Spinosad: A New Active Ingredient for Public Health

Natular™ larvicides introduce an entirely new active ingredient to public health markets. It’s derived from a naturally occurring bacterium: Saccharopolyspora spinosa, meaning “spiny sugar”. It is one of only five active ingredients to be registered for public health use in the United States.

Spinosad is also considered an EPA Reduced-Risk active ingredient. When it was first registered in 1997 for the agricultural markets, spinosad was reviewed as a Reduced-Risk Pesticide. The goal of this program is to quickly register commercially viable alternatives to riskier conventional pesticides. This ensures that these Reduced Risk pesticides get into the marketplace as soon as possible.

Spinosad has been labeled in more than 85 countries and on over 250 crops. Natular™ larvicides are the first public health label for spinosad and also the first aquatic use pattern for an active ingredient to public health markets. It’s derived from a naturally occurring bacterium: Saccharopolyspora spinosa. The natural metabolites produced during the fermentation process were termed “spinosyns”. Spinosad is the collective term for the two most unique and distinct among all other public health larvicides.

New Class of Chemistry

Spinosad is classified as a Group 5 insecticide, a class unique and distinct among all public health larvicides. The criteria met by Natular formulations make them excellent choices for labeled environmentally sensitive crop uses.

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Spinosad has an excellent safety record. It breaks down quickly and does not bioaccumulate in the environment.

New Mode of Action

Spinosad has a novel mode of action that makes it ideal for rotational use. It shows no cross-resistance with existing chemical uses for mosquito control. Spinosad offers the function of insect nicotinic acetylcholine receptors in a unique action causing continuous nervous impulses. This constant involuntary nervous stimulus causes paralysis and death. This action results primarily by ingestion, as well as contact with the active.

Frequently Asked Questions

Q. Is spinosad new?
A. Yes. The active ingredient (spinosad) is listed as an Allowed Substance on the EPA’s List of Minimal Risk Inert Ingredients. All Natular™ formulations for domestic use are currently under review by the Organic Materials Review Institute (OMRI). Once approved, OMRI labeling certifies that the formulated products meet the stringent requirements for use in organic agriculture.

Q. What is the ecological toxicity of the Natular™ formulations?
A. Spinosad. It is a naturally-derived active ingredient produced during fermentation by the soil organism, Saccharopolyspora spinosa. The natural metabolites produced during the fermentation process were termed “spinosyns”. Spinosad is the collective term for the two most unique and distinct among all other public health larvicides.

Q. How effective is Natular™ in an open / floodwater habitat with sunlight and other organic matter?
A. Natular™ formulations introduce an entirely new active ingredient with a new mode of action that makes it ideal for rotational use. It shows no cross-resistance with existing chemical uses for mosquito control. Spinosad offers the function of insect nicotinic acetylcholine receptors in a unique action causing continuous nervous impulses. This constant involuntary nervous stimulus causes paralysis and death. This action results primarily by ingestion, as well as contact with the active.

Q. How does Natular™ formulate perform in habitats with high concentrations of organic debris with Natular™ formulations, e.g. polluted water, sewage and other mosquito borne diseases.
A. It depends upon the formulation. The primary inert in one granular formulation is a food-grade binder that has a completely unique mode of action; we expect to see consistent performance across all species.

Q. Will Natular™ formulations control mosquitoes that carry the West Nile Virus and other mosquito-borne diseases?
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Q. What is the mode of action for Natular™ formulations?
A. Spinosad acts as a nicotinic acetylcholine receptor allosteric activator, impacting mosquito larvae by stimulating the nervous system.

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Natrual™: A New Class of Larvicides

Natrual™ larvicides are the result of six years and over 35,000 man hours of development and regulatory review. The result is a full spectrum of larvicides that set a new benchmark for mosquito control. They bring to the market:

- A new, Reduced-Risk active ingredient
- A new mode of action
- A new class of chemistry

Natrual™ larvicides are formulated as sustainability solutions for greater application flexibility with precision performance.

