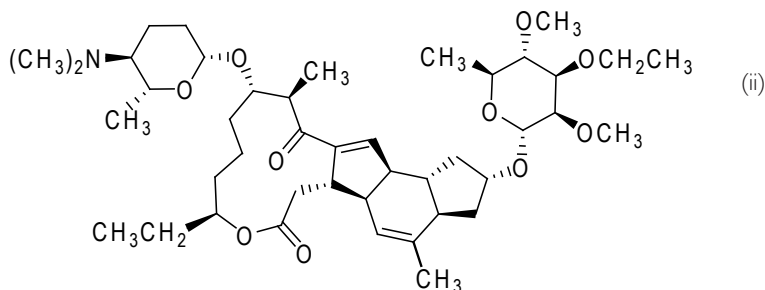
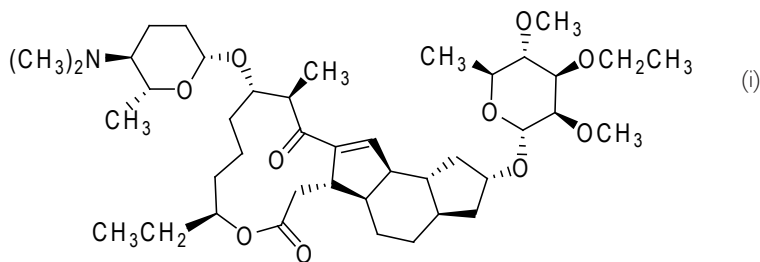


# 2:228 spinetoram

## Micro-organism-derived insecticide

The Pesticide Manual Fifteenth Edition entry number: 781



**NOMENCLATURE:** Approved name: spinetoram (BSI, ANSI, ISO).

**Development code:** XDE-175; DE-175; XR-175; X574175. CAS RN: [187166-40-1] spinosyn J; [187166-15-0] spinosyn L.

**SOURCE:** The commercial product is a mixture of chemically modified spinosyn J ((i) – major component) and spinosyn L (ii). Both compounds are derived from the soil Actinomycete, *Saccharopolyspora spinosa* Mertz & Yoa. The organism is composed of long, yellowish-pink aerial chains of spores encased in distinctive, spiny spore sheaths. The bacterium is aerobic, Gram-positive, non-acid-fast, non-motile, filamentous and differentiated into substrate and aerial hyphae. The aerial mycelium is yellowish-pink and the vegetative mycelium is yellow to yellowish-brown. The parent strain was originally isolated from an abandoned rum still in the Caribbean.

**PRODUCTION:** Spinetoram is obtained from a whole broth extraction, following fermentation of the organism on a feedstock of water, vegetable flours, sugar and animal fat, followed by synthetic modification.

**TARGET PESTS:** Applications for spinetoram products include control of crop-damaging pests such as codling moth (*Cydia pomonella* L.), leafminers (*Liriomyza* spp.), apple maggot (*Rhagoletis pomonella* (Walsh)), pear psylla (*Cacopsylla pyri* (L.) and *Cacopsylla pyricola* (Förster)), oriental fruit moth (*Carposina niponensis* Walsingham), navel orangeworm (*Amylois transitella* (Walker)), diamond-back moth (*Plutella xylostella* (L.)), armyworm (*Spodoptera* spp.), thrips (*Thrips* spp.), tomato fruit worm (*Heliothis zea* (Boddie)), loopers (*Anagrapha* spp., *Anticarsia* spp., *Autographa* spp., *Chrysodeixis* spp., *Syngrapha* spp. and *Trichoplusia ni* (Hübner)), bollworm (*Heliothis* spp and *Helicoverpa* spp.), cutworm (*Agrotis* spp.), grape berry moth (*Eupoecilia ambiguella* (Hübner)) and others.

**TARGET CROPS:** Crops that can be treated with spinetoram include apples and pears, stone fruit, tree nuts, crucifers, leafy vegetables, fruiting vegetables, citrus, grapes, honeydew and cantaloupe melons, maize (corn), cotton, soybeans, caneberries and bushberries.

