Besiege®

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TECHNICAL BULLETIN

®

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AN INTRODUCTION TO BESIEGE

WHAT IS BESIEGE?

Besiege® insecticide, which contains the active ingredients chlorantraniliprole and lambda-cyhalothrin, is a broad-spectrum foliar insecticide providing fast knockdown and control of a wide range of insect pests, including lepidopteran, sucking, and chewing pests. It provides long lasting control of insect pests in row crops, specialty crops and vegetable crops.

TECHNICAL FEATURES

- Broad-spectrum, foliar-applied insecticide providing both rapid knockdown and long lasting residual control of lepidopteran, sucking and chewing insect pests
- Combination of chlorantraniliprole (CTPR) and lambda-cyhalothrin (LCY)
- Dual mode of action provides insect pest control by contact, ingestion and ovicidal action
- Rainfast upon drying
- Wide margin of plant safety when used in accordance with the label

MODES OF ACTION

Besiege combines two different insecticide modes of action: the diamide (*chlorantraniliprole*) and pyrethroid (*lambda-cyhalothrin*) modes of action.

Chlorantraniliprole is a diamide insecticide. The mode of action of chlorantraniliprole is the activation of insect ryanodine receptors. This activation stimulates the release of calcium from the internal stores of smooth and striated muscle which causes impaired muscle regulation, paralysis and insect death. Diamides belong to IRAC mode of action Group 28.

Lambda-cyhalothrin is a third generation photostable pyrethroid insecticide, one of the most potent insecticidal compounds. Pyrethroids are sodium channel modulators, interfering with the central nervous system of insects. Pyrethroids belong to Insecticide Resistance Action Committee (IRAC) mode of action Group 3.

SPECTRUM OF ACTIVITY

Chlorantraniliprole is a foliar insecticide that is most effective through ingestion of treated plant material. After a foliar application, most of the compound stays on the leaf surface and a small amount penetrates into the leaf tissue where it moves systemically within the leaf to a very low extent. It is highly potent at low rates on target species, which are primarily lepidopterans but also some beetles and leafminers. Excellent crop protection results from rapid feeding inhibition.

Lambda-cyhalothrin kills insects by contact, ingestion and ovicidal action, and is not locally systemic in plants. It offers rapid knockdown and residual control while anti-feeding and repellency properties extend the biological effect against some pests. Lambda-cyhalothrin controls a wide spectrum of insect pests such as aphids, Colorado potato beetles, beetle larvae and adults, flies, leafhoppers, lepidopteran larvae and adults, plant bugs, stinkbugs, thrips and whiteflies.

TOXICOLOGY PROFILE

MAMMALIAN TOXICITY

Besiege exhibits moderate acute toxicity via oral and practically non-toxic acute toxicity via dermal and inhalation routes of exposure, is not irritating to the eyes and mildly irritating to the skin.

ACUTE TOXICITY / IRRITATION STUDIES (FINISHED PRODUCT)

Target	Study Type	Results
Ingestion	Oral (LD50 Female Rat)	98.11 mg/kg body weight
Dermal	Dermal (LD50 Rat)	> 5,000 mg/kg body weight
Inhalation	Inhalation (LC50 Rat)	> 4.05 mg/l air – 4 hours
Eye Contact	Rabbit	Non-irritating
Skin Contact	Rabbit	Non-irritating
Skin Sensitization	Guinea Pig	Not available

ECOLOGICAL TOXICITY

Besiege is toxic to wildlife, extremely toxic to fish and aquatic organisms, and toxic to aquatic invertebrates, oysters and shrimp. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Drift or runoff from treated areas may be hazardous to aquatic organisms in water adjacent to use sites. Do not contaminate water when cleaning equipment or disposing of equipment wash water. Besiege is a “Restricted Use Pesticide “ due to its toxicity to fish and aquatic organisms.

ECO-ACUTE TOXICITY (ACTIVE INGREDIENTS)

Test	Lambda-Cyhalothrin	Chlorantraniliprole
Fish (Rainbow Trout) 96-hour LC50	0.19 ppb	> 1.09 mg/l
Fish (Bluegill Sunfish) 96-hour LC50	0.21 ppb	> 1.19 mg/l
Bird (Mallard Duck) LD50 Oral	> 3,950 mg/kg	> 5,620 ppm
Invertebrate (Daphnia Magna) 48-hour EC50	> 0.04 ppb	0.011 mg/l
Bird (Bobwhite Quail) 8-day dietary	> 5,300 ppm	> 5,620 ppm
Bee (Contact) LD50	0.038 ug/bee	> 100 ug/bee

POLLINATOR PRECAUTION

Besiege is highly toxic to bees exposed to direct treatment or residues on blooming crops. Do not apply Besiege or allow it to drift to blooming crops if bees are visiting the treatment area. This is especially critical if there are adjacent orchards that are blooming. If bees are foraging in the ground cover and it contains any blooming plants or weeds, always remove flowers before making an application. This may be accomplished by mowing, disking, mulching, flailing or applying a labeled herbicide. Consult with a local cooperative extension service or state agency responsible for regulating pesticide use for additional pollinator safety practices.

