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Status of macro and micro nutrients in soils of Beed district (Maharashtra), India

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Abstract

This Study was carried out on soil nutrient index and soil fertility of six tehsil of Beed district. The soils were alkaline in reaction and within the safer limits of electrical conductivity. These soils were calcareous in nature, low to medium in organic content and low in available N, P and DTPA-Zn. However, available K and DTPA-Fe, Mn and Cu content was respectively, high and medium to high in the soil.

Keywords Beed, Cu, DTPA – Fe, Mn, nutrient index

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Introduction

Beed district is situated at the central west of Aurangabad, India. It is between 18.28° and 19.28° longitudinally and between 74-54° and 76.57° latitudinal. The total area of Beed district is 1061.5 Sq. Kms and it covers around 3.44% of Maharashtra state, with about 97.79% area in rural region. There are 1365 villages as per census report of 2001 (Source: Socio economy of Marathwada region) and eleven talukas in this district. Beed district comprises of various types of soils with lots of variation in their nutrient availability status. Main crops grown in Beed district during Kharif season are soybean, pigeon pea, pearl millet, maize (cereals), Black gram (pulses), sorghum, groundnut, sunflower (oil seeds), and cotton, sugar cane (cash crops).

Several key factors related to agriculture such as location, climatic conditions, soil and water management gives rise to new challenges in understanding the basic and strategic researches, that is the primary focus for less and dry land farmers. An increase in the cropping intensity coupled with the shift from traditional varieties to the nutrient demanding fertilizer responsive high yielding varieties have led to the large-scale mining of nutrients from the soil. The information regarding physico-chemical properties of the soil and availability of its macro and micro-nutrients to the plants in the study area is scarce. Therefore, in this study, an attempt was made to assess the status of available nutrients in the soils of Beed district to the grown crops.

Methodology

The present investigation was undertaken during the year 2013-14, and surface (20 cm) soil samples from 6 tahsils from Beed district were studied for available nutrients and for the estimation of soil nutrient index.

Selection of sampling location

Out of 11 tahsils of Beed district 6 tahsils (30 Villages) were selected for the study viz., Parali, Georai, Ashti, Patoda, Beed and Majalgaon.. The villages were selected randomly.

The villages (five) selected from each tahsil viz. Daundwadi, Digras, Hivra gowardan, Nagdara, Parali (rural), Luckhamsala, Bhogalgaon, Malhivra, Tartevadi, Nagzari, Kinhi, Vaghluj, Daulvadgaon, Hotalan, Hivra, mahasangvi, Dhas Pimpalgaon, Waijala, Rohatvadi, Savargaon Sone, Jirewadi, Ketura, Charahata, Aher Dhanora, Talegaon, Abegaon, Sandas Chincholi, Nipani takli, Savargaon, Gangamasla were identified for the collection of soil samples.

Standard procedures were followed for analysis of the soil samples collected from different villages of Beed district as outlined by Jackson [1], OC by Walkley and Black's [2] rapid titration method, and available micronutrients Fe, Mn, Cu and Zn were estimated by DTPA extractable method given by Lindsay and Norvell [3]. Nutrient Index was calculated as per the following formula suggested by Ramamoorthy and Bajaj [4] and values for low, medium and high will be taken as <1.67, 1.67-2.33, 72.33 respectively.

$$NIV = \frac{\text{No. of Samples Low} \times 1 + \text{No.of Samples Medium} \times 2 + \text{No. of Samples High} \times 3}{\text{Total No. of Samples.}}$$

Results and Discussion

The data (Table 1) revealed that the available nitrogen content in soils of six tahsils of Beed district was low. The lower content of available nitrogen in this area might be associated with hot and dry climate of this region. Low to medium content of organic matter and low total nitrogen reserve in term C:N ratio of immobilized forms of nitrogen was reported by Malewar [5]. The available phosphorus in these soils ranged from 4.12 to 24.02, 2.95 to 19.9, 4.22 to 22.31, 2.05 to 17.13, 2.63 to 55.78 and 3.29 to 53.07 kgha^{-1} with an average of 12.36, 12.37, 12.33, 6.02, 10.56 and 11.13 kg ha^{-1}, respectively; hence, the soils from the six tahsils of Beed district were low in available phosphorus. The swell shrink soils of Maharashtra were very low to high in available P content as reported by Patel et al. [6]. Similar results were recorded in Marathwada region where available P ranged from 10.0 to 19.1 kg ha-1. Available potassium in these soil samples varied from 210.2 to 1058. 239 to 2203, 276 to 2177, 350.62 to 1759.5, 108,78 to 1885.2 and 267.7 to 1791 Kg ha^{-1} with mean values of 419.2, 1002.7, 730.52, 868.12, 7.22.47 and 763.1 Kg ha^{-1} respectively. Most of the soils samples contained high amount of available K.

