Friends of the Earth

Insecticides with Acute Toxicity to Pollinators

Includes insecticides with acute contact toxicity, systemic insecticides with low contact toxicity but high oral toxicity, and with bee hazard statements on a product label. For a definition of acute toxicity and information on the challenges of representing the full range of toxicity to insects posed by pesticides, see page 6.

Active Ingredient	Chemical Class	Not registered in EU	Not registered in US for agriculture	Acute Contact Toxicity
Abamectin	Avermectin			High
Acephate	Organophosphate	X		High
Acetamiprid	Neonicotinoid			Moderate
Aldicarb	N-methyl carbamate	X		High
Alpha-cypermethrin	Synthetic pyrethroid			High
Azadirachtin	Botanical			1
Beta-cyfluthrin	Synthetic pyrethroid			High
Bifenazate	Carbazate			Moderate
Bifenthrin	Synthetic pyrethroid	X		High
Carbaryl	N-methyl carbamate	X		High
Carbofuran	N-methyl carbamate	X		High
Chlorethoxyfos	Organophosphate	X		High
Chlorfenapyr	Pyrroles	X		High
Chlorpyrifos	Organophosphate	X		High
Chlorpyrifos-methyl	Organophosphate	X		High
Chromobacterium subtsugae	Botanical	X		1
Clothianidin	Neonicotinoid	X		High
Cyantraniliprole	Diamide			High

1: Pesticides with Bee-Hazard statements on label, active ingredient not acutely toxic via contact.

2: Contaminated pollen highly toxic to bee larvae.

Active Ingredient	Chemical Class	Not registered in EU	Not registered in US for agriculture	Acute Contact Toxicity
Cyfluthrin	Synthetic pyrethroid	X		High
Cypermethrin	Synthetic pyrethroid			High
Deltamethrin	Synthetic pyrethroid			High
Diazinon	Organophosphate			High
Dichlorvos	Organophosphate	X	No food uses	High
Dicrotophos	Organophosphate	X	No food uses	High
Dimethoate	Organophosphate	X		High
Dinotefuran	Neonicotinoid			High
Emamectin benzoate	Avermectin			High
Esfenvalerate	Synthetic pyrethroid			High
Ethoprop	Organophosphate			Moderate
Etofenprox	Synthetic pyrethroid		X	High
Fenazaquin	Meti acaracide			High
Fenitrothion	Organophosphate	X	X	High
Fenpropathrin	Synthetic pyrethroid	X		High
Fipronil	Phenylpyrazoles	X	No food uses	High
Flupyradifurone	Neonicotinoid (butanolide)			High (Oral only)
Fluvalinate	Synthetic pyrethroid			High
Formetanate hydrochloride	N-methyl carbamate			High
Fosthiazate	Organophosphate			High

1: Pesticides with Bee-Hazard statements on label, active ingredient not acutely toxic via contact.

2: Contaminated pollen highly toxic to bee larvae.

Active Ingredient	Chemical Class	Not registered in EU	Not registered in US for agriculture	Acute Contact Toxicity
Gamma-cyhalothrin	Synthetic pyrethroid			High
Imidacloprid	Neonicotinoid			High
Imiprothrin	Synthetic pyrethroid			High
Indoxacarb	Oxadiazine			High
Lambda-cyhalothrin	Synthetic pyrethroid			High
Malathion	Organophosphate			High
Metaflumizone	Semicarbazone			High
Methiocarb	N-methyl carbamate	X	No food uses	High
Methomyl	N-methyl carbamate	X		High
Momfluorothrin	Synthetic pyrethroid			High
Naled	Organophosphate	X		High
Novaluron	Benzoylurea	X		2
Oxamyl	N-methyl carbamate			High
Permethrin	Synthetic pyrethroid	X		High
Phenothrin	Synthetic pyrethroid	X	X	Moderate
Phorate	Organophosphate	X		High
Phosmet	Organophosphate			High
Pirimiphos-methyl	Organophosphate	X		High
Prallethrin	Synthetic pyrethroid	X	X	High

1: Pesticides with Bee-Hazard statements on label, active ingredient not acutely toxic via contact.

2: Contaminated pollen highly toxic to bee larvae.

Active Ingredient	Chemical Class	Not registered in EU	Not registered in US for agriculture	Acute Contact Toxicity
Propoxur	N-methyl carbamate	X	X	High
Pyrethrum	Botanical pyrethrin			High
Pyridaben	Pyridazinone			High
Rotenone	Isoflavone	X	X	Moderate
Sabadilla	Botanical pyrethrin			1
Spinetoram	Spinosyn			High
Spinosad	Spinosyn			High
Spirodiclofen	Tetronic/tetramic acid derivative			2
Spirotetramat	Tetronic/tetramic acid derivative			2
Sulfoxaflor	4C Neonicotinoid (sulfoximine)			High
Tefluthrin	Synthetic pyrethroid			High
Tetrachlorvinphos	Organophosphate	X	X	High
Tetramethrin	Synthetic pyrethroid	X	X	High
Thiamethoxam	4A Neonicotinoid	X		High
Zeta-cypermethrin	Synthetic pyrethroid			High

1: Pesticides with Bee-Hazard statements on label, active ingredient not acutely toxic via contact.

