

Research Paper :

Water retention characteristics of soils in a toposequence of Cumbum valley, Tamil Nadu

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ABSTRACT

The water retention characteristics of soils in a toposequence in Cumbum valley of Tamil Nadu revealed that water retention decreased with increasing soil moisture suction. The water retentivity at 0.03 and 1.5 MPa tensions was significantly and positively correlated with clay, clay plus silt, and CEC but negatively with sand content. The effect of organic carbon on water retentivity, both at 0.03 and 1.5 MPa tensions was non-significant. The soils with high clay content had more water storage capacity showing their potential for growing two crops in a year whereas the shallow rooted annual crops may be the best option for shallow soils with relatively low clay content and lower moisture retention capacity.

Key words : Soil properties, Clay content, Water storage capacity, Alternate crop

Water retention characteristics of soils provide the right information on the ability of soils to store and release water for crop use. Soil water retentivity and release is highly influenced by physical and chemical properties of soils. In general, the rate of release of moisture and retention in fine textured soils is higher and gradual than the relatively coarse textured soils (Chinchmalatpure *et al.*, 2001). The effective use of water as a precious and shrinking natural resource thus necessitates the need for a more scientific investigation of the moisture retention characteristics site specifically. Studies were conducted by many researchers (Gajbhiye, 1990) to understand the water movement related properties in different soils under different agro-climatic conditions and their relationship with soil physical and chemical properties. However, the available information in this regard for the soils of Cumbum valley of Tamil Nadu is scanty and therefore, an attempt has been made to assess the water retention characteristics of these soils along a toposequence and to study their relationship with some important soil properties.

MATERIALS AND METHODS

The study area of Cumbum valley occupies the South western portion of VIII agro ecological region in Tamil Nadu uplands and lies between 9°43'46" and 9°57'47" N latitude and 77°14'31" to 77°26'50" E longitude with an elevation of 301 to 546 m above MSL. The geology of the area includes Charnockites and Khondalites of Archaean age. The study area is an undulating plain with

slope ranging from 1 to 8 per cent and mostly grades towards East and Southeast. The climate is semi-arid (dry half) with an annual rainfall of around 740 mm. The moisture regime is *ustic* and soil temperature regime is *isohyperthermic* (Soil Survey Staff, 1999). The crops grown in the study area include rice, sorghum, maize, cotton, legumes, vegetables, coconut and grapes.

The Cumbum valley resembles a boat and hence two distinct transects (T_1 and T_2) were chosen with both of their left ends starting from the foothills of Western Ghats and their right ends starting from the foothills of Varushanadu (Megamalai) hills meeting in alluvial fan position. Four pedons in each of left (LP) and right (RP) hands of the transect representing the major physiographic units *viz.*, foot hill, middle terrace, lower terrace and alluvial fan were dug open.

Horizon wise soil samples were collected from the studied pedons and analyzed for particle-size distribution, CEC and organic carbon following standard procedures. Water retentions at various tensions like 0.03, 0.4, 0.8, 1.0, 1.2 and 1.5 MPa were determined by using Pressure Plate Apparatus (Richard, 1948). Available soil water content (AWC) was expressed as a difference in volume of water retained at 0.03 and 1.5 MPa. Available soil water storage capacity was determined for the actual depths specified for a given soil pedon.

RESULTS AND DISCUSSION

The soils near the foot hills, middle and lower terraces were of *in situ* and colluvial in nature and those near the