



Research Article

CHARACTERIZATION AND CLASSIFICATION OF SOME TYPICAL SOILS OF VILLAGE MADAVA, DISTRICT SHAHDOL, MADHYA PRADESH

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Abstract: Three representative soil pedons belonging to village Madava of Block Sohagpur, district, Shahdol were characterised and classified. The soils were moderately deep. The soil colour varied from dark brown to dark grayish brown. The texture of deep soil was clay while moderately deep soil was clayloam. The deep soil showed typical characteristics of Vertisols. Sub angular to angular blocky structure were also observed in middle horizons of most of the pedons. Effervescence was observed in almost all the pedons in lower horizons. Well-developed intersecting slickensides were noticed in pedon3. The soils were neutral to moderately alkaline in reaction. The organic carbon contents in these soils were medium in surface and decreased with depth. Cation exchange capacity (CEC), Ca⁺⁺ and Mg⁺⁺ ions were found high in horizons where clay was more. Considering morphological, physical, and chemical characteristics pedons 1, 2 and 3 were classified as Typic Haplustepts, Vertic Haplustalfs and Typic Haplusterts, respectively.

Keywords: Soil morphology, Soil genesis and classification, Taxonomy

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Introduction

Geologically the area comprises of Maikal series contains of lime stone, Sand stone and schists etc. these are responsible for the soils origin in sedimentary development. Local alluvium due to natural nallas and rivers recognized in low and maid valley lands underlain by sand stone and lime stony rocky strata are common occurrence in Shahdol district of Madhya Pradesh. Adequate information on characterization and classification of these soils is lacking for this agro-climatic region. Keeping this in mind the present investigation was undertaken at village Madava, Shahdol district of Madhya Pradesh

Materials and Methods

The study area located in between 23°07'.493" to 81°24'.158" N longitude and 23°07'.493" to 81°24'.158" E longitude with an elevation 320 m above MSL. It is located about 25 km East of Singhpur and 40 kms from Shahdol district in Northern hill zones of Chhattisgarh Agro Climatic Zone of Madhya Pradesh. The climate of the area is hot sub humid which is characterized by hot summer and mild winters. The mean annual precipitation is 1174 mm of which more than 85 percent is received during monsoon months. The soil moisture and temperature regimes prevail, in the area as ustic and hyperthermic, respectively and are used for the purpose of soil classification. Three representative soil profiles of cultivated lands are studied for morphological properties [1]. Horizon wise soil samples were collected, dried, processed and analysed for various physical and chemical properties by using standard analytical procedures [2-5]. The soils were classified as per keys to soil taxonomy.

Results and Discussion

Morphological features of the soils

The important morphological features of the soils were observed in the field are presented in [Table-1].

The depth of the pedons varied from moderately deep to very deep. The colour of soil matrix in all the pedons was in hue 10YR and it ranged from yellowish brown to light yellowish brown in pedon 1 (P1), dark brown to very dark greyish brown in pedon 2 (P2) and dark brown to yellowish brown in pedon 3 (P3). Weak fine subangular blocky structure was noticed in surface horizons of all the pedons, while strong coarse angular blocky to moderate coarse angular blocky structure in sub soil horizons of pedons 2 and 3. The iron concretions were observed in pedons 2 and 3, while peon 1 contained only lime concretions. Effervescence was seen in pedon 2 and 3 in lower horizons but in case of pedon 1 it was seen in upper layer (Ap and Bw1 horizons).

Physical and chemical properties of the soils

The data on particle size distribution [Table-2] indicated that pedon 1 had sandy loam texture at surface horizons and loam in middle horizon except in C horizon. The texture of pedons 2 and 3 clayey throughout the profile except surface horizon (Ap) of pedon 2 which was clay loam. Soil reaction was mostly neutral to moderately alkaline (6.9 to 7.80). The electrical conductivity of soil was found normal and ranged from 0.154 to 0.36 dSm⁻¹. The content of CaCO₃ in the soil varied from 6 to 65 g kg⁻¹ and it increased with depth. Similar trends were reported by [6] and [7] In general, level of organic carbon decreases with depth and it range from 1 to 6.6 g kg⁻¹. The CEC values of soils varied from 18.22 to 47.28 cmol (p+) kg⁻¹ and increased with depth showing its direct relationship with clay content. Similar findings were reported by [8] and [9]. The exchange complex is mostly saturated with ca⁺⁺ followed by Mg⁺⁺, Na⁺ and K⁺. The exchangeable Ca⁺⁺ and Mg⁺⁺ existed in higher amount in B horizons as compared to A and C. The similar results were also observed by [10].

