

Monitoring the residues of currently used pesticides in agriculturally used fluvisols

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Demand for high food production in combination with decreasing soil quality induced by rapidly growing population is related to the increasing usage of pesticides [1]. Currently used pesticides (CUPs) include compounds of different chemical structures (organophosphates, pyrethroids, triazines, azoles...) and exhibit a broad range of chemical properties. Despite the fact that there are many non-bioaccumulative ($\log K_{ow} < 0$), non-persistent and quickly degradable, there are also CUPs for which high bioaccumulation and persistency in soils can be expected, based on their $\log K_{ow}$, $\log K_{oc}$, and DT_{50} .

Among the soils most intensively used for agriculture in the Czech Republic belong Fluvisols - soils developed in the vicinity of rivers. Fluvisols are frequently stressed by contamination coming from floods with settled sediments [2,3] and are exposed to high inputs of agrochemicals including CUPs. Understanding the fate and behavior of pesticides in fluvisols is fundamental for a proper assessment of their effects on soil quality, crop quality, and, more generally, the ecosystem and human health.

Therefore soil samples were taken in 75 agricultural localities in the vicinity of great Czech rivers. These 75 sites were sampled in early spring before possible CUP applications in order to identify CUP residues, not levels of CUPs which have been freshly applied. The basic soil properties were obtained. Samples were extracted by QuEChERS method and analyzed by liquid chromatography-mass spectrometry (LC/MS) with a triple quadrupole (QQQ), which guarantees sensitive CUP detection [4,5].

This study presents the list of CUPs present as residues in CR fluvisols, as well as their concentration ranges. Data on the major CUP degradation products/metabolites detected in fluvisols are included. Relationships between CUP residues and soil properties are revealed as well.

[1] Odukkathil G et al., 2013, Rev Environ Sci Biotech 12, 421-44;

[2] Vacha R et al., 2013, Plant Soil Environ 59, 136-42;

[3] Vácha R et al., 2014, Impact of floods on soil and food chains contamination with risky compounds, Annual report of project VG20102014026 (in Czech);

[4] Andreu V et al., 2004, Trend Anal Chem 23, 772-89;

[5] Pico Y et al., 2004, Mass Spec Rev 23, 45-85;