



**ANALYTICAL STUDY OF AGRICULTURAL SOIL OF PURANDAR TALUKA  
(DISTRICT PUNE, MAHARASHTRA, INDIA). WITH RESPECT TO STATUS OF  
SOME MICRONUTRIENTS**

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***Abstract***

*A study to assess the micronutrient status of agricultural soils of Purander taluka of Pune district was conducted. A total of five sampling stations S1, S2, S3, S4 and S5 were considered, soil samples from farmer's field were collected and analyzed for DTPA extractable micronutrient status. Content of micronutrient was in order of Mn > Cu > Fe > Zn. The DTPA-Mn, Fe, Cu and Zn in soils varied from 7.83 to 1.08, 4.0 to 0.55, 1.2 to 0.43 and 3.80 to 0.88 ppm. Among the micronutrients the deficiency of Fe and Zn are of major concern and soils require application of Zn and Fe fertilizers to maximize the crop yield. Deficiency is however likely to develop with continuous cropping and poor fertilizer management.*

**Key words:** Agriculture Soil, Micronutrients, Atomic absorption spectrophotometer.



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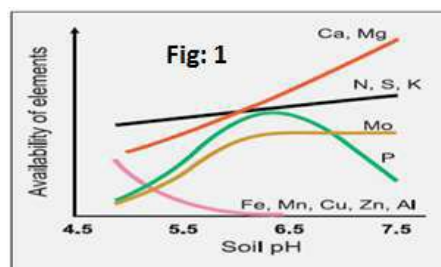
## INTRODUCTION

Soil testing is an essential part of the Environment Impact Assessment (EIA) Studies. The interpretation of soil test values obtained on soil analysis is an important part of the fertilizer recommendations to agricultural crops. The soil test based fertilizer recommendations have been found more appropriate to achieve sustainable crop production as well as to improve soil health.

There are 17 elements considered essential for plant growth. Three of them—C, H and O are supplied by the air and water. Of the remaining 14 elements, N, P, K, Ca, Mg and S are considered macronutrients. Fe, Mn, Zn, Cu, B, Mo, Cl and Ni are recognized as micronutrients. Investigation of micronutrients in soils mostly carried out to explain crop failures and to determine the effect on plant growth of elements, other than those already recognized as essential. Micronutrients are sometimes called minor or trace elements which required in fewer amounts. Without the adequate supply of micronutrients, it is impossible to get maximum benefit from the applied NPK fertilizers.

For this investigation Purander taluka area has selected. The sampling stations of district Pune and taluka Purander are situated between 18°17' and 18°24' north latitudes and 73°5' and 74°9' east longitudes.

Iron (Fe), manganese (Mn), copper (Cu) and zinc (Zn) are essential micronutrients for plant growth. Through their involvement in various enzymes and other physiologically active molecules, these micronutrients are important for gene expression, biosynthesis of proteins, nucleic acids, growth substances, chlorophyll and secondary metabolites, metabolism of carbohydrates and lipids, stress tolerance, etc. The deficiency of essential micronutrient induces abnormal pigmentation, size and shape of plant tissues, reduces leaf photosynthetic rates and leads to various detrimental condition. Specific deficiency symptoms appear on plant parts but discoloration of leaves is most commonly observed.



**Figure 1** is Relationship between soil pH and nutrient availability.

In acidic soils, some nutrients may be insufficiently available for optimal plant growth and aluminium may become toxic. The above chart modified from several sources (National Plant Food Institute, Illinois Agronomy Handbook) shows the relationship of soil pH to nutrient availability.

The optimum range the range of pH is 6.3 to 6.8 for most vegetable plants .The availability of micronutrient also reduces by other nutrient concentration in the soil (**Table 1**).

## **MATERIALS AND METHODS**

This study was designed to determine the status of micronutrients in agriculturally fertile soils of Saswad (S1), Kodit (S2), Veer (S3), Shivari (S4) and Ambale (S5) Villages of Taluka Purander and District Pune, Maharashtra state. Sampling sites were selected for the study during pre-monsoon seasons of 2014. Represented soil samples were collected with wooden tools to avoid any contamination of the soils. Four to six pits were dug for each sample. From each pit sample was collected at a depth 0-30cm. A composite sample of about 1kg was taken through mixing of represented soil sample. All composite samples were dried, ground with wooden mottle and passed through 2mm sieve. After sieving all the samples were packed in the polythene bags for laboratory investigations. Soil quality has been analyst to determine Cu, Fe, Mn & Zn micronutrient for the agricultural suitability following Indian Standard Procedures has been used in District soil water testing laboratory, Amravati, Maharashtra.

