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Fertility Mapping of Soils from Hingoli and Sengaon Tahsils of Hingoli District, India

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A B S T R A C T

Studies on "Fertility mapping of soils from Hingoli and Sengaon tahsils of Hingoli district" was carried out to investigate the nutrient status of these soils. From each village five representative soil samples were collected and from each tahsil twenty villages were selected. Hundred samples were collected from each tahsil and total 200 soil samples were collected from Hingoli and Sengaon tahsil. Available N content of Hingoli soils were ranged from 105.62 to 457.85 Kg ha^{-1} with a mean value of 183.04 Kg ha.$^{-1}$ The available phosphorus content in these soils were varied from 5.28 to 20.07 Kg ha^{-1} with a mean value of 10.09 Kg ha^{-1}. The available potassium content varies from 129.70 to 1053.40 Kg ha^{-1} with an average value of 498.59 Kg ha^{-1} K. Soils from Sengaon tahsils varies in available N from 112.88 to 313.60 Kg ha^{-1} with an average value of 216.42 Kg ha^{-1}. Available P content in these soils was ranges from 5.73 to 21.14 Kg ha^{-1} with an average value of 10.81 Kg ha^{-1}. Available K content in these soils was ranges from 206.50 to 910.30 Kg ha^{-1} with an average value of 485.30 Kg ha^{-1}. In secondary nutrients, exchangeable Ca content with an average value of 13.93 Cmol (P^+) kg $^{-1}$ of soil. The data on exch. Mg with an average value of 1.84 Cmol (P^+) kg $^{-1}$ of soil and available sulphur of these soil were ranged from 4.28 to 18.99 mg kg^{-1} with average value of (11.58 mg kg^{-1}) from Hingoli tahsil. Exch. Ca content of Sengaon tahsil soils were varied from 10.41 to 17.32 Cmol (P^+) kg $^{-1}$ of soil with an average value of 14.16 Cmol(P^+)kg $^{-1}$ of soil. The data on exch. Mg and their categorization in Sengaon soils showed that the exch. Mg content of these soils were varied from 0.16 to 5.12 Cmol (P^+) kg $^{-1}$of soil with an average value of 1.62 Cmol(P^+)kg $^{-1}$ of soil. Available sulphur of these soil were ranged from 4.24 to 16.56 mg kg^{-1} with average value of (10.40 mg kg^{-1}).

Introduction

Soils are a vital natural resource whose proper use greatly determines the capabilities of life support system and socio-economic development of people. Being important component of geosphere-biosphere system, Soil provides food, fiber, fodder, and fuel wood for varieties of basic human needs and shelter demand of future.

Therefore, management of soil resource on scientific principles is of prime important (Sarkar *et al.*, 2002). Soil is a natural dynamic body containing mineral matter, organic matter and living forms considered to be store house of nutrients even though their continuous removal by intensive cropping. Among the several factors that influence crop

production potential, soil fertility is fundamental factors. It is the integral part of soil and generally defined as capacity of soil to supply nutrient needed by crop in proper form and which having both direct and indirect effect on plant growth.

Intensive cropping and increased use of fertilizers, though there is increasing production tremendously, resulted in heavy turnover of nutrients from soil. There is a continuous decline in soil fertility and productivity due to exploitation of sol resource base. Imbalanced and indiscriminate use of fertilizers and emergence of micronutrients deficiencies have been identified as most important factors for declining crop productivity (Kanwar and Randhava, 1967) and Puri *et al.,* (2003).

To know the present status of soil and future productivity, it is essential to know the fertility status. Considerable work on physic-chemical properties of Maharastra soils was reported (Bharambe, 2001). Thus, it is necessary to define the areas of deficiency of particular nutrients in a particular areas and crops. Soil test data would be helpful in growing such deficient areas on soil and crop basis. Thus, the details of soil resource thematic maps and using data on various soil properties, focus given on fertility status, hence, present investigation is useful in judging the deficiencies of various nutrients.

Materials and Methods

Available macronutrient content in soils were determined by following methods.

Available nitrogen

Available nitrogen was determined by alkaline potassium permanganate method as suggested by (Subbiah and Asija, 1956).

Available phosphorus

The Available phosphorus was determined by Olsen's method using 0.5 M sodium bicarbonate (P^H 8.5) as an extracting reagent as described by (Chopra and Kanwar,1976).

Available potassium

The Available potassium was determined by soil treated with neutral normal ammonium acetate and the potassium in extract was determined by emission spectroscopy by flame photometer (Jackson,1967).

