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Farmers should choose pesticides that kill soybean aphids but spare their natural insect enemies

What is this research about?

The soybean aphid has become a serious pest of soybean crops in North America since it was first identified here in 2000. Not only does soybean aphid feeding reduce crop yields, but the insect pest can also introduce plant viruses to previously healthy plants. Currently, most soybean farmers control soybean aphid numbers by spraying non-selective pesticides on their fields when there is an outbreak, which kills other insects in addition to the soybean aphids. Scientists are increasingly finding, however, that natural enemies – the predators and parasites of the soybean aphid – can also control soybean aphid populations. For example, the parasitic wasp *Aphelinus certus* lays its eggs in the larvae (immature stages) of the soybean aphid. Unfortunately, the pesticides that control the soybean aphids also kill the natural enemies. Soybean farmers can try to encourage and protect insect natural enemies by choosing pesticides that have little effect on them, but still kill the aphids.

What did the researchers do?

Adult *A. certus* wasps were collected from soybean aphid larvae. Six soybean aphid insecticides were studied: two already in use in Canada (λ-cyhalothrin, dimethoate) and four identified for potential future use (flonicamid, mineral oil, spirotetramat, and *Beauveria bassiana,* a fungus that infects many insects). Groups of 10-15 wasps were exposed to either λ-cyhalothrin or dimethoate, at five different dose levels. Half of the groups were exposed to dry pesticide residues and half were sprayed directly with the pesticide. Groups of 12-15 wasps were directly sprayed with one of the six insecticides, at concentrations 0.5, 1, and 2 times what was recommended for use in soybean fields. After 24 and 48 hours, the number of dead wasps in each group was counted.

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What did the researchers find?

Dimethoate was between 7 and 25 times more harmful than λ-cyhalothrin when *A. certus* wasps were exposed to a dose of each equivalent to what would be found in a soybean field. All of the new pesticides were found to be relatively harmless (less than 30% of wasps died). In order from most harmful to least harmful, the toxicity after 48 hours was found to be dimethoate > λ-cyhalothrin > flonicamid > mineral oil > *Beauveria bassiana* > spirotetramat.

How can you use this research?

Soybean farmers can use this research to choose a pesticide that will be effective against soybean aphids, without unnecessarily harming natural enemies such as the parasitic wasp *Aphelinus certus.*

Pesticide developers can use this research to develop new, more selective pesticides, which spare non-pest insects and the natural enemies of the insect pest being targeted.

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What you need to know:

To protect the parasitic wasp *Aphelinus certus*, a natural enemy of the soybean aphid, soybean farmers should select pesticides that kill soybean aphids but spare the wasp. Potential pesticides to use in soybean pest management plans that are not harmful to *A. certus* include: spirotetramat, *Beauveria bassiana*, mineral oil, and flonicamid.