

Soil-physiographic relationship in a transect over basaltic trap

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ABSTRACT

The relationship between physiography and the associated soils has been studied. Five physiography units, viz., hill slope, upper piedmont, lower piedmont, piedmont plain and coastal plain were identified in a transect over basaltic trap area. The soils over elevated topography (75-150m MSL) are shallow to moderately shallow excessively to well drained, dark yellowish brown to dark grayish brown, medium textured and exhibit poor profile development while those on lower topography (0-25m MSL), are deep to very deep, moderately well drained to poorly drained, dark brown to brown and fine textured and exhibit good profile development. The soils over moderately elevated topography (10-75m MSL) possess the intermediate characteristics between higher and lower elevated topography and moderate profile development. There was a gradual increase in EC, CaCO_3 , CEC, exchangeable, water-soluble cations and SAR of soils with the decrease in topographic levels. Soils occurring at higher altitude lack diagnostic horizon and were classified as Entisols. While those occurring on depositional landscapes have well developed diagnostic horizons and were classified as Inceptisols.

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The nature of geographic features in conjunction with type of parent materials influences to a significant extent the type of soil formation under specific environmental features (Vink, 1975). Several attempts, to date, have been made to establish relationship between soil physiography and land use (Sharma and Roychowdhury, 1988; Deshmukh and Bapat, 1993; Singh *et al.*, 1994 and Sharma and Bhaskar, 2003). Information on soils developed on different physiographic units over basaltic trap in Saurashtra region is scanty. Hence an attempt has been made to establish soil-physiographic relationship in a basaltic trap area for precise recognition and mapping of homogenous soil units in southern Saurashtra region of Gujarat.

MATERIALS AND METHODS

The majority of the soils of Saurashtra region is medium black in colour and has been derived from basaltic trap in semi-arid climate (Gundalia and Savalia, 2000).

The study area lies between $20^{\circ}40'$ to $21^{\circ}10'$ N latitude, $70^{\circ}25'$ to $71^{\circ}26'$ E longitude at an elevation between 4 to 162 m above MSL. The aridity index, moisture index and humidity index of study area varied from 61.97 to 67.76, -54.31 to -67.74 and 1.16 to 7.65, respectively. Hence, the area falls under semi-arid (dry) climate, which is characterized by hot summer, mild winter and dry non-rainy days with mean annual, summer and winter temperature of 27.6°C , 30.6°C and 22.4°C , respectively. The mean annual rainfall of area is 732 mm. The temperature regime of the study area is hyperthermic

in hill slope, upper piedmont and lower piedmont, while isohyperthermic in piedmont plain and coastal area. The soil moisture control section meets the necessary criteria (Soil Taxonomy, 2003) to qualify for ustic soil moisture regime. The natural flora includes thorny and scrubby vegetation dominated by *Prosopis juliflora*, *Zizyphus rotundifolia*, *Butea monosperma*, *Diopyros melanoxylon*, *Tectona grandis*, *Zizyphus mauritiana* and *Cassia auriculata*. The ground flora comprises *Cynodon dactylon*, *Cyperus rotundus* L. *Dichanthium annulatum* and *Chenopodium album*. IRS 1A LISS II FCC imagery on 1:50,000 scale in conjunction with Survey of India topographical (SOI) map referred above on 1:50,000 scale were used to identify various land forms units such as hill slope, upper piedmont, lower piedmont piedmont plain and coastal plain.

IRS 1A LISS II FCC imagery on 1:50,000 scale in conjunction with survey of India topographical (SOI) map referred above on 1:50,000 scales were used to identify various land forms units. Sixteen representative soils of five landforms viz., hill slope (LS-1), upper piedmont (LS-2), lower piedmont (LS-3), piedmont plain (LS-4) and coastal plain (LS-5) were selected for present study (Fig. 1). The morphological characteristics of sixteen pedons representing these landform units were studied. Physico-chemical characteristics of horizon samples were determined by standard methods. The soils were classified as per Soil Taxonomy (Soil Taxonomy, 1998; 2003).