AS recorded highly significant positive correlations with Ks and OC in the subgroups Uhsf and Thsf only.

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Madras Agric. J., 81(10): 545-547 October, 1994

https://doi.org/10.29321/MAJ.10.A01578

DISTRIBUTION OF MICRONUTRIENTS IN LOWER BHAVANI PROJECT COMMAND AREA SOIL PROFILES

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ABSTRACT

The study of distribution of micronutrients in major soils of Lower Bhavani Project Command Area revealed that total and available Zn,Fe and Cu decreased with depth in Lithic Haplustalf, Typic Ustochrept, Typic Haplustalf and Typic Chromustert, while total Mn decreased only in Lithic Haplustalf and Typic Ustochrept. But in Typic Ustifluvent, there is an irregular distribution of both total and available Zn,Fe,Cu and Mn. All the micronutrients are in sufficient level except Zn indicating the need for $ZnSO_4$ for sustainable crop production. All the micronutrients are closely related with organic carbon and clay.

The soils of Lower Bhavani Project Command area, which is intensively cultivated, occur in various types of Physiography. Importance of Micronutrients viz., Zn, Cu, Fe and Mn to agricultural crops well augmented and recognised in India. The deficiency of micronutrients has been observed in light textured and calcareous soils. Such deficiencies/sufficiencies of micronutrients in soils are likely to increase due to the introduction of High Yielding Varieties and intensive cropping system in Indian agriculture. The fertility status and fertilizer recommendations are essential to transfer the agrotechnology to other soils having comparable soil properties. Hence, the present investigation was carried out to assess the micronutrient status of soils occurring at different physiography.

MATERIALS AND METHODS

The soil samples were collected from five profiles representing soils of different physiographic units and processed for laboratory investigation. Organic carbon content and free calcium carbonate of soils were determined by usual procedures. The available micronutrients cation were extracted with solution consisting of 0.05M. DTPA, 0.01M $CaCl_2$ and 0.1M Triethanolamine (pH 7.3) as per the procedure outlined by Lindsay and Norvell (1978) and Fe, Cu, Mn and Zn were estimated in the extracts with Atomic Absorption Spectrophotometer. Total micronutrient cations were estimated by digesting the soil (0.5 mm sieved) in a mixture of HF and perchloric acid at 180-200° C.

RESULTS AND DISCUSSION

Soil characteristics are presented in the table 1. Upper terraced soil (Lithic Haplustalf) was low in pH (7.2 - 7.5), $CaCO_3$ (<%) and organic carbon (0.2%) than plain soil (Typic Chromustert) which was relatively high in pH (8.3 - 8.7), $CaCO_3$ (4.2-7.9%) and medium in organic carbon content (0.38 - 0.53%). The soil occurring in alluvial fan (Typic Ustifluvent) was low in $CaCO_3$ (0.12 - 0.24%) but having the highest organic carbon (0.6%) content among the pedons. There is no

Table 1. Physico chemical properties and micro nutrient status of soils

Horizon	Depth (cm)	Mechanical composition (%)				Organic carbon %	pH	$CaCO_3$ cont cnt %	Total Micronutrient (ppm)				DTPA extractable micronutrient (ppm)			
		clay	silt	Fine sand	corse sand				Zn	Fe	Mn	Cu	Zn	Fe	Mn	Cu
								Pedon I Lithic Haplustalf								
Ap	0-9	13.96	23.25	36.40	25.36	0.23	7.2	0.42	420	2800	2620	96	0.44	10.3	18.6	5.74
Bt	9-23	20.62	82.02	32.08	23.56	0.18	7.3	0.56	310	2120	2150	82	0.31	8.5	14.2	3.08
C	23-45	11.26	19.56	21.86	47.30	0.14	7.5	0.50	220	1660	1200	50	0.20	5.6	6.0	2.26
								Pedon II Typic Ustochrept								
AP	0-16	24.56	21.04	27.44	26.50	0.39	7.6	2.6	560	1260	3100	69	0.68	6.8	12.6	5.60
BA1	16-38	27.52	21.86	26.12	24.40	0.32	7.9	3.2	470	1010	2200	60	0.59	5.9	10.4	4.72
BA2	38-82	28.85	22.34	26.56	22.64	0.26	7.9	3.6	420	1800	2000	51	0.48	4.2	10.0	3.84
C	82-125	32.62	25.34	19.13	20.64	0.20	7.2	4.1	360	1620	1850	46	0.37	3.6	8.6	3.06
								Pedon III Typic Ustifluvent								
AP	0-18	31.90	18.43	12.43	37.24	0.61	7.2	0.24	700	1760	4400	149	0.68	7.4	11.2	4.71
A	18-52	36.37	14.53	18.69	30.40	0.58	7.6	0.18	660	1510	4900	156	0.70	6.0	9.8	3.26
CI	52-78	27.89	19.55	14.50	36.03	0.62	7.7	0.19	610	1564	4000	131	0.65	7.0	10.6	3.02
C2	78-148	33.45	16.96	16.14	33.38	0.64	7.7	0.12	640	1502	4600	150	0.72	6.2	9.0	2.80
								Pedon IV Typic Haplustalf								
AP	0-21	38.26	21.60	11.76	28.36	0.46	7.4	3.1	790	2010	3600	88	0.66	8.2	10.8	6.12
Bt1	21-46	44.02	19.92	9.24	26.78	0.38	7.6	4.5	630	2980	4900	82	0.52	6.5	11.2	5.96
Bt2	46-75	45.84	10.87	9.06	25.13	0.35	7.6	5.0	560	1760	5600	75	0.41	3.9	12.3	5.72
C	75-112	30.98	19.04	14.55	35.05	0.24	7.8	5.3	510	1580	3100	61	0.30	2.6	7.2	3.69
								Pedon V Typic Chromustert								
Ap	0-18	39.83	19.15	25.58	15.42	0.53	8.3	4.2	890	1410	4200	102	0.92	6.2	9.4	6.43
Al2	18-46	45.06	21.38	19.72	12.81	0.51	8.6	5.8	830	1240	4800	98	0.68	4.8	8.1	5.20
Al3	46-90	46.22	22.35	18.43	11.98	0.43	8.7	6.4	800	1010	5100	86	0.65	3.5	7.6	4.52
Al4	90-145	46.93	23.02	18.01	10.02	0.38	8.7	7.9	760	880	5300	82	0.63	2.6	7.2	4.26
CCa	145-190	Kanker nodules														

