LEVERAGE™ 2.7 - A NEW BROAD SPECTRUM SOLUTION FOR COTTON INSECT CONTROL

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Abstract

LEVERAGE™ is a new insecticide from Agriculture Division, Bayer Corp. LEVERAGE™ provides cotton growers a broad spectrum of effective pest control with high degree of safety, economy and convenience.

Introduction

Cotton crops are frequently attacked by multi-insect pests, especially in the mid to late growing season. The complexity of pest species in cotton requires pesticide applications that cover a broad pest spectrum and a tank-mix of two or more products is a commonly used approach. Bayer developed LEVERAGE™, a new broad spectrum solution for cotton pest control. This report is a brief summary on the characteristics, pest control spectrum, and product use recommendations of LEVERAGE™.

Product Chemistry and Safety Profile

Table 1 presents physical and chemical properties of LEVERAGE™ Insecticide, and Table 2 shows its acute toxicity data. LEVERAGE™ has a more favorable toxicological and safety profile than many other cotton insecticides such as Furadan (carbofuran) and Bidrin (dicrotophos). Cyfluthrin and imidacloprid have been studied extensively from different aspects of toxicology to obtain their complete toxicological profiles and evaluate safety of their products.

LEVERAGE™, with its non-organophosphate chemistries and favorable safety factors to humans, mammals and the environment, has a very short restricted entry (re-entry) interval (12 hours) that allows basically un-interrupted scouting and other activities in the cotton field.

Dual Modes of Action and Broad Pest Control Spectrum

Cyfluthrin is a nerve cell membrane disrupter that is effective against most important pests including bollworm (*Heliothis zea*), boll weevil (*Anthonomus grandis*), plant bugs (*Lygus* spp.), stink bugs and fleahoppers. Imidacloprid affects insect nerve synapses and mainly controls sucking insects such as cotton aphid (*Aphis gossypii*) and plant bugs (*Lygus* spp.). Cyfluthrin and imidacloprid are widely used insecticides with well proven performance. LEVERAGE™, created by their combination, not only delivers the performance of cyfluthrin and imidacloprid as seen with their stand-alone products (thus, broadening the pest control spectrum), but also bring about synergies of dual modes of action and more effective control on several pests.

LEVERAGE™ provides stronger plant bug control, because both active ingredients are effective (Table 3). The dual modes of action also reduce the possibility of resistance development and make LEVERAGE™ effective against pyrethroid-resistant plant bugs.

Table 4 shows results of aphid trials with LEVERAGE™ in the South. LEVERAGE™ was also shown to improve square retention and yield in field trials through effective plant bug control, compared to other standard treatments and untreated plots.

The proven ovicidal efficacy of cyfluthrin on bollworm and budworm should be supplemented in LEVERAGE™ by the ovicidal effect from imidacloprid.

The performance of LEVERAGE™ in specific geographic regions are given at the Cotton Insect Research and Control Conference (Section C), Beltwide Cotton Conferences 2000 (Hopkins et. al., 2000; Cates 2000; North 2000; Young 2000).

Product Use Recommendations

LEVERAGE™ is designed for foliar applications. Table 5 lists the insect pests on LEVERAGE™ product label. Table 6 gives the recommended product uses and restrictions. The use of LEVERAGE™ is also subject to the restrictions of total imidacloprid use (0.5 lb ai/acre) and maximum pyrethroid applications (a total of 10).

LEVERAGE™ at 3.0 fl oz per acre (0.063 lb ai/acre) controls most of pests on its product label. The high rate (3.75 fl oz/acre, or 0.079 lb ai/acre) may be required for control of boll weevil, cotton bollworm, grasshoppers, whiteflies, tobacco budworm and pyrethroid-resistant plant bugs. Control of tobacco budworm may be affected by resistance to pyrethroid insecticides.

For Bt cotton, a low rate (3.0 fl oz/acre) of LEVERAGE™ may be used to supplement bollworm control.

As for effective uses of all pesticides, timing of applications should be based on careful scouting and local economic thresholds. Applications should conform to resistance management strategies established for the use area and pests.