Exchangeable Ca and Mg

Exchangeable Ca and Mg was determined by using ammonium acetate extractant of soil by EDTA Versenate Method (Jackson, 1973)

Available Sulphur

The available sulphur was determined by using Turbidi metric method by using 1:5 soil and extractant 0.15 % $CaCl_2$ solution on spectrophoto meter at 340 nm wavelength (William and Seinberes, 1969).

Results and Discussion

Status of Available N, P, and K in soils

The N, P and K are the key nutrient, which are required for plant metabolism. Due to imbalance supply of faulty management practices there is decrease in availability of these nutrients. Hence wide spread deficiency or unavailability of nutrients in soils of Hingoli and Sengaon tahsils undertaking for study.

The data on status of N, P and K and their categorization in soils of Hingoli tahsil showed in above table that the available N content of these soils were ranged from

105.62 to 457.85 Kg ha^{-1} with a mean value of 183.04 Kg $ha^{-1.}$ The lowest N content (105.62 Kg ha^{-1}) was observed in soils of Sakhara village whereas the highest N content (457.85 Kg ha^{-1}) were recorded in soils of Bhankheda (Sample No. A96). Out of 20 villages the lowest range 118.15 to 187.80 Kg ha^{-1} with an average value of 153.81 Kg ha^{-1} were recorded in Chaundi village while highest range 106.60 to 457.85 Kg ha^{-1} with a mean value of 211.95 Kg ha^{-1} was observed in Bhankheda. Out of 100 soil samples, 94 percent in low (<250 Kg ha^{-1}) and 6 percent medium (250 to 500 Kg ha^{-1}) in available N content.

The available phosphorus content in these soils were varied from 5.28 to 20.07 Kg ha^{-1} with a mean value of 10.09 Kg ha^{-1}. The lowest P (5.28 Kg ha^{-1}) content was observed in Sakhara village (Sample No. A9), while highest P (20.07 Kg ha^{-1}) was recorded in village Pimparilinga (Sample No. A55). These results clearly showed that the soils of Hingoli tahsil were low to medium in P content. The large range may be due to variation in soil properties and their high P fixing capacity, which prevents to come into readily available form in soil solution. These results were confirmity with Patil and Sonar, (1994) and Puri, (2009).

The available potassium contents in these soils were ranged from 129.70 to 1053.40 Kg ha^{-1} with an average value of 498.59 Kg ha^{-1} K. The lowest value of K was recorded in soils of Ghordari while highest value of K content was recorded in Suki village. Among twenty villages the lowest range in K content were ranges from 129.70 to 493.70 Kg ha^{-1} with an average value of 311.52 Kg ha^{-1} in village Ghordari while highest range 409.10 to 989.40 Kg ha^{-1} with an average value of 678.18 Kg ha^{-1} K were observed in Sakhara village. Out of 100 samples 3, 17 and 80 percent samples were categorized in low (< 150 Kg ha^{-1}), medium (150 to 300 Kg ha^{-1}) and high (> 300 Kg ha^{-1}) in K content respectively.

Status of available N, P and K of Sengaon tahsil soils

Available N content of these soils were varied from 112.88 to 313.60 Kg ha^{-1} with an average value of 216.42 Kg ha^{-1}. The lowest available N content was recorded in village Bhankheda. While, highest content of N was observed in village Warudkazi. Further, data indicate that the lowest range of 118.15 to 187.80 Kg ha^{-1} with a mean value of 153.81 Kg ha^{-1} was observed in Chaundi village whereas, highest range 106.60 to 457.85 Kg ha^{-1} were recorded with an average value of 211.95 Kg ha^{-1} in N content of these soils. Among twenty villages all villages were low in N content. Out of 100 soil samples 93 percent samples were low and 7 percent medium in available N content.

The available P content in these soils were ranges from 5.73 to 21.14 Kg ha^{-1} with an average value of 10.81 Kg ha^{-1}. The lowest P content was recorded in village Pimparilinga whereas, highest P content was recorded in village Borada. The lowest range 5.73 to 9.58 Kg ha^{-1} in available P content with a mean value of 7.66 Kg ha^{-1} were recorded in Pimparilinga village while highest range 10.57 to 21.14 Kg ha^{-1} with an average value of 15.62 Kg ha^{-1} were recorded in soils of Borala village. Among 20 villages, 10 villages were low and 10 villages which were medium in P content. Out of 100 soil samples 55 percent in low, and 45 per cent sample was categorized under medium content of available P.

