

## DTPA- Extractable Micronutrient Status of Surface and Profile Soils from Mango Orchards in Kudal Tehsil of Sindhudurg District (MS)

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### ABSTRACT

Mango is an important fruit crop of economic importance in our country. However, the productivity of this crop is below world average. Alphonso mango grown in Konkan region has its special identity in the world because of its attractive colour, typical flavor, excellent taste and pleasant aroma. Nutritional constraints in soil could be one of the limiting factors for achieving the potential yield in this crop. Very little information is available regarding the status of available micronutrients in soils of mango orchards. Some recent studies have reported that zinc deficiency is the major concern among the various micronutrients in Kudal tehsil. The present investigation is therefore, undertaken to assess the DTPA extractable micronutrients (viz., Fe, Mn, Zn and Cu) status of surface and profile soils from mango orchards in Kudal tehsil of Sindhudurg district (M.S.).

Twenty surface soil samples with 0 to 15 cm depth and eight profile soil samples (comprising two profile pits) with different depths of 0 to 15 cm, 15 to 30 cm, 30 to 45 cm and 45 to 60 cm were collected and analyzed for DTPA extractable micronutrients (viz., Fe, Mn, Zn and Cu). The status of available iron and manganese in surface soils are varied from 40.36 to 48.41 mg kg<sup>-1</sup> with an average value of 44.86 mg kg<sup>-1</sup> and 48.26 to 54.10 mg kg<sup>-1</sup> with an average value of 50.79 mg kg<sup>-1</sup>, respectively. The content of available zinc in surface soils was ranged between 0.99 to 3.34 mg kg<sup>-1</sup> with an average value of 1.68 mg kg<sup>-1</sup>. Whereas, available copper content in surface soils were in the range of 2.37 to 3.95 mg kg<sup>-1</sup> with an average value of 3.24 mg kg<sup>-1</sup>.

The mean values of available Fe, Mn, Zn and Cu in profile soils of the Kudal tehsil are 38.59, 44.76, 1.17 and 2.61 mg kg<sup>-1</sup>, respectively. It is also observed that these micronutrients were showing declining distribution pattern with the depth of profile.

**Keywords:** Available micronutrients, Mango, Soils, Kudal, Sindhudurg.

### Introduction:

In India, area and production of mango were 2.31 M ha and 15.03 Mt, respectively, with average national productivity of 6.5 t ha<sup>-1</sup> (Kumar *et al.*, 2010). Whereas, in Maharashtra, Konkan region is the major contributor of mango cultivation, occupying an area of about 1.65 lakh ha with production of 2.47 lakh tons and the average productivity is around 2.50 tons ha<sup>-1</sup> (Rangwala *et al.*, 2010). Considering the availability of 3 lakh ha of cultivable waste land in Konkan region and export demand of mango, there is tremendous scope for expansion of area under this crop in near future. The widespread need for the micronutrients observed in recent years can be accounted for in three ways viz, (i) naturally deficient in some soil types, (ii) their deficiency has been brought out by crop removal and (iii) widespread erosion together with destruction of soil organic matter has also brought about their removal from the soil (Yadav and Meena, 2009). Knowing the fertility status of the soil in respect of major nutrients alone is not enough for fertilizer

recommendation, knowledge of the micronutrient status of the soils is also essential.

It has therefore, been always considered to find out essential micronutrient status for making best use of the soil for crop production. Therefore, considering all these facts, present study was undertaken.

### Materials and Methods:

The study area is Kudal tehsil of Sindhudurg district, located between 16.0080° N to 73.6870° E in Maharashtra. The geology of the area is the Deccan trap i.e. a volcanic formation of basalt. The basalt has given rise to thick laterite. This area is characterized by hilly terrain which receives an average 2500 to 3000 mm rainfall during the period from June to July.

Twenty surface soil samples each from 0 to 15 cm depth were collected, while eight profile samples with four different layers viz., 0 to 15 cm, 15 to 30 cm, 30 to 45 cm and 45 to 60 cm depth from two profile pits were collected from two mango orchards representing Kudal tehsils of

Sindhudurg district. The collection of soil samples was done before onset of monsoon in the month of May, 2011. The soil samples were air dried and sieved through 2.0 mm sieve. The soil samples were analyzed for estimation of DTPA-extractable micronutrients (*viz.*, Fe, Mn, Zn and Cu by using atomic absorption spectrophotometer (Lindsay and Norvell, 1978).

## Results and Discussion:

### Status of micronutrients in surface soils

The data on status of micro-nutrients in surface soils of Kudal tehsil are presented in **Table 1**. The status of available iron and manganese in surface soils are varied from 40.36 to 48.41 mg kg<sup>-1</sup> with an average value of 44.86 mg kg<sup>-1</sup> and 48.26 to 54.10 mg kg<sup>-1</sup> with an average value of 50.79 mg kg<sup>-1</sup>, respectively.

