alkaline in reaction, EC value for these soils within safe limit. The organic carbon content in these soils is low to medium and soil of farms is moderately calcareous to calcareous due to presence of CaCO_3 . The soils of Katepurna block contain 132.82 to 288.51 kg ha^{-1} available nitrogen, 5.91 to 16.12 kg ha^{-1} available phosphorus and 235.2 to 397.3 kg ha^{-1} available potassium. Kurankhed block contain 125.44 to 288.51 kg ha^{-1} available nitrogen, 6.45 to 18.81 kg ha^{-1} available Phosphorous and 235.2 to 398.2 kg ha^{-1} available potassium. The nutrient index value calculated for soils of Katepurna and Kurankhed block shows that these soils have low NIV for organic carbon, available nitrogen and phosphorus, high NIV for available potassium.

Key words: Fertility status, Nutrient index, Soil fertility map.

Soil is a medium for plant growth and development that leads to crop productivity. Crop productivity depends on many factors and fertility is major amongst all. Soil fertility has direct relation with crop yields, provided other factors are in optimum level. Soil fertility must be periodically estimated as there is continuous removal of macro and micronutrients by crop intensively grown in every crop season. The area of soil science research which is most directly related to agricultural productivity, soil fertility and fertilizer use research and this is also an area where the expectations are high. All researches in soil fertility have one common goal that is to assess nutrient supplying capacity of the soil, deficiencies of nutrient if any and to supply nutrient based on crop needs. Thus, in the game of crop production, there are three dependent and yet interdependent players the soil, the plant and fertilizers, each one of them key players (Goswami, 1999). Indian soils have been developed under different climatic conditions such as semiarid, tropical and sub-tropical and thus vastly differ in their properties. Research work done so far is still inadequate to decide their fertility status. Crop nourishment in any region depends remarkably on

soil nutrient availability and on their profile similarities. All these problems make it necessary to closely analyze the physical and chemical status of agricultural soils, if they are managed for benefits of the individual farmers and of mankind. For this purpose soil survey was carried out which have given an account of anatomy as well as physiology of soil mantle. It is not only helpful to choose correct fertilizer doses but also keep farmers informed about inherent qualities and deficiencies.

MATERIAL AND METHODS

Central Demonstration Farm is a large farm located near the university campus and situated at the bank of Katepurna River & in command area of Katepurna dam. The major strength of CDF is availability of land i.e. 2031.83 ha at one location, with the acquisition of the land from adjoining villages Anwi, Borgaon, Dhaga, Katepurna, Kothari, Kurankhed, Mirzapur, Nipana, Pahadpur, Pailpada, Rajapur, Rambhapur, Sukali, Tamshi, Tankhed, Wani etc. and it is the largest farm of Univesity, from which Katepurna and Kurankhed blocks were selected for the study of fertility status

* & *** Assistant Professor, College of Agriculture, Akola.

** M.Sc Student, SSAC, PGI, Akola.

The, Katepurna Block is located at about 21°5' 10" N latitude and 79° 4' 24" E longitude at elevation of 300 M above the mean sea level and Kurankhed block is located at about 21° 7' 42" N latitude and 79° 4' E longitude at elevation of about 301 M above mean sea level.

Soil samples were collected by Grid method of soil sampling for which Field map of Katepurna and Kurankhed block for sampling having scale 1 cm = 80 m have been used.

The sample grid map is laid out on the map with 0.7 x 0.7 cm scale to divide the field in equal size square blocks of 60 x 60 m on the field. Hence, the whole

Katepurna and Kurankhed block is divided into 43 and 40 intersection areas respectively. These intersection areas are used as sampling sites and samples are collected from each intersection area. The surface soil samples at depth of 0-15 cm were collected for chemical analysis. Then location details (i.e. Latitude, Longitude and Altitude) are recorded with the help of GPS. Then these samples were analysed for pH, Electrical conductivity, (1:2.5 soil water suspension), organic carbon (Walkley and Blacks 1934), available nitrogen (Subbiah and Asija 1956), available phosphorous (Jackson 1973), available potassium (Jackson 1973).

