

INTREPID IS NOT JUST AN ARMYWORM PRODUCT

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Abstract

On July 5th, 2000, a federal registration was received from EPA on Intrepid for use in cotton. Commercial sales were initiated in 2001. Prior to the commercial registration, Section 18 Emergency Exemptions were granted for Intrepid (methoxyfenozide, RH-2485) insecticide in June of 2000 for control of the beet armyworm (*Spodoptera exigua*) on cotton (*Gossypium spp.*) in Arkansas, Louisiana, Mississippi and Texas. These exemptions allowed large scale aerial and ground experiments with Intrepid insecticide in cotton for control of the beet armyworm. In addition, data was also obtained with Intrepid insecticide for control of the soybean looper (*Pseudoplusia includens*) and saltmarsh caterpillar (*Estigmene acrea*). In May of 2001 an outbreak of saltmarsh caterpillar occurred in seedling cotton in the Mississippi Delta and Southeastern Arkansas. Data from both 2000 and 2001 indicated that Intrepid insecticide was not only highly effective for beet armyworms, but also provided highly effective control of soybean looper, cabbage looper and saltmarsh caterpillar with cessation of feeding occurring rapidly and mortality occurring in 2 to 5 days. Number of live worms and feeding damage was reduced with Intrepid applied at a rate range of 0.05 to 0.15 lb ai/acre in 5 gallons of water per acre by aerial application or 10 gallons of water per acre by ground equipment. Residual effectiveness on treated foliage with Intrepid was apparent for at least 14 days for beet armyworm, soybean looper and saltmarsh caterpillar.

Introduction

Intrepid is a novel "MAC" (Molting Accelerating Compound) insecticide from Dow AgroSciences which provides effective control of a broad range of lepidopterous insects. Intrepid, which is highly selective for Lepidoptera, is safe to other orders of arthropods including important beneficial predators, parasitoid insects and honeybees, thereby making it an excellent choice for integrated pest management. As a MAC insecticide, Intrepid 2F mimics the natural insect molting hormone, 20 hydroxyecdysone. It induces a premature lethal molt of the larvae within hours of ingestion of treated plant tissues and because Intrepid looks like ecdysone to the larvae, the level of molting hormone does not appear to decrease, disrupting the molting process, keeping the larvae from completing the molting cycle. The larvae will stop feeding within 24 hours and death will occur within 2 to 5 days. Intrepid is not systemic within the treated plant tissues, however limited translaminar activity does occur, improving rainfastness. Intrepid offers extended residual activity of 14 to 21 days on treated foliage, however because it is not systemic, new plant growth will require retreatment to maintain protection.

This manuscript will discuss the results of experiment conducted in 2000 and 2001. The objectives of these experiments were (1) To determine the minimum effective use rate of Intrepid for control of secondary pests in cotton other than beet armyworm and (2) To work closely with independent crop consultants and university/extension personnel to determine the "fit" for Intrepid for secondary pest control.

Evaluation parameters for beet armyworm, saltmarsh caterpillar and soybean looper included recording the number of live and dead larvae per either 6 foot of row or 100 foot of row in the plot at approximately 0, 3, 7 and 14 days after treatment application and averaging the data. Counts were taken with a drop cloth utilizing 6 foot of row with 8 separate locations. Feeding damage was recorded as percent defoliation and rated on a scale of 0 to 100 where 0 = no defoliation and 100 = complete defoliation. Approximately 10 row feet of cotton was tagged and percent defoliation recorded at approximately 0, 3, 7 and 14 days after treatment application with 8 locations recorded per treatment.

Results and Discussion

Table 1 represents number of live beet armyworm larvae taken at Lula, Mississippi with Intrepid applied at 0.05 and 0.10 lb ai/acre. The commercial standards were Tracer applied at 0.0625 lb ai/acre and Karate applied at 0.033 lb ai/acre. Please note that the armyworm population was severe with number per 6 foot of row averaging 96 live larvae in the untreated at 3 DAT (days after treatment). The results revealed that Intrepid was highly effective for beet armyworm control with excellent knockdown at 3 DAT, complete control at 6 DAT and excellent residual at 9 DAT. Tracer applied at 0.0625 lb ai/acre was slightly less effective than Intrepid, however Karate applied at 0.033 lb ai/acre appeared to be an untreated control with live number of beet armyworms higher than the untreated control.

Table 2 represents percent defoliation and reveals that with Intrepid, percent defoliation did not change in the 9 day period because beet armyworms stopped feeding after ingestion.

