COTTON PEST CONTROL WITH CAPTURE 2EC INSECTICIDE / MITICIDE

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Abstract

Capture 2EC (bifenthrin) has been extensively evaluated in field efficacy and laboratory bioassay trials during the past years for control of the major insect and mite pest of cotton. In field efficacy trials, Capture applied at 0.05 lb ai/A provided commercially acceptable control of the Heliothian complex, *Lygus* spp., phytophagous Pentatomidae and *Bemisia argentifolii* comparable to that of the standard cotton insecticides with a slight advantage in *Lygus* control over the other pyrethroid type insecticides. Capture at 0.06 lb ai/A also provided *Tetranychus urticae* and *Tetranychus cinnabarinus* control equal to that of the standard miticides. Superior arthropod control with Capture subsequently resulted in greater yields than that of the standard pyrethroids. Early season applications of Capture provided *Lugus lineolaris* and *Pseudatomoscelis seriatus* control superior to and resulted in negative impact on predator arthropods similar to that of Karate, Baythroid, Leverage, Orthene, Vydate and Provado. Predatory arthropod populations required approximately two weeks to rebound to that of the untreated check. Capture provided aphid suppression that minimized aphid flaring observed with Karate and Baythroid. Capture provided control of subsequent Heliothian infestations equal to that of Karate and Baythroid and superior to that of Orthene, Vydate and Provado. A positive yield response with early season applications was observed with yields generally higher with Capture than Karate, Baythroid, Leverage, Orthene and Vydate.

Introduction

Capture 2EC is a pyrethroid insecticide that has been used effectively across the Cotton Belt for many years to control a variety of cotton insect pests. Capture's strength is in its broad-spectrum of control and its ability to handle not only the numerious insect pests of cotton but the spider mite complex as well, an ability unique in the pyrethroid class of chemistry (Mitchell and Hatfield 1999). In addition, Capture has demonstrated effectiveness on the Hemipteras pest of cotton, specifically tarnished plant bugs, *Lygus lineolaris* (Palisot de Beauvious) and cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter). (Knabbe and Kukas 1986, Gage and Knabke 1987, Kukas 1987, Mitchell et al. 1987, Mitchell and Hatfield 1988, Mitchell and Hatfield 1999, Hatfield and Mitchell 2000). In past years, Capture has shown to be very effective for control of cotton aphid (Mitchell and Hatfield 1990). Although the level of aphid control with all pyrethroids has fluctuated over the years, Capture has consistently provided the greatest level of aphid control of the pyrethroid class of chemistry (Mitchell and Hatfield 1999). A summary of University/Extension efficacy studies from across the Cotton Belt demonstrated that Capture 2EC provides cotton bollworm and tobacco budworm control comparable to that of Karate 1EC, Baythroid 2EC and Scout-Xtra® (Mitchell and Hatfield, 1999).

Tarnished plant bugs have been shown to destroy meristematic tissue in developing plant terminals (Leigh et al. 1988). Tarnished plant bug and cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter), occur primarily during early season. An accumulation of feeding periods from tarnished plant bug can lead to damaged plant terminals and subsequently lead to aborted square positions and/or low square retention during early cotton development (Ruscoe et al. 1998). Turnipseed et al. (1995) noted a one-week delay in harvest maturity when mechanical square removal was conducted for four weeks but no reduction in yield. Phelps et a. (1996) noted a delay in harvest maturity when mechanical square removal was conducted for 2 through 4 week resulting in delayed maturity from 2-14 days, respectively. Thus, effective and timely early season insecticide applications are essential to prevent insect damage in cotton and early fruit retention is essential for high production yields.

For the past several years, Capture has been evaluated in University/Extension efficacy studies under a broad range of environmental conditions, cotton insect / mite pests and infestation levels across the Cotton Belt. Reported herein, are summary results of these studies with regard to the efficacy of Capture for control of the Heliothian complex, *Helicoverpa zea* (Boddie) and *Heliothis virescens* (F.), tarnished plant bug, cotton fleahopper, stink bug (Pentatomidae), two spotted spider mite, *Tetranychus urticae* (Koch), carmine spider mite, *Tetranychus cinnabarinus* spider mite and silverleaf whitefly, *Bemisia argentifolii* (Bellows and Perring). A two-year summary results to evaluate the early season applications of Capture for early season cotton insect control, impact on predatory arthropods, pest flaring and yield are also presented.

