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Impact of repeated chlorotoluron application on its degradation in soil

Martin Kocarek, Radka Kodesova, Ondrej Drabek, and Josef Kozak
Dept. of Soil Science and Soil Protection, University of Life Sciences, Prague, Czech Republic (kocarek@af.czu.cz)

The effect of repeated chlorotoluron application on its degradation was studied under the field condition in Haplic Chernozem. Chlorotoluron was applied repeatedly (dose of 0.025 mg.m-2) on the top of the soil profile in years 2006, 2008 and 2009. Climatic data as a daily minimal and maximal temperature and daily rainfall were collected during the experiment. Pressure heads at 4 depths (10, 25, 50, 80 cm) were measured using tensiometers. Soil-water contents and temperatures at 5 depths (5, 10, 25, 50, 80 cm) were monitored using the ECH20 EC-TE sensors. The suction cups were used to take soil-water samples at various depths (5, 10, 25, 50 cm) to indentify presence of the herbicide during 140 days period. In addition, soil samples were taken from layers 2 cm thick (to the depth of 50 cm) 35, 50 and 140 day after the herbicide application to measure a total content of the applied herbicide in each layer within the soil profile. Herbicide concentrations in soil extracts and soil water samples were analyzed using the HPLC technology. The total chlorotoluron content within the monitored soil profile was evaluated, and the herbicide field degradation rate and half-life were calculated.
Chlorotoluron was not detected below the depth of 32 cm during the entire experimental periods. Chlorotoluron field half-lives estimated in this study were 28.4, 33.4 and 32.3 days in 2006, 2008 and 2009, respectively. The herbicide half-lives were also measured in the laboratory under the controlled soil-water content and temperature conditions: 20.6 days (28 C, 40% soil-water content per mass), 33.16 days (28 C, 20% soil-water content per mass); 27.76 days (20 C, 40% soil-water content per mass); 39.85 days (20 C, 20% soil-water content per mass); 32.27 days (10 C, 40% soil-water content per mass); 45.7 days (10 C, 20% soil-water content per mass). The field herbicide half-lives (obtained under the similar average temperature and soil-water content conditions) corresponded to half-lives under the average laboratory conditions. Thus repeated chlorotoluron application at the same area did not accelerated microbial herbicide degradation as was expected.

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