\textbf{The First Reduced-Risk Larvicide}

In 1993, the U.S. Environmental Protection Agency created the Reduced-Risk Pesticide Initiative to "encourage the development, registration and use of fewer pesticide products, which would therefore result in reduced risks to human health and the environment when compared to existing alternatives." Spinosad, the active ingredient in Natrual™ larvicides, is one of only sixteen chemicals registered as a Reduced-Risk Pesticide, and the only larvicide for mosquito control. According to the EPA, advantages of Reduced-Risk pesticides include:

- Low impact on human health
- Lower toxicity to non-target organisms (birds, fish, plants)
- Low potential for groundwater contamination
- Low use rates
- Low pesticidal potential
- Compatibility with Integrated Pest Management (IPM) practices

Performance logged and observed in field and operational work has demonstrated consistent performance with exceptional control of larvae from the first through early fourth instar stages. Spinosad begins to work immediately upon ingestion and contact with the larval food items even within hours of application. Optimal control is reached within 3-7 hours and is sustained at very uniform levels for the labeled control period. Through 2008, Natrual™ formulations have been very effective in a wide spectrum of habitats in more than 50 domestic and 15 international studies. Data has been gathered in six species and will be expanded in 2009 with operational applications.

\textbf{Natrual™ DT – Formulations and Performance Fitting Any Habitat}

Natrual™ is available in a defined, low volume, multi-brood formulation. Each tablet contains just 12 mm (1/2 in) in size packs the larviciding power of two to three liters of water for 60+ days. The potentiating formulation consists of two layers, the first is an effervescent layer that provides an immediately visible cue of active to control existing larvae. The second layer slowly, visibly dissolves to provide control for 60+ days. These tablets, shipped in packaging similar to the size and weight of a pound of coffee, can be stored and transported more easily than other larvicides, and the simple tablet eliminates human error in measuring and treatment schedules. Natrul DT has been successfully evaluated by WHO/DE and is available for international use only.

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\textbf{Environmental Impact}

Spinosad is a highly selective insect control product with high potency for target insects but low toxicity toward mammals and other non-target organisms.

\textbf{Environmental Fate in Soil}

Spinosad degrades readily with a high volatility making it effective in the soil environment and non-persistent. Primary mechanisms of degradation are sunlight photolysis and microbial degradation. Under field conditions, spinosad breaks down rapidly in the soil with observed half lives of less than one day. Spinosad degrades into carbon dioxide and water by the soil microbial community.

\textbf{Environmental Fate in Water}

In natural water systems, spinosad degrades rapidly in sunlight. A water column halflife of less than one day has been observed in artificial pond studies in outdoor conditions.

\textbf{Fate in Animals}

Because of its unique mode of action spinosad is highly selective to insects. In mammals, spinosad is not readily absorbed through the skin. Any minute amounts that are absorbed or ingested are rapidly metabolized to inactive byproducts, which are excreted. As a result, it has very low acute toxicity in long term studies. no evidence of carcinogenicity, mutagenicity, or neurotoxicity has been observed.

\textbf{Toxicity, Mutagenicity, Genotoxicity}

The active ingredient in Natrual™ larvicides, spinosad, is well known to be non-toxic to freshwater and terrestrial non-target organisms. Spin0sad has been investigated in a battery of genotoxicity studies and has been found to possess no mutagenic potential.

\textbf{Chemistry}

\textbf{Spinosad Story: Spicy Sugar}

The scientific name for spinosad tells its story. Bacillariapora spinosad is a scientific name that translates into ‘spicy sugar.’ In 1982, a vacationing scientist took a soil sample from a drum that was used to make rum in the Caribbean. The bacteria, Spinosad, in the soil sample fermented in a lab. The fermentation yielded spinosan A and D. spinosan A + spinosan D = Spinosad

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