Materials and Methods

Field efficacy results presented herein were obtained from small plot trials conducted by university/extension personnel across the Cotton Belt utilizing similar test procedures. Test plot size generally ranged from 4 to 8 rows wide by 45 to 100 feet in length, replicated 4 times in a randomized complete block design. Applications were typically made with compressed air or CO2 charged small plot sprayers using water as the carrier. Total spray volume ranged from 9 to 12 gallons/acre. Cotton varieties, planting dates and production practices were typical of each geographic area.

Capture 2EC was evaluated at 0.05 lb ai/A and compared against the standard pyrethroid insecticides, Karate Z, Baythroid 2E, Leverage and Decis 1.5EC at 0.028, 0.03, 0.063 and 0.02 lb ai/A, respectively, plus an untreated check for control of the Heliothian complex and subsequent yield. Trials were initiated and subsequent treatments made in accordance with insect pest control recommendations for the region. Capture 2EC was evaluated at 0.05 lb ai/A in the tarnished plant bug, stink bug and whitefly trials and at 0.06 lb ai/A in the two spotted and carmine spider mite trials against standard insecticides / miticides.

Capture 2 EC was evaluated early season at 0.05 lb ai/A and compared against Karate Z, Baythroid 2 EC, Orthene 90 SP, Vydate 3.77 L and Provado 1.6 F at 0.028, 0.03, 0.5, 0.25 and 0.047 lb ai/A, respectively, plus an untreated check during the 1999 season. During the 2000 trials, Provado was replaced with Leverage at 0.063 lb ai/A. Early season treatment applications were initiated at pinhead square timing and a subsequent application made in accordance with state recommended threshold levels of tarnished plant bug / cotton fleahopper.

Insect infestation levels were determined by standard evaluation procedures that varied by species. Heliothian infestations were determined by examination of a set number of cotton terminals, squares and/or bolls per plot prior to and following subsequent applications. Data were then compiled and analyzed based on a seasonal mean percent live larvae (terminal + square larvae) and square damage over multiple applications and evaluations. Capture was analyzed against the specific competitive pyrethroid only in those replicated trials where both treatments occurred. By analyzing the data in this manner, variability due to pest infestation levels, application methods and environmental conditions could be eliminated.

Tarnished plant bug / cotton fleahopper infestations were determined using the standard sweep net technique. Numbers of adults and nymphs were

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obtained from a sample size of no less than 25 sweeps per plot taken at various intervals following application. Data were summarized using a combined total of both adult and nymph stages.

Predatory arthropod population levels were also assessed using the standard sweep net technique. Data were summarized using a combined total of adults and immatures of the following: big eyed bug, *Geocoris* spp., minute pirate bug, *Orius* spp., lady beetle, Coccinellidae spp., damsel bug, *Nabis* spp., green lacewing, *Chrysopa* spp., and predatory spiders.

Cotton aphid, *Aphis gossypii* Glover, spider mite and whitefly populations were assessed by counting the number of pests per leaf taken from a designated location on 5–10 randomly selected plants per plot at various post treatment intervals.

Results and Discussion

Results of the efficacy of Capture for control of the Heliothian complex and impact on subsequent yield is shown in Tables 1, 2, 3 and 4. Capture at 0.05 lb ai/A resulted in seasonal mean percent live larvae and square damage equal to that of Karate, Baythroid, Leverage and Decis at rates of 0.028, 0.03, 0.063 and 0.02 lb ai/A, respectively, based on 5, 8, 6 and 6 replicated head-to-head trials, respectively. All treatments were significantly better than the untreated check. Subsequent yields followed a similar pattern to that of the efficacy data. A numerical reduction in Heliothian square damage resulted in a significant increase in seed cotton yield over the untreated check with minimal difference between pyrethroid treatments. All treatments provided significantly greater yield than the untreated check.

Results of numerous head-to-head field trials to evaluate the efficacy of Capture against several insecticides for tarnished plant bug control are shown in Table 5. Capture at 0.05 lb ai/A provided plant bug control superior to that of Karate, Baythroid, Decis, Orthene, Vydate and Provado at 0.028, 0.03, 0.02, 0.5, 0.25, and 0.047 lb ai/A, respectively, in 3, 3, 1, 5, 3 and 5 replicated trials, respectively.