Table 3 illustrates that Intrepid provides excellent control of soybean looper. At 0 DAA (days after application), number of live soybean looper averaged approximately 30 per 6 foot of row per treatment. Efficacy data from this experiment revealed that Intrepid applied at 0.05 lb ai/acre was all that was required for excellent soybean looper control in cotton. Excellent knockdown was noted at only 4 days after application. Please note that the soybean looper population was continuing to increase in the untreated control at the 7 day rating interval while decreasing with all rates of Intrepid.

Table 4 illustrates that the majority of soybean loopers population in the untreated was greater than a 0.5 inch (large) in length, while almost impossible to find in the Intrepid plots regardless of rate at the 7 day interval. This trend continued at the 14 day rating interval.

Table 5 represents # of live saltmarsh caterpillar larvae at same site where soybean looper data was collected. As evidenced, saltmarsh caterpillars were extremely sensitive to the 0.05 lb ai/acre rate of Intrepid. Equally important is Table 6 where the number of dead saltmarsh caterpillars were detected at 14 days after treatment application, indicating excellent residual activity from Intrepid.

Table 7 represents percent defoliation at this location. Percent defoliation was rated at a uniform 10% across the field the day that treatments were initiated. Due to the heavy infestation from soybean looper and saltmarsh caterpillar, the percent defoliation in the untreated increased from 10 to 40 percent in only 7 days and from 40 to 60 percent at the 14 day rating interval. With all rates of Intrepid, percent defoliation did not change and was still at 10 percent at 14 DAA. Feeding was shut down completely with the 0.05 lb ai/acre rate.

Table 8 represents an experiment conducted by Dr. Blake Layton, extension entomologist with Mississippi State and reflects excellent saltmarsh caterpillar control with Intrepid applied 0.06 lb ai/acre at 2 DAA with live larvae counts significantly less than the untreated control. This was also apparent at 5 days after application.

Table 9 represents percent fall armyworm infestation with Intrepid at 0.05, 0.10 and 0.15 lb ai/acre compared to a commercial standard of 0.45 lb ai/acre of Orthene 90 tank-mixed with 0.03 lb ai/acre of Karate Z. Precounts at 0 DAA for fall armyworms revealed that the population was at 29.3% infestation with larvae ranging in size from 2nd to 5th instar. Most worms were found feeding in white and pink blooms at this time. Three day ratings revealed that another hatch out had occurred following application and the fall armyworm population in the untreated had increased to 52% infestation. Several of the worms found were 1st and 2nd instars grazing around the bracts on larger bolls. Most of the larger worms (3rd - 5th instar) detected were still in white and pink blooms. Data from the 3 day rating revealed that Intrepid rates of 0.05, 0.10 and 0.15 lb ai/acre did not get the fall armyworms out of the white or pink flowers; however, the grower's commercial standard did not get the larger fall armyworms out of the white or pink flowers either. The worms found feeding in the white blooms did not appear to have ingested Intrepid. With Intrepid, regardless of rate, the percent infestation was reduced by approximately 50% compared to the untreated control. Dead fall armyworms were found in the Intrepid plots; however, most were either 1st or 2nd instar. It was apparent that worms had ingested Intrepid based upon the symptoms. Results from 7 and 11 days after treatment were similar and revealed that fall armyworms in cotton with Intrepid are more difficult to control when compared to more sensitive pests such as beet armyworm or soybean looper. The data does reveal that fall armyworms can be effectively controlled with Intrepid with the rate increased to 0.15 lb ai/acre; however, Intrepid applied at either 0.05 or 0.10 lb ai/acre was as effective as the commercial standard.

Table 10 represents percent boll damage and revealed that boll damage with Intrepid at 0.15 lb ai/acre rate did not increase over the 11 day period. With Intrepid at either the 0.05 or 0.10 lb ai/acre rates, as well as the commercial standard, a slight increase in % boll damage was apparent. This same scenario was evident in the untreated control.

Conclusions

Conclusions from these experiments revealed that Intrepid applied at a use rate of 0.05 lb ai/acre was highly effective in reducing a saltmarsh caterpillare and soybean population at 2 to 3 days after application. Feeding by these pests was shut down completely. A rate response with Intrepid was not apparent. The length of residual with Intrepid at 0.05 lb ai/acre for saltmarsh caterpillar and soybean looper was apparent for 14 days after application on treated foliage. With the extended residual performance and broad spectrum of Intrepid for control of the secondary pest complex in cotton, in addition to a lower price/acre versus competitive products, Intrepid will have an excellent fit across the cotton belt.