The available K content in these soils were ranges from 206.50 to 910.30 Kg ha^{-1} with an average value of 485.30 Kg ha^{-1}. The lowest value of K content was recorded in village

Bhankheda whereas, highest value of K content was observed in soils of Ganeshpur village. The lowest range 206.50 to 520.80 Kg ha^{-1} K with mean value of 372.86 Kg ha^{-1} was recorded in Bhankheda village, while highest range 471.80 to 910.30 Kg ha^{-1} was observed in soils of Ganeshpur village. Out of Twenty villages, 13 villages viz., Bhankheda (372.86 Kg ha^{-1}), Chaundi (469.72 Kg ha^{-1}), Goregaon (406.22 Kg ha^{-1}), Gondala (406.96 Kg ha^{-1}), Ghordari (412.56 Kg ha^{-1}), Kendre (495.74 Kg ha^{-1}), Mhalsi (430.42 Kg ha^{-1}), Veltura (448.82 Kg ha^{-1}), Pimpaldari(452.00 Kg ha^{-1}), Vadhivra (479.84 Kg ha^{-1}) Sukli (493.18 Kg ha^{-1}), Waghjali (399.50 Kg ha^{-1}) and Warudkazi (459.86 Kg ha^{-1}) were categorized in medium K content and remaining villages were categorized under high content of K.

Status of exchangeable Ca, Mg and available Sulphur of Hingoli tahsil soils

Exch.Ca content of these soils were varied from 11.24 to 19.60 Cmol(P^+)kg^{-1} of soil with an average value of 13.93 Cmol(P^+)kg^{-1} of soil. The lowest available Ca content was recorded in village Sukli (Sample no.HQ1) While, highest content of Ca was observed in village Ajegaon (Soil sample No.HB2). Further, data indicate that the lowest range of 12.08 to 13.28 Cmol (P^+) kg^{-1} of soil with a mean value of 12.82 Cmol(P^+)/kg of soil observed in Hingoli village whereas, highest range 13.12 to 19.60 Cmol (P^+) kg^{-1} of soil recorded with an average value of 14.95 Cmol(P^+)/kg of soil content of these soils. Out of 100 soil samples 91 per cent samples were low and 9 per cent medium in available Ca content. These value indicated that Ca content in the Hingoli soils were low to medium.

From above result, it was inferred that high calcium because of presence of $CaCO_3$ which dominant source of calcium in soil and it liberate when mineral disintegrate and decompose. Mahapatra and Shahu (1996) reported that exchangable Ca^{++} varied from 1.07 to 29.6 Cmol(P^+)$kg^{-1.}$ Similar results were observed by More *et al.,* (2002).

The data on exch. Mg and their categorization in Hingoli soils showed in revealed that the exch. Mg content of these soils were varied from 0.16 to 6.32 Cmol(P^+)kg^{-1} of soil with an average value of 1.84 Cmol(P^+)kg^{-1} of soil. The lowest available Mg content was recorded in village Kalkondi (sample no.HK5). While, highest content of Mg was observed in village Takli (sample no.HT3). Further, data indicate that the lowest range of 0.64 to 1.60 Cmol(P^+)kg^{-1} of soil with a mean value of 1.28 Cmol(P^+)kg^{-1} of soil observed in Karanjali village whereas, highest range 0.80 to 5.44 Cmol(P^+)$kg^{-1}$of soil recorded with an average value of 2.92 Cmol(P^+)kg^{-1} of soil of these soils. Out of 100 soil samples, 87 per cent samples were low, 10 percent medium and 3 per cent were low in available Mg content (Fig 5). Mahapatra and shahu,(1996) reported that exch. Mg^+ varied from 0.66 to 30.1 Cmol(p^+)$kg.^{-1}$ Similar results quoted by More *et al.,* (2002).

Available Sulphur of these soil were ranged from 4.28 to 18.99 mg kg^{-1} with average value of (11.58 mg kg^{-1}). The lowest value (4.28 mg kg^{-1}) of S content was recorded in village Mauja, (sample no. A68) where as highest value of S was recorded in soils of Digraj village. The lowest range 4.72 to 12.81 mg kg^{-1} with mean value of 9.03 mg kg^{-1} were recorded in Boralwadi village while highest range 11.31 to 17.50 mg kg^{-1} with an average value of 14.44 mg kg^{-1} were observed in Ghota village in available S content in these soils of Hingoli tahsil.

