

SPINOSDA AND THE NEW NATURALYTE INSECT CONTROL CLASS

G. D. Thompson, P. W. Borth, M. C. Shaw,
R. W. Huckaba, B. A. Nead, L. G. Peterson,
J. M. Richardson, and D. J. Porteous

DowElanco
Indianapolis, IN

Abstract

Naturalyte Insect Control is the name for DowElanco's new proprietary biologically based Insect Control Products. Naturalytes are defined as naturally produced metabolites from living organisms that selectively control pests. To qualify within DowElanco's naturalyte class, the metabolites must possess a high level of efficacy that is equivalent or superior to commercial standards and at the same time possess human and environmental compatibility that is equivalent to that provided by most biological products. The technical properties of spinosad, the active ingredient in the first naturalyte insect control product, results of a 1995 EUP, and developmental timelines are briefly reviewed.

Introduction

Naturalyte Insect Control is the name for DowElanco's new proprietary biologically based Insect Control Products. They are the result of a long dedicated effort to discover biological based products which have broad application in agriculture. Naturalytes are defined as naturally produced metabolites from living organisms that selectively control pests.

To qualify within DowElanco's naturalyte class, the metabolites must possess a high level of efficacy that is equivalent or superior to commercial standards and at the same time possess human and environmental compatibility that is equivalent to that provided by most biological products.

DowElanco's expectation is that the naturalyte classification and information around the class will help communicate the sophistication and responsible stewardship found in modern pest control programs and encourage growers to adopt and receive recognition for using environmentally friendly products.

The first active ingredient in the naturalyte class will be spinosad (figure 1). Spinosad was initially disclosed at the 1994 ESA National Meeting and the 1995 Beltwide Conference but it has been in DowElanco and University field trials since 1988. As you can see, it is a large

macrocyclic lactone with a unique central ring system with sugars on each end. Spinosad is a naturally occurring mixture of spinosyn A & D that vary only by a methyl substitution at the R position. While it is vaguely similar to avermectin in structure, the mode of action, toxicological profile and spectrum are not similar to avermectin.

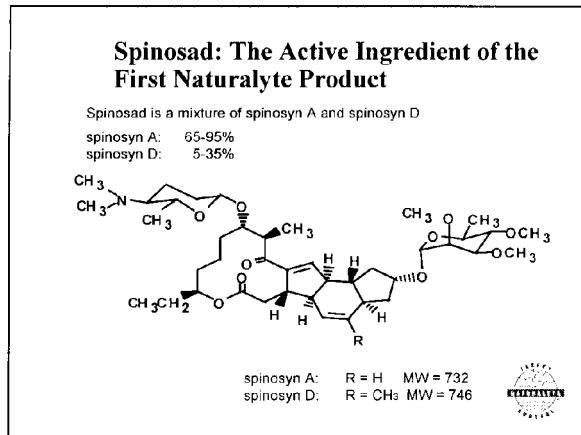


Figure 1.

Spinosad Origin

Spinosad is a secondary metabolite produced by an actinomycete in fermentation conditions. The organism responsible for the production is *Saccharopolyspora spinosa*.

Actinomycetes have both fungal and bacterial qualities but are considered as bacteria in most current taxonomic schemes. A transectional electronmicrograph of the vegetative stage resembles a fungi more than a bacteria, and this surface electronmicrograph reveals the spines that were described in the species name of spinosa.

One of the popular methods of classifying Integrated Pest Management control methods combines techniques based on origin and what they do (figure 2). Including cultural, host plant resistance, mechanical, biological, genetic, chemical and exclusionary.

In this scheme, metabolites of *S. spinosa* would be classified as an inundative bacterial tool (figure 3). The naturalyte classification, however, is based on the combined product attributes of origin, efficacy, selectivity and environmental compatibility which are descriptive to the end user. The naturalyte class is a class of products based on attributes and not meant to replace schemes based on origin such as this or chemical structure schemes. Hence, future naturalytes could conceivably originate from several taxa of microbial agents not just bacteria.

At this conference DowElanco is announcing Tracer* as the tradename for the spinosad based naturalyte insect control product in cotton. Tracer is a selective product in

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:870-872 (1996)
National Cotton Council, Memphis TN

that it controls lepidoptera pests only in cotton, but it has broad spectrum activity within the lepidoptera controlling all common species found in cotton. An environmentally friendly water based suspension concentrate formulation will be launched initially.

* Trademark of DowElanco

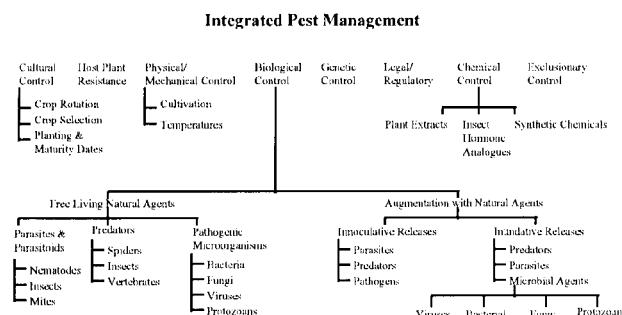


Figure 2.

