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Major and Micro Nutrients Status in Soils of Kaij Tahsil from Beed District, Maharashtra (India)

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ABSTRACT

The soil samples were collected during summer season of kaij tahsil from Beed district of Maharashtra as which was known for drought and whole district suffer from that .Green revolution has greatly increased food production in Kaij tahsil but continuous use of high doses of fertilizers and high yielding crop varieties have led to depletion of natural soil nutrients and soil fertility. There were about 25 soil samples collected from five different villages and analysed for the basic soil parameters like PH,EC,OC and CaCO3. The major nutrients N, P and K also the micronutrients like Cu, Mn, Fe and Zn by using atomic absorption spectrophotometer. Soils were light brown to black in colour excessive to poorly drained ,acidic to alkaline in soil reaction, medium to high n organic carbon, non calcareous to calcareous in nature and within range in EC suitable for germination. Low in N and P where as high in K. Sufficient in available DTPA-Cu and DTPA-Mn and deficient in available DTPA-Fe and DTPA-Zn.

Keywards : Major, micro nutrients, N, P,K, KAIJ.

I. INTRODUCTION

Agriculture in India is mainstay of nation and well known country at global level in farming. Agricultural practices by Indian farmers before the green revolution was environment friendly. Environment was affected by every human activity fortunately; today there is an increasing awareness about the close relationship between economic development and environmental management. Environment and food stuff is very important issue for all countries. Like human beings plants also require air, water, sunlight and different foods. We are concerned the last mentioned atom *viz*. Foods which are mainly supplied by the soil and contain vitally important nutrients required by plants. A good soil may contain as many as hundred separate mineral compounds which act as ultimate food. Management

of soil resources on scientific principle is essential to maintain the present level of soil productivity and prevent soil degradation [1]. In the [present years increasing emphasis has been on characterization for land evaluation .This call for comprehensive knowledge on soil resources in terms of soil type, their spatial extent, their physical chemical properties and limitations of capabilities, remote sensing technology has merged as a powerful tool for studying soil resources because it helps in studying in soil in spatial domain in time and cost effective manner [2]. The assessment of soil fertility is of prime importance in saving soil from nutrient deficiencies to increase crop production and to maintain the present level of soil productivity and meet the demand of future, management of soil resource on scientific principles is very important [3].

Marathwada is one of the regions of Maharashtra state of India was known for drought. Beed is one of the district contributing major share of kharif and rabbi harvest with production of cotton, cane sugar, wheat, bajra, pulses. Soil resources information and use of fertilizers planning options are useful to this area, keeping this mind, the present investigation was taken to characterise the soil of this district using analysis method of soil parameters and also used for achieving sustainable crop production.

II. MATERIALS AND METHODS

The study was conducted at Beed district is located at west side of Aurangabad division. It is 18 ^{0} 28 ' North altitude and 75^{0} 54'to 76^{0} 57' East latitude it is surrounded by Aurangabad and Jalna in the North, Parbhani and Latur in the East , Ahemadnager and Osmanabad in the South . covering about 10615.3 Sq. Km. and it is 3.44% of Maharashtra state. The district receive rain from east monsoon and the time is the second week of June and end the rainy season of September. The average annual rain fall ranges from 450-800 mm .,the temperature ranges minimum 10^{0}C and maximum reaches up to 40^{0}C to 45^{0} C in summer ,but this district known for draught affected by climate changes. The major and micro nutrients govern the soil fertility and control the yield of crops. The soil fertility of an area or region is an important aspect in context of sustainable agricultural production, particularly for drought region where copping depends on rain water. Most of the farmers having very less land to cultivate resulting very less crop yield.