Table-1 Morphological characteristics of the soil pedons

Horizon	Depth (cm)	Colour (moist)	Texture	Structure	Concretion	Effervescence	Root distribution	other
Pedon -1 fine mixed, hyperthermic, typic haplusteps								
Ap	0-15	10YR4/3	cl	1fsbk	ffconca	C	ff	-
Bw1	15-44	10YR4/3	scl	2fsbk	mmconca	Cs	ff	-
Bw2	44-91	10YR4/5	scl	2fsbk	mmconca	C	ff	-
C1	91-132	10YR4/3	scl	2fsbk	ffconca	Cs	-	-
C2	132-159	10YR4/4	scl	2fsbk	ffconca	Cv	-	-
Pedon-2 fine mixed, hyperthermic, vertic haplustalfs								
Ap	0-12	10YR4/3	cl	1fsbk	-	-	ff	-
Al2	12-41	10YR4/3	cl	2msbk	ffconir	-	ff	-
Bt1	41-89	10YR3/2	C	2msbk	ffconir	-	ff	-
Bt2	89-127	10YR3/2	c	2msbk	ffconir	-	ff	-
Bt3	127-145	10YR3/2	c	2msbk	ffconir	Cs	-	-
BC	145-200	10YR3/3	c	2msbk-abk	ffconir	Cs	-	-
Pedon-3 fine montmorillonitic, hyperthermic, typic haplusteps								
Ap	0-7	10YR3/2	c	1fsbk	-	-	ff	-1-13
Al2	7-20	10YR3/2	c	3cabk	ffconir	-	ff	1-2
Bw	20-38	10YR3/2	c	3cabk	ffconir	-	ff	pf
Bss1	38-45	10YR3/2	c	3cabk	ffconir	-	ff	ss
Bss2	45-114	10YR3/2	c	3cabk	ffconir	-	-	ss
BC	114-146	10YR3/2	c	3cabk	ffconir	-	-	
C1	146-178	10YR4/2	c	Massive	ffconir	Es	-	
C2	178-195	10YR4/3	cl	Massive	ffconir	Ev	-	

Table-2 Physical and chemical characteristics of the soils

Horizon	Depth	Sand %	Silt %	Clay %	pH	EC (dSm ⁻¹)	CaCO ₃ (gkg ⁻¹)	O.C. (g kg ⁻¹)	CEC [cmol (p+) kg ⁻¹]	Exchangeable cations (cmol(p+) kg ⁻¹)			
										Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺
Pedon 1 Fine mixed, hyperthermic, typic haplusteps													
AP	0-15	41.65	23.95	34.40	7.3	0.19	48.0	5.0	29.32	21.32	6.40	0.61	0.30
Bw1	15-44	40.41	22.05	37.54	7.8	0.21	52.0	4.6	31.14	23.84	5.52	0.62	0.34
Bw2	44-91	46.12	21.46	32.42	7.7	0.19	65.0	4.0	32.52	22.72	7.14	0.45	0.56
C1	91-132	46.90	25.47	27.63	7.8	0.14	60.0	3.6	20.52	14.67	4.06	0.40	0.42
C2	132-159	47.39	26.49	26.12	7.5	0.15	59.0	2.9	18.22	11.50	3.34	0.30	0.30
Pedon 2 Fine mixed, hyperthermic, vertic haplustalfs													
AP	0-12	35.55	26.70	38.75	7.2	0.25	9.0	6.1	33.16	21.51	8.53	0.73	0.60
Al2	12-41	31.90	26.50	41.60	7.2	0.25	11.2	5.9	33.86	22.03	8.53	0.69	0.58
Bt1	41-89	30.25	26.50	43.25	7.2	0.31	12.2	3.0	39.37	23.38	10.67	0.69	0.59
Bt2	89-127	28.95	26.30	44.75	7.3	0.32	13.1	1.5	39.73	24.36	10.53	0.48	0.52
Bt3	127-145	25.40	27.10	47.50	7.3	0.34	13.7	1.3	43.73	29.82	11.93	0.78	0.48
BC	145-200	25.00	27.80	47.20	7.4	0.36	13.3	1.0	41.49	27.31	10.72	0.75	0.40
Pedon 3 Fine montmorillonitic, hyperthermic, typic haplusteps													
Ap	0-7	30.25	20.40	49.35	7.3	0.03	6.0	6.6	44.67	28.91	10.96	0.67	0.57
Al2	7-20	32.65	18.00	49.35	7.7	0.05	10.0	6.5	44.50	29.57	11.04	0.71	0.62
Bw	20-38	31.32	18.42	50.26	7.5	0.04	12.0	6.3	45.62	29.89	12.20	0.75	0.66
Bss1	38-45	30.87	17.81	51.12	7.6	0.04	14.0	6.2	46.32	30.20	13.40	0.79	0.71
Bss2	45-114	29.74	16.92	53.34	7.6	0.05	15.0	5.8	47.28	29.94	13.89	0.77	0.69
BC	114-146	30.81	19.03	50.16	7.5	0.08	20.0	4.5	46.16	28.81	12.84	0.76	0.68
C1	146-178	33.87	20.37	45.76	7.6	0.05	25.0	3.6	44.63	27.94	11.42	0.70	0.65
C2	178-195	41.19	21.19	36.89	6.9	0.18	50.0	3.1	35.72	23.57	8.85	0.48	0.43

Table-3 Classification of soils

Pedon No	Order	Sub-order	Great- group	Subgroup	Family
1	Inceptisols	Ustept	Haplustept	Typic haplustept	Fine loamy, mixed hyperthermic, Typic haplustepts
2	Alfisols	Ustalf	Haplustalfs	Vertic haplustalfs	Fine loamy, mixed hyperthermic, Vertic haplustalfs
3	Vertisols	Ustert	Haplustept	Typic haplusterts	Fine, montmorillonitic hyperthermic, Typic haplusterts

Soil classification

Based on morphological, physical and chemicals properties of the soil are classified as per the criteria given in keys to soil taxonomy [Table-3]. The occurrence of ochric epipedon, cambic B horizon (i.e., the accumulation of clay was not such that it may qualify for argillic horizon) and organic carbon that decreased regularly with depth, the pedon 1 was classified as Typic. Pedon 2 showed presence of an ochric epipedon with argillic B horizon thus qualified for order Alfisols. The presence of a layer more than 25 cm thick associated with slickenside close enough to intersect in sub horizons more than 30 percent clay in the earth fraction and 1-3 cm wide cracks upto one meter Identified for Vertisols, (pedon 3) and Typic Haplusterts as sub group level.

Application of research: Study is applicable for characterization and classification of other soils also with same characters

Research Category: Soil science

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