Status of exch. Ca, Mg and available S of Sengaon tahsil soils

Exch. Ca content of these soils were varied from 10.41 to 17.32 Cmol(P^+)kg^{-1} of soil with

an average value of 14.16 Cmol(P^+)kg^{-1} of soil. The lowest exch.Ca content was recorded in village Goregaon (sample no.SI2). While, highest content of Ca was observed in village Ajegaon (sample no.SB1). Further, data indicated that the lowest range of 10.41 to 15.12 Cmol(P^+)kg^{-1} of soil with a mean value of 13.29 Cmol(P^+)kg^{-1} of soil observed in Bhankheda village whereas, highest range 12.80 to 17.32 Cmol(P^+)kg^{-1} of soil recorded with an average value of 14.85 Cmol(P^+)kg^{-1} of soil content of these soils. Among twenty villages, maximum villages were low in Ca content. Out of 100 soil samples indicated that Ca content in the Sengaon soils were low to medium. From above result, it was inferred that high calcium because of presence of $CaCO_3$ which dominant source of calcium in soil and it liberate when mineral disintegrate and decompose. The data on exch. Mg and their categorization in Sengaon soils showed in table 15 revealed that the exch. Mg content of these soils were varied from 0.16 to 5.12 Cmol(P^+)$kg^{-1}$of soil with an average value of 1.62 Cmol(P^+)kg^{-1} of soil. The lowest available Mg content was recorded in village Mhalshi (Sample no.SK1). While, highest content of Mg was observed in village Ghordari (sample no.SG4).Among twenty villages, maximum villages were low in Mg content.

Table.1 Status of available N,P and K in soils of Hingoli tahsil from Hingoli distrct

Sr. No.	Sample No.	N ($Kg\ ha^{-1}$)	P ($Kg\ ha^{-1}$)	K ($Kg\ ha^{-1}$)
1	HA1	185.45	12.00	311.10
2	HA2	126.78	9.84	381.20
3	HA3	180.45	15.90	237.40
4	HA4	194.43	11.91	403.70
5	HA5	240.60	10.03	341.50
6	HB1	214.24	8.96	139.00
7	HB2	244.60	11.51	493.40
8	HB3	195.22	7.43	894.30
9	HB4	165.20	11.91	367.80
10	HB5	147.34	8.06	797.90
11	HC1	158.45	10.43	471.80
12	HC2	457.85	9.58	424.90
13	HC3	210.10	8.96	335.80
14	HC4	126.78	6.98	813.60
15	HC5	106.60	6.76	308.20
16	HD1	187.80	9.40	385.40
17	HD2	154.66	10.57	287.50
18	HD3	142.28	9.77	645.00
19	HD4	166.20	12.00	367.80
20	HD5	118.15	6.09	273.60
21	HE1	380.40	19.26	368.90
22	HE2	125.40	7.51	558.00
23	HE3	185.72	6.63	242.30
24	HE4	106.68	7.17	526.10
25	HE5	188.42	17.20	669.30
26	HF1	179.90	8.51	652.70
27	HF2	178.75	9.04	337.00

28	HF3	191.20	6.89	486.40
29	HF4	174.39	17.90	451.60
30	HF5	142.12	9.98	571.20
31	HG1	129.64	5.82	296.50
32	HG2	196.42	14.51	1076.20
33	HG3	212.24	11.52	543.90
34	HG4	208.12	10.03	343.70
35	HG5	190.45	12.18	1486.90
36	HH1	219.42	8.96	316.20
37	HH2	176.38	6.23	129.70
38	HH3	144.28	7.57	493.70
39	HH4	195.56	10.00	168.80
40	HH5	212.44	7.97	449.20
41	HI1	210.79	11.24	506.80
42	HI2	238.33	14.24	349.80
43	HI3	181.88	11.64	446.60
44	HI4	150.98	8.24	282.70
45	HI5	225.78	16.93	588.50
46	HJ1	215.24	12.45	589.40
47	HJ2	175.32	10.57	438.30
48	HJ3	112.89	6.89	496.60
49	HJ4	210.11	9.22	416.00
50	HJ5	210.43	9.13	296.30
51	HK1	241.47	13.97	494.30
52	HK2	156.18	7.97	288.60
53	HK3	144.26	6.06	349..8
54	HK4	215.12	6.89	626.70
55	HK5	133.76	7.43	756.60
57	HL2	135.68	8.24	651.50