Besiege (Formulated Product)

Property	Physical Chemical Properties
Appearance	Light beige to brown liquid
Odor	Weak, uncharacteristic
Melting Point	Not applicable
Boiling Point	Not available
Specific Gravity/Density	1.08 g/cm3 @ 68 F (20 C)
pH	4.0 – 8.0 (1% w/v @ 68-77 F (20-25 C))

Besiege (Active Ingredients)

Property	Lambda-Cyhalothrin	Chlorantraniliprole
Solubility in H2O	4.1 g/l @ 77 F (25 C)	1.023 mg/l @ 68 F (20 C)
Vapor Pressure	1.5X10-9 mm Hg @ 68 F (20 C)	Not available

PRODUCT STEWARDSHIP

RESISTANCE MANAGEMENT

Some insect pests are known to develop resistance to products after repeated use. The objectives of Insecticide Resistance Management (IRM) programs are to prevent or delay the evolution of resistance to insecticides or to help regain susceptibility in insect pest populations in which susceptibility has been reduced. Because resistance development cannot be predicted, the use of Besiege should conform to sound resistance management strategies established for the crop and use area. Syngenta encourages responsible product stewardship to ensure effective long-term insect management with Besiege.

Besiege contains a Group 28 insecticide (chlorantraniliprole, belonging to the diamide class of chemistry), and a Group 3 insecticide (lambda-cyhalothrin, belonging to the pyrethroid class of chemistry). Insect biotypes with acquired or inherent resistance to Group 28 or Group 3 insecticides may eventually dominate the insect population if Group 28 or Group 3 insecticides are used repeatedly as the predominant method of control for targeted species. This may result in partial or total loss of control of those species by Besiege or other Group 28 or Group 3 insecticides.

As with any insecticide, it is very important to follow IRAC guidelines on resistance management, employing strategies such as:

- Always use the proper rate and timing.
- Alternate or rotate modes of action per product label instructions.
- Do not exceed the maximum number of applications or maximum active ingredient per acre specified on the Besiege label.

When using a pre-mixture like Besiege:

- Consider any known cross-resistance issues between the individual components for the targeted pest(s).
- Recognize that pre-mixtures become less effective if resistance is already developing to one or both active ingredients, but that they may still provide pest management benefits.
- The insect resistance management benefits of an insecticide pre-mixture are greatest if the two components have similar periods of residual insecticidal activity. Mixtures of insecticides with unequal periods of residual insecticide activity may offer an insect resistance management benefit only for the period where both insecticides are active.

Other IRM practices include:

- Incorporate Integrated Pest Management (IPM) techniques into the insect control program.
- Monitor treated insect populations for loss of field efficacy.
- Use tank mixtures or premixes with insecticides from a different target site of action group as long as the intended products are all registered for the same crop outlet and effective rates are applied.

For additional information on IRM:

- Contact a local extension specialist, certified crop advisor and/or product manufacturer for additional insect resistance management recommendations.
- The IRAC general principles of insecticide resistance management can be found on the following web site: http://www.irac-online.org/.

USE RECOMMENDATIONS

FORMULATION

Besiege contains 0.835 lb of chlorantraniliprole and 0.417 lb of lambda-cyhalothrin per gallon and is formulated as a Zeon Concentrate (capsule suspension plus soluble concentrate).

ADJUVANTS

The use of adjuvants is allowed on all crops and may improve the performance of Besiege insecticide. When an adjuvant is to be used with this product, use an adjuvant that meets the standard of the Chemical Producers and Distributors Association (CPDA) adjuvant certification program.

Besiege is an aqueous-based formulation. Do not use any type of non-emulsifiable oils in combination with Besiege. If adjuvants are used, use the following types:

- Nonionic Surfactant (NIS) containing at least 75% surface agent.
- Non-phytotoxic Crop Oil Concentrate (COC), including once refined Vegetable Oil Concentrate (VOC).
- Methylated Seed Oils (MSO) containing a minimum of 17% emulsifier.

