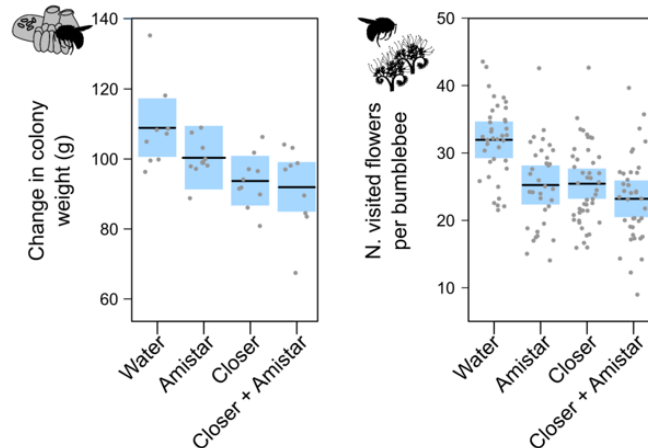


Fungicide and insecticide exposure adversely impact bumblebee health and behaviour

<https://doi.org/10.1016/j.envint.2021.106813>



Effects of spray application of the product Closer (sulfoxaflor) and Amistar (azoxystrobin) compared to the control treatment (water) on bumblebees. Closer had a negative effect on colony weight and both products decreased the number of flowers visited by bumblebees. Plots display model prediction (horizontal lines), and data variability (dots and bands).

Exposure to pesticides is considered a major threat to bees and several neonicotinoid insecticides were recently banned in cropland within the European Union because of their potential negative effects. However, bees remain exposed to many pesticides whose effects are poorly understood. Recent evidence suggests that one of the most prominent replacements of the banned neonicotinoids – the insecticide sulfoxaflor - harms bees. Similarly to neonicotinoids, sulfoxaflor is an insecticide that is first absorbed by treated crops and then it spreads throughout plant tissues, and can contaminate their pollen and nectar. However, experiments testing bee response to spray application of sulfoxaflor under real-world conditions are scarce. Moreover, fungicides have received less attention than insecticides, as they are often viewed as relatively non-toxic to bees. Some experiments have however shown that fungicides alone or mixed with other pesticides can have negative effects on bees. Here, we assess the impact of the product Closer, containing the insecticide sulfoxaflor, and the widely used Amistar, containing the fungicide azoxystrobin, and both pesticides on bumblebees (*Bombus terrestris*). We set up 40 large cages (12 m × 5.9 m, height:2 m, covered by nets), each one containing purple tansy (a plant often used in pollinator studies) and a bumblebee colony. The products were applied according to the then current regulations: Closer before and Amistar during the bloom of purple tansy. In this study, Closer was applied two days before bloom. The health and growth of treated colonies were compared to those of colonies placed in cages where only water was applied. We found that both the product Closer and the product Amistar negatively affected the individual foraging performance of bumblebees (measured as the number of flowers visited by bumblebees). The insecticide also reduced colony growth (measured as the weight of the colony) whereas the fungicide decreased the ability of bumblebees to transport pollen. The limited amount of flower resources in the cages during the experiment might have exacerbated pesticide effects on bumblebee colonies. Our work demonstrates that field-realistic applications of the product Closer (active ingredient: sulfoxaflor) can adversely impact bumblebees. Applying this insecticide only shortly before crop flowering (two days) may be insufficient to prevent its negative impacts on pollinators. Moreover, fungicide use during bloom could reduce bumblebee foraging performance and pollination services.