Unequal Risk: A Comparison of Pesticide Sensitivity of Wild and Managed Bees

Authors: Luca Dorio, Manon Fievet, Antoine Leprince, Marion Susini, Pierre-Louis Clochard, Antoine Gekière, Kévin Tougeron, Denis Michez.

The rise of the Anthropocene has brought unprecedented disturbances to the Earth's ecosystems. Of these disturbances, the increased use of pesticides is identified as one of the primary drivers in the sharp decline of wild pollinators. Pesticides effects on bees have been extensively studied these last years, but these studies were almost exclusively focus on domesticated bee species (e.g. honey bees, bumble bees) completely ignoring wild species. Bees (Hymenoptera: Anthophilia) is a diverse clade where belong many species (around 20,000 worldwide) presenting various ecological traits (i.e. morphology, physiology, behaviour). This diversity is also reflected in their resilience to environmental stress.

Assessing and characterising these interspecific differences among pollinators exposed to pesticides is one of the main objectives of the European WildPosh project (Horizon program, 2024-2028). The first step was to describe the lethal and sub-lethal effects of pesticides, in controlled conditions, on different species of wild bees using innovative and new exposure protocols adapted for wild species.

Three pesticides, commonly detected as environmental residues and among the most widely used in Europe (i.e. acetamiprid, cypermethrin and tebuconazole) were tested on four eusocial species from the *Bombus* genus (i.e. *B.terrestris*, *B.hypnorum*, *B.lapidarius*, *B.pascuorum*) and two solitary species (i.e. *Andrena vag*a and *Colletes hederae*). Wild bees were exposed to the weight-adapted LD_{50} of the commercial buff-tailed bumblebee (*Bombus terrestris* L.).

Exposure by both oral and topical routes revealed that wild species were more sensitive to pesticides than their domestic counterparts. The two solitary bees were the most sensitive species. *Bombus* species have also generally been more sensitive but higher sensitivity was compound- and species-dependent, revealing more complex mechanisms related to pesticide sensitivity.