Adjuvants other than NIS or COC may be used providing the product meets all of the following criteria:

- Contains only EPA exempt ingredients.
- Is non-phytotoxic to the target crop.
- Is compatible in mixture. (established through a jar test).
- Is supported locally for use with Besiege on the target crop through proven field trials and through university and extension specifications.

Do not use the following in combination with Besiege as diluents or adjuvants:

- Non-emulsifiable oils
- Diesel Fuel
- Straight Mineral Oil

COMPATIBILITY

Besiege is compatible with many commonly used pesticides, adjuvants and nutritional sprays. However, since it is not possible to test all possible mixtures, the user should pre-test to ensure the physical compatibility and lack of phytotoxic effect of any proposed mixture with Besiege.

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APPLICATION METHODS

GROUND APPLICATION

Apply Besiege using sufficient water volume to provide thorough and uniform coverage. In situations where a dense canopy exists and/or pest pressure is high, use greater water volumes. The use of a spray adjuvant may improve spray coverage and result in improved insect control. Avoid making applications under conditions where uniform coverage cannot be obtained or where excessive spray drift may occur.

AERIAL APPLICATION

Apply Besiege in water, using the minimum spray volume indicated on the product label for each crop group. Increase the spray volume where practical to improve coverage. Avoid making an application under conditions where uniform coverage cannot be obtained or where excessive spray drift may occur.

BESIEGE LABEL AT A GLANCE

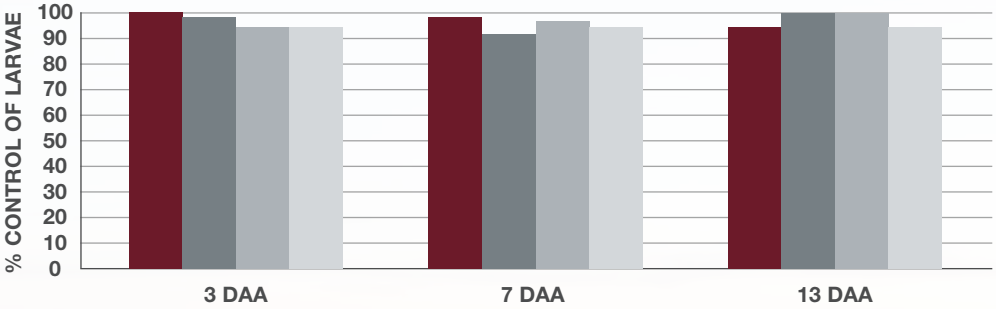
Crop	Pests	Rate Per Acre Per Application	PHI
Alfalfa, Alfalfa Grown for Seed	Alfalfa caterpillar, armyworms, cutworms, leafhoppers, loopers, weevils	5.0 – 10.0 fl oz/A	1 day (forage), 7 days (hay)
Brassica (Cole) Vegetables	Cabbage looper, diamondback moth, imported cabbageworm, aphids	5.0 – 9.0 fl oz/A	3 days
Canola	Armyworm species, looper species, cabbage aphid, cabbage seedpod weevil	5.0 – 10.0 fl oz/A	21 days
Cereal Grains *Barley, buckwheat, oats, rye, triticale, wheat, wheat hay*	Armyworm species, chinch bug, cutworm species, flea beetle species, greenbug, aphid species	5.0 – 10.0 fl oz/A	30 days
Corn *Field corn, popcorn, seed corn*	Armyworm species, beetle species, borer species, corn earworm, western bean cutworm, aphid species	5.0 – 10.0 fl oz/A	21 days
Cotton	Bollworms, fall armyworms, loopers, stinkbugs	5.0 – 12.5 fl oz/A	21 days
Cucurbit Vegetables	Beet armyworm, beetles, melonworm, pickleworm, aphids	6.0 – 9.0 fl oz/A	1 day
Fruiting Vegetables	Beet armyworm, southern armyworm, tomato fruitworm, aphids	5.0 – 9.0 fl oz/A	5 days
Grass, Forage, Fodder, Hay	Armyworm species, cutworm species	5.0 – 10.0 fl oz/A	0 days

