Many crops, like blueberries (*Vaccinium* spp.), require pollinators to set fruit. Organic farms can be an important asset in protecting pollinators and other insects beneficial to agriculture, such as predators and parasitoids of crop pests. Unfortunately, however, pesticides allowed for use in organic agriculture can cause harm to bees and beneficial insects.

While pest management programs should incorporate cultural, mechanical and other practices to prevent and manage pests, sometimes pesticides are the strategy of choice. There are many considerations when choosing between different pesticide options, including efficacy, specificity, cost, and risks to human health and the environment. This fact sheet is intended to be a quick reference to help you select and use organically-approved pesticides with the least impact on bees and other beneficial insects.

Bees can be exposed to pesticides in different ways as they move through the landscape. In addition to direct exposures to adult bees out collecting pollen and nectar or seeking mates and nesting sites, pesticides may be carried back to nests in contaminated pollen or nectar or nest materials, where they may harm larval bees. For pesticides that break down quickly in the environment, applying in the evening or at night can reduce exposure and harm to pollinators.

Pesticide toxicity to bees is complex and difficult to measure. Effects of pesticides range from immediate mortality to sublethal effects such as changes in reproduction, foraging, navigation, and memory. The toxicity ratings in this fact sheet are based on the most readily available toxicity data for bees, acute lethality. Where available, we considered other peer-reviewed research studies to expand our understanding of toxicity.

For more detailed information on organic-approved pesticides, including discussion of managing pests while protecting pollinators, preventive pest management, modes of action, and current research on pesticide impacts on bees and other beneficial insects, download the full guidelines at: [www.xerces.org/guidelines-organic-pesticides](http://www.xerces.org/guidelines-organic-pesticides).
## An Overview of Common Organic Pesticides

The table below provides a comparative overview of pesticides commonly permitted (or referenced) for U.S. organic agriculture. Use this table to determine which pesticide(s) is most appropriate for your situation as part of a new or existing Integrated Pest Management plan. See back for more information on how to download the complete guidelines, Organic Pesticides: Minimizing Risks to Pollinators and Beneficial Insects.

### DISCLAIMER:
This document is provided only as a guide. It offers science-based information to help you make informed decisions to reduce the risk of pest management efforts to pollinators and other beneficial insects. It may also contain specific pest management suggestions, including pesticide uses, but does not guarantee the efficacy of these uses. While based on guidance, advice, research literature, or other documentation, these recommendations are just that: recommendations for applicators and land managers to consider when developing or refining a specific pest management plan.

In the event of a conflict between this guide and the pesticide label, the pesticide user has sole and complete responsibility to comply with the applicable laws and the pesticide label instructions. Xerces and Xerces’ employees are not licensed pesticide applicators or advisors. Xerces makes no warranty, expressed or implied, regarding the accuracy, adequacy, completeness, legality, reliability or usefulness of any information contained in this document and assumes no liability resulting from use of such information. Risk of personal injury or property damage from any pesticide use is assumed by the pesticide user. Any trade names contained in this document are for identification and reference only, and no product endorsement or discrimination against similar products is intended.