### **Determinations of Fe, Mn Cu & Zn:**

The available fractions of iron (Fe), manganese (Mn), zinc (Zn) and copper (Cu) were extracted by DTPA-TEA buffer (0.005 M DTPA+ 0.01 M CaCl<sub>2</sub> + 0.1 M TEA) according to Lindsay and Norvell (1978) and the metals in the extract were determined using an PerkinElmer Analyst 800 atomic absorption Spectrophotometer[3,5,6,11,12,15] given in (Table 1).

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<b>Table No.1</b>	<b>DTPA Extractable Micronutrient Status of Soils of Purander</b>				
<b>Sampling station</b>	<b>Location coordinates</b>	<b>Fe(ppm)</b>	<b>Zn(ppm)</b>	<b>Cu(ppm)</b>	<b>Mn(ppm)</b>
Saswad purandar(S1)	18 <sup>0</sup> 21'N 74 <sup>0</sup> 1'E	3.8	0.43	2.95	6.48
Kodit purandar(S2)	18 <sup>0</sup> 20'N 73 <sup>0</sup> 5'E	2.1	0.83	2.35	1.08
Veer Purandar(S3)	18 <sup>0</sup> 24'N 74 <sup>0</sup> 4'E	2.15	0.5	0.55	5.28
Shivari Purandar(S4)	18 <sup>0</sup> 17'N 74 <sup>0</sup> 4'E	0.95	0.82	3.2	7.83
Ambale Purandar(S5)	18 <sup>0</sup> 24'N 74 <sup>0</sup> 9'E	0.88	1.2	4.0	6.75

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## RESULTS AND DISCUSSION

The minimum and maximum micronutrients values of analyzed soil are given in the **Table 2**. On the basis of micronutrients range rating (table-2) the micronutrients status of soil of selected areas are given below.

**Table No. 2 : The normal values of soil parameters**

Parameter	Unit	Normal Range	Remark
Iron	ppm	Less Than 2.00	Low
		2.01-4.50	Optimum
		More Than 4.50	High
Manganese	ppm	Less Than 1.00	Low
		1.01-2.00	Optimum
		More Than 2.01	High
Zinc	ppm	Less Than 0.50	Low
		0.51 – 1.00	Optimum
		More Than 1.01	High
Copper	ppm	Less Than 0.20	Low
		0.21– 1.00	Optimum
		More Than 1.01	High

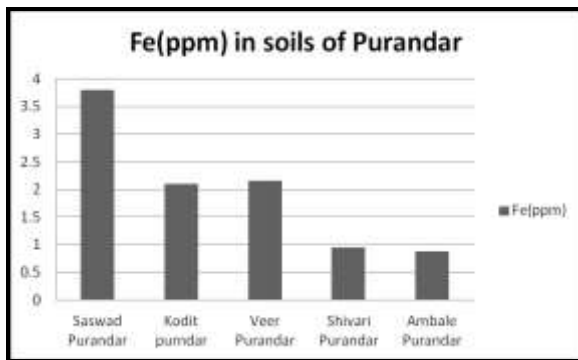
a) **Fe, Zn Cu and Mn in Saswad (S1) Village Soil:** Average Fe, Zn, Cu, & Mn, concentration in soil are found to Fe (iron) 3.8 ppm, Zn (zinc) 0.43ppm, Cu (copper) 2.95ppm, and Mn (manganese) 6.48 ppm. The Critical limits (**Rating**) for these soil nutrients available are Cu is high, Fe is optimum, Mn is high & Zn is low (Table 2).

b) **In Kodit (S2) Village Soil:** Average Fe, Zn, Cu, & Mn, concentration in soil are found to Fe (iron) 2.1 ppm, Zn (zinc) 0.83ppm, Cu (copper) 2.35ppm, and Mn (manganese) 1.08 ppm. The Critical limits (**Rating**) for these soil nutrients available are Cu is high, Fe is optimum, Mn is optimum & Zn is high (Table 2).