Crop	Pests	Rate Per Acre Per Application	PHI
Legume Vegetables	Armyworm species, beetle species, leafhopper species, webworm species, weevils, western bean cutworm	5.0 – 10.0 fl oz/A	7 days for edible podded and succulent (shelled) legumes 21 days for dried shelled legumes
Lettuce *Head & Leaf*	Beet armyworm, beetles, cabbage looper, corn earworm, leafminers	5.0 – 9.0 fl oz/A	1 day
Peanuts	Corn earworm, Cutworm species, fall armyworm, velvetbean caterpillar	5.0 – 10.0 fl oz/A	14 days
	Soybean looper	10.0 fl oz/A	
Pome Fruit	Codling moth, leafhoppers, obliquebanded leafroller, oriental fruit moth, plum curculio, stink bugs	6.0 – 12.0 fl oz/A	21 days
Sorghum *Grain*	Armyworm species, corn earworm, cutworm species, sorghum webworm	5.0 – 10.0 fl oz/A	30 days
Soybeans	Armyworms, corn earworm, velvetbean caterpillar	5.0 – 10.0 fl oz/A	30 days
	Soybean looper	10.0 fl oz/A	
Stone Fruit	Oriental fruit moth, peach twig borer, plant bugs, plum curculio, stink bugs	6.0 – 12.0 fl oz/A	45 days
Sunflower	Cutworm species, seed weevil (adult), sunflower beetle, sunflower moth	5.0 – 10.0 fl oz/A	21 days
Sugarcane	Lesser cornstalk borer, Mexican rice borer	8.0 – 10.0 fl oz/A	21 days
Sweet Corn	Aphid species, armyworm species, beetle species, borer species, corn earworm, Western bean cutworm	6.0 – 10.0 fl oz/A	1 day
Tobacco	Tobacco budworm, tobacco hornworm	5.0 – 10.0 fl oz/A	40 days
Tree Nuts	Navel orangeworm, peach twig borer	6.0 – 12.5 fl oz/A	14 days
Tuberous & Corm	Colorado potato beetle, leafhoppers, European Corn borer, beetles, aphids	5.0 - 9.0 fl oz/A	14 days

Label summaries should not be considered as a substitute for the actual federal and state- approved label. For instance, they do not contain specific recommendations for all pests that appear on the actual label. Always consult the approved label for the most complete set of recommendations and legal use guidelines.

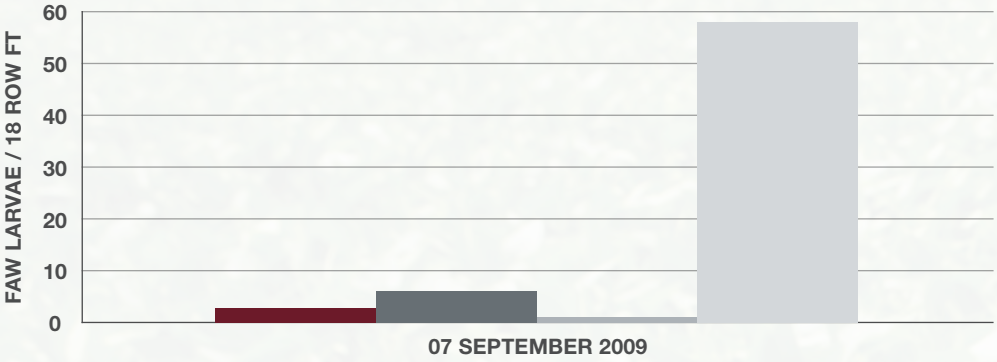
TRIAL DATA

SOYBEAN LOOPER CONTROL IN SOYBEANS: MISSISSIPPI, 2017



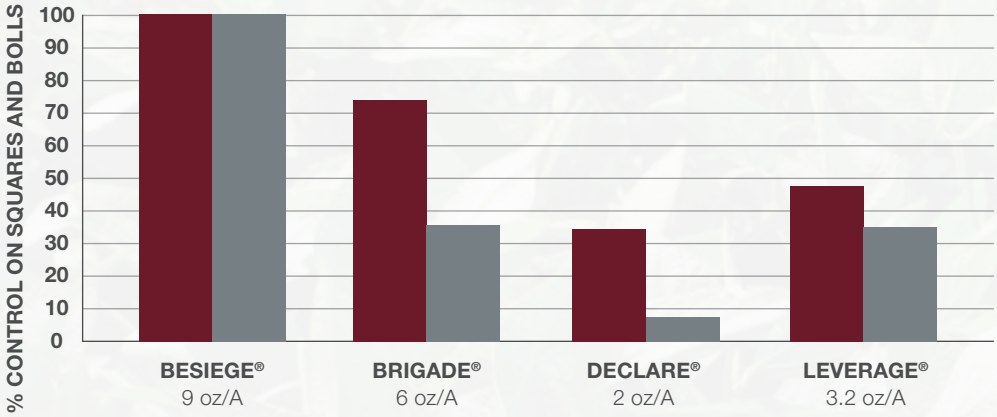
Planted: 27 March 2017, Application Method & Date: Foliar – 8 September 2017
USSBSI3172017 – Southern Ag Services