In order to study random surface soil samples from depth of 0.20 cm. Were collected from different five villages of Kaij tahsil. From each village five samples were collected as per standard procedure of soil sampling (Screw Agar Process). About 25 representative soil samples were collected From each selected location. Thus about 500gm soil samples was collected in polythene bags and brought to laboratory, thoroughly mixed, dried in shadow, grinded with porcelain mortar and pestle and passed through 2 mm Sieve for general analysis ,for organic carbon and for micro nutrients soil passed through muslin cloth. The sieved soil samples were stored with proper labeling for further analysis. All the precautions were followed in the estimation of micronutrients, particularly A.R. grade chemicals, uncontaminated glassware's, use of double distilled water as outlined by Jackson(1973) were scrupulously followed in order to avoid contamination. These samples were analysed for important physico-chemical properties by following standard methods.

Soil site:

The 25 representative surface soil samples were collected from the Kaij tahsil *viz*; Lavhuri, Pirachiwadi, Chincholi mali, Dongaon and Bhopla selected randomly . Generally vegetation from that area was cotton, bajra, jawar, wheat and soyabean.

The pH and EC of soil were estimated by soil suspension (1:2.5) using pH meter by method of Jackson[3], organic carbon(OC) by method of Walkley and Black (Wet oxidation method)[4], $CaCO_3$ outlined by Piper[5], available N by Subbiah

and Asija [6],available P_2O_5 estimated by olsen et.al.[7] , available K_2O in soil by using flame photometer[3] and micronutrients were obtained by DTPA-method with the help of atomic absorption (AAS) method described by Lindsay the help of atomic absorption (AAS) method described by Lindsay and Norvell [8].

III. RESULT AND DISCUSSION

The important and relevant soil characteristics are presented in table 1. The pH values of soils from Kaij tahsil Varied from 6.3 to 7.8 with pooled mean 7.1 from the samples lowest value of pH was observed in soil collected from Pirachivadi and the highest value observed from Chincholi mali village. Out of 25 soil samples 32% were alkaline, 48% samples were neutral and the 20% samples were acidic in reaction. This may be because of formation of these soils from basaltic parent material on the basis of Muhr *et.al.*[9]. About EC the soils were varied from values 0.07dSm^{-1} to 8.12 dSm^{-1} with mean value of 0.44 dSm^{-1}. The 96% of soil samples were found within safe limit only 4% soil samples were found unsafe for seed germination. The organic carbon content of soils was varied from the values 0.18 per cent to 1.10 per cent with a mean value of 0.62 per cent among the soil samples 16% samples showed low OC ,60% medium where as 24% were high in OC . The calcium carbonate content of soils varied from values2.8 to 8.5 per cent with a mean value of 4.8 per cent indicated soils were non calcareous in nature. About 56% soil samples were found non calcareous in nature and 44% soils were found calcareous in nature. It may be due to the nature of parent material from which these soils were formed. In the absence of sufficient natural drainage as in water lodged soils and without a proper leaching and drainage program to remove salts, this would lead to high salinity and reduced crop yields in the long run . Low level of $CaCO_3$ enhance soil structure and are generally beneficial to crop production but at higher concentration they may induce iron deficiency and when cemented limit the water storage capacity of soil.

IV. AVAILABLE MAJOR NUTRIENTS

The available major nutrients N, P and K in soils from Kaij tahsil region are presented in table no. 1 . From the data available nitrogen was found to be varied from the values 37 kg ha^{-1} to 220 kg ha^{-1} with mean value of 125.0 kg ha^{-1} . Out of 25 soil samples all the soil samples that is 100% soils were found low in N content. The OC content in these soil samples rated low to medium this also reflects on the poor availability of N status in these soils Age[10], Malewar *et al.*[11] also reported the lower content organic matter in these soils has been attributed to high temperature and good aeration in these soils increased the rate of oxidation of organic matter resulting in the reduction of soil organic carbon content[12,13].The low content is due to poor vegetation and high rate of organic matter decomposition under hyper thermic temperature regime leads to extremely high oxidizing condition. The available phosphorus in soil ranged from values 2.34kg ha^{-1} to 13.61 kg ha^{-1} with a mean value of 529.82 kg ha^{-1}. All the 25 soil samples were observed low in available phosphorus content. This may be due to lower doses of P fertilizers, fixation of phosphorus on clay minerals or $CaCO_3$ surfaces with time elapsed between fertilizer application and crop uptake. The available potassium content in soil varied from values 222.85 kg ha^{-1} to 1524 kg ha^{-1} with a mean value of 529.82 kg ha^{-1}. From all the 25 soil samples 100% soils were found high in available K content. This indicate that these soils of Kaij tahsil have K rich clay minerals like Illite (K,H30)(Al,Mg,Fe)2(Si,Al)40 10 [(OH)2,H20)] and Kaolinite Al2Si2o5(OH)4.

