EFFICACY OF XENTARI® DF BIOLOGICAL INSECTICIDE FOR CONTROL OF CABBAGE LOOPER AND IMPORTED CABBAGE WORM LARVAE ON COLLARDS

Russ Eldridge, Marcus Adair

Valent BioSciences Corporation, 870 Technology Way, Libertyville, IL 60048, USA

Introduction

XenTari® DF is an OMRI (Organic Materials Review Institute) listed insecticide approved for use in production of organic crops. XenTari® is based on the naturally occurring bacterium strain *Bacillus thuringiensis* subsp. *aizawai*. Under certain fermentation conditions, this bacterium produces insecticidal protein toxins that are very specific for Lepidoptera larvae. Once pest larvae, such as armyworm or diamondback moth, consume the toxin crystals and bacterial spores contained in XenTari®, the insects stop feeding rapidly and die a short time later. The toxins act by binding to specific receptors in the insect gut. Once bound to these receptors, the toxins disrupt the cells of the gut quickly causing the insect to stop feeding thus protecting the crop.

The organic foods segment is one of the fastest growing areas of the agricultural industry. An increasing number of consumers are looking for produce that is grown in a sustainable manner with limited conventional chemical inputs. Organic produce is grown, harvested, and stored under strict guidelines outlined by the U.S. National Organic Standards. Farm inputs for growing organic produce need to be approved by accredited independent state or private organizations such as OMRI. Most of the organically listed insecticide inputs come from natural sources and this limits the number of insecticides available to organic farmers.

Because of the limited insecticides available to organic growers, Bt products such as XenTari® DF have proven to be important materials for insect control. Since they have limited options for insect control the organic grower also wants to be sure that the insecticide they use will be efficacious against prominent pests of their crops. In this study we tested a season-long program that relied solely on weekly applications of XenTari® DF to control heavy infestations of imported cabbage worm (*Pieris rapae*) and cabbage looper (*Trichoplusia ni*). XenTari® DF significantly reduced cabbage looper and imported cabbage worm populations compared to the untreated check for all evaluation periods during the course of the season. Leaf damage by these pests was also significantly reduced compared to the untreated check. These studies show that XenTari® DF can be an efficacious insecticide in control of cabbage Lepidoptera pests, even under heavy pressure conditions.

Materials and Methods

Crop: To determine the efficacy of a XenTari® only control program, collard (*Brassica oleracea acephala*) was chosen as a crop for its fast growth characteristics, attractiveness to Lepidoptera pests, and susceptibility to feeding damage.

Location: Reno, GA

Trial Dimensions: The crop was set on a 36 inch row spacing with plants set every 12 inches. Plots dimensions were 4 rows X 30 feet with the first two rows of each plot being the sprayed rows.

Experimental Design: The experimental design of the trial was a randomized complete block design with 4 replications per treatment.

Statistical Analysis: Mean separations were performed using ANOVA with P set at 5%.

Spray Description for Applications
The boom used in the trial was 6 feet wide with 3 nozzles per row. Spray tips used were Tee-jet TX-6. Pressure used was 55 psi. Carrier used was water. The total volume used to spray 2 rows X 30 X 4 was 3.128 liters. All applications were made with a backpack sprayer. Speed during the applications was 3 mph. XenTari® was used with X-77 as a surfactant at a rate of 0.25% v/v.

The crop was set on 3/12/09 when the collards were at the 2-3 leaf stage. Insecticide applications began on 3/18/09 (7 days after transplanting) due to rapid build-up of the worm population. XenTari® DF applications were made on an approximately one week schedule after the initial application. Larval ratings were also made on a weekly basis staring approximately two weeks after the initial application.

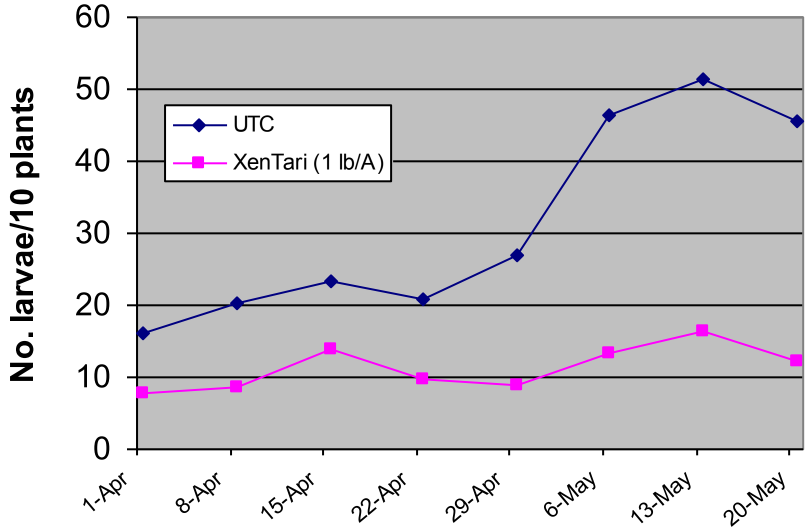
Rates:
XenTari was applied at a rate of 1 lb/acre.

