

Regional Water-Quality Analysis of 2,4-D and Dicamba in River Water Using Gas Chromatography-Isotope Dilution Mass Spectrometry

Authors: E. M. Thurman ^a; Lisa R. Zimmerman ^a; Diana S. Aga ^b; Robert J. Gilliom ^c

Affiliations: ^a U.S. Geological Survey. Lawrence, Kansas. USA

^b Dept. Chemistry, University of Nebraska. Kearney, NE. USA

^c U.S. Geological Survey. Sacramento, CA. USA

Published in:  [International Journal of Environmental Analytical Chemistry](#), Volume 79, Issue 3 March 2001 , pages 185 - 198

Abstract

Gas chromatography with isotope dilution mass spectrometry (GC-MS) and enzyme-linked immunosorbent assay (ELISA) were used in regional National Water Quality Assessment studies of the herbicides, 2,4-D and dicamba, in river water across the United States. The GC-MS method involved solid-phase extraction, derivatized with deuterated 2,4-D, and analysis by selected ion monitoring. The ELISA method was applied after preconcentration with solid-phase extraction. The ELISA method was unreliable because of interference from humic substances that were also isolated by solid-phase extraction. Therefore, GC-MS was used to analyzed 80 samples from river water from 14 basins. The frequency of detection of dicamba (28%) was higher than that for 2,4-D (16%). Concentrations were higher for dicamba than for 2,4-D, ranging from less than the detection limit (7lt; 0.05 µg/L) to 3.77µg/L, in spite of 5 times more annual use of 2,4-D as compared to dicamba. These results suggest that 2,4-D degrades more rapidly in the environment than dicamba.

Keywords: GC-MS analysis; ELISA analysis; 2,4-D; Dicamba; Herbicide