



Behavior of selected pharmaceuticals in topsoil of Greyic Phaeozem

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It has been documented in several studies that soil may be contaminated by human or veterinary pharmaceuticals. Some of pharmaceutical ingredient may be retained in soils. The rest can be transported to the surface and groundwater through surface runoff and infiltration. Mobility of contaminants in soils is dependent on many soil and pharmaceutical properties (e.g. pharmaceutical adsorption on soil particles and pharmaceutical degradation). The goals of this study were: (1) to measure adsorption isotherms of selected pharmaceuticals in one soil; (2) to evaluate degradation of selected pharmaceuticals in this soil, and (3) to evaluate impact of applied pharmaceuticals on biological activity in soil, which influences pharmaceutical decomposition. Batch sorption tests were performed for 7 selected pharmaceuticals (beta blockers Atenolol and Metoprolol, anticonvulsant Carbamazepin, and antibiotics Clarithromycin, Clindamycin, Trimetoprim and Sulfamethoxazol) and one soil (topsoil of Greyic Phaeozem from Čáslav). The same concentrations (0.5, 1, 2.5, 5 and 10 mg/l) were used for almost all pharmaceuticals except Clarithromycin (0.033, 0.08, 0.165, 0.25, 0.33 mg/l). The Freundlich equations were used to describe adsorption isotherms. Degradation of all 7 pharmaceuticals was also studied. Solutes of different pharmaceuticals (concentration of 8.3 mg/l) were added into the plastic bottles (one pharmaceutical per bottle) with soil. Concentrations of pharmaceuticals remaining in soil 1, 2, 5, 12, 23, 40 and 61 days after the pharmaceutical application were analyzed. Colony forming unites were evaluated to describe microbial activity in time affected by different pharmaceuticals. Adsorption of studied pharmaceuticals on soil particles decreasing as follows: Clarithromycin, Trimetoprim, Metoprolol, Clindamycin, Atenolol, Carbamazepin, Sulfamethoxazol. Degradation rates in some degree reflected adsorption of studied pharmaceuticals on soil particles and increased with decreasing adsorption. In all cases (including non contaminated soil sample) biological activity initially increased (1 and 2 day after the pharmaceutical application) and then dropped down on 5th day (Trimetoprim, Clindamycin, Atenolol, Sulfamethoxazol) or 23rd day (Clarithromycin, Metoprolol, Carbamazepin) of soil sample incubation. A closer correlation between the numbers of colony forming unites and degradation rates were not revealed.

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