

Humic substances under varied agro-ecological units of Jammu and Kashmir

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ABSTRACT

A study was carried on soils developed under varied agro ecological units of J&K under different climatic conditions. The physicochemical properties of the soils were determined and organic matter fractionation was carried out following standard methods. The micronutrient cations and their complexation with Humic and fulvic acids were also carried out. Humic and fulvic acids were subjected to IR studies. The result revealed that there was a distinct effect of major environmental factors namely rainfall and altitude on the distribution of soil humus into humic acids and fulvic acids fraction as well as the HA:FA ratio. Soil humus fractions decreased with increasing depth of soil irrespective of the agro climate zone studied. Humic substances had relatively high conc. of oxygen containing functional groups per unit weight. The total acidity Carboxylic and phenolic hydroxyl groups of Humic and fulvic acids showed more or less similar content in the soils of different agro climatic conditions. The potentiometric titration curves of all the Humic and fulvic acids showed sigmoidal nature with two inflection points showing their weak acidic nature. (Key words: Organic matter fractionation, soils of J&K, functional group).

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Sustainability points out to prevention of degradation and maintenance of status quo. In agriculture it implies prevention of soil degradation to ensure stable productivity. Inability of organic fraction of the soil to maintain physicochemical properties and extended crop demands for nutrient beyond the input level are the two factors generally responsible for soil degradation. Organic matter is the single property which influences soil fertility, soil formation soil biology, physical and chemical properties, organochemical, biotic and hydro chemical properties of soil (Malewar *et al.*, 1988, Katyal, 2000). The nature, content composition and behavior of organic matter in soils are fundamentally important for growth of crops under diverse climatic conditions. Humus present in soil acts as highly reactive natural polymer. Attempts have been made by several workers to characterize humic substances of Indian soils (Joshi 1981, Ram and Raman, 1981). However, scanty information is available about the nature of humic substances present in soils of J&K. The present investigation was undertaken to characterize humus extracted from major soils of J&K.

MATERIALS AND METHODS

The state of Jammu and Kashmir has three zones. Nine soil samples 3 from each zone of drought prone (Ladakh L₁, L₂, L₃), assured rainfall (Kashmir K₁, K₂, K₃) and transitionally high rainfall zones (Jammu J₁, J₂, J₃) were collected from different locations during the year 2006-2007. The zones were characterized by different altitudes rainfall pattern and vegetation cover. Soils were analyzed for pH (1:2.5), electrical conductivity (1:2.5),

organic carbon, total nitrogen and available N, P and K contents following standard procedures (Jackson, 1973). The micronutrient cations were determined by atomic absorption spectroscopic (AAs) method. Humic fractions of organic matter were isolated and purified following the methods of Stevenson (1982). Total acidity and carboxylic groups of soil organic matter fraction were determined by the methods suggested by Schnitzer and Gupta, 1965. The phenolic group contents were estimated by difference.

RESULTS AND DISCUSSION

The data pertaining to the physico-chemical properties showed variation in their content within and among the pedons of different agro climatic zones (Table 1). The pH and the electrical conductivity of these soils varied from 8 to 6.5 and 0.21 to 0.38 dsm⁻¹, respectively. The high organic carbon content in drought prone zone Ladakh can be attributed to be accumulation of annual crop residues and low microbial activity because of prevailing low temperature of the region. It can also be explained in view of the fact that the selected sites of the soil profiles were mostly cultivated and receiving application of farm yard manure, otherwise the area is devoid of vegetation.

The soils of K₁, K₂ and K₃- series showed higher content of organic carbon; particularly K₁-site which may be because of higher precipitation, altitude and forest vegetation. The organic content of the (J₁, J₂, J₃) soils has been influenced by vegetation, climate and altitude. The high temperature and low altitude (J₁, J₂, J₃) have