Spinosyn Naturalytes

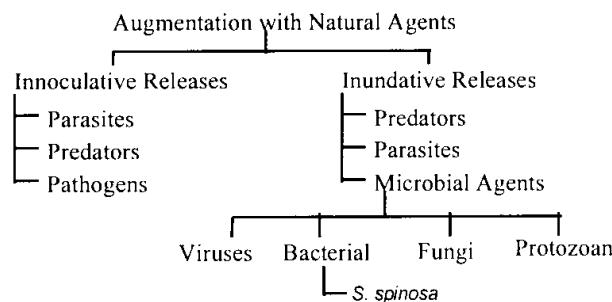


Figure 3.

Properties

Tracer, the first product in the naturalyte class, is characterized by both contact and stomach activity and rapid knockdown which is highly unusual for a natural sourced product. It controls a very broad spectrum of lepidoptera including eggs when directly sprayed and up to third instar larvae. It is active against the pest indicated in the lab at one ppm or less with field rates projected to range from 0.045 to 0.1 lb a.i./acre. It has little or no activity against predaceous insects or sucking pests. In crops other than cotton, spinosad based products do have activity on coleoptera that consume large amounts of foliage, such as the Colorado potato beetle and asparagus beetles, some thrip species, many diptera species, larval fleas and some species of ants.

Environmental Compatibility

Tracer SC will be classified as a FIFRA III product and will have minimal worker protection requirements. The technical active ingredient has an acute rat oral greater than 5000 mg/kg for female rats. Tracer naturalyte insect control has low aquatic and avian toxicity. It has a very short persistence in the environment and breaks down to its natural constituents of carbon, nitrogen, and oxygen. Registrations are still pending at the EPA but it has been placed in the agency's new reduced risk category. A more indepth review on the toxicology and environmental properties was provided in a poster by Paul Borth during the Wednesday session and will be included in the proceedings of the Insect Control Conference.

IPM Compatibility

Tracer, naturalyte insect control will work well as an IPM tool in that it has rapid curative activity, allowing you to treat only as needed and excellent selectivity for beneficial pests. Field trials are indicating that this product benefit is paying off economically with fewer sprays and longer spray intervals. Details and supporting data will be presented in several of the following technical conference papers.

Resistance Management

Tracer naturalyte insect control will greatly help with resistance management since the mode of action and chemistry are unique from all current and experimental products. With Bt cotton and new modes of action, cotton farmers will have more control tactics to rotate with than at any time in history. However, it will be a continuing challenge to counsel cotton growers to wisely use all tools within the context of sound resistance management plans and not rely too heavily on any single class of insect control products.

Status

DowElanco submitted full registrations during 1994 and had a successful EUP this past year which will be reported in additional papers at this conference. We anticipate launching Tracer in 1997 for cotton and as supply permits additional registrations in other crops will be sought. DowElanco is constructing a new special purpose fermentation facility to produce the product in volume as soon as possible.

1995 Results

During 1995 over 100 field trials were conducted, ranging from small plot efficacy screening trials to 10 acres of production fields. Time doesn't permit a complete summary, but in general the growers and consultants who participated in the EUP were very pleased with the performance results. Insect control was equivalent or

superior to the best standards against tobacco budworm, cotton bollworm, beet armyworm, and cabbage and soybean loopers. A series of papers this afternoon will highlight the results of the EUP program.

1995 Result Trends

The larger plots made available by the EUP facilitated taking counts on beneficial insects. It was known from lab studies and occasional observations in small plots that Tracer was selective with no activity on predacious insects such as lady beetles, lace wings, big eyed bugs, pirate bugs and nabids. In the majority of the trials higher numbers of beneficials were observed in the Tracer plots, and at several sites this translated into fewer required treatments or no flaring of secondary pests such as aphids, mites or armyworms. The yields which will be summarized in the technical conference regional papers, were generally higher in the Tracer plots.

Trials were applied in a variety of commercial equipment by air and ground, and tank mixes were allowed. No application problems have been identified to date, but we are continuing to learn about the product and want your input as you begin to work with the product.

1996 Program

During 1996 an expanded EUP or full label is expected, but supply will be limited. However, it is hoped that 10 to 25,000 acres can be treated to fully evaluate Tracer in as many situations as possible. Results to date have been highly encouraging and final validation under this expanded EUP is the last step before full labeling. It appears that Tracer can take a prominent role in IPM programs and when used in rotation with other classes of products can help keep all tools available and result in overall lower insect control costs for the producer. Your help during this last characterization year will be crucial in helping DowElanco deliver the full value of the technology to the cotton producer.

Future Products

Naturalyte insect control is an example of DowElanco's commitment to providing products that are both efficacious and safe. We are aggressively pursuing additional natural sources, including spinosad analogs. The EPA and others have tried to foster the development and adoption of biologically based products, but the acceptance of most previous biological products has been slow due to limited efficacy. Naturalyte insect control should set a new standard for combined efficacy, selectivity, and environmental compatibility.