Table 1
Chemical properties of soils of Central Demonstration Farms

(A) Katepurna Block					(B) Kurankhed block				
Grid.No	pH	EC (dSm ⁻¹)	OC(g kg ⁻¹)	CaCO ₃ (%)	Grid.No	pH	EC (dSm ⁻¹)	OC(g kg ⁻¹)	CaCO ₃ (%)
1	8.65	0.16	4.3	11	1	8.18	0.17	4.8	6.5
2	8.32	0.19	4.7	10.87	2	8.32	0.15	4.9	6.12
3	8.38	0.18	4.6	10.25	3	8.21	0.20	4.4	6.25
4	8.34	0.20	4.2	9.73	4	8.14	0.14	4.9	6.62
5	8.3	0.17	4.3	9.87	5	8.39	0.18	4.2	6.87
6	8.09	0.16	4.8	9.62	6	8.17	0.17	3.9	6.62
7	8.17	0.18	4.4	9.25	7	8.06	0.14	3.5	7
8	8.07	0.19	4	9.5	8	8.12	0.21	3.2	7.25
9	8.22	0.20	3.7	9.75	9	8.18	0.18	3.3	6.87
10	8.14	0.18	3.9	10.25	10	8.05	0.23	3	6.12
11	8.18	0.21	3.5	10.62	11	8.13	0.14	3.5	7.62
12	8.16	0.19	3.6	9.87	12	8.05	0.26	3.7	8.12
13	8.05	0.19	3.9	10	13	7.98	0.21	3.9	8.75
14	8.03	0.14	4	10.37	14	7.81	0.20	3.3	8.5
15	8.01	0.25	4.2	10.62	15	8.14	0.19	4	8.25
16	8.04	0.23	4.7	11.12	16	7.87	0.18	4.2	8.62
17	8.02	0.21	4.9	11.5	17	7.93	0.14	4.3	9.25
18	8.08	0.15	4.8	11.87	18	7.99	0.16	4.8	9.12
19	7.79	0.16	4.6	11.62	19	8.27	0.15	4.9	9.87
20	7.75	0.19	4.3	12	20	7.81	0.17	4.7	9.75
21	7.65	0.17	4	12.37	21	7.93	0.16	4.4	8.62
22	7.79	0.18	3.6	12.25	22	8.31	0.14	3.6	10
23	7.93	0.17	3.7	11.77	23	8.23	0.15	4	9.62
24	7.96	0.20	3.3	11.62	24	8.13	0.19	3.9	8.25
25	7.73	0.17	3	10.87	25	8.27	0.17	3	7.62
26	8	0.18	3.2	10.25	26	8.17	0.14	2.8	8
27	7.74	0.17	2.8	9.87	27	8.36	0.20	2.5	7.62
28	8.03	0.19	2.5	9.25	28	8.08	0.21	3.1	7.5
29	8.18	0.14	2.6	9.12	29	8.27	0.19	3.3	6.87
30	8.1	0.18	2.8	9	30	7.93	0.24	2.5	7.25
31	8.19	0.24	2.5	8.75	31	7.98	0.14	2.8	6.62
32	8.07	0.16	2.6	8.5	32	8.06	0.17	4.6	6.5
33	8.24	0.20	3	8.62	33	7.91	0.26	4.9	6.12
34	8.11	0.24	2.8	8.12	34	7.78	0.15	4.3	6.25
35	7.96	0.14	3.3	7.62	35	7.95	0.19	4.6	7.25
36	7.79	0.15	3.7	8	36	7.73	0.17	4.7	6.62
37	7.99	0.18	3.3	8.37	37	7.75	0.18	4.9	8.75
38	8.12	0.17	3.9	7.62	38	7.89	0.21	4.3	9
39	8.07	0.25	4.2	6.62	39	8.26	0.24	3.9	9.87
40	7.98	0.16	4.4	7.25	40	8.07	0.22	4	10
41	7.76	0.14	4	7.37	Range	7.73-8.39	0.14-0.26	2.5-4.9	6.12-10
42	7.95	0.19	4.3	7	Mean	8.07	0.18	3.93	7.81
43	8.37	0.14	4.6	6.87					
Range	7.65-8.65	0.14-0.25	2.5-4.9	6.62-12.37					
Mean	8.05	0.18	3.78	9.75					