In a replicated field cage study, Capture at 0.05 lb ai/A was evaluated against Baythroid, Provado, Vydate, Orthene and Bidrin at 0.033, 0.047, 0.25, 0.8, and 0.375 lb ai/A, respectively, for green stink bug control (Table 6). Capture provided green stink bug control equal to that of Baythroid, Orthene and Bidrin and significantly superior to that of Provado and Vydate at 2 days after treatments (DAT). In a second cage study, Capture was evaluated for brown stink bug control against Baythroid, Leverage, Provado, Bidrin, Steward and Denium at 0.033, 0.063, 0.047, 0.375, 0.11 and 0.01 lb ai/A, respectively. Bidrin provided the greatest control (100%) followed by Steward (88%) and Capture (82%) with all other treatments falling below 80% by the 4 DAT evaluation.

In a replicated silverleaf whitefly trial, an average of two post treatment evaluations of number of adults per 10 leaves resulted in no significant difference among Capture at 0.05, Leverage at 0.079, Danitol at 0.2 and Centric at 0.047 lb ai/A (Table 7). Danitol + Orthene at 0.2 + 0.5 lb ai/A and Assail at 0.05 lb ai/A provided the greatest level of control with all treatments significantly better than the untreated check.

Results of numerous head-to-head field trials to evaluate the efficacy of Capture against standard miticides for spider mite control are shown in Table 8. Capture at 0.06 lb ai/A was evaluated against Curacron, Kelthane and Comite at 1.0, 1.5 and 1.5 lb ai/A for two spotted and carmine spider mite control. In all cases, Capture provided 2 to 11 percent greater control than that of the standard miticides for both species. The ability for Capture to effectively control the cotton spider mite complex is an ability unique to the pyrethroid class of chemistry.

Capture applied early season for control tarnished plant bug, cotton fleahopper and predatory arthropods are shown in Tables 9, 10 and 11. Seasonal mean number of tarnished plant bug were generated from two replicated field trials in 1999, based on four to five post treatment evaluations following two early season applications and four replicated trials in 2000 based on four to nine post treatment evaluations following two early season applications. Capture at 0.05 lb ai/A resulted in 27, 41, 33, 30, 13 and 48 percent less seasonal mean number of plant bugs than that of Karate, Baythroid, Orthene, Vydate, Provado and the untreated check, respectively, in 1999 (Table 9). Only Capture and Provado resulted in plant bug numbers significantly less than of the untreated check. No significant difference was observed among insecticide treatments. In 2000, only Capture resulted in significantly less plant bug numbers than the untreated check with no significant difference among insecticide treatments. Capture resulted in 9, 23, 29, 26, 34 and 40 percent less seasonal mean number of plant bugs than that of Karate, Baythroid, Leverage, Orthene, Vydate and the untreated check, respectively. When results of both years were combined, Capture provided 13, 28, 27, 33 and 42 percent less seasonal mean number of plant bugs than that of Karate, Baythroid, Orthene, Vydate and the untreated check from a total of six replicated trials. Capture resulted in significantly less plant bug numbers than that of Vydate and the untreated check with no significant difference among Capture, Karate, Baythroid and Orthene.

Seasonal mean number of cotton fleahopper were generated from one replicated field trials in each of 1999 and 2000, based on seven and six post treatment evaluations, respectively, following two early season applications (Table 10). The 1999 trial resulted in Capture at 0.05 lb ai/A providing 28, 51, 6, 30, 24 and 43 percent less seasonal mean number of fleahopper than that of Karate, Baythroid, Orthene, Vydate, Provado and the untreated check, respectively. Only Capture and Orthene resulted in fleahopper numbers significantly less than of the untreated check. All insecticide treatments resulted in significantly less fleahoppers than Baythroid. In the 2000 trial, fleahopper numbers were not significantly different among insecticide treatments but all were significantly less than the untreated check. Capture providing 5, 20, 16, 1, 20 and 48 percent less seasonal mean number of fleahopper than that of Karate, Baythroid, Leverage, Orthene, Vydate, and the untreated check, respectively. The combined 1999 and 2000 trials resulted in Capture providing 17, 39, 3, 25, and 46 percent less seasonal mean percent number of fleahopper than that of Karate, Baythroid, Orthene, Vydate and the untreated check, respectively, and was significantly less than Baythroid, Vydate and the untreated check.

