

SPECTROSCOPIC, CHROMOTOGRAPHIC AND ELECTROCHEMICAL CHARACTERIZATION OF GLYPHOSATE ON SOIL

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Among the compounds of environmental concern, phosphate derivatives constitute an important class of herbicides use in agriculture. One of the most commonly used phosphate herbicide in Sri Lanka is Glyphosate ($C_6H_{17}N_2O_5P$). Although Glyphosate is subject to a transformation in soil, with half-life of about 60 days, persistence of it or its degraded products could be found even after 3 months. As a result, it may found to be distributed in natural water and natural resources. Therefore the detection and characterization of such compounds are of environmental interest. In this work, attempts have been made to identify and characterize Glyphosate in soil by employing vibrational-spectroscopic (FT-IR), chromatographic and electrochemical techniques.

Cyclic voltametric technique gave a characteristic voltammogramme for a $5.0 \mu\text{mol}$ Glyphosate solution indicating that the method serves as a versatile tool for the detection of the compound in low concentrations. The FT-IR spectroscopy and Gas Chromatography techniques were then employed to characterize Glyphosate in soil. Time-dependent FT-IR spectra obtained from Glyphosate-treated soil showed distinct variations in the OH bending region as can be seen in figure 1. The loss of intensity of such bands ($\sim 1000 \text{ cm}^{-1}$) during first 3 days indicate the existence of a bond between soil and Glyphosate and we assume that this period as the initiative step of the degradation. The slow recovery of the intensity of the bands during a month period reveals that the activity of Glyphosate remains even after one month. This feature is also supported by the chromatographic observations obtained for the water-extracts of the soil and the results are shown in figure 2. The appearance of signals 1, 2 and 3 after one day and there depletion during first week indicates the initiation of activity of Glyphosate during that period. Further, the chromatogrammes obtained (not shown) after two and three months showed the re-appearance of signal 2 indicating the persistence of Glyphosate or its degraded products even after 3 month period.

