Madras Agric. J. 80 (10) : 581 - 585 October 1993
https://doi.org/10.29321/MAJ.10.A01701

PHYSICO-CHEMICAL PROPERTIES OF PEDONS UNDER THE INFLUENCE OF DIFFERENT VEGETATIONS IN KODAIKANAL HILLS OF TAMIL NADU

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ABSTRACT

The morphology and physico-chemical properties of six pedons representing two each of soils with forest, plantation crop and tree crop cover, physical properties such as bulk density and saturated hydraulic conductivity were substantially influenced by the organic matter and clay content of the profiles. Forest vegetation profiles contained more organic matter, higher CEC, lower bulk density and higher saturated hydraulic conductivity.

KEY WORDS : *Pedons - Different vegetational cover - Physico-chemical properties*

Out of a total area of 98,920 ha in the Kodaikanal hills, nearly 17,000 ha area are under cultivation (1989). Forests constitute 61,656 ha. There is large scale clearing of hills in recent years for inhabitation, planting coffee and tree crops. The variation in soil physico-chemical properties in such differing soils at Kodaikanal hills was studied and the results are presented in this paper.

MATERIALS AND METHODS

The experimental area was divided into three groups based on the land cover namely 1. seasonal crop area (cabbage, beans, cauliflower, potato, etc.) 2. Plantation crop area (tea, silveroak, etc.) and 3. forest area with species such as pines (Pinus insularis), wattle (Acacia dealbata), eucalyptus, etc. Two soil profiles for each vegetation were dug. Horizonwise soil samples were collected and analysed for particle size distribution by International Pipette Method (Piper, 1966), organic carbon by the wet digestion method of Walkley and Black (1934) and the cation exchange capacity (CEC) by the method proposed by Schollenberger and Dreibelbis (1930).

Saturated hydraulic conductivity and bulk density were determined in undisturbed core samples (7.5 cm dia and 7.5 cm length) as per the method described by Dhakshinamoorthy and Gupta (1968).

RESULTS AND DISCUSSION

The morphological characteristics of the different pedons and the data on mechanical analysis, textural classes, bulk density and hydraulic conductivity are presented in Table 1 and 2 respectively.

The clay content increased with depth in all the pedons probably due to progressive weathering and pronounced clay movement to subsurface horizons. The highest clay content was recorded

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Table - 1 Morphological charctersistics of the pendons of Kodaikanal hills

Horizon	Depth (cm)	Boundary	Colour (Moist)	Texture	Structure	Consistence	
						Dry	Moist
Pedon I (Horticultural Research Station. Kodaikanal, South aspect - Seasonal Crop)							
Ap	0 - 40	g	10 YR 3/2	gsl	mlsbk	dsh	mfr
B1t	40 - 81	g	10 Y/R 5/8	gscl	c 1 sbk	dsh	mvfr
B2t	81 - 126	g	5 YR 5/8	gscl	c 2 sbk	dsh	mfr
B3	126 - 197	g	5 YR 5/8	scl	c 3 sbk	dh	mfr
Pedon II (Horticultural Research Station. Kodaikanal, East aspect - Seasonal Crop)							
Ap	0 - 22	g	10 YR 2/2	sl	m 2 sbk	dh	mfr
B1t	22 - 59	g	10 Y/R 3/1	scl	m 2 sbk	dh	mfr
B2t	59 - 118	g	10 Y/R 5/6	ascl	m 2 sbk	dh	mfr
Pedon III (Horticultural Research Station. Kodaikanal, North aspect - Seasonal Crop)							
Ap	0 - 30	g	10 YR 3/2	scl	m 3 sbk	dh	mvf
B1t	30 - 76	g	10 Y/R 3/4	scl	m 2 sbk	dh	mfr
B2t	76 - 126	g	5 YR 6/8	scl	m 3 sbk	dh	mfr
B3	126 - 202	g	5 YR 5/6	scl	m 2 sbk	dh	mfr
Pedon IV (Perumalmalai at Palani Kodaikanal Road, North aspect - Seasonal Crop)							
Ap	0 - 22	g	10 YR 3/1	scl	m 1 sbk	dh	mfr
B21t	22 - 47	g	10 Y/R 3/1	sc	m 2 bk	dh	mfr
B22t	47 - 91	g	10 Y/R 5/6	sc	m 2 bk	dh	mfr
Pedon V (0.5 KM from Horticultural Research Station, Kodaikanal, East aspect - Forest area)							
A1	0 - 22	g	10 YR 2/1	gsl	m 2 bk	dh	mfr
A2	22 - 72	g	10 Y/R 2/1	gsl	m 1 sbk	dsh	mfr
B1t	72 - 135	g	10 Y/R 5/6	gsl	m 2 sbk	dh	mfr
B3	135 - 195	g	5 Y/R 5/8	gsl	m 2 sbk	dh	mfr
Pedon VI (0.5 KM Horticultural Research Station, Kodaikanal, South aspect - Forest area)							
Ap	0 - 30	g	10 YR 2/1	sc	m 1 prm	dsh	mfr
B21t	30 - 76	g	10 Y/R 2/2	gscl	m 3 sbk	dsh	mfr
B22t	76 - 126	g	10 Y/R 2/2	gscl	m 2 prm	dsh	mfr
B3	126 - 202	g	7.5 YR 5/6	sc			