RESULTS AND DISCUSSION

Chemical properties of soil

The pH of katepurna block ranges from 7.65 to 8.65 with mean value of 8.05, whereas for Kurankhed block pH ranges from 7.73 to 8.39 with mean 8.07 indicating slightly to moderately alkaline in reaction. Electrical conductivity ranges from 0.14 to 0.25 dSm⁻¹ in Katepurna block. In Kurankhed block it ranges from 0.14 to 0.26. The organic carbon in soils of both Katepurna and Kurankhed block ranges from 2.5 to 4.9 g kg⁻¹. The magnitude of free lime content in farm soils ranges from 6.62 to 12.37 percent in Katepurna block and in Kurankhed block it ranges between 6.12 to 10 percent. It indicates that these soils are moderately calcareous to calcareous in nature.

Table 2
Nutrient status of Katepurna Block

Grid No.	Available N (Kg ha ⁻¹)	Available P (Kg ha ⁻¹)	Available K (Kg ha ⁻¹)
1	150.52	5.91	280
2	163.07	7.52	246.4
3	175.61	13.44	347.4
4	188.16	8.6	336
5	163.07	9.67	302.4
6	200.7	11.82	324.8
7	213.24	12.9	313.6
8	188.16	14.98	257.6
9	175.61	16.12	347.2
10	163.07	9.67	380.8
11	150.52	12.9	392
12	175.61	13.44	386.1
13	165.33	10.21	378.6
14	163.07	9.13	313.6
15	150.52	7.52	280
16	138.52	11.28	302.4
17	137.98	14.51	268.8
18	125.44	15.59	291.2
19	150.52	13.97	324.8
20	137.98	7.52	358.4
21	125.44	9.13	392
22	132.82	8.6	369.6
23	150.52	8.06	397.3
24	163.07	6.45	358.4
25	175.61	13.97	358.4
26	188.16	6.98	392
27	200.7	15.59	268.8
28	210.11	15.05	392
29	213.24	12.36	358.4
30	188.16	6.98	397.3
31	200.17	11.28	369.6
32	225.74	6.98	324.8
33	188.16	8.6	268.8
34	238.33	9.67	302.4
35	250.88	9.13	392
36	231.46	12.9	347.2
37	225.79	13.97	246.4
38	250.88	16.12	347.2
39	263.42	12.9	257.6
40	250.88	15.59	313.6
41	200.17	12.36	336
42	188.16	15.05	235.2
43	175.61	11.82	280
Range	132.2-288.51	5.91-16.12	235.2-397.3

MAJOR AND SECONDARY NUTRIENTS IN SOIL

Available nitrogen

All soils of Katepurna are very low to medium and also Kurankhed block are very low to medium in available nitrogen content. The availability of nitrogen in Katepurna block is 132.82 to 288.51 kg ha⁻¹ and 125.44 to 288.51 kg ha⁻¹ was recorded in Kurankhed block.

All soils of Katepurna and Kurankhed block are found to be deficient in respect of available nitrogen content. As per rating standard soil containing less than 280 kg ha⁻¹ nitrogen per hectare are normally rated as low in available nitrogen content. The soils thus need judicious application of both organic manure and N fertilizers to meet the N requirement of crops grown in them.

Table 3
Nutrient Status of Kurankhed Block

Grid No.	Available N Kg ha ⁻¹	Available P Kg ha ⁻¹	Available K Kg ha ⁻¹
1	163.07	13.97	397.3
2	200.17	13.44	358.4
3	263.42	10.75	378.6
4	288.51	12.36	347.2
5	250.88	10.21	398.2
6	263.42	11.28	380.8
7	238.33	10.75	268.8
8	225.79	12.9	336
9	200.17	6.45	246.4
10	188.16	12.36	268.8
11	150.52	13.44	347.2
12	163.07	6.98	398.2
13	137.98	17.74	358.4
14	200.17	13.97	378.6
15	213.24	8.6	336.1
16	188.16	9.67	369.6
17	150.52	13.44	235.2
18	163.07	13.97	268.8
19	137.98	15.05	246.4
20	125.44	9.13	313.6
21	188.16	16.12	280
22	163.07	15.59	369.6
23	200.17	9.67	347.2
24	225.79	13.44	324.8
25	238.33	11.28	291.2
26	250.88	15.05	369.6
27	263.42	10.21	319.2
28	263.42	15.59	352.2
29	288.51	14.51	347.2
30	250.88	7.52	392
31	263.42	16.12	358.5
32	288.51	11.28	380.8
33	250.88	16.12	336.2
34	238.33	13.44	369
35	225.79	13.97	380.8
36	263.42	9.67	347.2
37	200.17	7.52	280
38	188.16	6.45	268.8
39	213.17	12.36	246.4
40	210.11	9.13	302.4
Range	125.44-288.51	6.45-18.81	235.2-398.2