Table 1. Available N, P, K in soils of Beed district

S. N.	Name of Tahsil	No. of Samples	Available N (kgha^{-1})	Available P (kgha^{-1})	Available K (kgha^{-1})
1	Parali	25	102-398 (211)*	4.12 – 24.02 (12.36)*	210.2 – 1058.3 (419.2)*
2	Georai	25	70-332 (150)*	2.95-19.9 (12.37)*	239-2203 (1002.7)*
3	Ashti	25	42-484 (170)*	4.22-22.31 (12.33)*	276.2177 (730.52)*
4	Patoda	25	58-356 (140.89)*	2.05-17.13 (6.02)*	350-62 – 1759.5 (868.12)*
5	Beed	25	34-260 (117.1)*	2.63-55.78 (10.56)*	108.78-1885.2 (722.47)*
6	Majalgaon	25	114-410.2 (272.7)*	3.29-53.07 (11.13)*	267.7-1791 (763.1)*

(* figures are average values)

Status of available Cu, Fe, Mn and Zn in different soil samples of six above mentioned tahsils were recorded in table no. 2. DTPA – Cu in these soil samples were ranged from 0.23 to 2.21, 0.11 to 0.53, 0.09 to 0.77, 1.89 to 5.52, 0.05 to 0.64 and 0.21 to 2.49 ppm with mean values of 0.96, 0.23, 0.36, 3.53, 0.21 and 1.03 ppm, respectively. All the soil samples showed different content of DTPA–Cu. In Georai, Ashti and

Beed, 28%, 20% and 40% soil samples showed deficiency, respectively in DTPA-Cu, whereas in Patoda, Majalgaon and Parali 100% soils showed sufficiency in DTPA-Cu.

Table 2. Available micronutrients in soils of Beed district

S. N.	Name of Tahsils	No. of samples	DTPA-Cu (ppm)		DTPA –Fe (ppm)	DTPA-Mn (PPm)	DTPA-Zn (ppm)
1	Parali	25	Range	0.23-2.21	0.29-2.21	0.12-9.17	0.10-5.60
			Mean	0.96*	1.17*	3.48*	1.13*
2	Georai	25	Range	0.11-0.53	2.14-5.12	0.96-4.13	0.43-1.58
			Mean	0.23*	4.06*	2.92*	0.43*
3	Ashti	25	Range	0.0.77	2.80-7.08	1.98-6.23	0.21–1.00
			Mean	0.36*	4.56*	3.74*	0.47*
4	Patoda	25	Range	1.89-5.52	2.98-5.65	2.56-540	0.15-0.37
			Mean	3.53*	4.14*	4.17*	0.25*
5	Beed	25	Range	0.05-0.64	1.97-8.05	0.45-6.21	0.16-1.39
			Mean	0.21*	4.52*	3.19*	0.48*
6	Majalgaon	25	Range	0.21-2.49	0.4-2.10	1.93-9.33	0.01-0.52
			Mean	1.03*	0.70*	6.17*	0.26*

(* figures are average values)

Same results were reported by Age et.al. [7]. The DTPA-Fe of six tahsils ranged from 0.29 to 2.21, 2.14 to 5.12, 2.80 to 7.08, 2.98 to 5.65, 1.97 to 8.05 and 0.4 to 2.10 ppm with mean values of 1.17,4.06, 4.56, 4.14, 4.52, and 0.70 ppm, respectively. From the above data analyzed from Parali and Majalgaon, 100% soils were deficient in DTPA-Fe., where as 44%, 44%, 60% and 48% soil samples from Georai, Ashti, Patoda and Beed, respectively showed deficiency. The DTPA-Mn content from the above data (Table 2) showed that Parali and Georai soil showed 28%, and 12% deficiency in Mn respectively; while Ashti and Patoda soils were 100% sufficient in DTPA-Mn. In Beed and Majalgaon only 4% soils were deficient in DTPA-Mn. Kharche et al. [8] recorded the DTPA-Mn varied from 1.04 to 8.6 mgkg-1 in soil of Nashik district of Maharashtra. DTPA-Zn in all the six tahsils ranged from 0.10 to 5.60, 0.43 to1.58, 0.21 to 1.00, 0.15 to 0.37 0.16 to 1.39 and 0.01 to 0.52 with mean value of 1.13, 0.43, 0.47, 0.25, 0.48 and 0.26 ppm, respectively. From the observed data, 99% soil samples showed deficiency in Zn content.

All the soil samples showed some variations in micronutrients, DTPA–Cu, Fe, Mn content were sufficient, while Zn content was deficient

Calcium and magnesium are the most abundant cations occupying the exchange sites of both organic and inorganic soil colloids. The micronutrients though required in very less quantities. They are equally important as macronutrients for completing life cycle of plant. Zinc is essential for the production of chlorophyll and carbohydrates.