V. AVAILABLE MICRO NUTRIENTS

The status of available micronutrients ie. DTPA-extractable Cu, Fe, Mn and Zn content in these soil samples were analysed and shows the recorded values as , on the basis of critical limits of available Cu ranges from 2.04ppm to 5.84 ppm with a mean value of 4.10 ppm. From the observation all the 25 soil samples ie. 100% soils were found sufficient in available DTPA-Cu. Copper availability is dependent on soil characteristic it increase in organic matter but decreases with increase in pH and $CaCO_3$ content of soil. DTPA-Fe in the soil samples varied from 2.36 ppm to 6.12ppm with a mean value of 4.09 ppm . The available Fe decreased with significantly with increase in pH and $CaCO_3$ on the basis of critical limits of available Fe, 36% soil samples were sufficient and the 64% soils were found deficient in available DTPA-Fe content. DTPA-Mn in these soil samples ranged from values 2.35 ppm to 5.52 ppm with a mean value of 3.99 ppm . Manganese availability is mostly affected by soil PH , organic matter and soil moisture. On the basis of critical limits of available Mn 100% soil samples were found sufficient. In case of available DTPA-Zn in these soil samples ranged from values 0.10 ppm to 0.36 ppm with a mean value of 0.24 ppm that indicate that all the 25 soil samples ie. 100% soils were found deficient available Zn content. Zn content of soil depends on the parent material, organic matter, the available Zn reduced with increased in pH, OC and $CaCO_3$.

VI. CONCLUSION

It can be concluded from the result under study area that the soil properties like pH ,EC, OC and $CaCO_3$ the main characteristics playing major role in controlling the available of micronutrients . Among the micronutrients the deficiency of Fe was medium and Zn of major concern require application of Zn fertilizers to maximize crop yield .These soils were neutral to alkaline in soil reaction , the salinity was in safe limit, organic carbon content low to high, calcareous to non calcareous in nature. Available nitrogen and phosphorus was very low in content where as very high in potassium content. Hence the soil require attention regarding integrated nutrients management approaches and regular monitoring for soil health for high and healthy, nutritious food productivity and sustainable agriculture.

Table 1: Soil parameters of Kaij tahsil from Beed District

Village	pH	EC (dSm^{-1})	OC (%)	$CaCO_3$ (%)	N ($kgha^{1}$)	P ($kgha^{-1}$)	K ($kgha^{-1}$)	Cu (ppm)	Fe (ppm)	Mn (ppm)	Zn (ppm)
V_1S_1	7.3	0.07	0.57	3.2	114.4	7.03	512.24	4.54	3.73	4.08	0.22
V_1S_2	7.6	0.09	0.27	5.0	56	2.78	720.3	4.23	3.98	3.0	0.32
V_1S_3	7.3	0.1	0.44	2.9	88.5	7.17	385.5	3.06	2.95	4.42	0.24
V_1S_4	7.3	0.1	0.72	4.1	144	4.68	260.87	3.65	6.12	5.01	0.29
V_1S_5	7.4	0.07	0.18	3.9	37	7.17	368.6	2.89	5.01	4.04	0.32
Average	**7.3**	0.08	0.43	3.82	82	5.76	449.50	3.67	4.35	4.11	0.27
Range	7.3-7.6	0.07-0.12	0.18-0.72	2.9-5	37-144	2.78-7.17	260.87-720.30	2.89-4.54	2.95-6.12	3.0-5.01	0.22-0.32
V_2S_1	6.3	0.1	0.18	3.0	112	2.89	345.6	4.82	3.87	5.21	0.31
V_2S_2	6.4	0.08	0.56	3.2	145.1	6.30	264.04	4.26	2.99	3.54	0.36
V_2S_3	6.4	0.1	0.72	2.8	136.6	4.65	448.87	2.85	4.92	3.81	0.33
V_2S_4	7.6	0.09	0.68	6.2	84	3.22	433.59	5.08	3.96	4.16	0.21
V_2S_5	6.4	0.09	0.42	5.0	160	7.03	343.25	5.32	3.29	4.75	0.24