Available phosphorus

The data on available phosphorus shows that all soils of Katepurna and Kurankhed block are very low to medium in available phosphorus. The available phosphorus ranges from 5.91 to 16.12 kg ha⁻¹ in Katepurna block. In Kurankhed block it ranges from 6.45 to 18.81 kg ha⁻¹.

Available potassium

The data on available potassium reveals that soil of Katepurna and Kurankhed block moderately high to very high in available potassium content. The magnitude of available potassium for Katepurna block soil ranges from 235.2 to 397.3 kg ha⁻¹ and for Kurankhed block it ranges from 235.2 to 398.2 kg ha⁻¹. As per ratings, soils containing available potassium more than 300 kg ha⁻¹ categories as very high in available potassium content. The data on the basis of available potassium content indicates that the soils have no problem of K deficiency. The high potassium content may be attributed to presence to potassium supplying minerals in parent rock of the area. Similar results were also reported by Kashikar (1983); NBSS and LUP (1986) for black soils.

Table 4
Nutrient index of soils of blocks

(A) Katepurna block

Sr. No	Nutrient element	Category (No. of Samples)						NIV
		Very low	Low	Medium	Moderately high	Very High	High	
1	Organic Carbon (%)	0	26	17	0	0	0	1.20 (Low)
2	Available N (kg ha ⁻¹)	5	33	5	0	0	0	1 (Low)
3	Available P(kg ha ⁻¹)	5	29	9	0	0	0	1.04 (Low)
4	Available K (kg ha ⁻¹)	3	9	31	0	0	0	2.82 (Very High)

(B) Kurankhed block

Sr. No	Nutrient element	Category (No. of Samples)						NIV
		Very low	Low	Medium	Moderately high	Very High	High	
1	Organic Carbon (%)	0	21	19	0	0	0	1.23 (Low)
2	Available N (kg ha ⁻¹)	3	32	5	0	0	0	1.02 (Low)
3	Available P(kg ha ⁻¹)	3	27	10	0	0	0	1.08 (Low)
4	Available K (kg ha ⁻¹)	0	0	0	6	5	29	2.78 (Very High)

FERTILITY INDEX

Fertility index for Katepurna and Kurankhed block were prepared by categorizing them into various categories as per six tier system by considering the average value of surface soils of blocks.

The soil nutrient index value of Katepurna block calculated for organic carbon content on soils is 1.20 g kg⁻¹ and for Kurankhed block is 1.23 g kg⁻¹ accordingly the overall soils of are Katepurna and Kurankhed blocks shows the low nutrient index for organic carbon content. As per the six tier classification system of soils for nutrient content the soils of Katepurna and Kurankhed block are classified as very low to medium for available nitrogen, available phosphorus and moderately high to very high for available potassium for both the blocks. The nutrient index calculated for Katepurna block for Available Nitrogen, available phosphorus and available potassium is 1, 1.04 and 2.82 respectively and for Kurankhed block it shows 1.02, 1.08 and 2.78 nutrient index values for available N, P and K respectively. Accordingly the soils of Katepurna block show low nutrient index value for available nitrogen and available phosphorous and very high nutrient index for available potassium. In case of Kurankhed block the low nutrient index for available nitrogen and available phosphorous and very high for available potassium. The soil nutrient index for the soils of Katepurna and Kurankhed block were in category of low fertility status for available nitrogen and available phosphorus and very high with respect to available potassium.

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