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Categorization of red soils from hasegaonwadi for its micronutrients status

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Abstract

The present investigation entitled "Characterization and classification of red soils for land use planning from Hasegaonwadi of Latur district". Hasegaonwadi is twenty five km away from Latur city on the way of Budhode-Lodga road. Total geographical area of Hasegaonwadi village is 1016 ha. The study area were surveyed and four soil profiles were discussed and forty surface soil samples (0-30cm) were collected for laboratory analysis. The DTPA extractable micronutrients (Fe, Mn, Zn and Cu) status were high in soils of Hasegaonwadi of Latur district. The results showed that average DTPA extractable Fe, Mn, Zn and Cu content in soil ranged from 9.32 to 12.58, 9.36 to 17.23, 2.01 to 3.86 and 0.63 to 0.95 mg kg⁻¹ respectively, with a mean value of 10.85, 13.91, 3.03 and 0.77 mg kg⁻¹ respectively.

Keywords: Available micronutrients, fertility status, red soils

Introduction

The study area Hasegaonwadi village of AUSA tahsil located at 18° 16' 51" N latitude and 76° 37' 31" E longitudes. Geographical area of Hasegaonwadi is 1016 ha. The climate of the study area was hot, dry and arid. The soil are formed from weathered basalt. The soil was red in colour. During the preliminary survey of area, it was observed that most of the trees grown on these soils were well developed, green foliated and bears good quality and quantity of fruits. Latur district is located on the map to the South-East of Maharashtra on the border of Maharashtra and Karnataka. Latur district is well known for growing oil seed crops (Soybean, Sunflower and Groundnut) pulses (Pigeon pea, Urd bean, Mung bean and Gram), cereals (Jowar) cash crops (Sugarcane) and fruit crops (Mango, Grapes and Pomegranate).

The distribution of available micro nutrients within soils profiles and surface soil samples has been considered useful for a better understanding of soil capacity to sustain an adequate supply of these nutrients to plants and their downward movement in soil. The present study was taken to evaluate the availability of Fe, Mn, Zn and Cu in red soils of Hasegaonwadi of Latur district.

Material and methods

Study Area

The study area of Hasegaonwadi is situated at 18° 16' 51" N latitude and 76° 37' 31" E longitudes. It is 25 km away from the Latur city and 18 km away from AUSA which is tahsil of Hasegaonwadi. Total Geographical area of Hasegaonwadi is 1016 ha. The area include red soil hill and its adjoining area having also red colour soils.

Soil Characteristics

The area is covered by the basaltic lava-flows. Same layer of the lava-flow are hard and compact while other are soft. These basalt flows are the result of intense volcanic activity during Cretaceous Eocene period (almost seventy million year ago). When the lava flows were ejected through long narrow fissures on the earth surface. This area has shallow cover of gravelly sediments over a hard basaltic contact within 50 cm of the surface.

Climate

The study area is characterized by hot, dry and arid climate. It has uneven distribution of rains during the monsoon season. The annual rainfall of 794 mm at which nearly 85 per cent is received during June to September.

The mean maximum and minimum temperature are 32.12 °C and 19.69 °C respectively. April and May have high temperature (37.80 °C and 39.82 °C mean temperature), December and January coolest month (12.06 °C and 13.54 °C mean temperature). The length of growing period 149 days and humid period were 104 days. The soils has Ustic moisture regime and Hyperthermic temperature regime.

Land use and natural vegetation

The study area is under natural tress viz. Babul, Pimpal and Fruit tress viz. Tamarind (*Tamarindus indica*), Ber (*Zizyphus jujube*), Mango (*Mangifera indica*), Custard apple (*Annona reticulata*). Field bunds and banks of nalas are covered under dry deciduous plant species and grasses. Other commonly occurring crops are Pigeon pea (*Cajanus cajan*), Gram (*Cicer arietinum*), Sorghum (*Sorghum bicolar*), Soybean (*Glycine max*), Congress Grass (*Parthenium hysterophorus*), Kans (*Succharum spontaneum*).

Analysis of samples

The soil samples were collected during summer, air dried in laboratory at room temperature, grinded using wooden mortar and pestle and sieved through 2 mm sieve, properly labeled and stored in polythene bags for the determination of soil reaction, organic matter, macronutrients and micronutrients content by adopting standard laboratory methods.

Available micronutrients DTPA (0.005 M) extractable Fe, Mn, Zn and Cu were determined as the procedure outlined by Lindsay and Norvell (1978) [2] using atomic absorption spectrophotometer.

Results and Discussion

The data in respect of soil fertility micronutrients status of selected pedons of Hasegaonwadi of Latur District are presented in Table 1.