Soil nutrient index value

The data on nutrient index value of Beed districts of six tahsils were presented in table 3. According to observed results, nutrient index values of the soils of these tahsils of Beed district were found low in available N, P, Fe and Zn, while high in available K, Mn and Cu.

The nutrient index values for N were 1.16, 1.08, 1.12, 1, 1 and 1.64; the values for P were 1.4, 1.48, 1.32, 1, 1.2 and 1.32 and for K were 2.96, 3, 3, 3, 2.76 and 3 respectively. The nutrient index value for Cu were 3, 2.44, 2.6, 3, 2.12 and 3; while for Fe, 3, 2.12, 2.12, 1.8, 2.04 and 1 respectively. Nutrient index values for Mn and Zn were 2.44, 2.76, 3, 3, 2.92, 2.92 and 2.6, 1, 1.08, 1, 1.16, 1.08 respectively.

The data compiled on nutrient index value revealed that all the soils collected from surveyed area were rated low in nitrogen, thus soils of this region are expected to respond to added N fertilizers to a greater magnitude.

Table 3. Nutrient index value of six tahsils of Beed district

S. N.	Nutrients	Parli		Georai		Ashti		Patoda		Beed		Majalgaon	
	Category	NIV	Category	NIV	Category	NIV	Category	NIV	Category	NIV	Category	NIV	Category
1	Available N	1.16	Low	1.08	Low	1.12	Low	1	Low	1	Low	1.64	Low
2	Available P	1.4	Low	1.48	Low	1.32	Low	1	Low	1.2	Low	1.32	Low
3	Available K	2.96	High	3	High	3	High	3	High	2.76	High	3	High
4	DTPA – Cu	3	High	2.44	High	2.6	Medium	3	High	2.12	Medium	3	High
5	DTPA-Mn	3	High	2.12	High	2.12	Medium	1.8	Low	2.04	Medium	1	Low
6	DTPA – Mn	2.44	High	2.76	High	3	High	3	High	2.92	High	2.92	High
7	DTPA – Zn	2.6	Low	1	Low	1.08	Low	1	Low	1.16	Low	1.08	Low

The lower content of available nitrogen in this region is associated with hot and dry climate complex, low content of organic matter and total N reserve and intern C:N ratio of immobilized forms of Nitrogen. Malewar et. al. [9] reported N deficiency in soils of northern Marathwada. The investigated soils were also rated low in available phosphorus becausee of continuous mining of soils by crops and higher amount of CaCO3 in these soils thatfix the native and applied phosphorus in soil. On the other hand, most of the soils were rated high in available potassium. The high content of available potassium in soils is mainly associated with the presence of K rich minerals and associated black soils. Further available Cu, Fe, Mn and Zn were found high, medium and low according to the fertility index value category, respectively (table 3.)

References

[1] M. L. Jackson **(1973)**. Soil Chemical Analysis, Pentis Hall of India Pvt. Ltd, New Delhi.
[2] A. Walkley and I. A. Black **(1934)**. An examination of the Degtijareff method for determining soil organic matter proposed modification of the method. Soil Sci., **37:** 29-38.
[3] W. L. Lindsay and W. A. Norvell **(1978)**. Development of DTPA soil test for Zinc, iron Manganese and Copper. Soil Sci. Soc. Am. J., **42:** 421- 428.
[4] B. Rammoorthy, J. Bajaj and N. Available **(1969)**. P and K Status of Indian Soils, Fertil. News, **14:** 24-26.
[5] J. U. Malewar **(1995)**. Micronutrient Availability as influenced by cropping pattern in Marathwada region of Maharashtra. J. Maharashtra Agri. Univ., **20:** 330-333.
[6] K. C. Patel, V. P. Ramni and K. P. Patel **(1994)**. Available phosphorus, sulphus status in Soils of Gujrat. Paper presented in Seminar on development in Soils Sci. No. 28, pp 707.
[7] A. B. Age, S. M. Magar, G. V. Godhawle and S. B. Baraonkar **(2007)**. Studies on available micronutrient Status in Beed district of Maharashtra State, Int. J. Tropical Agriculture, **25:** 487-489.
[8] V. K. Kharche, J. D. Patl and A. V. Bulbule **(2001)**. Micronutrient Status of Soils of Nashik district. Maharashtra, National Seminar on Development in Soil Sci. No.2 1 pp 161 Bull. Rome, **5:** 92.
[9] J. U. Malewar and N. S. Randhawa **(1978)**. Distribution of Zinc, iron, Manganese and Copper in Marathwada Soils (India). J. Maharashtra Agri. Univ., **3:** 157-159.