Geophysical Research Abstracts
Vol. 21, EGU2019-19050, 2019
EGU General Assembly 2019

Acetamiprid transport and mobility within UK agricultural soils - A comparison of commercial mixtures under different soil organic matter treatments

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Neonicotinoids are one of the most widely used insecticides on the current global market. Their systemic mechanisms allow for ease of application and relatively successful outcomes in controlling biting and sucking invertebrates, however neonicotinoids have been strongly associated with recent declines in various non-target organisms. The majority of neonicotinoids can be applied directly to the soil, either as a seed coating or as a soil drench in the form of water-dispersible granules. Despite these application methods there is relatively little research focusing on the movement, fate and interactions of these chemicals in British soils under general field management strategies, though current evidence suggests that practices such as the addition of soil bio-amendments can influence the mechanisms behind pesticide mobility.

The aims of this study were to i) assess the effect of soil organic matter level on Acetamiprid mobility and transport within soil, and to ii) assess the difference in active ingredient transport across different domestic pesticide mixtures. We used 14C labelled Acetamiprid to track the degradation and movement of the domestic pesticide mixtures within soil. We chose to compare two commercially available Acetamiprid pesticide mixtures against the pure active ingredient. Most previous research has chosen to use just the pure active ingredient, however this isn't necessarily representative of true field scenarios. These spiked pesticides were then added to soils collected from the long term experimental site at Woburn, part of Rothamsted research. To assess the movement and behaviour of these pesticide mixtures we ran a range of leaching, sorption and mineralisation experiments.

The mineralisation of all three mixtures was shown to be very slow, with no more than 23% of any given chemical/SOM combination being mineralised over the 60 day experimental period. The highest mineralisation rates were found in the samples with the highest SOM level. Preliminary examination of the leaching data found that over 80% of each chemical passed through each soil sample during the experiment. This combined with the negligible sorption values collated from the initial sorption study plus the low rates of mineralisation imply that neonicotinoids are highly persistent within the environment. Further investigation is required to understand the implications of this in the context of larger agricultural and domestic garden systems.