Table 2 Physico - chemical properties of soils

Horizon	Depth (cm) (%)	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	Org. C. (%)	CEC (cmol (p^+) kg^{-1})	Bulk density (Mg m^{-3})	Saturated hydraulic conductivity (cm hr^{-1})
Pedon I									
Ap	0 - 40	50.5	18.8	11.8	19.0	2.62	21.2	1.48	3.36
B1t	40 - 81	62.8	4.4	11.4	21.6	0.60	13.5	1.50	3.09
B2t	81 - 126	51.3	5.8	12.5	29.9	0.49	15.5	1.52	2.86
B3	126 - 197	28.4	26.8	15.5	26.3	0.34	12.4	1.53	2.87
Pedon II									
Ap	0 - 22	41.0	18.3	18.8	19.5	2.31	18.5	1.50	3.37
B1t	22 - 59	26.9	16.1	21.5	27.6	1.53	17.3	1.59	2.80
B2t	59 - 118	31.5	33.4	13.2	28.7	0.76	14.4	1.61	2.72
Pedon III									
Ap	0 - 30	48.0	10.6	13.5	24.9	1.35	29.5	1.58	2.92
B2t	30 - 76	41.4	11.5	10.5	35.6	1.23	16.3	1.62	2.68
B2t	76 - 126	48.9	7.8	5.0	34.3	0.44	12.8	1.64	2.53
B3	126 - 202	25.2	28.7	14.6	29.4	0.31	11.9	1.61	2.82
Pedon IV									
Ap	0 - 22	28.6	16.5	15.1	30.8	1.27	26.6	1.60	2.73
B21t	22 - 47	34.4	19.0	5.8	37.4	0.64	14.3	1.67	2.36
B22t	47 - 91	26.2	18.1	13.3	393	0.36	13.4	1.73	1.28
Pedon V									
A1	0 - 22	49.4	19.8	9.5	19.3	4.52	20.4	1.53	3.37
A2	22 - 72	65.6	8.5	11.6	14.3	3.85	14.7	1.48	5.30
B2t	72 - 135	48.6	6.9	16.7	28.8	0.87	15.4	1.55	2.96
B3	135 - 195	20.2	34.8	27.3	5.5	0.45	11.7	1.52	3.53
Pedon VI									
A1	0 - 30	20.1	30.5	31.5	4.8	4.58	12.1	1.48	3.36
B2d	30 - 76	19.7	38.1	15.6	24.7	24.7	13.3	1.53	2.94
B22t	76 - 126	24.4	38.5	8.8	34.3	34.3	15.1	1.52	2.92
B3	126 - 202	29.9	40.2	8.2	18.4	18.4	13.5	1.50	3.34

in B25 horizon in all the pedons indicating the zone of illuviation. Though there was a slight increase of silt with depth in some pedons, the silt content did not reveal any pattern with depth. This kind of irregular silt distribution and absence of relation between clay and silt distribution might express the varying degree of physical and chemical weathering of rocks and minerals and 8difference in the rate of eluviation and/or illuviation. Similar obsevations were recorded by Buol et al. (1980).

The sand fractions generally decreased with depth in all the pedons. The sand content was relatively higher in seasonal crop pedons (P_1 and P_2) followed by plantation crop (P_3 and P_4) and forest vegetation pedons (P_5 and P_6) in the decreasing order indicating the influence of vegetational cover on the removal of fine particles such as clays from the surface.

Eventhough the surface soil had relatively lesser clay than the subsurface in all the profiles, the CEC was higher in the surface soils only because of higher organic matter content in the surface horizons. This revealed the combined effect of organic matter and clay in influencing the CEC of any horizon. Govindarajan and Gopala Rao (1978) observed that the surface horizons, CEC value was contributed mainly by organic carbon while in the subsurface horizons clay contributed to the CEC.

The organic carbon incresed with increasing altitude, but decreased with depth in the perndons, having the highest concentration in surface horizon. Among vegetations, the forest (P5 and P6) recorded the highest organic carbon content (4.5 per cent) followed by seasonal crop (P1 and P2) and plantation crops (P3 and P4) in decreasing order reflecting the vegetation density, weathering and pedon development sequences.

The bulk density increased with depth in all the profiles. Close dependence of bulk density on organic matter (r = 0.493***) and clay content (r=0.635***) as indicated that the organic matter content influenced aggregates formulation resulting in decreased bulk density. Accumulation of clay particles and lack of organic matter at the lower horizons increased the bulk density giving an overall positive correlations for clay content. Similar observations were recorded by Nicholas and Boelter (1984). The bulk density of the surface soils of the forest pedons recorded lower values (1.48 to 1.50 Mg m^{-3}) than seasonal and plantation crop pedons (1.53 to 1.60 Mg m^{-3}).

The hydraulic conductivity decreased with depth in all the profiles, due to increading clay content with depth. Among the vegetations the profile of the forest vegetation recorded higher hydraulic conductivity (2.92 to 5.30) followed by profiles with seasonal (2.72 to 3.37 cm/hr) and plantaion crop vegetation (1.28 to 2.98 cm/hr) as this parameter was associated with bulk density increased with sand content (r=0.694**), decreased with clay (r=-0.484**) increased with organic carbon (r=0.468*) and decreased with increasing bulk density (r=-0.706**).

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Madras Agric. J. 80 (10) : 585 - 587 October 1993

STUDIES ON VARIABILITY IN CHILLI

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ABSTRACT

Genetic variability for yield and certain fruit characters of chilli was studied. The variances and coefficients of variation indicated the influence of environment on the characters. The estimates of genotypic coefficient of variation, heritability and genetic advance revealed that the length of fruit, weight of dry fruit and number of seeds per fruit offer scope for phenotypic selection.

Genetic variability in long type (samba) of chilli has been reported by Elangovan et al (1981), Vadivel et al (1983) and Chandra et al. (1983). However, information on the variability of gundu type is lacking. Studies were,

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