RESEARCH REVIEW:

Isoclast™ Active and Pollinators

It's estimated 20-40% of crops are lost each year to pests, with invasive insects alone costing the global economy around $70 billion.[1] Sap-feeding pests are among the most damaging for farmers and our food supply. They suck vital nutrients from plants, transmit diseases and reduce the quality and yield of row crops, fruits and vegetables. In some specialty crops there is zero tolerance for damage from sap-feeding pests, so damaged harvests may go to waste. This means less of the fruits and vegetables we all enjoy are available to buy.

Isoclast™ active (sulfoxaflor) is an insecticide active ingredient that controls sap-feeding pests. Since these pests are active alongside beneficial insects, such as pollinators, scientists have spent years studying how Isoclast may affect non-target organisms, including honeybees, that are critical to the health of crops and our environment.

The effects of Isoclast on pollinators have been investigated in over a hundred studies performed by Corteva Agriscience around the world. The results have been used to develop product use instructions that protect pollinators and to verify that the recommended protective measures are sufficient.

Recently, a team of experts reviewed over 300 studies of Isoclast, comprising both Corteva studies and published studies. In their analysis, they came to three important conclusions about Isoclast and pollinators:

1. **Field studies of Isoclast applications confirm concentrations in nectar and pollen are below levels considered hazardous to honeybees.[2*]**
2. **When used as directed, Isoclast does not have significant effects on health, growth or survival of common bee species.[3]**
3. **In well-designed experimental studies, no lasting effects on honeybee behavior or hive activity were demonstrated after exposure to Isoclast.[4]**

*In very limited isolated, individual samples, residues may exceed levels of concern, but the overall concentrations are below those levels.

This analysis confirms that when used according to label directions, Isoclast poses minimal risk to pollinators and continues to be a responsible choice for protecting crops.

Analysis overview

300+ studies, 3 independent scientists

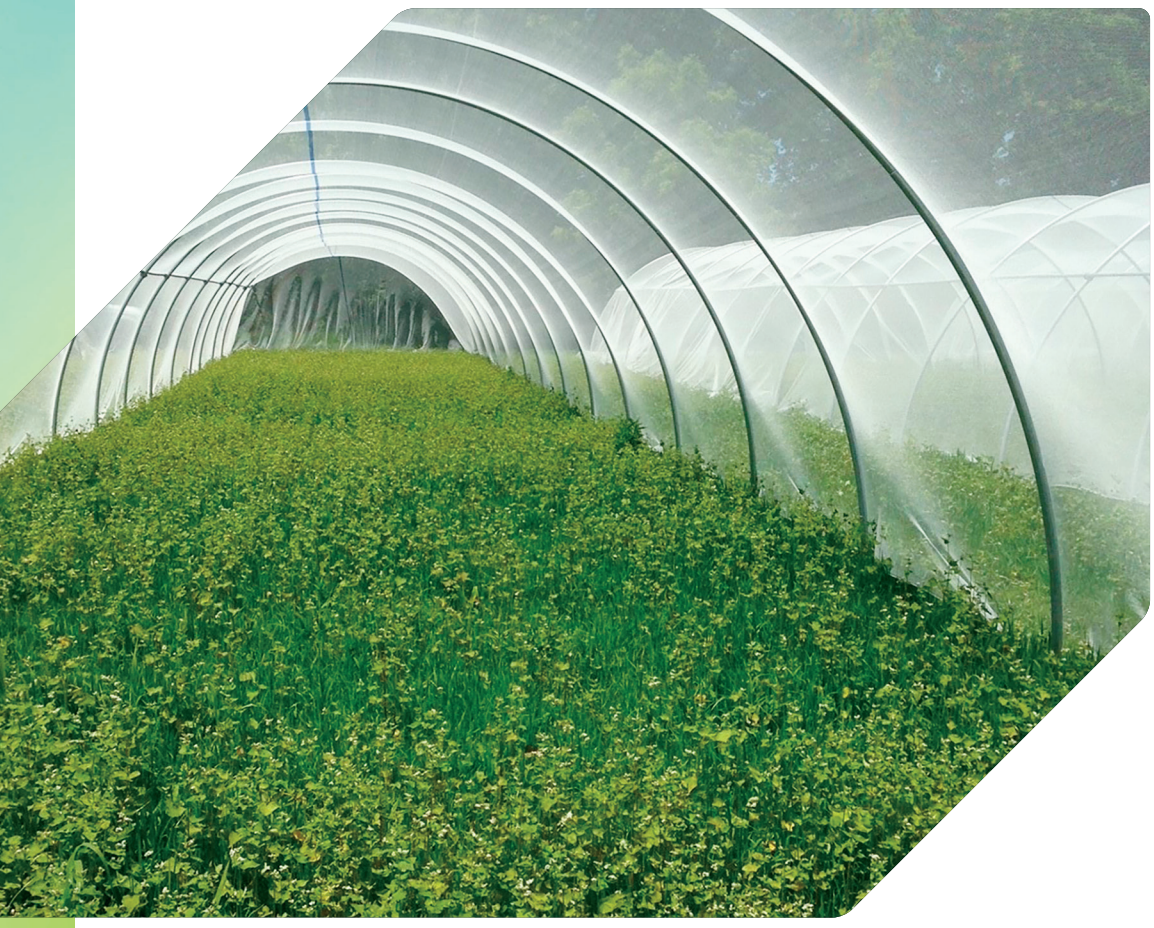
This research review looked at over 300 studies of Isoclast™ active, comprising open literature studies and research conducted by Corteva Agriscience. The review was commissioned by Corteva and followed an objective set of criteria. It was led by three review panel scientists who respectively are experts in environmental sciences, pollinator effects and insecticide toxicology. These scientists summarized their independent findings in six manuscripts, which have been published in the *Journal of Toxicology and Environmental Health, Part B*. This summary will focus on three of their reports. Their full findings are available as open-access publications, and all studies reviewed are available in the **Corteva Pollinator Reading Room**. A capstone summary of the review can be found **here**.