FALL ARMYWORM EVALUATION IN COTTON: SOUTH CAROLINA (CLEMSON UNIVERSITY)



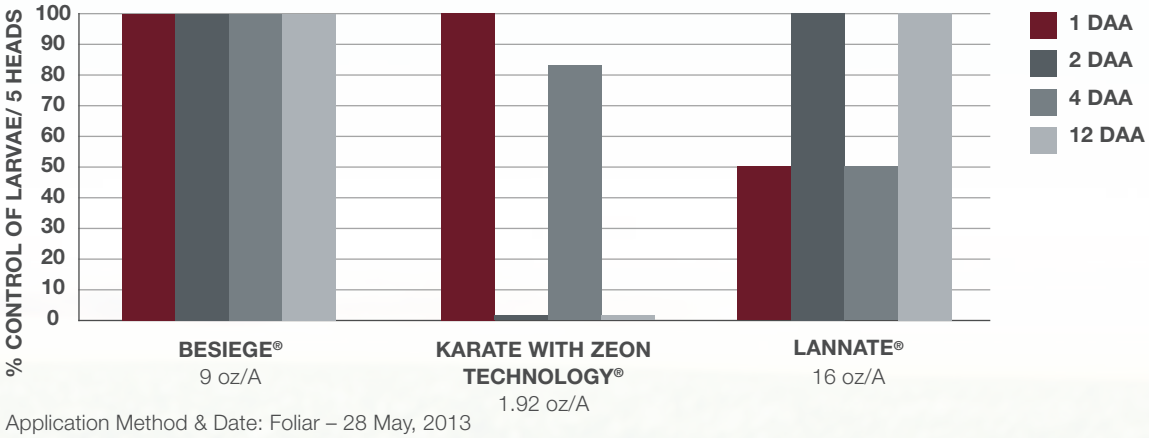
Application Dates: Besiege – 28 Aug., Brigade + Diamond – 27 Aug., fb Diamond – 2 Sept. 2009
Jeremy Greene & Tommy Walker – Fall Armyworm Demonstration Trial – Hampton, SC

H. ZEA CONTROL IN COTTON: NORTH CAROLINA, 2013



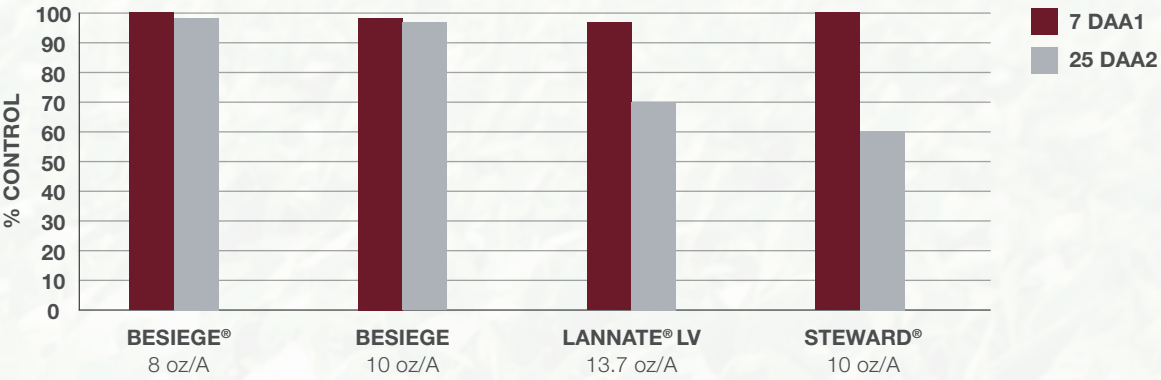
Application Method & Date: Foliar – 9 August, 16 August, 2013
USSJ0I1152013 – NCSU – Rocky Mount, NC

FALL ARMYWORM CONTROL IN SORGHUM: TEXAS, 2013



Application Method & Date: Foliar – 28 May, 2013
USSA0I1062013 – R. Parker – Texas A&M – Kleburg County, TX

FALL ARMYWORM CONTROL IN PEANUTS: FLORIDA



Application Method & Date: Foliar, 2 July, 9 July, 2013
USVN0I3022013 – J. Curtis – Better Crops, LLC – Newberry, FL

Trials reflect treatment rates commonly recommended in the marketplace
Performance assessments are based upon results or analysis of public information, field observations and/or internal Syngenta evaluations.

