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Effect of soil compaction on the degradation and ecotoxicological impact of isoproturon

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Soil is essentially a non-renewable resource which performs many functions and delivers services vital to human activities and ecosystems survival. However the capacity of soil to keep on fully performing its broad variety of crucial functions is damaged by several threats and, among them, chemical contamination by pesticides and compaction due to intensive agriculture practices. How these two threats could interact is largely unknown: compaction may modify the fate of pesticides in soil therefore their effects on the biological functioning of soil.
The aim of this work was to study the effect of soil compaction on (1) the degradation of one herbicide, isoproturon (2) the ecotoxicological impact of this herbicide measured through two enzyme activities involved in C (beta-glucosidase) and N (urease) cycles in soil.
Undisturbed soil cylinders were sampled in the 2-4 cm layer of La Cage experimental site (INRA, Versailles, France), under intensive agriculture practices. Several soil samples were prepared with different bulk density then treated with isoproturon (IPU). The samples were incubated at 18 $\pm$ 1°C in darkness for 63 days. At 0, 2, 7, 14, 28 and 63 days, the concentrations of isoproturon and of two of its main metabolites in soil (monodesmethyl-isoproturon, IPPMU; didesmethyl-isoproturon, IPPU), and the enzyme activities were measured.
The results showed that there was no significant difference in IPU degradation under no and moderate soil compaction. IPU was less persistent in the highly compacted soil, but this soil had also higher humidity which is known to increase the degradation. Only one metabolite, IPPMU, was detected independently of the conditions of compaction. The compaction did not modify the effect of IPU on beta-glucosidase and urease activities in the long term, but microbial communities were probably the same in all the soil samples that were initially not compacted. The communities developed in durably compacted zones in the field are possibly different and modification in enzyme activities might be observed as a result.
These first results seem to show that compaction did not modify the degradation and ecotoxicological impact of isoproturon in the soil. However, further studies should be performed using soil samples taken in different zones of compaction in the field, and taking into account the relation between bulk density and soil humidity.