Seasonal mean number of predatory arthropods were generated from three and four replicated field trials in 1999 and 2000, respectively, based on four to seven and four to nine post treatment evaluations, respectively, following two early season applications (Table 11). All insecticide treatments resulted in significantly less mean predators than the untreated check with no significant difference observed among insecticide treatments in 1999. However, in the 2000 trials, Karate and Baythroid resulted in significantly higher numbers of predators than Leverage and Orthene. Mean predator numbers in the Capture treatment were not significantly different among other insecticide treatments or the untreated check. Closer examination of these results indicated that the significantly higher predator numbers in the Karate and Baythroid treatments were due to a large Coccinellidae population that developed as a result of an aphid population flared by the Karate and Baythroid applications. The high aphid population in the Karate and Baythroid treatments provided a food source for the development of a Coccinellidae population in excess of the other treatments evaluated.

Due to the rapid rebound of the predator population following applications, insecticide treatments demonstrated only a 25 to 36 % reduction in mean predator levels over that of the untreated check during the three to four week post sampling period. When population levels were examined on a per trial bases across evaluation dates, all insecticide treatments

demonstrated a rebound in levels of predators equal or in excess of the untreated check within two weeks following the last application.

Mean cotton aphid infestation levels taken 5-14 days following the second insecticide application are shown in table 12. All insecticide treatments were not significantly different from the untreated check and with the exception of significantly greater aphid numbers with Karate vs Provado, no significant differences among treatments were observed in three 1999 trials. Of the insecticide treatments evaluated, Capture and Provado were the only treatments which resulted in aphid infestation levels lower than that of the untreated check. The 2000 results were very similar. Only Karate and Baythroid resulted in significantly greater numbers of aphids than Capture, Leverage, Orthene, Vydate and the untreated check with no significant differences among the latter. These results were similar when all six trials were evaluated for the two-year period. As mentioned earlier, the flaring of aphids with both Karate and Baythroid likely provided a food supply for Coccinellidae populations resulting in a significant increase in the predator population numbers in these treatments. Although the level of control was minimal, the ability of Capture to suppress aphid populations along with rapid resurgence in the predator population limited the flaring of an aphid infestation that has historically been observed with other insecticides in the pyrethroid class of chemistry.

Seasonal mean Heliothian square damage were generated from two replicated field trials in 1999, based on four to five post treatment evaluations following two early season applications (Table 12). Capture, Karate and Baythroid resulted in significantly less square damage than that of the untreated check with no significant difference among the pyrethroid insecticides. Orthene, Vydate and Provado were not significantly different from the untreated check. Heliothian populations did not adequately develop during the 2000 trials to assess treatment effects.

Subsequent yields followed a similar pattern to that of the efficacy data (Table13). All insecticide treatments resulted in a numerical increase in yield over the untreated check demonstrating the positive attributes of early season insecticide applications in 1999. However, only Capture and Provado resulted in a significant increase over the untreated check with no significant difference among treatments. Capture, Karate, Baythroid, Orthene, Vydate and Provado resulted in a yield increase over the untreated check by 395, 202, 208, 254, 141, and 371 pounds seed cotton per acre, respectively. In the 2000 trials, Karate, Baythroid, Orthene and Vydate resulted in significantly greater yields than the untreated check with no significant differences among treatments. Capture, Karate, Baythroid, Leverage, Orthene, and Vydate resulted in a yield increase over the untreated check by 309, 396, 374, 225, 357, and 370 pounds seed cotton per acre, respectively. When 1999 and 2000 trials were combined, all treatments resulted in significantly greater yields than the untreated check with no significant differences among treatments. Capture, Karate, Baythroid, Orthene, and Vydate provided a yield increase over the untreated check of 352, 299, 292, 306 and 256 pounds seed cotton per acre, respectively.

These results demonstrated that Capture 2EC at 0.05 lb ai/A provided Heliothian, plant bug, stink bug and whitefly control comparable to that of the standard cotton insecticides with a slight advantage in plant bug control with Capture over the other pyrethroid type insecticides. Capture also provided two spotted and carmine spider mite control equal to that of standard miticides, an ability unique to the other cotton pyrethroid insecticides. Excellent insect control with Capture subsequently resulted in greater yields than that of the other cotton pyrethroids.

