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Pesticide interactions with soil affected by olive mill wastewater (OMW): how strong and long-lasting is the OMW effect?

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Sorption interactions with soils are well known to control the environmental fate of multiple organic compounds including pesticides. Pesticide-soil interactions may be affected by organic amendments or organic matter (OM)-containing wastewater brought to the field. Specifically, land spreading of olive mill wastewater (OMW), occurring intentionally or not, may also influence pesticide–soil interactions. The effects of the OMW disposed in the field on soil properties, including their ability to interact with pesticides, become of great interest due to the increasing demand for olive oil and a constant growth of world oil production. This paper summarizes some recent findings related to the effect of prior OMW land application on the ability of soils to interact with the organic compounds including pesticides, diuron and simazine. The major findings are as following: (1) bringing OMW to the field increases the potential of soils to sorb non-ionized pesticides; (2) this sorption increase may not be related solely to the increase in soil organic carbon content but it can reflect also the changes in the soil sorption mechanisms; (3) increased pesticide interactions with OMW-affected soils may become irreversible, due, assumedly, to the swelling of some components of the OMW-treated soil; (4) enhanced pesticide-soil interactions mitigate with the time passed after the OMW application, however, in the case of diuron, the remaining effect could be envisioned at least 600 days after the normal OMW application; (5) the enhancement effect of OMW application on soil sorption may increase with soil depth, in the 0-10 cm interval; (6) at higher pesticide (diuron) concentrations, larger extents of sorption enhancement, following the prior OMW-soil interactions, may be expected; (7) disposal of OMW in the field may be seasonal-dependent, and, in the case studied, it led to more distinct impacts on sorption when carried out in spring and winter, as compared with summer. It appears that when examining the fate of organic compounds in soil environments affected by OMW, more attention is needed to (a) the effect of the OMW penetration into the depth on soil-pesticide interactions; (b) long-term and seasonal-dependent effects of OMW application.