

CHARACTERISING PESTICIDE RESIDUES IN FLORAL RESOURCES FOR BEES.

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INTRODUCTION

Most pesticides applied in Ireland, in terms of volume, are Plant Protection Products (PPPs), including herbicides, fungicides and insecticides. Systemic PPPs applied via spraying or as seed treatments get dispersed in soil, and can be translocated through the plant tissues, contaminating nectar and pollen of both crops, and nearby growing wild plants. Pollen and nectar are the main food source for bee pollinators and this oral exposure, along with direct contact through spraying, is of concern for their health and for the delivery of pollination services. To determine potential levels of exposure, there is a need to assess the presence and quantify the concentrations of these PPPs found in pollen and nectar, within and beyond the target plants.

METHODOLOGY

To address this issue in a European context, the most extensively used systemic PPPs in Ireland were selected for analysis, as systemic PPPs have potentially negative impacts on pollinating insects. Oilseed rape and field bean were chosen as model crop species since they are the most pollinator attractive of the crops cultivated in Ireland. Since brambles are abundant and a valuable food source for bee pollinators in field edges during the summer months, they were chosen as model wild plant species. Several fields in the southeast of Ireland were included and a minimum of 1000 flowers were collected from each model plant in every site, to extract the required amounts of pollen and nectar for chemical analysis (~ 100 mg and ~ 100 µl respectively). For the PPP chemical analysis, extraction protocols including QuEChERS were used. The frequency of detection and the concentration of the target PPPs in samples from each site were determined by the appropriate validated Liquid Chromatography - Mass Spectrometry (LC-MS) method, to estimate the PPP exposure risk for pollinators.

RESULTS

How many of the active ingredients applied on the crops were actually detected in pollen and nectar and in which combinations? Do these residues vary over different sampling periods? Does their concentration pose a hazard for bee health? Is pollen and nectar of wild plants growing on the field margins contaminated with the same chemicals? Is there a correlation between the PPP residues found in pollen and those found in nectar? These questions will be answered and future challenges will be discussed.

DISCUSSION

PPPs are beneficial, by providing crop protection, food preservation and disease control; however, they are toxic by design posing serious environmental risks. Their persistence may turn food sources into reservoirs of poisonous mixtures, leading to chronic exposure of non-target organisms. Bees are an ideal suite of conservation focal species; they have evoked public support, they are sensitive to changes and their ecological impact is disproportionate to their abundance. The levels of PPPs bees are exposed to in the natural environment can be extreme, impairing their ability to provide pollination services, causing severe economic and ecological implications. Despite regulatory safeguards, the introduction of new PPPs and the adoption of existing ones in new regions, continue to cause global concerns. Our results will feed into a broader evidence base that needs to be assessed prior to the development of policy and regulation of PPPs to the market. Proof of quantity, distribution and prevalence of PPPs in plant pollen and nectar in Ireland, will be incorporated into both local and international guidance documents regarding the risk assessment of PPPs on bees.