2: Contaminated pollen highly toxic to bee larvae.

Fungicides Posing Risks to Pollinators

Includes fungicides which research has linked to impacts on pollinators and with bee hazard statements on a product label. Data on fungicide risk to pollinators are limited, and this is not an exhaustive list of all fungicides that may pose pollinator risk. Please see the Fungicide Risk section below for more detail.

Active Ingredient	Chemical Class	Not registered in EU	Risk
Chlorothalonil	Chlorontrile		Linked to reduced colony growth and increased risk of infection in honeybees
Propiconazole	Demethylation inhibitor (DMI)		Linked to bee toxicity, synergistic effects
Tetraconazole	Triazole		Contaminated pollen highly toxic to bee larvae

Herbicides Posing Risks to Pollinators

Includes herbicides that threaten forage/habitat, are acutely toxic or have bee-hazard statements on a product label. Herbicides that threatens forage/habitat are defined here as those with crops genetically modified to tolerate (survive) applications of the herbicide, leading to widespread use across the landscape. Please see the Herbicide Risk section below for more detail.

Active Ingredient	Chemical Class	Not registered in EU	Risk
2,4-D	Phenoxy-carboxylic-acid		Threatens forage/habitat
Bensulide	Phosphorodithioate		Bee hazard statement on label
Dicamba	Benzoic acid		Moderate acute toxicity, threatens forage/habitat
Glufosinate ammonium	Phosphinic acid		Threatens forage/habitat
Glyphosate	Glycine		Threatens forage/habitat
Paraquat dichloride	Bipyridylium	X	Moderate acute toxicity
Sethoxydim	Cyclohexanedione		Moderate acute toxicity

Defining Acute Toxicity

This resource reflects assessment of acute toxicity in insects: toxicity to honeybees via contact exposure where those data are available, toxicity via oral or an unspecified exposure route where contact data are not available, and where contact toxicity is low but oral toxicity is high and the chemical is systemic and therefore may expose pollinators that consume contaminated pollen, nectar or guttation fluid. Acute and moderate toxicity is determined by the LD_{50}, the dose of chemical that is lethal to 50% of a population.

- Pesticides highly toxic to bees have an acute contact LD_{50} of less than or equal to 2µg active ingredient (a.i.) per bee.
- Pesticides moderately toxic to bees have an acute contact LD_{50} greater than 2µg and less than or equal to 11µg a.i. per bee.

The Challenge of Reflecting Chronic Toxicity

Due to the complexity and inconsistency of available data, this resource does not indicate which pesticides pose chronic toxicity to insects. Chronic toxicity is challenging to quantify since the effects from long-term pesticide exposure can be expressed in many ways. Unlike acute toxicity, chronic toxicity accounts for risks of long-term exposure to the survival of a species. The measures for evaluating chronic toxicity to insects consider how pesticide exposure impacts fecundity, fertility and delayed development of a species. For example, chronic toxicity from neonicotinoid exposure could include studies which show how neonicotinoids impair the foraging behavior of bees or impair acquired memory and navigation behavior that allows bees to find their way back to a hive. If pollen or nectar contaminated with pesticides is brought back to the hive and exposure delays the development of bee larvae or has other negative impacts on hive health, this could be considered chronic toxicity. Insecticides with ovicidal activity could kill bee eggs if contaminated pollen or nectar are brought back to the hive.

Fungicide Risks

Current data on fungicide impacts on pollinators are limited, and there is no consensus on a metric to easily evaluate the potential for negative impacts. While the acute and oral contact toxicity of fungicides to pollinators is generally low, little is known about how fungicides affect bee larva, hive health, and foraging behavior. The synergistic effects of mixing fungicides with surfactants or insecticides, which could increase toxicity to pollinators, also remains unknown. As a precautionary approach, multiple peer-reviewed studies suggest that applications of chlorothalonil and propiconazole have negative impacts on pollinator health.

Herbicide Risks

Most herbicides have low acute toxicity to pollinators but may still pose risks from their use or misuse. Herbicides used to kill weeds or dry crops prior to harvest risk damaging pollinator habitat by either killing the flowering plants that serve as food sources or from the movement of the pesticide beyond the intended target (drift). This risk of pesticide drift has increased with widespread adoption of herbicide-tolerant crops, which are genetically engineered to tolerate herbicide applications directly to the crop; over 90% of corn, soybeans, and cotton acres in the U.S. are now planted with herbicide-tolerant varieties. Herbicides are also used to manage invasive weeds in range land, clear road right of ways, and in the turf and landscape industries, and these uses pose risks to pollinator foraging habitat.

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