58	HL3	173.38	7.70	281.00
59	HL4	192.14	13.44	253.10
60	HL5	150.52	8.24	423.10
61	HM1	144.32	7.43	401.80
62	HM2	187.85	6.63	609.10
63	HM3	128.08	10.03	200.50
64	HM4	180.42	9.63	304.80
65	HM5	166.25	10.30	694.40
66	HN1	238.33	5.28	512.10
67	HN2	105.62	7.16	409.10
68	HN3	290.51	15.59	864.50
69	HN4	140.82	11.91	615.80
70	HN5	195.88	17.90	989.40
71	HO1	168.75	11.37	210.30
72	HO2	270.52	12.27	329.60
73	HO3	174.5	6.90	636.20
74	HO4	158.24	9.67	485.10
75	HO5	172.48	10.43	388.30
76	HP1	177.52	10.04	283.30
77	HP2	128.30	6.89	228.70
78	HP3	180.32	11.46	494.70
79	HP4	195.84	11.91	396.50
80	HP5	182.45	11.10	456.40
81	HQ1	213.24	11.82	261.50
82	HQ2	125.78	7.30	510.50
83	HQ3	235.20	12.72	445.80
84	HQ4	260.28	15.85	390.80
85	HQ5	213.24	5.56	1053.40
86	HR1	166.20	8.37	250.30

87	HR2	125.74	6.36	671.10
88	HR3	189.28	11.11	401.80
89	HR4	194.43	6.09	225.70
90	HR5	166.22	14.51	376.80
91	HS1	191.29	10.57	800.40
92	HS2	187.85	9.31	693.40
93	HS3	146.28	7.43	737.20
94	HS4	123.30	6.72	367.50
95	HS5	153.82	7.88	385.40
96	HT1	185.45	14.16	275.10
97	HT2	188.00	12.19	348.60
98	HT3	193.36	11.20	270.00
99	HT4	124.12	9.13	670.60
100	HT5	215.88	12.27	580.80
Mean		**183.10**	**10.20**	**463.45**

Table.2 N, P, and K status of Sengaon tahsil soils

Sr.No.	Sample No.	N (Kg ha^{-1})	P (Kg ha^{-1})	K (Kg ha^{-1})
1	SA1	188.10	14.11	629.80
2	SA2	132.68	8.51	787.60
3	SA3	165.80	6.89	424.10
4	SA4	154.18	8.24	445.20
5	SA5	140.02	7.88	256.90
6	SB1	216.38	7.97	906.80
7	SB2	205.16	7.61	550.80
8	SB3	185.02	9.22	446.80
9	SB4	222.65	11.37	270.70
10	SB5	310.40	7.52	550.50
11	SC1	150.54	8.15	450.80
12	SC2	256.60	14.15	253.40
13	SC3	112.88	10.57	520.80
14	SC4	182.75	7.62	432.80
15	SC5	191.83	6.09	206.50
16	SD1	206.97	16.93	337.60
17	SD2	197.00	9.36	605.20
18	SD3	219.52	14.78	507.60
19	SD4	191.29	18.45	426.40

20	SD5	142.62	10.12	471.80
21	SE1	263.42	12.45	366.50
22	SE2	205.10	10.93	509.20
23	SE3	194.48	12.18	325.80
24	SE4	200.70	7.17	233.00
25	SE5	184.65	11.64	596.60
26	SF1	238.18	16.57	277.20
27	SF2	206.10	6.98	375.80
28	SF3	200.70	10.03	635.80
29	SF4	156.75	13.97	325.80
30	SF5	242.80	12.85	420.20
31	SG1	163.20	9.04	910.30
32	SG2	170.85	15.05	650.30
33	SG3	144.25	7.52	475.20
34	SG4	159.93	8.96	628.50
35	SG5	181.88	6.45	171.80
36	SH1	124.30	9.14	378.50
37	SH2	176.15	9.58	268.30
38	SH3	163.84	15.41	562.40
39	SH4	198.65	13.96	327.80
40	SH5	172.82	16.53	430.20
41	SI1	188.16	13.88	420.00
42	SI2	175.88	9.67	270.40
43	SI3	192.12	7.16	734.00
44	SI4	191.29	9.76	737.20
45	SI5	169.52	6.45	317.10
46	SJ1	232.40	13.44	275.30
47	SJ2	185.02	10.57	737.20
48	SJ3	238.33	14.78	430.20
49	SJ4	313.60	21.14	712.90
50	SJ5	181.88	18.18	509.60
51	SK1	193.50	8.37	475.20
52	SK2	203.84	18.90	320.70
53	SK3	210.11	14.24	596.40
54	SK4	191.29	12.81	350.70
55	SK5	178.20	11.91	409.10
56	SL1	190.22	9.58	328.60
57	SL2	185.30	5.73	224.10
58	SL3	178.75	6.36	409.10
59	SL4	194.43	7.70	705.30
60	SL5	198.60	8.96	592.90