Application dates:
3/18, 3/25, 4/1, 4/8, 4/15, 4/23, 4/29, 5/6, 5/13, 5/20.

Results and Discussion

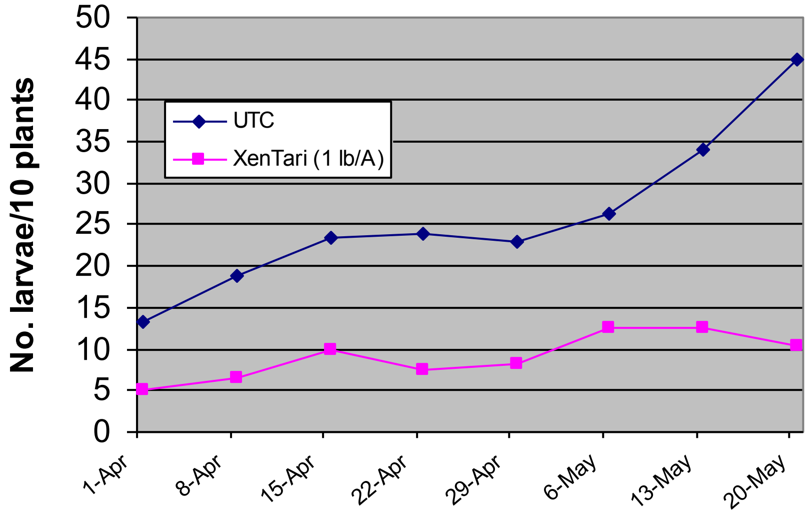
Collard was chosen as the crop in this study because of its attractiveness to Lepidoptera insect pests and fast growth characteristics. The crop had the desired effect because pest populations established rapidly and grew quickly. The population for imported cabbage worm (*Pieris rapae*) in the untreated check increased from 16 insects per 10 plants on April 1 to a peak of over 50 insects per 10 plants by 56 days after the initial application (Figure 1). XenTari® showed statistically significant control of the cabbage worm pests at all dates, with populations holding at approximately 10 larvae/10 plants.

Figure 1. Imported cabbage worm larval counts for collard plants that were left untreated (UTC), and treated with XenTari® DF at 1 lb/acre.



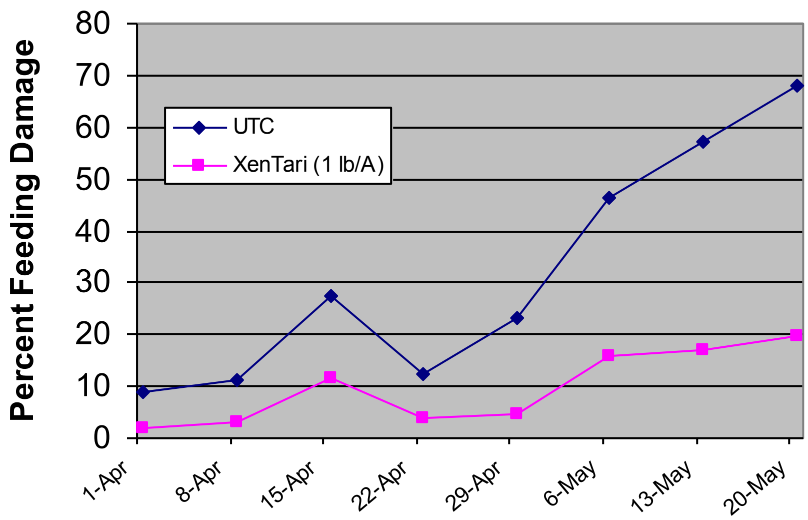
The plants also became heavily infested with cabbage looper, going from more than 10 insects/10 plant on April 1 to 45 larvae per 10 plants by 63 days after infestation on May 20 (Figure 2). When treated with XenTari®, the insect population was maintained at approximately 10 insects per 10 plants through most of the season. There was statistically different numbers of larvae between the UTC and XenTari® treated plants for all evaluation dates with XenTari® showing good control of very heavy populations of pests.

Figure 2. Cabbage looper larval counts for collard plants that were left untreated (UTC), and treated with XenTari DF at 1 lb/acre.



As expected, plant damage from this level of pest pressure is extremely high. By 56 days after the initial application, collard leaf damage in the untreated check (UTC) was greater than 50%, and by 70 days after initial application damage was rated at nearly 80% (Figure 3). Leaf damage in the XenTari treated plants was below 20% except for the very last date, and damage was held to below 10% for the first half of the trial. In light of the extreme pressure XenTari® performed well in suppressing leaf damage.

Figure 3. Percent feeding damage on collards left untreated (UTC) or treated with XenTari® DF at 1 lb/acre.



Conclusions

Although insect pressure was extremely high in these field trials, a program that utilized only XenTari® DF demonstrated the ability to significantly reduce insect populations and the damage associated with insect feeding.