

Identification Micro and Macro Nutrients in (soil) Land use Planning of Various Farm of Selected District Yavatmal, Maharashtra

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Abstract : The present investigation was carried out for assessment of available macro nutrient and micro nutrient status of soil and their relation with soil chemical properties of various farm of selected district Yavatmal, Maharashtra. Total 75 surface soil samples were collected and analyzed for chemical properties and fertility status of soil. The data revealed that the soils of various talukas farm of district Yavatmal, Maharashtra were moderately alkaline (pH 7.38 to 8.49) in soil having safe electrical conductivity (EC 0.21 to 1.21 dSm⁻¹), low to high in organic carbon content (3.1 to 7.7 g kg⁻¹) and non-calcareous to calcareous (43 to 98 g kg⁻¹) in nature. According to the concept of soil nutrient index values the availability of available N (NIV 1), S (NIV 1.50) and Zn (NIV 1) nutrients was in low range and soils were medium in available P (NIV 1.8) and high in available K (NIV 2.86), DTPA- and DTPA- Cu (NIV 3). Further, the organic carbon content showed positive and significant correlation with available Nitrogen (0.210*), Phosphorus (0.205*), Sulphur (0.218*) as well as micronutrients like, Mn (0.265*) and Zn (0.310*) in the soils of various talukas farm of district Yavatmal, Maharashtra. Thus, deficiencies of N, S and Zn were the soil nutritional constraints identified and according to soil site suitability characteristics, land use planning may be done for production of soybean, Channa, Wheat, Jawari and cotton crops at various farm of selected district Yavatmal, Maharashtra.

Index term: Micro Nutrients, Macronutrients, zinc, sulphur

Introduction : The soil word is derived from Latin word, 'Solum' meaning the earthy material in which plant growth occurs. Soil is the natural material spread in different layers. It differs in physical, chemical and mineralogical characteristics. Soil is result of rocks due to environmental processes: weathering and erosion.

Soil is dynamic material of minerals, organic matter, water, air, bacteria etc. Soil quality varies

Integration of Artificial Intelligence in the Advancement of Science and Engineering July 2024

due to farming, parent material and environmental changes. Soil quality mainly depends on the response of soil to different land use systems and management practices, which may often modify the soil properties and soil productivity. The major and micro nutrients govern the fertility of the soils and control the yield of crops. With the introduction of high yielding crop varieties and intensive agriculture with modern agro-techniques and less use of on farm organic manures, most soils becoming deficient in major and micro nutrients. Such deficiencies of major and micro nutrients affect the growth, yield and nutrition of crops to great extent. Therefore, it is important to know the availability of nutrients in soil as influenced by various factors for the efficient management through external application. Soil fertility evaluation of an area or region is an important aspect in context of sustainable agricultural production. Land is finite natural resource and there is no scope to increase area under cultivation. The food production in India can only be increased by increasing the crop productivity. The higher productivity can only achieved with better information of land and its use. In present dynamic situation accurate, meaningful, current data on land use are essential. Thus, it is necessary to have information on availability of major and micro nutrients of the study area.

Yavatmal district is the region of Western Vidarbha: the part of Maharashtra. In this district and hence in various Taluka region the main crops are cotton, soyabean, jawari, bajari, chana, toor etc. Essential nutrients required for proper growth of plants is supplied by soil. Hence the yield and quality of crop depends on the quality of soil. Various nutrients are supplied to soil from fertilizers. Productivity of crop is increased by use of various chemical fertilizers on large scale, but it is decreasing the quality of soil. So, a comprehensive study was undertaken to know the fertility status of soils of land various talukas farm of district Yavatmal, Maharashtra.

Materials and Methods

25 farms of each village were selected for physico-chemical analysis of soil. Total sixteen talukas situated in Yavatmal district were selected for study. Average value of parameter selected farms of a talukas was reported. The study area comes under assured rainfall zone. Soil samples were collected in the depth of 5-20cm from the surface of soil and were taken in polythene bags. The soil samples were collected in the month of June 2022 from different sampling stations. Sample stations used from selected 'Yavatmal district selected region' are given in following table-1 and named as S1, S2, S3, S4, S5 and S25.

