

IV. Chemical Control / New Products

c. Biological Control

1. Spinosad, a new Naturalyte Class insect control agent

R.E. Williams
DowElanco
2673 Selah Loop Rd.
Selah, WA 98942
509 / 697-9151

Spinosad - The first product in the new naturalyte class of insect control.

Spinosad is the common name of the active ingredient in the first product of a new class of insect control agents called *Naturalytes*. Naturalytes are naturally produced metabolites from living organisms that offer the combined benefits of the efficacy of synthetic chemical classes such as pyrethroids, and the toxicological profile and environmental compatibility of the biologicals such as *Bt*. into a unique IPM, resistance management package. Spinosad is comprised of a mixture of *spinosyn* factors A and D, where spinosyns are naturally-produced fermentation-based, macrocyclic lactones from *Saccharopolyspora spinosa*, a new species of Actinomycete bacteria. More than 20 active spinosyn factors have been identified, each with unique biological activity characteristics.

Although the exact mode of action of spinosad is not yet known, spinosad exhibits both ingestion and contact activity in a manner distinct from all other insect control agents. Because of this unique activity, no cross resistance with other insect control agents has either been observed or would be expected.

Spinosad symptomology in insects is characterized by initial flaccid paralysis followed by cessation of feeding, weak tremors of crochets and mandibles, incoordination and death with limited to no recovery. Spinosad does not provide the immediate knockdown commonly observed with many conventional insecticides. The insect may remain alive for hours to days following exposure, but continued damage caused by their feeding is stopped within minutes of exposure.

The spectrum of control with spinosad includes a number of arthropod Orders, including several significant lepidopteran, coleopteran and dipteran pest species, such as leafrollers, tentiform leafminers, citrus thrips, peach twig borer, navel orangeworm, grape leaf skeletonizer, grape berry moth, diamondback moth, loopers, pinworms, hornworms, armyworms, cutworms, budworms, bollworms, dipteran leafminers and Chrysomelid leaf beetles (e.g., elm-leaf, flea, asparagus, cucumber and Colorado potato beetles plus strawberry and corn rootworms).

Spinosad formulations will carry the "CAUTION" signal word because spinosad is practically non-toxic to birds and has a large margin of safety to mammals and aquatic

organisms compared to other insect control agents. Spinosad also degrades rapidly in the soil with no ground or surface water concerns.

In addition to a high level of target pest efficacy plus high margins of safety for mammals, birds and aquatic organisms, spinosad also has demonstrated a good margin of safety to beneficial arthropods. Relative to common pyrethroid standards, spinosad has LC50 values 10 - 30 times higher for tested Hymenopteran species, and greater than 1000-fold differences for many Hemipteran and Coleopteran species.

All these features that describe spinosad, the first naturalyte insect control agent, translate to reduced risk factors leading to the following favorable regulatory attributes: spinosad is active at grams ai/acre; spinosad is practically non-toxic to beneficial arthropods compared to conventional insecticides; spinosad is highly selective between target and non-target organisms; spinosad provides efficacy against significant lepidopteran, dipteran, coleopteran and other pests, which is equivalent or superior to current products; spinosad is a nearly completely utilized fermentation product, resulting in a significantly reduced production waste stream compared to many current products; and IPM options with spinosad are great due to spinosad's low toxicity to beneficial arthropods and to an effective and unique mode of action, which will allow for rotation and tank-mixing without cross-resistance concerns to reduce selection pressure and prolong usefulness of current products.

In conclusion: (1) spinosad is a natural product with a wide margin of environmental and human safety plus highly favorable regulatory attributes; (2) spinosad is a novel, highly selective, fermentation-derived pest management tool with little or no effect on most beneficial arthropods and without cross-resistance to conventional insecticides; and (3) spinosad has acute and residual activity comparable to pyrethroids on significant lepidopteran, dipteran and coleopteran pests.