CAPTURE PERFORMANCE ON KEY COTTON PEST

H. R. Mitchell
Senior Research Biologist
FMC Corporation
Louisville, MS
L. D. Hatfield
Market Development Manager
FMC Corporation
Philadelphia, PA

Abstract

Capture® 2EC (bifenthrin) was evaluated in field efficacy trials for early season insect control, impact on predatory arthropods, pest flaring and subsequent yield when applied early season. Early season applications included a pinhead square application followed by a second application made at state recommended threshold levels of tarnished plant bug, *Lygus lineolaris (*Palisot de Beauvois), or cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter). Various insecticide treatments included Capture 2 EC at 0.05 lb ai/A, Karate Z at 0.028 lb ai/A, Baythroid 2 EC at 0.03 lb ai/A, Orthene 90 SP at 0.5 lb ai/A, Vydate 3.77 L at 0.25 lb ai/A and Provado 1.6 F at 0.047 lb ai/A. Capture provided tarnished plant bug and cotton fleahopper control superior to and resulted in negative impact on predator arthropods similar to that of the other insecticides evaluated. Predatory arthropod populations required approximately 10-14 days to rebound to that of the untreated check. Capture provided aphid suppression that minimized aphid flaring observed with Karate, Baythroid, Orthene and Vydate. Capture provided control of subsequent Heliothine infestations equal to that of Karate and Baythroid and superior to that of Orthene, Vydate and Provado. Positive yield response with early season applications was observed with yields generally higher with Capture and Provado than Karate, Baythroid, Orthene and Vydate.

Introduction

Capture 2EC is a pyrethroid insecticide that has been used successfully throughout the Cotton Belt for many years to control a variety of pests. Capture's strength is in its broadspectrum control and its ability to control the spider mite complex in addition to the numerous insect pests of cotton like tarnished plant bugs, *Lygus lineolaris* (Palisot de Beauvious) (Knabbe and Kukas 1986, Gage and Knabke 1987, Kukas 1987, Mitchell et al. 1987, Mitchell and Hatfield 1988, Mitchell and Hatfield 1999). 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 bugs 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 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 to high production yields.

The objective of these studies was to evaluate the early season applications of Capture 2 EC for early season insect control, impact on predatory arthropods, pest flaring and yield of cotton.

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 80 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 2 EC was evaluated 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. 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.

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Insect infestation levels were determined by standard evaluation procedures that varied by species. Tarnished plant bug/cotton fleahopper infestations were determined using the standard sweep net technique. Numbers of adults and nymphs were 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 in the same manner. 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, 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 approximately one week following the second application.

Heliothine infestations were determined by examination of a set number of cotton terminals and squares per plot at 3-4 day intervals following the second application for 4-5 evaluation dates. Data were then compiled and analyzed based on a seasonal mean percent square damage over multiple evaluations.

Results and Discussion

Results of the efficacy of Capture for control tarnished plant bug, cotton fleahopper and predatory arthropods are shown in Table 1. Seasonal mean number of tarnished plant bug were generated from two replicated field trials (LA, AL), based on four to five 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. Only Capture and Provado resulted in plant bug numbers significantly less than of the untreated check. No significant difference was observed among insecticide treatments.

When tarnished plant bug infestations levels were examined on a per trial bases across evaluations dates, minimal significant differences among insecticide treatments were observed (Table 2 and 3). However, in the Louisiana trial, Capture resulted in residual control through eleven days following the second application superior to that of Karate, Baythroid and Provado and equal to that of Orthene and Vydate. In the Alabama trial, residual control through seventeen days following the second application resulted in superior control with Capture to that of Karate, Baythroid and Vydate and equal to that of Orthene and Provado.

Seasonal mean number of cotton fleahopper were generated from one replicated field trials (OK), based on seven post treatment evaluations following two early season applications (Table 1). Capture at 0.05 lb ai/A resulted in 28, 51, 6, 30, 24 and 43 percent less seasonal mean number of fleahoppers 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.

When cotton fleahopper infestations levels were examined on a per trial bases across evaluations dates, again, minimal significant differences among insecticide treatments were observed (Table 4). However, as with the plant bug data, Capture resulted in residual control through nine days following the second application superior to that of Karate, Baythroid and Vydate and equal to that of Orthene and Provado.