The soil samples were collected and brought to the laboratory for the study of physico-chemical parameters. The standard methods of soil analysis Black(1965P) and Richard(1945) for

**Integration of Artificial Intelligence in the Advancement of
Science and Engineering
July 2024**

particle size distribution, bulk density, maximum water holding capacity, available water capacity, hydraulic conductivity and Piper (1966) for soil pH, electrical conductivity, cation exchange capacity, free calcium carbonate and organic carbon were adopted.

Table No.1 Available nutrient and secondary nutrients in soil of district Yavatmal

Sample	Available nutrient (kg ha ⁻¹)			Secondary nutrients			pH	EC dSm ⁻¹	CaCO ₃ %
	N	P ₂ O ₅	K ₂ O	CaCmol (P+) kg- 1	Mg Cmol(P+) kg-1	S (mg kg-1)			
S-1	133		450.31	24.3	13.01	7.4	7.35	0.463	4.6
S-2	124.3	24.94	493.41	38.5	17.2	7.93	7.44	0.226	1.8
S-3	58.5	30.6	414.33	47.8	13.1	7.9	7.66	0.133	1.6
S-4	80.28	23.29	493.41	35.2	12.6	9.15	7.67	0.23	1.6
S-5	101.7	12.77	331.33	48.9	19.2	4.94	7.29	0.467	1.7
S-6	110.4	16.27	187.73	34.1	13.1	4.71	7.2	0.38	1.6
S-7	102.4	10.82	193.04	31.1	19.3	5.3	7.18	0.296	1.9
S-8	103.3	11.23	202.71	29.2	17.5	5.73	7.56	0.234	1.9
S-9	98.64	10.2	214.3	29.9	18.2	5.12	7.96	0.146	1.7
S-10	101.4	10.75	230.49	24.8	18.6	5.31	7.03	0.3	1.6
S-11	58.5	23.29	493.41	40.2	18.1	5.91	7.18	0.226	1.9
S-12	102.4	16.27	331.33	40.8	15.6	7.63	7.03	0.38	1.1
S-13	101.7	11.23	450.31	29.13	17.1	16.9	7.35	0.234	1.8
S-14	98.64	10.75	493.41	18	6.8	3.03	6.94	0.146	1.7
S-15	124.3	27.21	187.73	19.3	9.1	2.22	7.29	0.133	1.9
S-16	103.3	30.6	202.71	18.4	9.4	11.19	7.2	0.467	1.6
S-17	101.7	12.77	230.49	31.2	16.9	7.12	7.2	0.296	1.7
S-18	101.4	10.82	214.3	23.3	11.9	5.1	7.67	0.234	1.6
S-19	80.28	10.2	331.33	17.8	6.9	5.08	7.2	0.23	1.8
S-20	58.5	10.75	414.33	21.8	13.9	5.71	7.13	0.226	1.2
S-21	58.64	12.77	202.71	31.1	13.1	3.03	7.29	0.146	1.1
S-22	124.3	11.23	193.04	29.9	17.2	5.3	7.21	0.3	1.3

**Integration of Artificial Intelligence in the Advancement of
Science and Engineering
July 2024**

S-23	101.7	16.27	331.33	40.2	18.2	5.73	7.32	0.23	1.4
S-24	110.4	23.29	214.3	38.5	18.1	7.63	7.1	0.234	1.9
S-25	103.3	24.94	187.73	34.1	15.6	4.94	7.16	0.226	1.8

Result and discussion:

The results of study presented in Table 1 indicated that all the soil samples from various farm of district Yavatmal, were moderately alkaline in soil and within safe limit of electrical conductivity . The pH of soil varied from 7.5 to 8.7. Moderately alkaline nature of soil may be due to formation of these soils from basaltic parent material rich in basic cations. Similar findings were reported by Mandal, 1998. Electrical conductivity (EC) of soil varied from 0.11 to 0.24 dSm⁻¹. The organic carbon content varied from 0.8 to 6.9 g kg⁻¹. It indicates that majority of these soils were low to moderately high in organic carbon content. This might be due to increased rate of decomposition of organic matter .The free CaCO₃ content varied from 4.1 to 113 g kg⁻¹ indicating calcareous nature of these soils. The available N was found low to moderate in soils of various farm of district Yavatmal, (28.3 to 78.4 kg ha⁻¹) farm of various farm of district Yavatmal, It may be due low organic matter content of soil as well as rapid loss of applied N in soil . The available P content varied from 10.20 to 30.60 kg ha⁻¹ in soils of various talukas farm of district Yavatmal, was categorized as low to moderate range, the low amount of available P may be due to application of lower doses of P fertilizer, fixation of P on clay minerals or CaCO₃ surfaces with the time elapsed between fertilizer application and crop uptake. All soil samples were found high with respect to available K content which ranged from 187.73 to 493.41 kg ha⁻¹. This may be due to occurrence of potash rich minerals like mica and feldspar in parent material of the soils . The available S was found deficient in all the samples from various talukas farm of district Yavatmal (5.35 to 14.32mg kg⁻¹) farm. The availability of S in soil depends on the combined action of factors like nature of parent material, rain fall, clay and organic matter content in soil . The continued soybean cultivation over a long period for seed production might also be a reason for low available S status. The DTPAextractable micronutrients Cu (17.90 - 38.50 mg kg⁻¹), Fe (0.7 - 7.9 mg kg⁻¹), Mn (6.90 – 19.80 mg kg⁻¹) were found sufficient and Zn (0.5 - 1.5 mg kg⁻¹) was found deficient in soils of various talukas farm of district Yavatmal.

**Integration of Artificial Intelligence in the Advancement of
Science and Engineering
July 2024**

Table 2. Nutrient Index values of various talukas farm of district Yavatmal.

Parameters	Parker index	Remark
Organic Carbon	2.48	High
Available Nitrogen	1.00	Low
Available Phosphorus	1.89	Medium
Available Potassium	2.86	High
Available Sulphur	1.50	Low

Available NIV Category nutrients Nitrogen 1.2 Low Phosphorus 1.8 Medium Potassium 3.0 High Sulphur 1.0 Low Iron 3.0 High Zinc 1.0 Low Manganese 3.0 High Copper 3.0 High Soil nutrient index value : As per the NIV developed by the the nutrient index value for (Table 2) Parkers nutrient index was used to compare the level of soil fertility in the study of various farm of selected district of yavatmal as it is the measure of nutrient supplying capacity of soils. The nutrient index value (NIV) of organic carbon (2.48) and available potassium (2.86) were high in farms of yavatmal. NIV of P was medium (1.89) while N and S were low with values of 1.00 and 1.50 , respectively (Table 2). Pathak (2010) also reported similar results while assessing temporal soil fertility changes in Maharashtra.

The data on soil site suitability characteristics of various blocks of UPRS farm is given in Table 4. On the basis of the analyzed soil properties and the criteria given by NBSS and LUP (1994), the suitability of various crops was determined. The soil site suitability properties of selected district Yavatmal farm observed that these soils were highly suitable for agriculture soil planning and growing crops of soybean, wheat, channa and cotton crops and agriculture production

CONCLUSION :

The study indicated that the soils of Yavatmal district farm slightly alkaline to alkaline in reaction with safe limit of soluble salt content. The OC was medium to high and low in available N. The area showed low to medium in available P and S and high in available K content. The DTPA extractable Zn and Fe was deficient and Mn and Cu were sufficient in the area. The NIV for N and S were low, medium for P and high for K. The results of the study area having potential to identify soil site suitability properties of selected district Yavatmal farm observed that these

Integration of Artificial Intelligence in the Advancement of Science and Engineering July 2024

soils were highly suitable for agriculture planning and growing crops of soybean, wheat, channa and cotton crops and production at various farms of selected districts of Yavatmal.

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**Integration of Artificial Intelligence in the Advancement of
Science and Engineering
July 2024**

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