

Science for Environment Policy

Pesticide additives can weaken the predatory activity of spiders

Two chemicals used as co-formulants in pesticides have been found to reduce the predatory behaviour of the wolf spider *Pardosa agrestis*, an insect predator found within agricultural landscapes. A third co-formulant was found not to affect the predatory behaviour of females and increased the prey behaviour of male spiders. This is the first time that pesticide additives have been shown to alter the predatory activity of a potential biological control agent of crop pests.

Surfactants are a common component of pesticides. They are conventionally mixed with liquid pesticides in order to increase dispersal of the pesticide through plant cuticles or to reduce the surface tension of insect exoskeletons, meaning the surface is unable to repel the liquid pesticide.

The use of surfactants has increased globally over the last decade, with global consumption of these [chemicals](#) increasing at a rate of 5% annually. Possible cumulative effects with other compounds of a pesticide on non-target insects are subject to a risk assessment ahead of authorisation, but the impact of surfactants alone on the range of non-target insect species is rarely studied. Recent research has indicated that surfactants alone may have an even more negative effect on insects than pesticides themselves, including on beneficial species such as pollinators.

Spiders are abundant predators within agricultural ecosystems and can significantly reduce pest populations, bringing significant economic benefits. However, spiders are also highly susceptible to non-specific agricultural chemicals, which are designed to target a wide range of insects. In this study the researchers assessed the effect of three common agricultural surfactants on the predatory behaviour of the wolf spider *Pardosa agrestis*. The wolf spider (Lycosidae) is a common species with potential value within [agricultural](#) systems as a natural biological control agent of pest species.

In a laboratory experiment, male and female wolf spiders were exposed to three surfactants commonly used as herbicide additives in agriculture: Wetcit®, Šaman® and Trend 90®. Eighty spiders were sorted by sex (36 males, 44 females) and assigned to four random experimental groups, each consisting of 20 individuals. Each of the three herbicide additives was applied to one group and the fourth group was a control.

The surfactants were diluted with distilled water and sprayed directly onto the spiders. The control group was sprayed with distilled water only. The concentrations of the surfactant solutions were: 0.2% for Šaman®, 0.1% for Trend 90®, and 0.15% for Wetcit®. Both short- and long-term predatory activity of the spiders was studied, as surfactants can persist for a long time in the environment (from 30 days to 8 months). The predatory activity (number of fruit flies killed) of the spiders was assessed in the immediate four hours (short-term) following surfactant exposure and over the four days following exposure (long-term).

Continued on next page.



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Contact:
xniedobo@mendelu.cz

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The surfactants had no lethal effects on the spiders treated. There was also no significant long-term effect on the predatory behaviour of the spiders. However, in the short term there were significant impacts on predatory activity. Spiders of both sexes in the Šaman® and Trend 90® treatments killed significantly fewer flies than did those in the control group. Differences in predatory behaviour were found only during the first day of the study. No effects were found from the second to fifth day.

For the Wetcit® treatment, the effect was sex specific. Males in the Wetcit® treatment killed significantly more flies than males in the control treatment, while females were not significantly influenced. This increase in the predatory rate of males may be due to a stimulatory effect of low doses of a toxicant. However, the researchers caution that the long-term impact on the spider's ecology may still be negative and further research is necessary to understand this result.

The researchers suggest that surfactants may be an overlooked potential environmental hazard of pesticide formulations within agricultural areas. The researchers therefore recommend further research into the impacts of surfactants on natural pest predators such as the wolf spider.