Results of early season applications of Capture provided tarnished plant bug and cotton fleahopper control superior to and resulted in negative impact on predator arthropods similar to that of Karate, Baythroid, Leverage, Orthene, Vydate, and Provado. Predatory arthropod populations require approximately 14 days to rebound to that of the untreated check. Capture provided aphid suppression at a level that minimized aphid flaring observed with Karate, Baythroid, Orthene and Vydate. Capture provided control of subsequent Heliothian infestations equal to that of Karate and Baythroid and superior to that of Orthene, Vydate and Provado. Excellent early season insect control with Capture subsequently resulted in a positive yield response with yields generally higher with Capture than Karate, Baythroid, Leverage, Orthene and Vydate.

References

Gage, E.V. and J.J. Knabke. 1987. Utilization of Capture 2.0 EC insecticide/miticide for insect and mite control in cotton. Proceedings Beltwide Cotton Conferences. 255-256.

Knabke, J.J. and R.D. Kukas. 1986. Mite control in western cotton with Capture 2.0 EC insecticide/mitecide. Proceedings Beltwide Cotton Conferences. 209-210.

Kukas, R.D. 1987. Cotton pest control in the San Joaquin Valley of California with Capture 2.0 EC insecticide/miticide. Proceedings Beltwide Cotton Conferences. 233-235.

Leigh, T.F., T.A. Kerby, and P.F. Wynholds. 1988. Cotton square damage by the plant bug, Lygus hesperus (Hemiptera:Heteroptera:Meridae), and abscission rates. J. Econ. Entomol. 81(5): 1328-1337.

Mitchell, H.R., D.R. Edwards and L.D. Hatfield. 1987. Aerial application of Capture insecticide/miticide for cotton insect and mite control. Proceedings Beltwide Cotton Conferences. 235-237.

Mitchell, H.R. and L.D. Hatfield. 1988. Cotton insect and mite control with Capture 2.0 EC insecticide/miticide. Proceedings Beltwide Cotton Conferences. 321-323.

Mitchell, H.R. and L.D. Hatfield. 1990. Aphid and mite control in cotton with Capture 2 EC insecticide/miticide. Proceedings Beltwide Cotton Conferences. 284-286.

Mitchell, H.R. and L.D. Hatfield. 1999. Capture 2EC: efficacy on cotton arthropod pests. Proceedings Beltwide Cotton Conferences. 1095-1098.

Mitchell, H.R. and L.D. Hatfield. 2000. Capture performance on key cotton insect pest. Proceedings Beltwide Cotton Conferences. 1087-1090.

Phelps, J.B., J.T. Ruscoe, and W.H. McCarty. 1996. Cotton development following early square removal. Proceedings Beltwide Cotton Conferences. 1412-1413.

Ruscoe, J.T., G.L. Andrews, J.B. Phelps, and B.R. Savoy. 1998. Efficacy of early insecticides and their effect on yield and maturity on Bt cotton. Proceedings Beltwide Cotton Conferences. 1043-1049.

Turnipseed, S.G., J.E. Mann, M.J. Sullivan, and J.A. Durant. 1995. Loss of early season fruiting sites. Should we re-examine as pest management strategies change?? Proceedings Beltwide Cotton Conferences. 821-823.

Table 1. Efficacy of Capture 2EC vs Karate Z 2EC for control of bollworm/budworm and subsequent yield. (1998-2000)

		Seasonal Mean Percent		
Treatment	Rate (lb. Ai/A)	Hel.Square Larvae	Hel. Square Damage	Yield (lb sc/A)
Capture	0.05	3.3	2.8	2109
Karate	0.028	3.6	3.3	2043
Check		10.8	5.3	1741
n =[1]		5	4	4

[1] Number of replicated head-to-head trials.

Table 2. Efficacy of Capture 2EC vs Baythroid 2EC for control of bollworm/budworm and subsequent yield. (1998-2000)

		Seasonal Mean Percent		
Treatment	Rate (lb. Ai/A)	Hel. Square Larvae	Hel. Square Damage	Yield (lb. Sc/A)
Capture	0.05	3.1	7.8	2544
Baythroid	0.03	2.9	7.4	2598
Check		9.0	12.4	2171
n = [1]		7	8	7

[1] Number of replicated head-to-head trials.

Table 3. Efficacy of Capture 2EC vs Leverage for control of bollworm/budworm and subsequent yield. (1998-2000)

		Seasonal Mean Percent		
Treatment	Rate (lb ai/A	Hel Square Larvae	Hel. Square Damage	Yield (lb sc/A)
Capture	0.05	3.8	10.7	3115
Leverage	0.063	3.7	10.8	3099
Check		7.9	24.2	2276
n = [1]		6	5	4

[1] Number of replicated head-to-head trials.

