

Tebuthiuron Monitoring in Sandy Soils of the Guarany Aquifer Recharge Zone in Southeastern Brazil

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The Guarany aquifer zone comprises eight Brazilian states, as well as portions of Argentina, Uruguay, and Paraguay, with a total intercontinental area of approximately 1,200,000 Km². The region of Ribeirão Preto, located in São Paulo State is an important area for the production of sugarcane, for the production of ethanol fuel in Brazil. This region is located on part of the recharge area of the groundwater of Guarany aquifer, which supplies water to the region.

The agriculture activity on this area has required a constant use of pre-emergent herbicides and fertilizers. Thus, the risk of groundwater contamination by these chemicals is a major concern, also because parts of the soils of the recharge area are highly permeable allowing the leaching of applied chemicals. The herbicide tebuthiuron is a phenylurea herbicide used in sugar cane culture for pre and post-emergence control of weeds. Since this herbicide has a leaching potential, this study was conducted to evaluate its movement throughout soil in a sandy soil area, on a Typic Quartzipsamment soil located in Santa Rita do Passa Quatro, São Paulo state, with and without sugarcane cover. Gomes et al. have indicated that the sandy soils present in the area has a high water infiltration potential and based on this information the infiltration study was conducted on this area as a worst case situation in terms of leaching potential.

Soil samples were collected, at 20 cm depth down to 120 cm and analyzed for tebuthiuron at zero, 3, 30, 60, 90, 120, 150, 180, 240, and 300 days after application. The extraction of tebuthiuron from soil (20 g) was made with methanol and the analyses by high performance liquid chromatography. The validation parameters were: limit of detection of method 0.01 and the limit of quantification 0.02 mg kg⁻¹; linearity from 0.050 to 5.00 mg L⁻¹ ($r^2 \geq 0.999$); recoveries from 90 to 103%.

Soil experiments conducted in sandy soils demonstrated that tebuthiuron half-life varied from 20 days in sugarcane cover area to 16 days without crop cover. There was no apparent effect of sugarcane coverage on the degradation, although it was quicker where there was no cover. Tebuthiuron half-life was lower than expected, international literature indicates a period from 12 to 15 months. This finding was not expected but higher microorganism activity in semitropical areas could degrade herbicides quicker.

Apparently there was no effect of sugarcane coverage on tebuthiuron degradation in soils, but it moved faster where there was no cover and the herbicide did not move deeper than 40 cm at anytime, which agrees with the data collected from the wells revealing no residue of the herbicide.

Gomes, M.A.F.; Spadotto, C.A.; Luiz, A.J.B.; Neves, M.C. In *Método de classificação preliminar dos potenciais de infiltração e de escoamento superficial da água do solo: subsídio à avaliação do risco de contaminação por agroquímicos. Proceedings of the XIII Latin American Soil Science Meeting*. Agua de Lindoia, Brazil. Braz. Soil Sci. Soc. Viçosa, MG, Brazil, 1996, CD-ROM. Weed Science Society of America. *Herbicide Handbook*, 7th Edition. Champaign, IL, p.1994.