### ACTIVITY INGREDIENT (A.I.) | TYPE* | EXAMPLE PRODUCT NAMES | BEE TOXICITY | NOTES & SPECIAL PRECAUTIONS
---|---|---|---|---
Acetic acid (vinegar) | F | Weed Pharmi | MEDIUM | Applications made with concentrations of acetic acid over 10% likely to be toxic to bees and other beneficials
Azadirachtin / neem oil | F | Neemix, Trilogy, Azatrol, Debug, Neem Pro | MEDIUM | Mixing with soap increases toxicity to bees
Bacillus amyloliquefaciens | F | Stangus | LOW | Slow-acting MOA—Impacts on bees likely to be delayed
Bacillus subtilis | F | Serebrol | MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Bacillus thuringiensis sp. azoreus | F | Xentari, Agree | MEDIUM–HIGH† | Toxic to butterflies and other beneficials (Diptera)
Bacillus thuringiensis sp. kurstaki / israelensis | F | DePêt, Javelin, Biobt | LOW | Slow-acting MOA—Impacts on bees likely to be delayed; ▲ (see Coppers below); W—wet formulation
Beauveria bassiana | F | RotanGard | MEDIUM–HIGH† | Toxic to other beneficials (ground beetles, mites, nematodes)
Bicarbonates (sodium / potassium) | F | Armicarb, Kaligreen, Remedy | LOW | Uses for structural pest control are unlikely to affect bees; use caution if applying fertilizers that contain boracic acid
Boric acid | F | Boric acid, Borax | LOW | MOA—suggests that impacts could be delayed, but no data currently available
Borrelia spp. strain A396 | F | Venerate, Majestene | LOW–MEDIUM | Repellent to bees and may disrupt pollination
Chromobacterium subsutius | F | Grandvo | LOW–MEDIUM | Impacts on bees likely to be delayed; repellent to bees and may disrupt pollination for up to a week
Cinnamaldehyde | F | Cinnacure, Cinnrate, Bravado | LOW–MEDIUM | Toxic to other beneficials (ground beetles, mites, nematodes)
Copper sulfate (CuSO₄) | F | GreenPatch, Orange Guard, Avenger | LOW | Repellent to bees and may disrupt pollination
Copper sulfate + lime (Bordeaux mixture) | F | Bordeaux | MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Corn gluten | F | Corn gluten | LOW | Do not apply copper(s) within one week of Beauveria application
Cyclodinemonilla granulovirus | F | Cyd-X | LOW | Slow-acting MOA—Impacts on bees likely to be delayed
Diatomaecous earth | M | Diatomaceous earth | MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Garlic, cottonseed, or clove oil | M | CC-Mite, Mafatec, Scary Garlic Plus | LOW–MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Glibberelial acid | F | ProGibb | LOW–MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Glischrosis catenulatum | F | Pestrol | LOW | Slow-acting MOA—Impacts on bees likely to be delayed
Horticultural oil / narrow range oil | F | JVS Stylet Oil, Ecotrol, Leaf Life Gavicide Green | MEDIUM | Only toxic to bees upon direct contact; if applying during bloom, apply at night to minimize risk to bees
Hydrogen dioxide, peroxyacetic acid | F | Oxicide 2.0 | HIGH | CAUTION
Insecticidal soap | M | M-Pede | LOW–MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Isaria fumosorosea | M | Preferal, NoFly | LOW–MEDIUM | Can disrupt foraging bees at time of application; if applying during bloom, apply at night
Kadim clay | M | Surround | LOW | Repellent to bees and may disrupt pollination
Lime sulfur | F | Lime sulfur, Sulfornx | LOW–MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Pyrithrin | M | PyGaric, Azeroa | HIGH | CAUTION
Pythium oligandrum | F | Polyvermic | LOW | MOA—suggests that impacts could be delayed, but no data currently available
Reynoutria sachalinensis extract | F | Regalia | LOW | Slow-acting MOA—Impacts on bees likely to be delayed
Rotenone | M | PROHIBITED FOR USE IN U.S. ORGANIC AGRICULTURE | HIGH | Highly toxic to honey bee larvae
Rotenone/Ryanodine | M | CANCELLED | LOW–MEDIUM | Slow-acting MOA—Impacts on bees likely to be delayed
Sabadilla (Schoenocaulon officinale) | M | Venator, Success, Regard | HIGH | Granular spinosad bait products generally have a much lower exposure risk for bees
Spinosad | F | Actinovate, MycoStop | HIGH | Only registered for greenhouses / ornamentals
Streptonvys spp | F | Actinovate, MycoStop | HIGH | Slow-acting MOA—Impacts on bees likely to be delayed
Sulfur | M | Sulfur, Microthiol | LOW | Repellent to bees and may disrupt pollination; may reduce pollen viability for some crops
Tea tree oil | M | Timorex | LOW | Slow-acting MOA—Impacts on bees likely to be delayed
Trichoderma spp. | F | Bio-Tam 2.0 | LOW | Slow-acting MOA—Impacts on bees likely to be delayed

* TYPE: — insecticide (I), miticide (M), fungicide (F), herbicide (H), repellent (R), adjuvant (A), plant growth regulator (P)
† MOA—Mode of action (eg., how a pesticide works)
Organic farms can support diverse and abundant pollinator and beneficial insect populations. Protecting these insects from pesticides is key to sustaining their populations and the important pollination and pest control services they provide.

Download the full guidelines at: [http://xerces.org/guidelines-organic-pesticides](http://xerces.org/guidelines-organic-pesticides)

**Source**


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**Additional Resources:**

- Guidance to Protect Habitat from Pesticide Contamination: [xerces.org/guidance-to-protect-habitat-from-pesticide-contamination/](http://xerces.org/guidance-to-protect-habitat-from-pesticide-contamination/)

**Photographs & Layout**

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