Table 4. Efficacy of Capture 2EC vs Decis 1.5 EC for control of bollworm/budworm and subsequent yield. (1998-2000)

		Seasonal Mean Percent		
Treatment	Rate (lb ai/A)	Hel. Square Larvae	Hel. Square Damage	Yield (lb sc/A)
Capture	0.05	5.7	9.1	1674
Decis	0.02	5.3	9.2	1618
Check		13.0	14.8	1333
n = [1]		5	5	2

[1] Number of replicated head-to-head trials.

Table 5. Efficacy of Capture 2EC for control of plant bug in cotton. (1999-2000)

		Adults and Nymphs per 25 Sweeps (3-7 DAT)							
Treatment	Rate (lb ai/A)								
Capture	0.05	7	7	1	2	5	7	5	1
Karate	0.028	9							
Baythroid	0.03		13						
Decis	0.02			4					
Leverage	0.063				2				
Orthene	0.5					7			
Vydate	0.25						10		
Provado	0.047							7	
Bidrin	0.25								2
Untreated Check		10	10	7	9	12	14	12	7
n = [1]		3	3	1	3	5	3	5	1

[1] Number of replicated head-to-head field trials in mean.

Table 6. Efficacy of Capture 2EC for control of stink bug (SB) in cotton [1].

	Rate	Percent mortality	
Treatment	(lb ai/A)	Green SB (2 DAT) [2]	Brown SB (4 DAT) [2]
Capture	0.05	96 a	82 abc
Baythroid	0.033	96 a	69 abc
Leverage	0.063	--	53 cd
Provado	0.047	33 c	65 bcd
Vydate	0.25	85 b	--
Orthene	0.8	96 a	--
Bidrin	0.375	100 a	100 a
Steward	0.11	--	88 ab
Denim	0.01	--	34 d
LSD(.05)		9	34

[1] Field cage mortality trial.

[2] Research conducted by Dr. Phillip Roberts, GA (1998, 2000).

Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 7. Efficacy of Capture 2EC for control of silverleaf whitefly in cotton [1].

Treatment	Rate (lb ai/A)	Adults per 10 Leaves[2]
Capture	0.05	16 bc
Leverage	0.079	16 bc
Danitol	0.2	21 bc
Danitol + Orthene	0.2 + 0.5	8 a
Assail	0.05	8 a
Centric	0.047	13 ab
Untreated		26 d
LSD(.05)		6

[1] Research conducted by Dr. Phillip Roberts, GA (2000).

[2]Average of two post treatment evaluations.

Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 8. Efficacy of Capture 2EC for control of spider mite in cotton .

		Percent Control	
Treatment	Rate (lb ai/A)	Two Spotted	Carmine
Capture	0.06	70	--
Curacron	1.0	68	--
n =		(11) [1]	(-)
Capture	0.06	74	90
Kelthane	1.5	71	81
n =		(12)	(2)
Capture	0.06	--	87
Comite	1.5	--	76
n =		(--)	(6)

[1] Number of replicated head-to-head trials.

Table 9. Efficacy of early season applications of Capture 2EC on tarnished plant bug (TPB).

		Seasonal Mean Per 100 Sweeps		
Treatment	**Rate (lbai/ac)**	**TPB[1]**	**TPB[2]**	**TPB[3]**
Capture	0.05	5.4 b	8.5 b	7.5 c
Karate Z	0.028	7.4 ab	9.3 ab	8.6 bc
Baythroid	0.03	9.2 ab	11.0 ab	10.4 abc
Leverage	0.079	----	11.9 ab	----
Orthene	0.5	8.0 ab	11.5 ab	10.3 abc
Vydate	0.25	7.7 ab	13.0 ab	11.2 ab
Provado	0.047	6.2 b	----	----
Untreated		10.3 a	14.2 a	12.9 a
LSD (.05)		3.8	5.2	3.6

[1] Average of four to five post treatment evaluations (2 trials) following two early season applications (1999).
[2] Average of four to nine post treatment evaluations (4 trials) following two early season applications (2000).
[3] Average of four to nine post treatment evaluations (6 trials) following two early season applications (1999-2000).
Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 10. Efficacy of early season applications of Capture 2EC on cotton fleahopper (CFH).

