

# HERBICIDE AND NITRATES RESIDUES IN SURFACE AND GROUNDWATER FROM SUGARCANE AREA IN BRAZIL.

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Various studies have demonstrated the presence at high levels of pesticides and nitrates in soil, surface, and groundwater. Prior studies have identified a watershed area in Brazil with a high risk of soil, surface, and groundwater contamination by pesticides at the region of Ribeirao Preto, SP. Surface and groundwater were collected at the area during the period of October 1995 to November 1998. By means of gas chromatography-mass spectrometry (GC-MS) technique the herbicides tebuthiuron, diuron, simazine, atrazine, and ametryne, and nitrates were analyzed according to the protocols established in literature. The recovery obtained in the extraction procedure was higher than 95% for all herbicides except simazine for which the recovery was 85.6%. Due to the enrichment in the extraction procedure and the sensitive detection at two wavelengths it was possible to obtain a quantification limit of 0.02 µg/L for the herbicides studied. The method was linear over the range of 0.02 to 2.0 µg/L. Soil data showed a higher level of the herbicide tebuthiuron, at the levels of 59.6 ppb; than the other applied during all the months. The results have shown the herbicide tebuthiuron as the one with higher concentrations in groundwater and in January of 1996 the concentration found was 0.08 µg/L, close to the maximum allowed, 0.1 µg/L, but this fact was not consistent during the other months. No residue of the other herbicides was detected (Table 1). In case of nitrates, with maximum level allowed of 10 mg/L, it was found the maximum of 0.9 mg/l, but in a shallow well inside the area. Commercial wells at the edge of the watershed showed low levels of nitrates, below the risk level, but with potential for dangerous contamination (Table 2).

Table 1. Concentration of the herbicides in groundwater of Espiraiado watershed collected during the months of October, November and December, 1995 and the months of January, March, May, July, September and November de 1996. Average of four samples.

HERBICIDES	1995			1996					
	Oct	Nov	Dec	Jan	Mar	May	Jul	Set	Nov
Tebuthiuron	0,06	0,04	0,04	0,08	0,03	0,06	0,07	0,03	0,04
Diuron	n.d.	n.d.	0,02	0,02	n.d.	n.d.	n.d.	0,03	0,02
Ametryn	0,02	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Atrazine	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Simazine	0,02	0,03	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

Level of detection: 0,02 µg/L

n.d.: not detected.

Table 2. Average amount of nitrate (mg/L) found in wells of Espiraiado watershed area during the year of 1966.

Wells	Months		
	May	September	November
Faz. São José	0,9	0,6	0,9
P1	1,0	0,3	0,2
P2	1,0	0,2	0,3
P3	0,3	0,2	n.d.
P4	0,6	0,4	0,5
P5	0,4	0,6	0,3
P7	0,5	0,6	0,4

Detection Limit: 0,2 mg/L