INFLUENCE OF MANAGEMENT TECHNIQUES OF A COTTON PLANTATION ON PESTICIDES FATE

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The intensive use of pesticides in the agriculture can result in the contamination of surface and groundwater resources due the processes of precipitation, runoff and leaching. Different factors can influence these processes, such as pesticides properties, environmental conditions and the management technique[1,2]. This study assessed the influence of management techniques applied in cotton cultivation in Campo Verde, Mato Grosso, Brazil on pesticides fate. Losses of soil and water and surface and groundwater contamination by pesticides were investigated from 2005 to 2007. To assess the groundwater pollution, lysimeters, water soil sampler and monitoring wells were installed in two experimental plots with cotton crops, where two management techniques were employed, no-tillage and conventional tillage. A collection system was installed at the lower end of the plots and water and run-off sediment samples were collected to assess the surface water pollution. The pesticides most frequently applied in the area were investigated. Acetamiprid, azoxystrobin, carbendazin, carbofuran, diuron, methomyl, teflubenzuron, thiamethoxan, thiacloprid and triflumuron were identified and quantified by HPLC/DAD. Solid-phase extraction (SDVB) and horizontal shaking (acetone:acetonitrile:pH 2 KCl/HCl buffer solution, 2:2:1) were employed for water and sediment samples analysis, respectively. Atrazine and its metabolites (deethyl-atrazine (DEA) and deisopropyl-atrazine (DIA)), chlorpyrifos, α- and β-endosulfan, endosulfan sulfate, malathion, metolachlor, monocrotophos, permethrin and profenophos were identified and quantified by GC/MS-SIM, with SPE (C18) and horizontal shaking (acetone:ethyl acetate:water, 2:2:1) employed for water and sediment analysis, respectively. Atrazine, malathion, profenophos, permetryne, monocrotophos, metolachlor, clorpiriphos, α- and β-endosulfan, DIA, DEA, diuron and endosulfan sulfate were detected in run-off sediment and atrazine, DEA, DIA, α- and β-endosulfam, endosulfan sulfate, diuron, malathion, metolachloro and methomil were detected in run-off water samples from the both experimental plots. Atrazine, DIA, DEA, metolachlor, α- and β-endosulfan and endosulfan sulfate were detected in the percolate samples collected in the plot with no-tillage. These same pesticides plus carbendazin and thiamethoxan were detected in the plot with tillage. Losses of pesticides by run-off were lower in the plot with no-tillage than in the plot with tillage, showing that this kind of technique can result in a lower risk of surface water pollution by pesticides. No significant difference ($p<0.05$) were observed for pesticides in percolate water in both management techniques, while the detection frequency of the most soluble pesticides was higher in the plot with no-tillage. In the no-tillage technique, two processes act in opposite ways; water infiltration can increase due to less soil compaction and there is a greater accumulation of organic matter in the soil surface that can retain the pesticides, resulting in small effect of this system on pesticides leaching.

[1] Kookana, R. S., Baskaran, S., Naidy, R. 1998. Pesticide fate and behaviour in Australian soils in relation to contamination and management of soil and water: a review. Australian J. Soil Res. 36: 715–764.

[2] Locke, M. A., Zablotowicz, R. M., Reddy, K. N., Steinriede, E. W. 2008. Tillage management to mitigate herbicide loss in runoff under simulated rainfall conditions. Chemosphere. 70: 1422–1428.