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The Effect of Prometryn Soil Residue on Soil Microbial Biomass and Different Crops Biomass

Mohammad Taghi Alebrahim, Mohammad Mehdizadeh

University of Mohaghegh Ardabili, Fac. of Agriculture and Natural Resources, Dep. of Agronomy and Plant Breeding, Iran

Abstract

The environmental risk of herbicides should be evaluated near sites of use, even though basic ecotoxicological tests have been conducted before they can be registered for marketing. For example, triazine herbicides, which are photosynthetic PSII herbicides are considered only slightly or moderately toxic for soil microorganisms, mammals and humans. However, concerns have arisen because these herbicides are members of a class claimed to be carcinogenic, or may affect the development of reproductive toxins. For this reason, more reliable evidence is needed to test these claims and investigate their ecological effects. Prometryn is a triazine herbicide that may leave residual activity in the soil for extended periods, causing injury of susceptible soil microorganisms and yield reduction of crops in rotation. A pot experiment was conducted under greenhouse conditions in order to study the sensitivity of 4 different crops (lettuce, barley, rapeseed and beet) to prometryn soil residue (0.0033, 0.0166, 0.033, 0.066, 0.1 and 0.166 mg kg^{-1}soil) in Iran, 2014. The plants were thinned to five plants per pot after germination. The pots were kept for 30 days under controlled conditions. Shoot and root biomass production was measured 30 days after emergence. Results showed that the shoot and root dry matter were significantly affected by increasing prometryn soil residue in all crops ($p < 0.01$), but seed emergency was not affected. Crops showed different responses to prometryn soil residues. Based on ED50 parameter rapeseed (0.0137 mg kg^{-1}soil) and barley (0.0282 mg kg^{-1}soil) appeared the most sensitive and tolerant crops to prometryn soil residue, respectively. Overall crop sensitivity to prometryn soil residue was: rapeseed>lettuce>beet>barely. Based on the mechanism of action of prometryn and its best efficiency on broad leaf plants control, the least biomass reduction obtained for barley is understandable. It means Prometryn is more efficient on dicotyledons, so barley as a monocotyledon crop will be tolerable to this herbicide and it's biomass reduction will be low. In general, it is safe to plant a susceptible species if the plant-available residue is less than the species ED10 value, and there would be a great risk of crop damage if the plant-available residue is higher than ED50 values of the species.

Keywords: ED50, microorganism, persistance, rapeseed, triazine

Contact Address: Mohammad Taghi Alebrahim, University of Mohaghegh Ardabili, Fac. of Agriculture and Natural Resources, Dep. of Agronomy and Plant Breeding, Daneshgah St., Ardabil, Iran, e-mail: m.t.alebrahim@gmail.com