



RESEARCH PAPER

Characterization and classification of soils of Northern hills Zone of Chhattisgarh, Madhya Pradesh

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Abstract : Three representative soil pedons of northern hills of Chhattisgarh, M.P were morphologically studied, characterized and classified. The soils are very deep, colour ranges from brown (10YR5/3) to dark brown (10YR3/3) and very dark greyish brown (10YR3/2) in different horizons. Fe and calcretes are observed in sub surface horizons. The texture in surface soils varied from clay loam to clay while in pedon 2, the texture was observed sandy clay loam throughout the profile. The soils are calcareous and pH ranged from 7.0 to 7.5. The organic carbon content in these soils were (4.4 g kg⁻¹), low to medium (6.1 g kg⁻¹) in surface and decreased with depth. Cation exchange capacity (CEC) were found high in horizons where clay content was more. Based on morphological, physical and chemical properties P₁ and P₃ were classified as VerticHaplustalfs and pedon (P₂) was placed under Typic Haplustepts.

Key Words : Soil morphology, physical and chemical characteristics, Taxonomy

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INTRODUCTION

The nature and properties of soil mainly dependent on geological formation, Topography and Climate of the region in which it occurs. Soils are considered as integral part of landscape and they are largely governed by the land form on which they are developed. A variety of soils ranging from light textured shallow sandy loam to clay loam occur in the zone. The present study highlights the details soil survey under totally to characterize and classify the soil of Zone.

MATERIAL AND METHODS

The study area lies in between 24°36'45" to 24°37'15" (N) latitude and 81°24'00" to 81°31'00" E longitude. The elevation ranging from 300 to 340 m above mean sea level. Sand stone enriched sedimentary rocks are main geological formations of the area. The area is almost level except in the vicinity of nala. The climate of the area is hot sub humid which is characterized by hot summer and mild winters. The mean annual rainfall is 1106 mm in 56 rainy days in most of the years. The annual water deficit amounts 500 to 700 mm during the post rainy and summer season. There is a distinct dry

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Table 1 : Classification of soils					
Pedon	Order	Sub order	Great group	Sub group	Family
P ₁	Alfisols	Ustalf	Haplustalf	VerticHaplustalfs	Fine loamy, mixed hyperthermic, VerticHaplustalfs
P ₂	Inceptisols	Ustept	Haplustept	Typic Haplustepts	Fine loamy, mixed hyperthermic, Typic Haplustepts
P ₃	Alfisols	Ustalf	Haplustalf	VerticHaplustalfs	Fine loamy, mixed hyperthermic, VerticHaplustalfs

period from February to May suggesting Typic Ustic soil moisture regime. The mean annual temperature more than 22°C (31.5°C) qualifies the area for hyperthermic soil temperature regime. The field and laboratory studies were carried out at KVK Sahdol (M.P.) during 2018-19.

Three representative soil profiles of cultivated land were studied for morphological properties (Soil Survey Staff, 1995). Horizon wise soil samples were collected, dried, processed and analysed for particle size distribution by Bouyoucos Hydrometer method, pH and EC (electrical conductivity) in 1:2.5 soil water suspension (Piper, 1966). The cation exchange capacity (CEC) and exchangeable cations were determined as described by Bower *et al.* (1952) and Black (1965), respectively. The soils were classified according to Soil Taxonomy (Soil Survey Staff, 2014).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Morphological features of the soils:

The soils of all the pedons are very deep *i.e.* above 150 cm and soil colour values ranges from 3 to 5, chroma 2 to 4 with hue 10 YR in all the pedons (Table 1). The surface soil colour in pedon 1 was brown (10YR5/3) which changed to dark brown (10YR3/3) in B horizons. Pedon 2 showed brown (10YR4/3 M) in A horizon and tended to become dark brown (10YR3/3 M) in lower horizons. Pedon 3 showed brown (10YR4/3 M) coloration, which tended to become very dark greyish brown (10YR3/2 M) in Bt horizons. Weak fine to medium sub angular blocky structure was noticed in surface horizons of all the pedons, while strong coarse angular blocky to moderate medium sub angular blocky structure in sub soil horizons of pedon 1 and 2. The structure in sub soil horizons of pedon 3 was moderate medium angular blocky throughout the profile. Fe-Mn concretions were found in pedon 1 while pedon 2 and 3 contained lime and iron concretions. Effervescence was seen in all the soil

pedons of the area in middle and lower horizons.

Physical and chemical properties of the soils:

The data on particle size distribution (Table 2) indicate that the texture of pedon 1 and 3 were clay throughout the profile, except surface horizons (Ap) which was clay loam. The pedon 2 contain sandy clay loam texture throughout the depth of the profile.

The pH of soils (Table 3) was in neutral to moderately alkaline (7.0 to 7.5) and did not show much variation with depth. The electrical conductivity was also normal with the ranged from 0.25 to 0.37 dSm⁻¹ in all the pedons. The content of calcium carbonate in the soils varied from 7 to 15.7 g kg⁻¹ and it increased with depth similar trends were reported by Tripathi *et al.* (2018). The soils had medium range 4.4 to 6.1 g kg⁻¹ organic carbon content which decreased with increasing soil depth. Deshmukh and Bapat (1993) also reported similar findings in soils of Raissen district of M.P. The cation exchange capacity (CEC) of the soils ranged from 17.63 to 43.73 cmol(p) kg⁻¹ (Table 3) and overall its values increased in B horizons due to accumulation of clay in all the pedons. Trivedi *et al.* (2018) reported similar findings in Chambal Command soils of M.P. Calcium was predominant followed by magnesium, sodium and potassium.

Classification of the soils:

Based on the properties, all the three pedons were grouped according to Soil Taxonomy (Soil Survey Staff, 2014). Pedon 1 and 3 were classified as fine loamy, mixed, hypothermic family of Vertic Haplustalfs showing significant increased in alluvial clay content (argillic horizon) with depth. The occurrence of cambic B horizon and organic carbon that decreased regularly with depth, the pedon 2 was classified as Typic Haplustepts.

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