much variation in pH, $CaCO_3$ and organic carbon in soils occurring middle terraces (Upper and Lower).

Zinc

Total Zn varied from 220 to 890 ppm and decreased with depth of the soil and this distribution pattern was similar to organic carbon except alluvial fan (Typic Ustifluvent). This might be largely due to accumulation of biomass, where organic carbon in Ap horizon was more than in B horizon. Total Zn was significantly correlated with per cent organic carbon (r=0.562**) and per cent clay (r=0.763**).

Available Zn in these soils varied from 0.20 to 0.72 ppm. The available Zn status in all the soil profiles was in deficient range less than 1.2 ppm. This indicates that soils of Lower Bhavani Project Command area may require Zn SO_4 application for increasing agricultural production. Appreciable variation in available Zn content was noticed between profiles and within the profile. The highest level of Zn was observed in surface layers of all the profiles, which might have been due to their regular addition through plant residues on the surface (Tiwary and Mishra 1990). Available Zn, like total Zn, decreased with depth. Regarding the distribution pattern. Zn showed regular decreasing tendency with depth, except Typic Ustifluvent showing irregular trend with depth. Besides the distribution pattern is more closely related with organic carbon (r=0.723**). In soils occurring lower middle terrace and classified as Typic Ustochrept, the concentration of available Zn was maximum in Ap horizon and thereafter decreased regularly with depth. Such a distribution of Zn is typical of the ustochrept, where only a little accumulation of translocated materials occur in the cambic B horizon.

Iron

Total Fe ranged from 620 - 2800 ppm. All the soils contained sufficient reserves of total Fe. Mostly total Fe decreased with soil depth in all the soil profiles except the soil occurring in alluviafan (pedon III - Typic Ustifluvent) and this appeared to be influenced by clay (r=0.740**) and organic carbon (r=0.623**). The higher content of total Fe in upper terraced soil (Lithic Haplustalf - Pedon I) might be due to the presence of Iron containing minerals in the parent materials.

Available Fe ranged from 2.6 to 10.3 ppm among the pedons decreasing with depth. Relatively higher amount of available Fe in the surface layer of upper terrace soil (Lithic Haplustalf - Pedon I) might be due to low pH (acidic), nature of parent materials and advanced stage of weathering. Coefficient of correlation between available Fe and soil properties indicated that the pattern of distribution has largely resulted from the variation in organic matter (r=0.547**), $CaCO_3$ (r=0.601**) and clay (r=0.601**).

Manganese

The available Mn contents varied from 6.0 to 18.6 ppm in the pedon. These wide variation were due to the degree of weathering, topography, clay, organic carbon and $CaCO_3$ within and among the pedons. In general, the available Mn in surface horizons of all the profiles were higher which decreased with depth. This could be due to higher organic carbon content of surface layers, which showed significant positive relationship with exchangeable Mn (r=0.638**). Pedon V (Typic Chromustert) calcareous black soil had comparatively lower amount of exchangeable Mn due to higher pH and calcareous nature of the soil. A significant negative correlation of available Mn with pH (r=-0.526**) was recorded which is in the line with the findings of Yadav et al. (1982).

Copper

Total Cu content ranged from 46 to 156 ppm among the pedons decreasing with depth except pedon III. The distribution pattern of total Cu in alluvial soil (Pedon III - Typic Ustifluvent) was inconsistant due to uneven distribution of clay and organic matter. The Cu was significantly correlated with percent organic carbon (r=0.460**), per cent $CaCO_3$ (r=0.624**) and per cent clay (r=0.482**). Available Cu ranged from 2.26 to 6.43 ppm with the highest value in pedon V and the lowest in pedon I. In general, available Cu content decreased with depth in all the soil profiles. The significant positive correlation with organic carbon (r=0.548**) indicates that higher available Cu to be present in surface than in the sub soil due to higher organic carbon content at the surface.

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