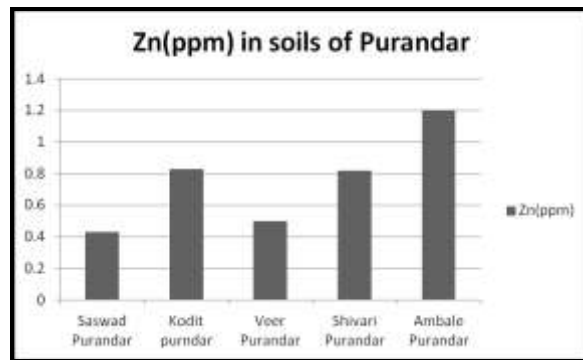
**c) In Veer(S3) Village Soil:** Average Fe, Zn, Cu, & Mn, concentration in soil are found to Fe (iron) 2.15 ppm, Zn (zinc) 0.5ppm, Cu (copper) 0.55ppm,and Mn(manganese) 5.28 ppm. The Critical limits (**Rating**) for these soil nutrients available are Cu is optimum, Fe is high, Mn is high & Zn is high (Table 2).

**d) In Shivari (S4) Village Soil:** Average Fe, Zn, Cu, & Mn, concentration in soil are found to Fe (iron) 0.95 ppm, Zn (zinc) 0.82ppm, Cu (copper) 3.2ppm,and Mn(manganese) 7.83 ppm. The Critical limits (**Rating**) for these soil nutrients available are Cu is high, Fe is low, Mn is high & Zn is optimum (Table 2).

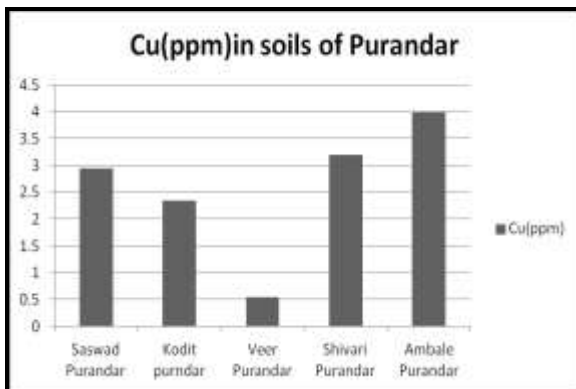
**e) In Ambale(S5) Village Soil:** Average Fe, Zn, Cu, & Mn, concentration in soil are found to Fe (iron) 0.88 ppm, Zn (zinc) 1.2ppm, Cu (copper) 4.00ppm,and Mn(manganese) 6.75 ppm. The Critical limits (**Rating**) for these soil nutrients available are Cu is high, Fe is low, Mn is high & Zn is high (Table 2).



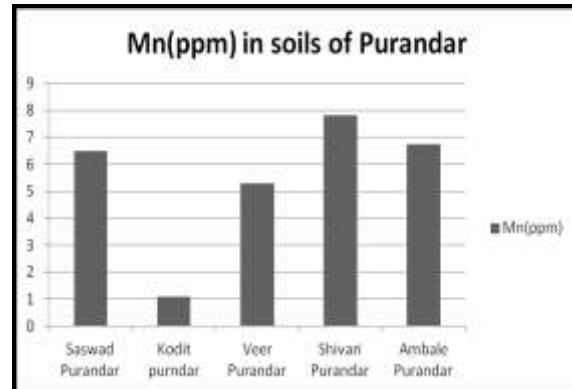
**Figure 2 –Graph showing availability of Fe(ppm) in soils of Purander**



**Figure 3 - Graph showing availability of Zn(ppm) in soils of Purander**



**Figure 4 –Graph showing availability of Cu (ppm) in soils of Purander**



**Figure 5 - Graph showing availability of Mn (ppm) in soils of Purander**

## CONCLUSION

Maximum and minimum values were observed in available micronutrient among different soils sample collected from different locations of five villages of Purander taluka of Pune district. In Saswad villages S1 site have optimum of Zn , optimum iron Fe and high availability of Cu and Mn. The Village KoditS2 site has optimum Fe, Zn and Mn and maximum Cu. Those in Veer villages S3 site have deficiency of Zn only. While In Shivari S4 and Ambale S5 villages site have deficiency and high availability of Zn Cu and Mn.

Deficient nutrients soil site are required micronutrient for soil health and maximum yield. Deficiency is however likely to develop with continuous cropping and poor fertilizer management.

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