REVIEW PANEL SCIENTISTS

Dr. John Giesy
Environmental toxicologist

Dr. John Purdy
Environmental scientist and beekeeper

Dr. Keith Solomon
Entomologist and environmental toxicologist



An example of a netted tunnel used in Isoclast pollinator studies. The tunnel keeps pollinators within the study area.

About Isoclast™ active

- **Controls sap-feeding insects such as citrus scale, mealybugs, stinkbugs and aphids.**
- **Protects specialty crops, fruits and vegetables, and row crops including soybean and cotton.**
- **Selective activity limits effects on non-target organisms.**
- **In use for more than 10 years.**
- **Registered for use in 90+* countries.**
- **Degrades in the environment quickly after application.**
- **Can be applied at lower use rates and less often.****
- **The only insecticide classified by IRAC in Group 4C.**

Isoclast is an active ingredient in Transform® WG and Ridgeback® insecticides, as well as other insecticide products.

*As of 2024.
**Compared to other commonly used insecticides for sap-feeding pests.

3 important conclusions about pollinator effects

"To provide the world with a reliable supply of food for a growing population, we need agricultural chemicals like sulfoxaflor that protect crops and maximize yields with minimal damage to non-target organisms including honeybees."

Dr. John Giesy
Environmental toxicologist

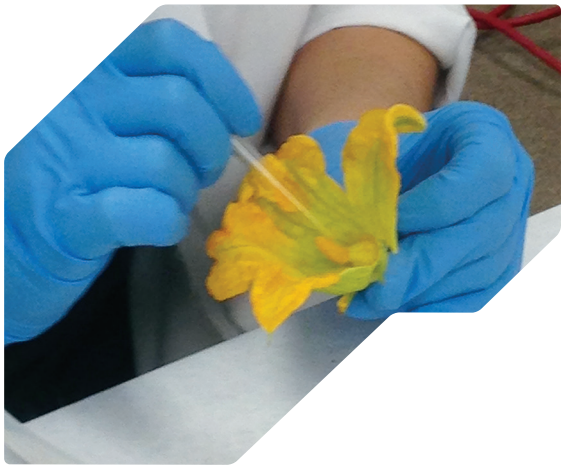
1 Field studies of Isoclast™ active applications confirm concentrations in nectar and pollen are below levels considered hazardous to honeybees.[2]*

Key question:

Do concentrations of Isoclast in nectar and pollen reach the toxicity threshold for honeybees?

What did the reviewers examine?

- 90 use scenarios from field studies measuring concentrations of Isoclast in pollen and nectar
- Research drawn from one of the largest sets of pollen and nectar studies of any insecticide
- Studies in 16 diverse species of crops



A researcher draws nectar from a pumpkin flower to study concentrations of Isoclast.

What did they learn?

Isoclast has one of the largest datasets of pollen and nectar findings of any insecticide. A review of these data confirms that Isoclast dissipates rapidly in pollen and nectar, reducing any hazards of exposure for pollinators.

*In very limited isolated, individual samples, residues may exceed levels of concern, but the overall concentrations are below those levels.

A scientist examines a frame of honeycomb, counting the number of bees present.

2 When used as directed, Isoclast does not have significant effects on health, growth or survival of common bee species.[3]

Key question:

Does Isoclast exposure in the field result in significant effects on bees?

What did the reviewers examine?

- 24 field studies with different species of bees, including honeybees, bumblebees and solitary bees, such as mason bees
- Bees were exposed to a range of labeled application rates of Isoclast-containing products as well as lower rates testing the effects of spray drifts
- Products were applied to test various exposure scenarios including during bee flight, in the evening after bee flight and pre-bloom times
- Includes data on residues in honey, nectar, pollen, worker jelly larvae, whole plants and soil

What did they learn?

