

## APPLICATION OF $^1\text{H}$ -NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY TO STUDY THE STRUCTURE OF SOME HUMIC ACIDS

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### ABSTRACT

A study has been made using the  $^1\text{H}$ -n.m.r. spectroscopic technique to investigate the structure of some humic acids extracted from different composts.

The results gave useful information about the nature of the extracted humic acids, which differed slightly from one to another and quite similar with a little difference in the intensity of the resonances. The  $^1\text{H}$ -NMR spectra of the extracted humic acids identified polymethylene compounds and terminal methyl groups of polymethylene chains. In addition, protons attached to carbon  $\beta$  to carboxylic groups or aromatic rings have also identified.  $^1\text{H}$ -NMR spectra of the studied humic acids showed that protons of aromatic rings are presented in humic acids.

The humic acid extracted from Bostan compost (Bos-HA) contained the highest aliphatic hydrogen content. On the other hand, humic acids from Sanbest (San-HA) and Al-Enzy (Enz-HA) composts exhibited the highest aromatic hydrogen content.

**Keywords:** compost, humic acids (HA),  $^1\text{H}$ -NMR spectroscopy.

### INTRODUCTION

Nuclear Magnetic Resonance spectroscopy (NMR) has been an invaluable technique in elucidating the structure of organic compounds.

Application of nuclear magnetic resonance to organic molecules is concerned largely with proton resonance. The resonance frequency varies slightly for hydrogens in different molecules, and for hydrogens in different environments in the molecule, so that different types of hydrogens in an unknown structure can be distinguished in a NMR spectrum (Stevenson, 1982).

$^1\text{H}$ -NMR spectra have been obtained for soil humic acids (Lentz *et al.*, 1977 and Ruggiero *et al.*, 1980<sub>b</sub>) but the results have provided little information on the chemical structure of humic substances. Spectra obtained for humic substances often show broad and poorly resolved resonances, possibly caused by their extreme molecular complexities. Ogner and Gronneberg (1977) have recorded the spectra of degraded humic materials. In all the  $^1\text{H}$ -NMR spectra, the general features were the same. The signals at 0.90, 1.22 and 3.40 ppm were found. They concluded that the aromatic entities in humic substances are highly substituted and the aliphatic contributions of straight chains of 6-8 units are significant. Taha (1992) and Taha *et al.* (2000) investigated  $^1\text{H}$ -NMR spectra for humic acids extracted from different soils. They reported that the signal from 6.0-8.3 ppm arises from aromatic protons including quinones, phenols and oxygen-containing heteroaromatic aromatics. Also, polycyclic aromatics can be characterized by a resonance at 8.1 ppm due to sterically hindered peri protons.