ABSTRACT

Tropical Andepts on volcanic islands in the West Indies tend to accumulate substantial amounts of organic matter. To elucidate the factors responsible for this, humic materials from these soils were characterised chemically by non-degradative and degradative methods.

Elementary and functional group analyses as well as optical and IR data for humic and fulvic acids were similar to those from soils of widely differing origins. Ranges were generally wider for fulvic than for humic acids indicating greater reactivity and heterogeneity. The humic materials contained high concentrations of acidic amino acids - glutamic and aspartic acids but about 50% of the total N was non-protein.

More than 70 compounds were identified on a gas chromatography - mass spectrometry-computer system, following oxidative degradation. Benzenecarboxylic, phenolic and aliphatic mono- and dicarboxylic acids were the major products (identified as esters and ethers). Furan derivatives, n-alkanes and dialkyl phthalates were also isolated. Major chemical structures detected were aromatic rings substituted by: (a) 3 to 6 C-atoms only (b) 1 OCH_3 group and 3, 4 and 5 C-atoms and (c) 2 OH groups and 1, 2, 3 and 4 C-atoms. Most of the fatty acids were esterified to phenolic compounds. Chemical structures appear not to differ significantly from those of humic materials from soils on other locations on the earth's surface.

Up to 70% of the soil-C occurred as complexes in which $Al(OH)^{2+}$ and $Fe(OH)^{2+}$ were bonded to carboxylic and phenolic groups. There were at least two and possibly three binding sites for Fe which occurred in the trivalent state. The tropical fulvic acids retained (in water-soluble form) relatively large amounts of ash (9.4 to 12.6% of oven-dry weights) rich in silica. Chemical, spectroscopic, spectrophotometric and thermal evidence indicate that the accumulation and stability of organic matter in the West Indian Andepts is related to the formation of stable silica-fulvic acid 'complexes'.