A review of field studies confirmed that even when actively foraging bees were exposed to the highest labeled application rates of Isoclast, any effects were minor and temporary and did not contribute to the collapse of colonies.

This study photograph shows how honeybees engage in complex behaviors within the hive. The large bee seen here is the queen.

3 In well-designed experimental studies, no lasting effects on honeybee behavior or hive activity were demonstrated after exposure to Isoclast™ active.[4]

Key questions:

How are residues of Isoclast carried from the field to the hive, and what happens once they're in the colony?

What did the reviewers examine?

- Comprehensive study data applied to model-based analysis to predict potential impacts on honeybees and colonies
- Models built on established knowledge of honeybee biology, life history, behavior and diet
- Models assumed honeybee exposures at the highest permitted application rates for products containing Isoclast

What did they learn?

There are no significant risk concerns for honeybees or their colonies when Isoclast is applied according to the label.

"Our weight-of-evidence approach allowed us to evaluate the quality of studies in a consistent way. We could see the high-quality studies pointed to sulfoxaflor as fairly innocuous to pollinators."

Dr. Keith Solomon
Entomologist and environmental toxicologist

"It was a unique experience to compile, in one effort, published data and proprietary data. That's new, and is thanks to Corteva's forward-looking approach to communication."

Dr. John Purdy
Environmental scientist and beekeeper

What do these findings mean for farmers?

Farmers need effective options to control sap-feeding insects, and Isoclast™ active continues to be a responsible choice that's effective at lower use rates and fewer applications than other insecticides. This research review reinforces that when farmers follow the label directions for products containing Isoclast, they can minimize risk to pollinators while protecting their high-value harvests.

Research continues

Corteva Agriscience takes a diligent and thorough approach to studying every crop protection active ingredient we develop. Our goal in sharing the information from this review is to enhance understanding of how Isoclast works to control target pests, how it behaves in the environment and how it affects beneficial organisms like honeybees. Our research is ongoing as we strive to ensure Isoclast continues to meet the needs of farmers and key sustainability criteria for the health of pollinators and the planet.

Visit the Corteva Pollinator Research Reading Room

Access all of the research reviewed by the expert panel.

References:

[1] Gula, Lori Tyler. February 13, 2023. "Researchers Helping Protect Crops from Pests." USDA National Institute of Food and Agriculture, https://www.nifa.usda.gov/about-nifa/blogs/researchers-helping-protect-crops-pests#:~:text=Between%2020%20to%2040%20of%20global%20crop,significant%20biotic%20constraint%20on%20global%20food%20production.

[2] Solomon, K. R., J. R. Purdy, V. J. Kramer, and J. P. Giesy. 2025. "Evaluating Pollinator Exposures to Sulfoxaflor via Bee-Relevant Matrices: A Systems-Level Approach Using Semi-Probabilistic Methods for Assessing Hazards; Sulfoxaflor Environmental Science Review Part IV." *Journal of Toxicology and Environmental Health*, *Part B*, March, 1–24. https://doi.org/10.1080/10937404.2025.2478970.

[3] Purdy, J. R., K. R. Solomon, V. J. Kramer, and J. P. Giesy. 2025. "Weight of Evidence Assessment from Field Studies on Effects of the Insecticide Sulfoxaflor on Hymenopteran Pollinators: Sulfoxaflor Environmental Science Review Part V." *Journal of Toxicology and Environmental Health*, *Part B*, March, 1–32. https://doi.org/10.1080/10937404.2025.2478964.

[4] Purdy, J.R., K.R. Solomon, V.J. Kramer, and J.P. Giesy. 2025. "A Quantitative *Apis Mellifera* Hazard and Risk Assessment Model (AMHRA) Illustrated with the Insecticide Sulfoxaflor: Sulfoxaflor Environmental Science Review Part VI." *Journal of Toxicology and Environmental Health*, *Part B*, March, 1–29. https://doi.org/10.1080/10937404.2025.2478972.

Additional manuscripts available:

- **Critical Review of the Potential Effects and Risks to Pollinators and Aquatic Organisms from the Agricultural Uses of Sulfoxaflor: Sulfoxaflor Environmental Science Review Introductory Comments https://doi.org/10.1080/10937404.2025.2462285**
- **Properties, Mode of Insecticidal Action, Environmental Exposure Pathways, and Uses of the Insecticide Sulfoxaflor: Sulfoxaflor Environmental Science Review Part I https://doi.org/10.1080/10937404.2025.2478963**
- **Weight of Evidence Assessment of Effects of Sulfoxaflor on Aquatic Invertebrates: Sulfoxaflor Environmental Science Review Part II https://doi.org/10.1080/10937404.2025.2478965**
- **Acute and Repeated Exposure Toxicity of the Insecticide Sulfoxaflor on Hymenopteran Pollinators: Sulfoxaflor Environmental Science Review Part III https://doi.org/10.1080/10937404.2025.2478969**

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