Performance of Intrepid* For Control of Beet Armyworms in Cotton Lula, MS

Table 1.

Treatment	Rate/ lb/ai/a	<u>Number Beet Armyworms 6 Foot of Row</u>		
		3 DAT	6 DAT	9 DAT
Untreated	0.0	96	80	42
Intrepid	0.05	24	8	1
Intrepid	0.10	13	2	1
Tracer	0.0625	31	48	20
Karate	0.033	157	88	36

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Performance of Intrepid* For Control of Beet Armyworms in Cotton Lula, MS

Table 2.

Treatment	Rate/ lb/ai/a	<u>% Defoliation @</u>		
		3 DAT	6 DAT	9 DAT
Untreated	0.0	19	42	60
Intrepid	0.05	11	13	11
Intrepid	0.10	10	9	10
Tracer	0.0625	10	20	26
Karate	0.033	28	49	60

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**Control of Soybean Loopers on Bt. Cotton with
Intrepid* in Aerial Demonstration:
Indianola, MS
Cotton Cultivar: DPL 422 Bt. RR**

Table 3.

Treatment ⁽¹⁾	Rate/ lb/ai/a	Number of Live Soybean Loopers per 6 Foot of Row			
		0 DAA	4 DAA	7 DAA	14 DAA
Intrepid	0.05	30.6	8.8	4.1	0
Intrepid	0.10	28.5	9.5	2.9	0
Intrepid	0.15	32.0	3.5	1.6	0
Untreated	0.0	31.2	30.0	35.2	11.5

¹ Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

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**Control of Soybean Loopers on Bt. Cotton with
Intrepid* in Aerial Demonstration:
Indianola, MS
Cotton Cultivar: DPL 422 Bt. RR**

No. of Live Soybean Loopers per 6 Foot of Row Separated by Size⁽²⁾

Table 4. Treatment ⁽¹⁾	Rate/ lb/ai/a	No. of Live Soybean Loopers per 6 Foot of Row Separated by Size ⁽²⁾		
		4 DAA SB Looper Larvae by Size	7 DAA SB Looper Larvae by Size	14 DAA SB Looper Larvae by Size
Intrepid	0.05	S=2.5, M=3.0, L=3.3	S=2.9, M=1.1, L=0.1	S=0, M=0, L=0
Intrepid	0.10	S=4.5, M=2.1, L=2.9	S=1.8, M=1.1, L=0.0	S=0, M=0, L=0
Intrepid	0.15	S=1.0, M=1.1, L=1.4	S=0.3, M=1.0, L=0.3	S=0, M=0, L=0
Untreated	0.0	S=3.3, M=8.9, L=17.8	S=1.6, M=6.1, L=27.5	S=0.1, M=0.6, L=10.8

¹ Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

² SB Looper larvae separated by size: S = Small where live larvae are 0 to 1/8 inch in length, M = Medium where larvae are 1/8 to 1/4 inch in length and L = Large where larvae are greater than 1/4 inch long.

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Control of Saltmarsh Caterpillars on Bt Cotton with Intrepid* in Aerial Demonstration:

Indianola, Mississippi

Cotton Cultivar: DPL 422 Bt RR

Table 5. <i>Treatment</i> ⁽¹⁾	<i>Rate/ lb/ai/a</i>	<i>Number of Live Saltmarsh Caterpillars per 6 Foot of Row</i> ⁽²⁾		
		<i>4 DAA</i>	<i>7 DAA</i>	<i>14 DAA</i>
Intrepid	0.05	0.10	0.0	0.0
Intrepid	0.10	0.10	0.0	0.0
Intrepid	0.15	0.10	0.0	0.0
Untreated	0.0	5.60	4.60	6.5

1 Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2 Number of live and dead saltmarsh caterpillars was determined by counting the number of live and dead saltmarsh caterpillars per 6 foot of row at 8 separate locations in the plot and averaging the data.

