FULFILL™ (PYMETROZINE) A NEW APPROACH TO SUCKING INSECT CONTROL

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Abstract

Fulfull™ is a new insecticide from Ciba research that came into our development effort several years ago. It is a representative of a novel new class of chemistry referred to as a pyridine azomethine derivative. It came into our screening program as CGA-215944 with the common name - pymetrozine - now approved. We plan to use the trademark Fulfill in cotton for aphid control. A 50% wettable powder formulation is currently in development while a water dispersible granule is under consideration.

Fulfill is a highly specific insecticide with a novel mode of action. Once the material is absorbed into the insects body, either through the integument or from the plant, sucking insects stop feeding immediately and die of starvation. This takes one to three days depending on the crop and insect species. Due to this novel mode of action, Fulfill is effective on insects resistant to existing chemistries. The compound has both contact and feeding activity and is absorbed by the plant and distributed acropetally. The primary use will be as a foliar spray, but both soil application and seed treatments have shown useful activity.

The novel mode of action and limited spectrum of activity shows the product to be completely safe to beneficial insects as seen in this summary (Figure 3) from a Mississippi field study on minute pirate bugs. Two days after application of a high rate of Fulfill there are no measurable negative effects on the development of immature stages.

Further results from the Mississippi study and other observations show a profile of complete selectivity to immature and adult stages of the most common (Figure 4) beneficials in cotton.

The useful control spectrum of Fulfill is limited primarily to aphids and whiteflies but some value is reported on Hemipterans such as tarnished plant bugs and flea hoppers.

Table 1 summaries aphid results from three locations across the South. Rates as low as 25 grams ai/ha have provided excellent control but additional trial work encourages us to plan to label 50-100 gram rates for consistent performance. Many times the addition of organosilicone based surfactants has increased the performance of Fulfill on aphids in cotton. In Figure 5 we see greater than 10% increase in the performance, depending on the rate of application. The increase in performance is likely related to increased absorption into the plant or into the body of the aphids.

Table 2 presents results of Fulfill performance on plant bugs in a field trial in Arkansas. Control is not 100% but good activity is noted and we see value for this activity when mixed with other toxiphores. Better performance is noted in Figure 6 on flea hoppers in a field study in Texas. Fulfill appears equal to competitive insecticides in this trial.

Fulfill also demonstrates a high level of performance against whiteflies but at somewhat higher rates than on aphids. The activity is primarily against adult whitefly. In our research (Figure 7) we have found that combinations of Fulfill plus the insect growth regulator fenoxycarb can result in stronger performance against whitefly at lower rates. Rates of 105 + 70 grams have provided consistent performance equal to or better than existing standards. Fenoxycarb is primarily active against eggs and immature stages of whitefly. We have this combination in development under the trademark Sterling™.

We summarize Fulfill as a novel, selective approach to sucking insect control in cotton. Excellent control of aphids and whiteflies is reported and value is observed on Lygus and fleahoppers. Full development is under way in the U.S.

Cotton Aphid Control: MS, TN, and TX, 1993

Table 1

Treatment	g ai/ha	Percent Control MS (6DAA[1]) (165)[2]	TN (7DAA[1]) (24)[2]	TX (7DAA[1]) (12)[2]
UTC				
CGA-215944	25	87		85
CGA-215944	50	85	91	89
CGA-215944	100	90	94	91
Bidrin	450	86		
Bidrin	224			77

[1] Days After Application
[2] Mean Number of Aphids/Leaf

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Tarnished Plant Bug Control Following Fulfill™ Applications, AR 1995

Table 2

Treatment	Rate	No. of Damaged Squares/10
Fulfill	100 g ai/ha	2.8
Control	—	7

Two Applications: July 12, 19, 1995
Rated July 27

Tugwell – U. of AR

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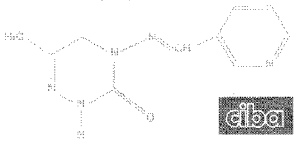
National Cotton Council, Memphis TN

Fulfill™

Figure 1

Name and Chemical Properties:

Active Ingredient:	CGA-215944
Common Name:	Pymetrozine
Systematic Chemical Name:	4,5-dihydro-6-methyl-4-[(3-pyridinyl-methylene) amino]-1,2,4-triazine-3(2H)-one(CA)
Empirical Formula:	$C_{10}H_{11}N_5O$
Structural Formula:	



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Fulfill™

Figure 2

- A New Insecticide With a Novel mode of Action on Sucking Insects
- Pyridine Azomethine Derivative Causes Insects to Stop Feeding and Starve
- The Compound Has Both Contact and Feeding Activity
- It Is Absorbed by the Plant and Distributed Acropetally
- Safe to Most Beneficial Arthropods
- Very Compatible With IPM
- Safe Acute Toxicology Profile

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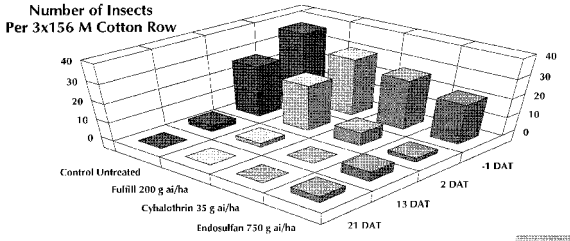
Development of Immature Stages of Orius Following the Application of Various Insecticides

Figure 3



Sechser + Reber

Greenville, MS
1995

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Fulfill™ Safety* Profile to Immature and Adult Cotton Beneficials

Figure 4

- *Chrysoperla cornea* - - - - - - - - Lace Wing
- *Geocoris punctipes* - - - - - - - - Big-Eyed Bug
- *Coccinella* spp. - - - - - - - - - - Lady Beetle
- *Hymenopterous parasitoids*
- Spiders

*No Detrimental Effects

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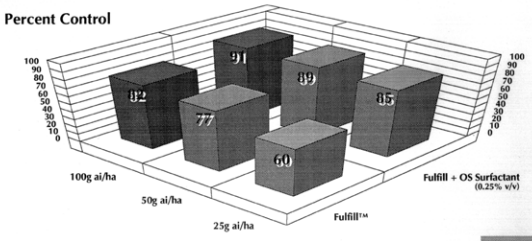
Enhanced Cotton Aphid Control With Organosilicone Surfactants

Figure 5



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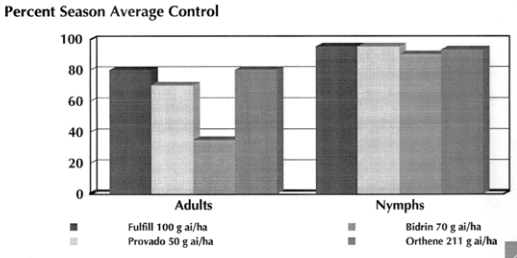
Fleahopper Control Following Fulfill™ Applications, TX 1995

Figure 6



Two Applications: May 15, 23, 1995

Parker, Texas A&M

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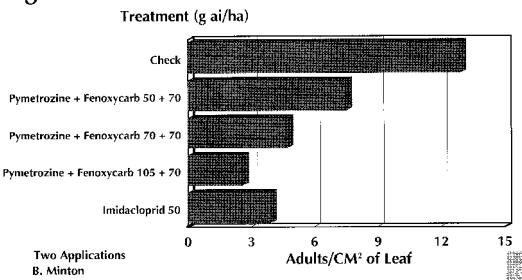
Control of Whitefly (B. tabaci) in Cotton, TX 1995

Figure 7



Two Applications
B. Minton

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