61	SM1	222.65	19.89	460.50
62	SM2	200.70	8.10	305.90
63	SM3	166.20	7.97	457.90
64	SM4	168.20	10.16	534.40
65	SM5	263.42	11.71	485.40
66	SN1	203.84	8.96	627.20
67	SN2	242.75	7.88	817.80
68	SN3	240.20	8.37	575.80
69	SN4	238.33	16.12	214.80
70	SN5	194.43	7.70	540.30
71	SO1	202.10	12.32	345.80
72	SO2	199.42	9.76	662.30
73	SO3	263.42	6.36	611.80
74	SO4	182.30	7.52	394.30
75	SO5	194.43	6.90	385.00
76	SP1	208.90	9.67	437.30
77	SP2	141.12	9.40	644.30
78	SP3	188.22	14.87	717.80
79	SP4	194.43	6.99	817.80
80	SP5	175.70	16.48	391.90
81	SQ1	182.48	9.31	510.20
82	SQ2	191.29	11.64	605.70
83	SQ3	165.60	14.69	220.60
84	SQ4	216.45	13.52	757.00
85	SQ5	170.24	10.93	372.40
86	SR1	241.47	8.37	415.30
87	SR2	197.56	7.16	220.30
88	SR3	214.38	11.12	637.80
89	SR4	188.72	7.61	315.40
90	SR5	435.90	12.09	408.70
91	SS1	222.65	10.03	509.60
92	SS2	248.40	7.03	306.30
93	SS3	172.10	8.96	366.20
94	SS4	185.30	7.70	720.80
95	SS5	291.52	12.00	528.80
96	ST1	178.75	13.61	625.60
97	ST2	275.96	12.36	437.40
98	ST3	140.34	6.45	602.40
99	ST4	205.10	6.98	395.20
100	ST5	313.60	21.13	238.70
Mean		**216.42**	**10.81**	**485.3**

Table.3 Exchangable Ca, Mg and available S status of soils

Sr. No.	Sample No.	Ca Cmol (P^+) kg^{-1}	Mg Cmol (P^+) kg^{-1}	S mg kg^{-1}
1	HA1	12.88	2.40	08.80
2	HA2	13.60	0.80	5.74
3	HA3	14.00	5.44	12.84
4	HA4	13.04	1.28	13.99
5	HA5	13.36	4.72	9.20
6	HB1	14.00	1.76	11.73
7	HB2	19.60	5.12	8.50
8	HB3	14.08	2.00	4.72
9	HB4	13.96	1.32	7.42
10	HB5	13.12	1.76	12.81
11	HC1	14.24	1.12	7.36
12	HC2	16.00	0.88	13.61
13	HC3	13.84	4.80	11.63
14	HC4	14.08	1.60	8.07
15	HC5	13.76	1.76	11.97
16	HD1	11.24	6.32	6.70
17	HD2	15.36	1.44	12.88
18	HD3	14.72	2.16	9.38
19	HD4	14.24	1.48	7.05
20	HD5	14.72	1.20	10.55
21	HE1	14.32	1.68	11.31
22	HE2	17.20	1.24	17.22
23	HE3	16.24	0.56	14.09
24	HE4	12.80	1.28	12.08
25	HE5	14.00	2.48	17.50
26	HF1	12.08	1.36	14.965

27	HF2	13.76	2.88	12.631
28	HF3	13.52	0.88	14.930
29	HF4	14.32	0.88	4.28
30	HF5	13.60	2.00	7.81
31	HG1	12.40	2.72	11.97
32	HG2	14.60	1.20	9.12
33	HG3	18.00	0.89	7.26
34	HG4	13.64	1.48	14.06
35	HG5	10.28	2.24	16.21
36	HH1	12.92	1.56	12.56
37	HH2	13.28	0.80	15.97
38	HH3	12.80	2.56	12.46
39	HH4	12.08	0.87	11.45
40	HH5	15.04	1.00	11.18
41	HI1	12.48	1.28	14.79
42	HI2	11.36	1.44	8.65
43	HI3	14.56	1.12	11.73
44	HI4	17.48	1.24	6.84
45	HI5	13.64	1.88	9.02
46	HJ1	12.00	0.96	9.32
47	HJ2	13.92	2.24	7.63
48	HJ3	14.88	1.28	11.80
49	HJ4	12.04	2.96	12.67
50	HJ5	15.12	0.56	15.83
51	HK1	14.16	1.76	11.94
52	HK2	14.24	1.68	10.06
53	HK3	13.52	1.50	11.11
54	HK4	16.16	1.60	16.31
55	HK5	13.76	0.16	5.92