**BIOLOGICAL ACTIVITY: Mode of action:** Spinetoram effects on target insects are consistent with the activation of the nicotinic acetylcholine receptor, but at a different site than nicotine or the neonicotinoids. Spinetoram also affects GABA ( $\gamma$ -aminobutyric acid) receptors, but their role in the overall activity is unclear. There is currently no known cross-resistance to other insecticide classes. *O*-ethylation of the rhamnose sugar, as in spinetoram, has been shown to increase insecticidal activity. Reduction of the 5,6-double bond is associated with improved residuality in the field. **Efficacy:** The mode of action causes a rapid death of target phytophagous insects. Its moderate residual activity reduces the possibility of the onset of resistance, but it is strongly recommended that it be used within a strong, pro-active resistance management strategy. Spinetoram is recommended as an ICM tool, as it shows no effects on predatory insects such as ladybirds, lacewings, big-eyed bugs or minute pirate bugs. It has reduced activity against parasitic wasps and flies. It is toxic when sprayed directly onto honeybees and other pollinators, but, once dry, residues have little effect. Due to its low effective use rate of 10–100 g/ha (0.5–2.0 oz/A), safety toward the environment, and safety toward mammals and beneficial insects, spinetoram was accepted for review and registration under the Reduced Risk Pesticide Program of the US Environmental Protection Agency (EPA). **Key reference(s):** 1) A Chloridis, P Downard, J E Dripps, K Kaneshi, L C Lee, Y K Min, L A Pavan. 2007. Spinetoram (XDE-175): a new spinosyn, *Proc. XVI Int. Plant Protection Congress*, Glasgow, 1, 68–73. 2) Spinetoram Technical Bulletin, Dow AgroSciences LLC, Form No. Y47-343-001 (11/06) BOD, November 2006, pages 2–4. 3) Spinetoram Pesticide Tolerance, US Environmental Protection Agency, Federal Register Docket ID No. DOCID: fr21mr07-4, Federal Register: March 21, 2007 (Volume 72, Number 54), Rules and Regulations pages 13 170–2.

**COMMERCIALISATION: Formulation:** Spinetoram is formulated as a water dispersible (WG) granule or as a suspension concentrate (SC). **Tradenames:** ‘Delegate WG’, ‘Exalt SC’ and ‘Radiant SC’ (Dow AgroSciences).

**APPLICATION:** The compound is applied at rates of 5 to 100 g per hectare. It should be applied when pest pressure demands treatment. The active ingredient does not dissolve in water and continual agitation is required to prevent the active ingredient from settling out in the spray tank. The addition of adjuvants has not been shown to improve or reduce the performance of spinetoram consistently, with the exception of leaf miner control and the penetration of closed canopies, where emulsified vegetable oils have helped.

**PRODUCT SPECIFICATIONS: Specifications:** Spinetoram is obtained from a whole broth extraction, following fermentation of the organism on a feedstock of water, vegetable flours, sugar and animal fat, followed by synthetic modification. **Purity:** The commercial product is composed of spinosyns J and L. Analysis is undertaken by hplc or immunoassay (details from Dow AgroSciences). **Storage conditions:** Spinetoram is stable over a wide range of temperatures. Protect from freezing. Shake well before use. **Shelf-life:** The formulated product has a shelf-life of 3 years.

**COMPATIBILITY:** No compatibility problems have been identified to date when tank-mixing spinetoram with other crop protection products, foliar fertilisers or adjuvants. A jar test for compatibility is recommended prior to use.

**MAMMALIAN TOXICITY:** Not considered to be toxic to mammals. **Acute oral LD<sub>50</sub>:** rats >5000 mg/kg. **Inhalation:** LC<sub>50</sub> for rats >5.5 mg/litre. **Skin and eye:** Acute percutaneous LD<sub>50</sub> >5000 mg/kg. Eye contact with spinetoram formulations may cause slight irritation. **Other toxicological effects:** No indications of mutagenicity, teratogenicity, or oncogenicity (Ames and chromosomal aberration tests, mutation and mouse bone marrow micronucleus assays).

**ENVIRONMENTAL IMPACT AND NON-TARGET TOXICITY:** The acute and chronic toxicity of spinetoram to mammals, birds, fish, earthworms and aquatic plants is low. Spinetoram is toxic to aquatic invertebrates from chronic exposure. However, because of its rapid degradation in aquatic systems, spinetoram is not expected to impact these species negatively. **Bird toxicity:** Acute oral LD<sub>50</sub> for mallard ducks and bobwhite quail >2250 mg/kg. Acute dietary LC<sub>50</sub> for mallard ducks and bobwhite quail >5620 ppm. **Fish toxicity:** LC<sub>50</sub> (96 h) for rainbow trout >3.46, bluegill sunfish 2.69 mg/litre. **Other aquatic toxicity:** EC<sub>50</sub> (48 h) for *Daphnia* >3.17 mg/litre. **Effects on beneficial insects:** Toxic to honeybees, but residues aged 3 hours or longer are practically non-toxic. LC<sub>50</sub> (96 h) for worms (*Eisenia foetida*) >1000 mg/kg soil. Toxic to predatory mites and insect parasitoids in laboratory tests, but effects under field conditions are much less significant. Not toxic to predatory insects, such as coccinellids and lacewings. **Behaviour in soil:** Rapidly degraded in soil, field dissipation DT<sub>50</sub> 3–5 days; aquatic field dissipation DT<sub>50</sub> <1 day.