**Table-1 depicts the DTPA-extractable micronutrient status of surface soils from mango orchards of Kudal tehsil of Sindhudurg district (MS).**

Depth of soil (cm)	Fe	Mn	Zn	Cu
<b>Kudal I</b>				
<b>0-15</b>	46.10	49.40	1.60	3.27
	45.29	51.10	1.49	3.40
	41.92	51.32	1.76	2.96
	44.18	50.60	1.24	3.10
	40.36	51.37	3.27	3.55
	46.77	50.09	2.34	2.78
	48.41	50.43	1.25	3.47
	45.30	51.60	1.16	3.95
	46.44	51.00	1.83	3.18
<b>Mean</b>	45.06	50.56	1.73	3.30
<b>Kudal II</b>				
<b>0-15</b>	42.14	50.13	1.60	2.98
	44.96	50.90	1.54	2.77
	46.33	52.77	1.80	3.07
	45.21	48.26	1.22	3.32
	45.39	49.61	1.12	3.48
	43.79	52.18	0.99	3.51
	44.00	48.45	2.07	2.37
	44.91	54.10	3.34	2.99
	44.70	53.72	1.45	3.87
	45.08	50.08	1.10	3.42
<b>Mean</b>	44.65	51.02	1.62	3.18
<b>Location Mean</b>	44.86	50.79	1.68	3.24

The content of available zinc in surface soils was ranged between 0.99 to 3.34 mg kg<sup>-1</sup> with an average value of 1.68 mg kg<sup>-1</sup>. Whereas, available copper content in surface soils were in the range of 2.37 to 3.95 mg kg<sup>-1</sup> with an average value of 3.24 mg kg<sup>-1</sup>. The results were in conformity with the findings of Taware (1983), Vaidya (1988), Mahajan (2001) and Suryavanshi (2010).

### Status of micronutrients in profile soils

The data on micro-nutrient status of profile soils collected from Kudal tehsil are presented in

**Table 2.** The DTPA extractable Fe, Mn, Zn and Cu content in the profile soils ranged from 30.27 to 45.26 mg kg<sup>-1</sup> with an average value of 38.59 mg kg<sup>-1</sup>, 38.30 to 52.31 mg kg<sup>-1</sup> with an average value of 44.76 mg kg<sup>-1</sup>, 0.49 to 1.80 mg kg<sup>-1</sup> with an average value of 1.17 mg kg<sup>-1</sup> and 1.24 to 3.94 mg kg<sup>-1</sup> with a mean value of 2.61 mg kg<sup>-1</sup>, respectively. A general declining trend down the profile was found in DTPA extractable Fe, Mn, Zn and Cu. The results were in conformity with the findings of Mahajan (2001) Suryavanshi (2010) and Pawar *et al.* (2013).

**Table-2 showing DTPA-extractable micronutrient status of profile soils from mango orchards of Kudal tehsil of Sindhudurg district (MS).**

Depth of soil (cm)	Fe	Mn	Zn	Cu
<b>Kudal I</b>				
<b>0-15</b>	45.26	50.24	1.62	3.94
<b>15-30</b>	42.81	46.71	1.32	3.17
<b>30-45</b>	37.30	40.56	1.09	2.48
<b>45-60</b>	31.66	38.30	0.66	2.03
<b>Mean</b>	39.26	43.95	1.17	2.91
<b>Kudal II</b>				
<b>0-15</b>	44.63	52.31	1.80	3.21
<b>15-30</b>	40.19	47.94	1.33	2.66
<b>30-45</b>	36.54	42.20	1.02	2.13
<b>45-60</b>	30.27	39.84	0.49	1.24
<b>Mean</b>	37.91	45.57	1.16	2.31
<b>Profile Mean</b>	38.59	44.76	1.17	2.61

Maximum accumulation of available iron was found in the surface soils and it decreased with depth. The high content of available iron may be due to accumulation of sesquioxides and also higher organic matter content, which keeps iron in complexes and available form (Katyal *et al.*, 1982). The high concentration of available manganese and copper might be due to decomposition and mineralization of organic matter due to warm and humid climate of the region (Mehta and Patel, 1967). The higher level of available zinc in surface soils is associated with the higher content of organic carbon and their low pH values which favoured the formation of organic complexes and binding of zinc as suggested by Sims and Patrick (1978).

Using 20.00, 4.00, 1.20 and 0.10 mg kg<sup>-1</sup> as the critical limit for DTPA extractable Fe, Mn, Zn and Cu, respectively (Raghupathi and Bhargava, 1997), it was observed that all the surface and profile soils were well supplied with available Fe, Mn and Cu for normal plant growth. Whereas, in case of DTPA extractable Zn, 20.00 per cent of the surface soils and 50.00 per cent of the profile soils belonging to different depths were found deficient in DTPA extractable zinc content.

The deficiency of zinc might be due to large amount of hydrous oxides of Fe, Al or Mn in lateritic soil which coat the clays and form clay size particles themselves. Zinc is occluded and co-precipitated with hydrous oxides of Fe and Mn (Tandon, 1995).

#### Conclusion:

From the present investigation, it can be concluded that in mango orchards of Kudal tehsil of Sindhudurg district (Maharashtra), all the surface as well as profile soil samples at different depths had high amount of Mn and well supplied with available Fe and Cu for normal plant growth. But, 20.00 per cent of the surface soils and 50.00 per cent of the profile soils belonging to different depths were found deficient in DTPA extractable Zn content. Furthermore, the distribution of available micronutrients *viz.*, Fe, Mn, Zn and Cu exhibited declining trend with depths.

Considering the findings, in future integrated nutrient management should be followed to sustain fertility status in order to improve the quality and yield of mango orchards in Kudal tehsil of Sindhudurg district.

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