56	HL1	14.56	3.12	12.40
57	HL2	14.88	1.60	14.72
58	HL3	13.36	2.72	8.70
59	HL4	15.60	1.76	10.22
60	HL5	12.96	1.60	11.25
61	HM1	18.40	1.76	14.40
62	HM2	13.76	1.76	9.65
63	HM3	15.12	1.84	13.12
64	HM4	13.36	2.48	11.11
65	HM5	10.76	1.12	14.40
66	HN1	14.48	1.44	7.10
67	HN2	14.64	2.88	11.49
68	HN3	13.68	1.76	11.97
69	HN4	17.08	1.60	7.46
70	HN5	13.44	1.84	14.65
71	HO1	14.08	1.36	9.79
72	HO2	12.24	2.32	12.50
73	HO3	13.48	1.72	7.84
74	HO4	14.96	0.88	13.26
75	HO5	12.32	2.64	12.36
76	HP1	13.00	2.64	4.88
77	HP2	12.84	1.60	11.11
78	HP3	15.52	0.72	6.00
79	HP4	13.60	1.48	11.00
80	HP5	12.92	1.24	12.29
81	HQ1	11.24	2.16	10.72
82	HQ2	13.76	1.84	14.06
83	HQ3	14.82	2.70	18.99
84	HQ4	15.28	3.20	13.78

85	HQ5	13.62	1.92	12.80
86	HR1	14.88	0.64	13.75
87	HR2	11.24	1.60	12.98
88	HR3	13.52	1.44	9.25
89	HR4	13.60	1.16	6.98
90	HR5	12.48	1.56	14.75
91	HS1	15.04	0.89	14.93
92	HS2	13.92	1.68	9.02
93	HS3	16.36	1.68	9.20
94	HS4	13.76	0.85	13.19
95	HS5	13.32	1.80	13.81
96	HT1	13.88	1.08	11.73
97	HT2	14.00	1.54	14.93
98	HT3	14.48	6.32	11.73
99	HT4	13.84	1.96	5.62
100	HT5	14.68	0.36	11.01
	mean	**13.93**	**1.84**	**11.58**

Table.4 Exchangable Ca, Mg, and available S status of soils

Sr.No.	**Sample No.**	**Ca Cmol(P^+)kg^{-1}**	**Mg Cmol(P^+)kg^{-1}**	**Avail. S (mg kg^{-1})**
1	SA1	12.50	1.00	12.43
2	SA2	13.92	1.44	10.83
3	SA3	15.00	1.92	6.87
4	SA4	14.80	1.12	10.65
5	SA5	15.04	0.88	13.95
6	SB1	17.32	1.04	9.38
7	SB2	12.80	1.92	9.61
8	SB3	14.96	1.92	12.84
9	SB4	14.80	1.28	15.90

10	SB5	14.40	2.72	12.59
11	SC1	13.00	2.68	9.44
12	SC2	14.72	1.48	12.04
13	SC3	13.80	2.00	8.50
14	SC4	15.60	1.68	11.97
15	SC5	14.44	1.48	12.91
16	SD1	15.12	1.68	7.60
17	SD2	13.68	1.92	11.00
18	SD3	14.40	2.16	9.75
19	SD4	10.41	1.52	13.12
20	SD5	12.88	2.24	9.86
21	SE1	13.12	2.32	5.74
22	SE2	14.16	1.28	7.12
23	SE3	15.00	1.84	11.14
24	SE4	13.28	1.76	6.50
25	SE5	12.44	1.66	12.22
26	SF1	14.48	2.00	7.25
27	SF2	12.48	3.52	8.10
28	SF3	14.60	1.88	11.04
29	SF4	15.04	0.92	6.20
30	SF5	13.96	2.68	12.84
31	SG1	13.12	1.68	8.61
32	SG2	11.68	0.96	7.98
33	SG3	14.36	0.96	12.11
34	SG4	13.96	5.12	16.56
35	SG5	14.88	0.48	14.16
36	SH1	16.92	2.12	10.93
37	SH2	14.16	1.36	11.18
38	SH3	12.00	3.28	13.71
39	SH4	14.12	1.32	11.80
40	SH5	16.00	1.28	14.46