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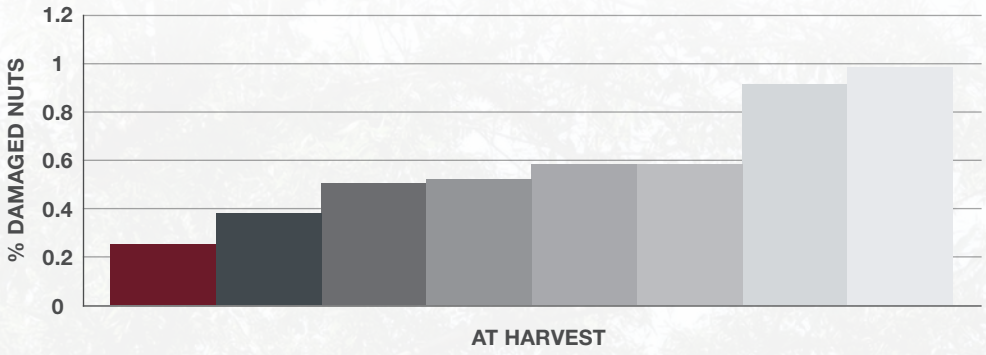
TRIAL DATA

NAVEL ORANGEWORM CONTROL IN ALMONDS

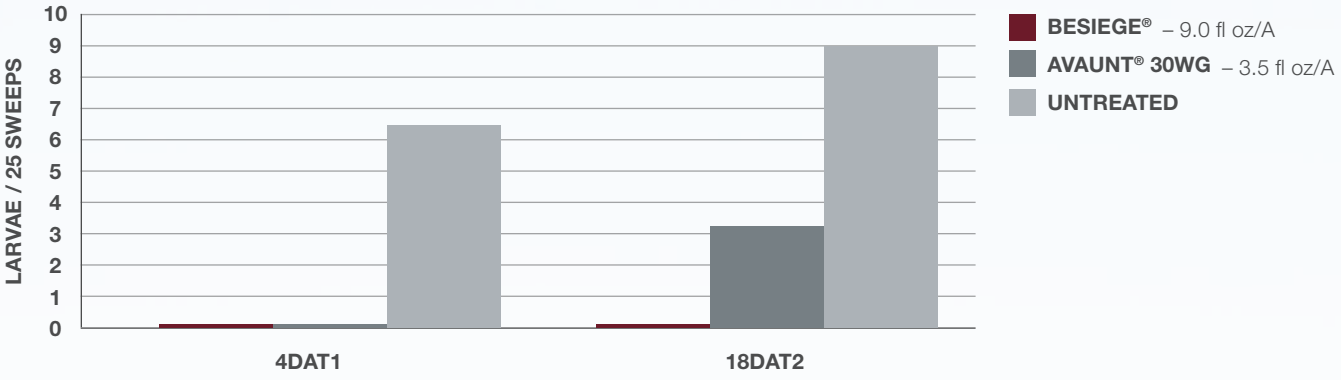


- **BESIEGE®** – 12 fl oz
- **TOURISMO® SC** – 14 fl oz
- **DELEGATE® 25 WG** – 6.4 fl oz
- **INTREPID® 2F** – 16 fl oz
- **ALTACOR® 35 WG** – 4 fl oz
- **BELT® 480 SC** – 4 fl oz
- **PROCLAIM® 5 SG** – 4 fl oz
- **UNTREATED**

**Treatment contains pyrethroid*

Application Date: 22 July 2010 (Onset of Hull Split)
J. David Haviland, Brent A. Holtz, and Stephanie Rill (University of CA Cooperative Extension)
Kearney Agricultural Center, Parlier; Fresno Co, CA

DIAMONDBACK MOTH CONTROL IN CABBAGE: CALIFORNIA



Application Dates: 6, 13 August 2009
USWA0I2152009 – ARA - CRO – San Luis Obipso, CA - 2009

Trials reflect treatment rates commonly recommended in the marketplace
Performance assessments are based upon results or analysis of public information, field observations and/or internal Syngenta evaluations.

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For more information

about Besiege, visit **www.SyngentaUS.com/Besiege**
or contact your local Syngenta representative.

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