Average	**6.6**	0.092	0.63	4.04	127.6	4.81	367.05	4.46	3.80	4.29	0.29
Range	6.3-7.6	0.08-0.10	0.42-0.80	2.8-6.2	84-160	2.89-7.03	264.04-448.87	2.85-5.32	2.99-4.92	3.81-5.21	0.21-0.36
V_3S_1	7.8	8.12	0.80	8.5	106	8.21	560.82	4.54	3.73	4.08	0.22
V_3S_2	6.6	0.25	0.53	3.0	84.2	11.13	624.19	4.23	3.98	3.0	0.32
V_3S_3	6.9	0.14	0.42	5.6	74	13.61	1524.0	3.06	2.95	4.42	0.24
V_3S_4	6.7	0.13	0.37	4.2	56.7	7.47	1306.4	3.65	6.12	5.01	0.29
V_3S_5	6.8	0.18	0.28	3.2	96	8.05	620.6	2.89	5.01	4.04	0.32
Average	**6.9**	1.76	0.41	4.9	83.38	9.69	927.20	4.34	3.03	3.61	0.17
Range	6.6-7.8	0.13-8.12	0.28-0.53	3-8.5	56.7-106	7.47-13.61	560.82-1524	4.01-5.02	2.36-3.33	2.35-5.23	0.10-0.22
V_4S_1	6.4	0.14	0.48	2.9	220	3.07	516.46	4.30	3.84	4.02	4.26
V_4S_2	7.4	0.16	1.10	3.5	208.2	2.34	222.85	3.85	4.65	2.83	2.85
V_4S_3	6.5	0.12	1.04	3.0	164	5.56	423.52	5.01	3.85	4.20	5.08
V_4S_4	6.6	0.07	0.82	4.8	130.3	3.07	587.22	3.94	5.01	4.14	0.23
V_4S_5	6.5	0.13	0.65	5.0	160	8.20	402.4	5.84	4.89	3.99	0.28
Average	**6.6**	0.12	0.88	3.84	176.5	4.44	430.49	4.58	4.44	3.83	0.24
Range	6.4-7.4	0.07-0.16	0.65-1.10	2.9-5	130.3-220	2.34-8.20	222.85-402.40	3.85-5.84	3.84-5.01	2.83-4.14	0.16-0.29
V_5S_1	7.8	0.13	0.65	8.4	131.1	4.98	592.51	3.56	4.02	3.44	0.24
V_5S_2	7.6	0.17	0.75	6.2	151.2	4.54	645.31	3.02	5.22	3.98	0.20
V_5S_3	7.8	0.12	0.64	8.3	128.6	4.10	403.45	2.04	5.20	3.50	0.21
V_5S_4	7.6	0.14	0.84	6.7	168	2.93	329.52	3.63	4.65	5.52	0.27
V_5S_5	7.7	0.12	0.84	7.9	167.9	4.54	403.45	4.89	5.00	3.99	0.20
Average	**7.7**	**0.13**	0.74	7.5	149.36	4.21	474.84	3.42	4.81	4.08	0.22
Range	7.6 - 7.8	0.12-0.17	0.64-0.84	6.2-8.4	128.6-168	2.93-4.98	329.52-645.31	2.04-4.89	4.02-5.22	3.44-5.52	0.20-0.27

From the table 1 the data revealed that the v stands for village and s stands for the soil sample number viz., v_1s_1,v_1s_2 etc.

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