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Thorough coverage is required for optimum pest control. Addition of a spray adjuvant at a rate recommended by its manufacturer may improve product performance. Spray volume may also affect pest control and a minimum of 5 gallons per acre is recommended for optimum results.

Please consult the product label fully for safe and effective use of this product.

Summary

LEVERAGE™, with two widely used insecticide active ingredients, provides the broadest spectrum of cotton pest control with proven performance, safety and convenience. It provides dual modes of action and is flexible for both Bt and non-Bt (conventional) cotton.

References

Hopkins, A., F. Donaldson, R. Bell, and B. Sweeden. 2000. Performance of Leverage 2.7 in the Mississippi Delta. In Cotton Insect Research and Control Conference - Section C (presented on January 8, 2000), Beltwide Cotton Conferences 2000.

Cates, E. 2000. Efficacy of Leverage on a Mixed Insect Population in Arkansas. In Cotton Insect Research and Control Conference - Section C (presented on January 8, 2000), Beltwide Cotton Conferences 2000.

North, J. 2000. Efficacy of Leverage on Mixed Insect Population in Mississippi. In Cotton Insect Research and Control Conference - Section C (presented on January 8, 2000), Beltwide Cotton Conferences 2000.

Young, H. 2000. Performance of Leverage in the Southeast. In Cotton Insect Research and Control Conference - Section C (presented on January 8, 2000), Beltwide Cotton Conferences 2000.

Table 1. Physical and Chemical Properties of LEVERAGE™

Product	Leverage	
Formulation	SE (suspension emulsion)	
Product Use	Commercial insecticide	
Physical Form	Viscous liquid	
Color	White to beige	
pH	6	
Melting point	- 10 °C	
Viscosity	600 cps @ 23 °C	
Specific Gravity	1.1 @ 20 °C / 20 °C	
Active Ingredients	Imidacloprid	Cyfluthrin
Molecular Weight	255.4	434.3
Vapor Pressure (mm Hg @ 20 °C)	1.5×10^{-9}	7.2×10^{-9}

Table 2. Acute Toxicity of LEVERAGE™

Oral LD50	200 mg/kg (male and female rats)
Dermal LD50	>5,000 mg/kg (male and female rats)

Table 3. Control of Tarnished Plant Bug in the South

Treatment	Rate (lb ai/ac)	Average % Control (# Trials)
LEVERAGE™	0.06-0.08	80 (9)
Imidacloprid	0.047	66 (6)
Cyfluthrin	0.032	56 (3)

Table 4. Control of Cotton Aphid in the South

Treatment	Rate (lb ai/ac)	Average % Control (# Trials)
LEVERAGE™	0.06-0.08	87 (6)
Imidacloprid	0.047	86 (5)

Table 5. Recommended Use Rates and Target Pests of LEVERAGE™

3.0 fl oz LEVERAGE™ /ac
- Cabbage looper
- Cotton aphid
- Cotton leaf-perforator
- Cutworms
- European corn borer
- Flea beetles
- Fleahoppers
- Garden webworm
- Leafworm
- Lygus / plant bugs
- Pink bollworm
- Saltmarsh caterpillar
- Southern garden leafhopper
- Stinkbugs
- Three-cornered alfalfa hopper
- Thrips

3.0-3.75 fl oz LEVERAGE™ /ac
- Boll weevil
- Cotton bollworm (Bt cotton)

3.75 fl oz LEVERAGE™ /ac
- Cotton bollworm (non-Bt cotton)
- Grasshoppers
- Bollworm/budworm (ovicidal effect)
- Pyrethroid resistant plant/lygus bugs
- Tobacco budworm (affected by resistance to pyrethroid)
- Whiteflies (suppression)

Table 6. Recommended Uses and Restrictions of LEVERAGE™

Application Rates	3.0-3.75 fl oz/acre (0.063-0.079 lb ai/acre)
Seasonal Max. Rate	22.5 fl oz/acre
Application Interval	7 days (3 days if followed by Baythroid)
PHI (pre-harvest interval)	14 days
REI (restricted entry interval)	12 hours