Seasonal mean number of predatory arthropods were generated from three replicated field trials (AL, LA, OK), based on four to seven post treatment evaluations following two early season applications (Table 1).
All insecticide treatments resulted in significantly less mean predators than the untreated check with no significant difference observed among insecticide treatments. However, due to the rapid rebound of the predator population following applications, insecticide treatments demonstrated only a 26 to 38 % 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 (Table 5 and 6).

Mean cotton aphid infestation levels taken 5-8 days following the second insecticide application are shown in table 7. 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. 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. Although the level of control was minimal, the ability of Capture to suppress aphid populations along with rapid resurgence in the predator population limit the flaring of an aphid infestation that has historically been observed with other insecticides in the pyrethroid class of chemistry.

Seasonal mean Heliothine square damage were generated from two replicated field trials (LA, OK), based on four to five post treatment evaluations following two early season

applications (Table 7). 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.

Subsequent yields followed a similar pattern to that of the efficacy data (Table7). All insecticide treatments resulted in a numerical increase in yield over the untreated check demonstrating the positive attributes of early season insecticide applications. 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.

These results demonstrate that Capture 2EC, applied early season, provides tarnished plant bug and cotton fleahopper control superior to and resulted in negative impact on predator arthropods similar to that of Karate, Baythroid, Orthene, Vydate, and Provado. Predatory arthropod populations require approximately 10-14 days to rebound to that of the untreated check. Capture provides aphid suppression at a level that can minimize aphid flaring observed with Karate, Baythroid, Orthene and Vydate. Capture provides control of subsequent Heliothine 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 results in a positive yield response with yields generally higher with Capture and Provado than Karate, Baythroid, 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.

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 early season applications of Capture 2EC on tarnished plant bug (TPB), cotton fleahopper (CFH) and predatory arthropods.

Treatment	Rate (lbai/ac)	Seasonal Mean Per 100 Sweeps		
		TPB[1]	CFH[2]	Predators[3,4]
Capture	0.05	5.4 b	8.1 c	15.5 a
Karate Z	0.028	7.4 ab	11.3 bc	18.4 a
Baythroid	0.03	9.2 ab	16.6 a	18.5 a
Orthene	0.5	8.0 ab	8.6 c	17.2 a
Vydate	0.25	7.7 ab	11.5 bc	17.8 a
Provado	0.047	6.2 b	10.6 bc	16.6 a
Untreated		10.3 a	14.2 ab	24.9 b
LSD (.05)		3.8	5.4	5.0

[1] Average of four to five post treatment evaluations (2 trials) following two early season applications.

[2] Average of seven post treatment evaluations (1 trial) following two early season applications.

[3] Average of four to seven post treatment evaluations (3 trials) following two early season applications.

[4] Predatory arthropods included big-eyed bug, minute pirate bug, lady beetle, green lacewing and spiders.

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

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

Treatment	Rate (lbai/ac)	TPB Per 50 Sweeps				
		2A1[1]	5A1	3A2	7A2	11A2
Capture	0.05	0.0 b	0.3 c	0.5 a	0.8 b	1.5 a
Karate Z	0.028	0.3 b	0.5 c	0.3 a	1.3 b	2.3 a
Baythroid	0.03	0.8 b	0.8 c	0.5 a	1.0 b	3.3 a
Orthene	0.5	0.5 b	3.5 a	0.3 a	0.8 b	1.5 a
Vydate	0.25	1.0 b	1.3 bc	0.3 a	1.0 b	1.3 a
Provado	0.047	0.5 b	0.5 c	1.5 a	1.3 b	3.5 a
Untreated		2.3 a	2.8 ab	2.0 a	4.3 a	3.0 a
LSD (.05)		1.2	1.5	1.4	1.7	1.9

[1] Number of days after (A) 1st (6/16/99) or 2nd (6/25/99) application.
[2] Research conducted by Dr. B. R. Leonard, LA (1999).
Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 3. Efficacy of early season applications of Capture 2EC on tarnished plant bug (TPB)[2] .

Treatment	Rate (lbai/ac)	TPB Per 25 Sweeps				
		7A1[1]	13A1	7A2	17A2	Mean
Capture	0.05	2	24	5	7	9.5
Karate Z	0.028	5	21	8	18	13.0
Baythroid	0.03	4	31	11	16	15.5
Orthene	0.5	4	29	14	6	13.3
Vydate	0.25	8	23	5	17	13.3
Provado	0.047	6	19	4	8	9.3
Untreated		9	21	7	22	14.8

[1] Number of days after (A) 1st (6/08/99) or 2nd (6/22/99) application.
[2] Research conducted by Barry Freeman, AL (1999).

