

ET&C POINTS OF REFERENCE

Points of Reference are part of a regular series intended to address an emerging or controversial topic of interest to the scientific community.

A Brief Note on Pollinator Exposure to Co-Formulants and Adjuvants

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Co-formulants and adjuvants do not have mitigation measures attached to their use. Instead, they are applied with the mitigation measures for the formulation they are being sprayed with. This makes sense for insecticide applications, where the insecticide active ingredient is likely to be considerably more hazardous than the co-formulants or adjuvants. However, for active ingredients with low or intermediate toxicities to non-target organisms, like herbicide and fungicide, the co-formulants or adjuvants in the spray mixture could potentially be more toxic than the active ingredient the mitigation measures are linked too.

TEXTBOX 1: Definitions

Co-formulants: The ingredients in a pesticide formulation other than the active ingredient; they can be surfactants, solvents or a range of other chemical types.

Adjuvants: Separate products applied alongside pesticide formulations which serve to supplement the function of the formulation and are typically very similar to co-formulants.

Mitigation measures: Restrictions to how a pesticide is applied, designed to reduce the exposure of non-target organisms.

Because co-formulants and adjuvants are applied without specific mitigation measures, non-target organisms face substantial exposure to them. To illustrate this point let us consider the mitigation measures attached to a tank mixture containing a high proportion of co-formulants and adjuvants (using the example of the herbicide formulation Roundup[®] ProActive and the surfactant adjuvant Newmans T-80), and, for contrast, an insecticide active ingredient (using the example of the insecticide formulation Closer[®] which contains sulfoxaflor).

As Table 1 demonstrates, pollinators are thus exposed to considerable levels of co-formulants and adjuvants because of the lack of mitigation measures. Worse still, fungicides can be applied directly to crops. Despite this exposure, regulators have very little understanding of the toxicity of co-formulants and adjuvants to non-target organisms.

In the European Union and in the USA there is currently no systematic regulatory testing of the safety of co-formulants or adjuvants to pollinators (European Commission [EC], 2009; US Environmental Protection Agency, 2014). Co-formulants are only ever tested as part of a formulation, and only one formulation for each active ingredient is typically submitted to the full suite of toxicity testing, whereas the rest only undergo highly limited testing. Furthermore, adjuvants are not subjected to any ecotoxicity testing whatsoever for their use in agriculture. So, although recent European Union legislation has sought to ban co-formulants that are harmful to human health, the impacts on environmental health are secondary concerns (EC, 2021). The implementation of this legislation is yet to be resolved and it still does not cover adjuvants.

In the absence of rigorous systematic data it is not possible to make generalizations. However, some co-formulants or adjuvants, particularly surfactants, have been found to be harmful

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Published online 18 April 2022 in Wiley Online Library (wileyonlinelibrary.com).

DOI: 10.1002/etc.5344

TABLE 1: Comparison of mitigation measures for a co-formulant and adjuvant tank mixture versus an insecticide only tank mixture^{a,b,c}

Co-formulants and adjuvants: Roundup [®] ProActive + Newmans T-80	Insecticidal active ingredients: Closer [®]
A maximum application rate of 1200 g/ha and 180 g/ha of the co-formulant surfactants alkylpolyglycoside and nitrotyl, respectively, and 1600 g/ha of the adjuvant ingredient ethoxylated tallow amine	A maximum application rate of 24 g/ha of the active ingredient sulfoxaflor
No restrictions on applications per year	A maximum of two applications per crop
Can be applied at any time of day	Must be applied outside of pollinator daily foraging activity times
Can be directly sprayed onto pollinator attractive flowering weeds while pollinators are foraging on them	Application banned near flowering weeds
Specifically recommended to be applied at approximately the flowering stage	
No plant development stage restriction	Can only be applied at a plant development stage well prior to flowering to reduce floral residues

^aMonsanto. (2021).^bDe Sangosse. (2021).^cCorteva Agriscience. (2021).

Although a fungicide comparison is not presented, fungicides have similar relaxed mitigation measures and can even be sprayed onto flowering crops like strawberries.

to bees (Straw & Brown, 2021; reviewed in Straw et al., 2022). These examples highlight that co-formulants and adjuvants are not toxicologically benign and could pose serious potential harm to pollinators.

To conclude, co-formulants and adjuvants are applied in agriculture at very high rates, with little to no mitigation measures in place. They are not properly regulated or systematically tested, and we know very little as to their toxicity to pollinators. As such more research into, and regulation of, these substances is warranted.

Acknowledgement—Open access funding provided by IReL.

Disclaimer—The author declares no conflict of interest. No experimental work was conducted, so no ethics approval is required.

Data Availability Statement—No data is presented.

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