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Control of Saltmarsh Caterpillars on Bt Cotton with Intrepid* in Aerial Demonstration:

Indianola, Mississippi

Cotton Cultivar: DPL 422 Bt RR

Table 6. <i>Treatment</i> ⁽¹⁾	<i>Rate/ Oz/Acre</i>	<i>Number of Dead Saltmarsh Caterpillars per 6 Foot of Row</i> ⁽²⁾		
		<i>4 DAA</i>	<i>7 DAA</i>	<i>14 DAA</i>
Intrepid	0.05	1.80	0.13	2.1
Intrepid	0.10	2.30	0.0	0.80
Intrepid	0.15	2.00	0.13	0.0
Untreated	0.0	0.0	0.0	0.0

1 Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2 Number of live and dead saltmarsh caterpillars was determined by counting the number of live and dead saltmarsh caterpillars per 6 foot of row at 8 separate locations in the plot and averaging the data.

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Control of Soybean Loopers/Saltmarsh Caterpillars on Bt. Cotton with Intrepid* in Aerial Demonstration:

Indianola, MS

Cotton Cultivar: DPL 422 Bt. RR

Table 7. Treatment ⁽¹⁾	Rate/ lb/ai/a	Percent Defoliation ⁽²⁾			
		0 DAA	4 DAA	7 DAA	14 DAA
Intrepid	0.05	10	10	10	10
Intrepid	0.10	10	10	10	10
Intrepid	0.15	10	10	10	10
Untreated	0.0	10	20	40	60

¹ Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

² Percent defoliation is from a scale of 0 to 100 where 0 = no defoliation and 100 = complete defoliation.

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Control of Saltmarsh Caterpillars on DPL 436 RR Cotton with Selected Insecticides

Washington County, Mississippi

Dr. Blake Layton, MSU

Number of Live Saltmarsh Caterpillars
per 100 Foot of Row⁽²⁾

Table 8. Treatment ⁽¹⁾	Rate/ lb/ai/a	Number of Live Saltmarsh Caterpillars per 100 Foot of Row ⁽²⁾	
		2 DAA	5 DAA
Untreated	0.0	10.3 a	4.3 a
Intrepid	0.06	2.7 b	0.7 a
Bidrin 8E	0.50	3.3 b	3.7 a
Fury 1.5E	0.045	1.7 b	1.0 a
Larvin + Fury	0.6 + 0.5	1.3 b	3.0 a
Larvin 3.2SC	0.8	4.3 b	1.0 a
Orthene 97	0.75	2.3 b	1.7 a

Pretreatment counts
were 14.9 live
worms/100 row ft

¹ Treatments applied with CO₂ backpack powered sprayer at 10 gallons per acre.

² Number of live saltmarsh caterpillars was made by counting the number of live saltmarsh caterpillars per 100 foot row.

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**Control of Fall Armyworms on Bt Cotton with
Intrepid* in Aerial Demonstration:
Louise, Mississippi
Cotton Cultivar: DPL 20B**

Table 9.

<i>Treatment⁽¹⁾</i>	<i>Rate/ lb ai/a</i>	<i>Percent Infestation⁽²⁾</i>			
		<i>0 DAA</i>	<i>3 DAA</i>	<i>7 DAA</i>	<i>11 DAA</i>
Intrepid	0.05	29.3	24.0	33.3	24.0
Intrepid	0.10	29.3	24.0	36.6	20.0
Intrepid	0.15	29.3	28.0	10.0	12.0
Orthene 90S + Karate Z + Crop Oil	0.45 + 0.03 + 1 pint/acre	29.3	44.0	30.0	20.0
Untreated	0.0	29.3	52.0	46.6	44.0

1. Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2. % Infestation at 0 DAA for fall armyworm counts were made by closely examining a total of 75 plants in three sections of the field.

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**Control of Fall Armyworms on Bt Cotton with
Intrepid in Aerial Demonstration:
Louise, Mississippi
Cotton Cultivar: DPL 20B**

Table 10.

<i>Treatment⁽¹⁾</i>	<i>Rate/ lb ai/a</i>	<i>Percent Boll Damage⁽²⁾</i>			
		<i>0 DAA</i>	<i>3 DAA</i>	<i>7 DAA</i>	<i>11 DAA</i>
Intrepid	0.05	2.0	2.4	4.4	4.9
Intrepid	0.10	2.0	2.3	4.8	4.7
Intrepid	0.15	2.0	2.1	2.1	1.0
Orthene 90S + Karate Z + Crop Oil	0.45 + 0.03 + 1 pint/acre	2.0	5.6	3.4	6.0
Untreated	0.0	2.0	1.8	6.5	7.8

1. Treatments applied with airplane at 5 gallons per acre. Latron CS-7 included with all Intrepid treatments at 0.25% v/v.

2. % Boll damage rated on a scale of 0 to 100 where 0 = no boll damage and 100 = all bolls damaged.

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