Table 4. Efficacy of early season applications of Capture 2EC on cotton fleahopper (CFH)[2] .

Treatment	Rate (lbai/ac)	CFH Per 25 Sweeps					
		5A1[1]	9A1	13A1	2A2	6A2	9A2
Capture	0.050	1.0 a	2.8 a	3.5 a	0.3 b	1.8 a	3.0 a
Karate Z	0.028	0.8 a	3.0 a	4.8 a	0.3 b	1.8 a	5.3 a
Baythroid	0.03	1.8 a	4.3 a	6.8 a	1.0 b	1.3 a	6.3 a
Orthene	0.5	1.0 a	2.5 a	2.8 a	0.8 b	2.0 a	3.5 a
Vydate	0.25	2.0 a	4.3 a	3.5 a	0.3 b	2.8 a	4.3 a
Provado	0.047	1.3 a	3.5 a	4.0 a	2.5 b	2.3 a	2.0 a
Untreated		2.8 a	2.3 a	3.3 a	5.3 a	3.3 a	5.8 a
LSD (.05)		2.3	2.6	2.8	1.9	1.7	3.2

[1] Number of days after (A) 1st (7/07/99) or 2nd (7/21/99) application.
[2] Research conducted by Stan Musick, OK (1999).
Means within columns followed by the same letter do not significantly differ (P=0.05, LSD).

Table 5. Efficacy of early season applications of Capture 2EC on predatory arthropods[2] .

Treatment	Rate (lbai/ac)	Predators[3] Per 100 Sweeps				
		7A1[1]	13A1	7A2	17A2	Mean
Capture	0.05	4	26	8	54	23.0
Karate Z	0.028	5	28	13	51	24.3
Baythroid	0.03	17	28	8	56	27.3
Orthene	0.5	9	15	13	42	19.8
Vydate	0.25	9	28	10	44	22.8
Provado	0.047	10	22	8	38	19.5
Untreated		21	16	12	49	25.5

[1] Number of days after (A) 1st (6/08/99) or 2nd (6/22/99) application.
[2] Research conducted by Barry Freeman, AL (1999).
[3] Predatory arthropods included big-eyed bug, minute pirate bug, lady beetle, damsel bug, green lacewing and spiders.

Table 6. Efficacy of early season applications of Capture 2EC on predatory arthropods[2] .

Treatment	Rate (lbai/ac)	Predators Per 100 Sweeps					
		5A1[1]	9A1	2A2	6A2	9A2	12A2
Capture	0.050	8.0	5.2	3.2	9.2	13.6	20.8
Karate Z	0.028	11.2	9.2	1.2	5.2	22.4	30.8
Baythroid	0.03	8.4	8.4	1.2	10.4	17.2	16.0
Orthene	0.5	26.8	9.2	9.6	5.2	23.2	14.0
Vydate	0.25	13.6	12.0	6.4	17.6	18.4	19.2
Provado	0.047	21.2	19.2	3.2	12.8	21.6	13.6
Untreated		26.4	17.2	24.4	22.4	22.4	12.8

[1] Number of days after (A) 1st (7/07/99) or 2nd (7/21/99) application.
[2] Research conducted by Stan Musick, OK (1999).
[3] Predatory arthropods included big-eyed bug, minute pirate bug, lady beetle, green lacewing and spiders.

Table 7. Efficacy of early season applications of Capture 2EC on subsequent cotton aphid and Heliothine infestations and yield.

Treatment	Rate (lbai/ac)	Aphids / 10 leaves[1]	Seasonal Mean Heliothine Square Damage[2]	Yield (lbs sc/ac)[3]
Capture	0.05	20 ab	1.6 c	2545 a
Karate Z	0.028	35 a	1.6 c	2352 ab
Baythroid	0.03	30 ab	0.9 c	2358 ab
Orthene	0.5	25 ab	4.5 a	2404 ab
Vydate	0.25	29 ab	2.3 bc	2291 ab
Provado	0.047	14 b	4.0 ab	2521 a
Untreated		24 ab	3.7 ab	2150 b
LSD (.05)		18	2.1	329

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