DTPA extractable Iron

The data presented in Table 1 indicated that the DTPA extractable iron contents in soils of Hasegaonwadi of Latur

district varies from 6.15 to 12.32 mg kg⁻¹ indicating that these soils were high in available iron content. The high amount of iron content (weighted mean- 10.74 mg kg⁻¹) was found in Typic Ustorthents and low amount in Typic Haplustepts. The iron content was higher in red soil may be due to the granite gneiss parent material which is known to possess higher iron content. Rajkumar *et al.* (1994) [3] and Krishna *et al.* (2017) [1] also reported similar trends.

DTPA extractable Manganese

The data presented in Table 1 indicated that the DTPA extractable manganese content in soils of Hasegaonwadi of Latur district were found high and varies from 7.01 to 16.90 mg kg⁻¹ and it decreased with depth. The high amount of available manganese content (weighted mean-13.51 mg kg⁻¹) was found in Typic Ustorthents and low manganese found in Typic Haplustepts. Srikanth *et al.* (2008) [4] reported that higher manganese content in soils originated from granite genesis parent material with semi-arid climate.

DTPA extractable Zinc

The data presented in Table 1 indicated that the DTPA extractable zinc in soils of Hasegaonwadi of Latur district ranged from 1.21 to 3.62 mg kg⁻¹ (weighted mean 3.25 mg kg⁻¹) indicating that the soil were high in zinc. The maximum amount of available zinc content 3.62 mg kg⁻¹ was recorded in Typic Ustorthents.

DTPA extractable Copper

The data presented in Table 1 indicated that the DTPA extractable copper content in soils of Hasegaonwadi of Latur district ranged from 0.52 to 0.94 mg kg⁻¹. The copper status showed high in copper content. The maximum amount of DTPA extractable copper content (weighted mean 0.84 mg kg⁻¹) was recorded in Typic Ustorthents. The overall higher copper in this area was due to the parent material (Rajkumar *et al.* (1994) [3].

Table 1: Available Micronutrients in Hasegaonwadi of Latur district

Horizon	Depth (cm)	DTPA Fe (mg kg ⁻¹)	DTPA Mn (mg kg ⁻¹)	DTPA Zn (mg kg ⁻¹)	DTPA Cu (mg kg ⁻¹)
Pedon 1 Hasegaonwadi of Latur District (Typic Ustorthents)					
Ap	0-11	10.32	13.92	2.82	0.94
Ac	11-22	8.65	11.87	2.47	0.87
Cr	22-65	7.56	10.52	2.24	0.81
Pedon 2 Hasegaonwadi of Latur District (Typic Ustorthents)					
Ap	0-10	12.32	16.90	3.62	0.89
Ac	10-16	11.96	14.12	3.46	0.83
Cr	16-53	10.12	12.50	3.12	0.78
Pedon 3 Hasegaonwadi of Latur District (Typic Haplustepts)					
Ap	0-18	9.45	10.15	3.18	0.67
Ac	18-40	8.25	9.13	2.95	0.61
Bw1	40-70	7.70	8.05	2.78	0.56
Cr	70-85	6.15	7.01	2.53	0.52
Pedon 4 Hasegaonwadi of Latur District (Typic Ustorthents)					
Ap	0-18	10.38	12.40	2.05	0.71
Ac	18-40	9.25	11.90	1.53	0.66
Cr	40-70	8.12	11.20	1.21	0.63

Status of Available Micronutrients in surface soil samples (0-30 cm)

The data presented in table 2 indicated that the DTPA extractable Fe content in Hasegaonwadi of Latur district soils varied from 9.32 to 12.58 mg kg⁻¹ with a mean value of 10.85 mg kg⁻¹. The highest value (12.58 mg kg⁻¹) of Fe was

observed in sample H13 and the lowest (9.32 mg kg⁻¹) value was recorded in sample H31. All the samples categorized in high (>4.5 mg kg⁻¹).

The DTPA extractable Mn content in Hasegaonwadi of Latur district soils was ranged from 9.36 to 17.23 mg kg⁻¹ with a mean value of 13.91 mg kg⁻¹. The highest value (17.23 mg kg⁻¹)

¹) of Mn was recorded in sample H13 and the lowest (9.36 mg kg⁻¹) value of Fe was observed in sample H34. All the samples categorized in high (>5 mg kg⁻¹).

The DTPA extractable Zn content in these soils varied between 2.01 to 3.86 mg kg⁻¹ with a mean value of 3.03 mg kg⁻¹. The highest value (3.86 mg kg⁻¹) of Zn was observed in sample H15 and the lowest (2.01 mg kg⁻¹) value in sample H38. All the samples categorized in high (>1.2 mg kg⁻¹).