41	SI1	13.04	2.20	7.35
42	SI2	14.83	0.41	4.76
43	SI3	12.80	0.20	8.20
44	SI4	13.56	1.76	12.77
45	SI5	11.72	1.64	9.58
46	SJ1	14.37	1.37	7.35
47	SJ2	12.88	2.80	13.61
48	SJ3	15.28	2.32	8.24
49	SJ4	13.92	1.76	8.90
50	SJ5	14.96	1.92	7.80
51	SK1	14.88	0.16	5.72
52	SK2	15.64	1.64	8.68
53	SK3	11.56	1.32	5.79
54	SK4	13.84	0.52	4.24
55	SK5	14.08	1.64	9.36
56	SL1	11.36	2.00	7.40
57	SL2	16.88	0.64	5.70
58	SL3	13.28	2.00	11.98
59	SL4	14.36	1.60	9.65
60	SL5	16.16	3.08	14.53
61	SM1	14.00	1.68	11.80
62	SM2	14.56	1.84	10.13
63	SM3	13.00	1.28	4.65
64	SM4	18.36	1.52	12.53
65	SM5	14.60	1.48	8.61
66	SN1	13.04	2.40	13.47
67	SN2	16.40	1.68	8.88
68	SN3	13.36	1.84	10.06
69	SN4	14.72	0.64	14.75
70	SN5	19.16	1.72	9.82
71	SO1	14.08	1.56	10.65

72	SO2	13.48	1.64	8.60
73	SO3	14.44	1.04	9.30
74	SO4	11.28	1.44	11.49
75	SO5	13.92	1.96	11.52
76	SP1	14.92	1.76	8.40
77	SP2	14.12	1.24	13.57
78	SP3	12.48	1.96	4.74
79	SP4	11.96	1.60	12.32
80	SP5	15.04	1.44	9.47
81	SQ1	14.20	2.28	11.28
82	SQ2	14.64	0.52	9.30
83	SQ3	12.28	1.92	12.18
84	SQ4	13.84	1.52	12.63
85	SQ5	15.08	0.40	7.22
86	SR1	14.84	0.52	13.68
87	SR2	12.48	1.36	11.66
88	SR3	14.88	0.96	12.43
89	SR4	15.04	1.28	9.30
90	SR5	18.84	1.64	12.15
91	ss1	14.88	1.36	7.77
92	SS2	13.76	1.44	12.22
93	SS3	10.40	1.48	9.75
94	SS4	13.48	0.40	7.60
95	SS5	14.08	1.56	13.85
96	ST1	18.48	1.36	10.48
97	ST2	12.56	2.16	7.84
98	ST3	13.60	1.92	6.79
99	ST4	13.90	1.76	8.88
100	ST5	16.50	1.52	14.13
	MEAN	14.10	1.63	10.40

Available Sulphur of these soil were ranged from 4.24 to 16.56 mg kg^{-1} with average value of (10.40 mg kg^{-1}). The lowest value (4.24 mg kg^{-1}) of S content was recorded in village Kalkondi, where as highest value of S was recorded in soils of Deulgaon village. The lowest range 4.24 to 9.36 mg kg^{-1} with mean value of 6.75 mg kg^{-1} were recorded in Kalkondi village while highest range 10.93 to 14.46 mg kg^{-1} with an average value of 12.41 mg kg^{-1} were observed in Hingoli in available S content.

In conclusion, in all, from Hingoli tahsil 94 per cent soils were low and 6 per cent were placed in medium category in available N content whereas 92 per cent were low and 8 per cent were medium in availabl N content from Sengaon tahsil The Soils from Hingoli and Sengaon tahsil were found 54 per cent low and 46 per cent medium whereas from Sengaon 52 per cent in low and 48 per cent found in medium available P content. The available K content from Hingoli tahsil, 80 per cent soils were high, 17 per cent were medium K content and from Sengaon 88 per cent soils were high in K content.

The exch. Calcium and Magnesium in soils of Hingoli and Sengaon were varied from 10.28 to 19.60 Cmol(P^+) kg^{-1} of soil and 10.19 to 19.16 Cmol(P^+) kg^{-1} of soil respectively. The soils from Hingoli and Sengaon tahsil were found high category in calcium content and low in magnesium. In case of available Sulphur, 67 per cent and 83 per cent were deficient in Hingoli and Sengaon tahsils, respectively. According to concept of "soil nutrient index", the status of available N and P are low to medium whereas K are high in soils of Hingoli and Sengaon tahsils. The exch. Ca is high and Mg is low in these soil whereas these soils are deficient in S content. Thus, it can be concluded that soils of Hingoli and Sengaon tahsil are low to medium in fertility status.

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