		Seasonal Mean Per 100 Sweeps		
Treatment	**Rate (lbai/ac)**	**CFH[1]**	**CFH[2]**	**CFH[3]**
Capture	0.05	8.1 c	9.0 b	8.6 c
Karate Z	0.028	11.3 bc	9.5 b	10.4 bc
Baythroid	0.03	16.6 a	11.3 b	14.0 ab
Leverage	0.079	----	10.7 b	----
Orthene	0.5	8.6 c	9.1 b	8.9 c
Vydate	0.25	11.5 bc	11.3 b	11.4 abc
Provado	0.047	10.6 bc	----	----
Untreated		14.2 ab	17.3 a	15.8 a
LSD (.05)		5.4	5.9	4.6

[1] Average of seven post treatment evaluations (1 trial) following two early season applications (1999).
[2] Average of six post treatment evaluations (1 trial) following two early season applications (2000).
[3] Average of six to seven post treatment evaluations (2 trials) following two early season applications (1999-2000).
Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 11. Efficacy of early season applications of Capture 2EC on predatory arthropods.

		Seasonal Mean Per 100 Sweeps		
Treatment	**Rate (lbai/ac)**	**Predators[1,4]**	**Predators[2,4]**	**Predators[3,4]**
Capture	0.05	15.4 a	56.7 ab	39.0 ab
Karate Z	0.028	18.4 a	77.9 a	52.4 a
Baythroid	0.03	18.5 a	78.8 a	52.9 a
Leverage	0.079	----	45.7 b	----
Orthene	0.5	17.2 a	46.1 b	33.7 b
Vydate	0.25	17.8 a	60.6 ab	42.4 ab
Provado	0.047	16.6 a	----	----
Untreated		24.9 b	71.1 ab	51.3 a
LSD (.05)		5.0	27.1	14.5

[1] Average of four to seven post treatment evaluations (3 trials) following two early season applications (1999).
[2] Average of four to nine post treatment evaluations (4 trials) following two early season applications (2000).
[3] Average of four to nine post treatment evaluations (7 trials) following two early season applications (1999-2000).
[4] Predatory arthropods included big-eyed bug, minute pirate bug, lady beetle, damsel bug, green lacewing and spiders.
Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 12. Efficacy of early season applications of Capture 2EC on subsequent cotton aphid and Heliothine infestations.

	Rate	**Aphids / 10 leaves**			**Seasonal Mean Heliothene Square Damage[4]**
Treatment	**(lbai/ac)**				
Capture	0.05	20 ab[1]	85 a[2]	52 a[3]	1.6 c
Karate Z	0.028	35 a	407 b	221 b	1.6 c
Baythroid	0.03	30 ab	512 b	271 b	0.9 c
Leverage	0.079	--	66 a	---	---
Orthene	0.5	25 ab	73 a	49 a	4.5 a
Vydate	0.25	29 ab	86 a	57 a	2.3 bc
Provado	0.047	14 b	--	---	4.0 ab
Untreated		24 ab	75 a	50 a	3.7 ab
LSD (.05)		18	313	154	2.1

[1] Average of three trials, evaluation taken 5-8 days following the second of two early season applications (1999).
[2] Average of three trials, evaluation taken 8-14 days following the second of two early season applications (2000).
[3] Average of six trials, evaluation taken 5- 14 days following the second of two early season applications (1999-2000).
[4] Average of four to five post treatment evaluations (2 trials) following two early season applications (1999).
Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 13. Efficacy of early season applications of Capture 2EC on yield.

	Rate	**Yield**	**Yield**	**Yield**
Treatment	**(lbai/ac)**	**(lbs sc/ac)[1]**	**(lbs sc/ac)[2]**	**(lbs sc/ac)[3]**
Capture	0.05	2545 a	2584 ab	2564 a
Karate Z	0.028	2352 ab	2671 a	2511 a
Baythroid	0.03	2358 ab	2649 a	2504 a
Leverage	0.079	-----	2500 ab	-----
Orthene	0.5	2404 ab	2632 a	2518 a
Vydate	0.25	2291 ab	2645 a	2468 a
Provado	0.047	2551 ab	-----	-----
Untreated		2150 b	2275 b	2212 b
LSD (.05)		329	342	206

[1] Average of two trials (1999).
[2] Average of two trials (2000).
[3] Average of four trials (1999-2000).
Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).