**Effects of systemic neonicotinoid insecticides: the importance of exposure pathways**

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In recent years neonicotinoid pesticides have become one of the most widely used classes of insecticides worldwide in agriculture, horticulture, forestry, and tree nursery. One reason for their success is their systemic nature leading to a fast uptake and distribution of these insecticides within treated plants. However, due to their extensive application, chemical properties (i.e. high water solubility) and environmental persistence within plants (up to several months), neonicotinoids are susceptible to be transported into adjacent surface waters via runoff either dissolved in the water phase or together with the treated plant material (e.g. contaminated leaf litter). There, neonicotinoids pose a threat to non-target species as well as associated ecosystem functions, such as the breakdown of leaf litter. In this context, leaf shredding organisms participating in this function might experience neonicotinoid exposure via both the water phase and the ingestion of contaminated leaf litter. To assess for potential risks of three frequently used neonicotinoids, that is imidacloprid, thiacloprid and acetamiprid, in leaf litter breakdown, *Gammarus fossarum* (Amphipoda), a key leaf-shredding macroinvertebrate, was chosen as test species using its feeding rate over seven days as ecotoxicological response variable. In six independent experiments, *Gammarus* was exposed either to a) water spiked with different neonicotinoid concentrations (1 to 24 μg/L) and allowed to feed upon uncontaminated leaves or to b) initially uncontaminated water in combination with leaves collected from trees previously treated with different amounts of the respective neonicotinoid (0.0375 to 9.6 g active ingredient per cm trunk diameter at breast height). Experiments that assessed for the water phase exposure (scenario a) revealed a concentration-dependent decrease in the feeding rate of *Gammarus* with effect concentrations causing 50% reduction in feeding (7d EC50s) being within environmentally relevant levels (3.1 μg/L thiacloprid; 8.3 μg/L imidacloprid; 9.5 μg/L acetamiprid). These 7d EC50s were, however, significantly higher compared to 7d EC50s obtained following exposure to contaminated leaf litter (scenario b) when based on the neonicotinoid concentration leached into the test medium at the termination of the experiment. These observations display that the implications observed in the latter scenario are not solely explainable by the neonicotinoids leaching from leaves into the water. Therefore, the ingestion of contaminated leaf litter seems to be, besides water phase exposure, the additional factor negatively affecting the feeding of gammarids and likely associated ecological functions.

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