The DTPA extractable Cu content in these soils was ranged from 0.63 to 0.95 mg kg⁻¹ with a mean value of 0.77 mg kg⁻¹. The highest value (0.95 mg kg⁻¹) of Cu was recorded in sample H6 and the lowest (0.63 mg kg⁻¹) value was observed in sample H29. All the samples categorized in high (>0.5 mg kg⁻¹).

Table 2: Available micronutrients of surface soil samples of Hasegaonwadi of Latur district

Sr. No.	Plot No.	DTPA Fe (mg kg ⁻¹)	DTPA Mn (mg kg ⁻¹)	DTPA Zn (mg kg ⁻¹)	DTPA Cu (mg kg ⁻¹)
1	H1	10.64	13.65	2.75	0.86
2	H2	10.32	13.52	2.65	0.89
3	H3	10.64	14.65	2.82	0.91
4	H4	11.42	14.23	2.24	0.89
5	H5	12.52	13.62	2.41	0.92
6	H6	11.23	14.52	2.05	0.95
7	H7	10.25	14.88	2.15	0.91
8	H8	11.42	14.02	3.14	0.89
9	H9	10.45	15.52	3.35	0.86
10	H10	10.25	15.47	3.06	0.90
11	H11	12.32	16.95	2.98	0.92
12	H12	12.04	16.86	3.53	0.89
13	H13	12.58	17.23	3.26	0.86
14	H14	11.24	17.14	3.62	0.87
15	H15	10.32	17.06	3.86	0.83
16	H16	10.45	16.58	3.18	0.85
17	H17	9.45	17.01	3.67	0.75
18	H18	9.65	16.78	3.85	0.71
19	H19	10.25	10.23	3.62	0.67
20	H20	10.98	12.52	3.23	0.64
21	H21	11.35	12.58	3.25	0.68
22	H22	10.28	11.32	3.32	0.70
23	H23	9.78	10.58	3.50	0.75
24	H24	9.64	10.98	3.54	0.74
25	H25	11.42	13.65	3.62	0.77
26	H26	11.32	13.85	3.41	0.67
27	H27	10.52	15.25	3.09	0.69
28	H28	10.65	15.98	3.63	0.65
29	H29	11.58	16.95	3.42	0.63
30	H30	10.25	14.52	3.25	0.69
31	H31	9.32	12.62	3.13	0.71
32	H32	9.55	9.85	3.09	0.66
33	H33	12.05	9.42	3.65	0.73
34	H34	12.16	9.36	2.96	0.75
35	H35	11.85	11.85	2.32	0.71
36	H36	11.48	13.12	2.47	0.70
37	H37	10.32	14.36	2.14	0.67
38	H38	10.75	13.85	2.01	0.72
39	H39	10.65	12.03	2.09	0.73
40	H40	10.96	12.14	2.19	0.71
	Range	9.32-12.58	9.36-17.23	2.01-3.86	0.63-0.95
	Mean	10.85	13.91	3.03	0.77

Table 3: Categorization of available micro nutrients of Hasegaonwadi of Latur district

Sr. No.	Nutrient	Range	Rating	No. of Samples	General %
1	DTPA Fe (mg kg ⁻¹)	9.32-12.58	Low (<2.5)	0	0
			Medium (2.5-4.5)	0	0
			High (>4.5)	40	100
2	DTPA Mn (mg kg ⁻¹)	9.36-17.23	Low (<2)	0	0
			Medium (2-5)	0	0
			High (>5)	40	100
3	DTPA Zn (mg kg ⁻¹)	2.01-3.86	Low (<0.6)	0	0
			Medium (0.6-1.2)	0	0
			High (>1.2)	40	100
4.	DTPA Cu (mg kg ⁻¹)	0.63-0.95	Low (<0.3)	0	0
			Medium (0.3-0.5)	0	0
			High (>0.5)	40	100

Conclusion

It can be concluded from the results under study that the DTPA extractable micronutrients (Fe, Mn, Zn and Cu) status were found to be high in soils of Hasegaonwadi of Latur district. In profile sample, DTPA Fe, Mn, Zn and Cu was ranged from 6.15 to 12.32, 7.01 to 16.90, 1.21 to 3.62 and 0.52 to 0.94 mg kg⁻¹.

In surface soil samples, the DTPA Fe, Mn, Zn and Cu ranged from 9.32 to 12.58, 9.36 to 17.23, 2.01 to 3.86 and 0.63 to 0.95 mg kg⁻¹, with a mean value of 10.85, 13.91, 3.03 and 0.77 mg kg⁻¹. All DTPA extractable micronutrients (Fe, Mn, Zn and Cu) were found high in surface soil sample than subsoil surface samples.

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