Comparison of Baythroid® 2 and Renounce® 20WP for Fall Alfalfa Insect Control

Michael D. Rethwisch, Michael Williams, Manuel Luna, Mark Reay and Joe Van Dyke

Abstract

Two formulations of the insecticide active ingredient cyfluthrin (Baythroid® 2, Renounce® 20WP) were compared for fall alfalfa insect control, as was a lower active ingredient rate of both chemistries that included dimethoate. Differences in formulation effects of cyfluthrin were noted for cowpea aphids, spotted alfalfa aphids and alfalfa caterpillars at one day post treatment. At four days post treatment formulation significant differences were evident for numbers of bigeyed bugs, while at seven days after application formulations differed in numbers of spotted alfalfa aphids. Usage of dimethoate with a lower rate of cyfluthin resulted in less control of threecornered alfalfa hoppers throughout the study, improved initial control of spotted alfalfa aphids and clover leafhoppers, an increase in leafminer flies at four days post treatment and reductions in numbers of bigeyed bugs and spiders on this sample date, as well as significant reductions of lygus bugs later in the study compared with cyfluthrin only treatments.

Introduction

The insecticide active ingredient cyfluthrin is available as two formulations for usage in alfalfa, with these being Baythroid® 2 and Renounce® 20WP. Previous research on alfalfa had noted that these two formulations differed slightly in their control of spring alfalfa isnects, with application of Baythroid® 2 resulting in significantly greater control of cowpea aphids at four days after treatment and significantly fewer blue alfalfa aphids at 44 days post treatment than the Renounce® active ingredient equivalent (Rethwisch et al., 2002). Comparisons of Baythroid® and Renounce® in 2003 had noted a significant difference in fall alfalfa hay yields between the two formulations when insects were far below economic levels with Renounce® application resulting in 0.09 tons/acre more hay yield than Baythroid® 2 (Rethwisch et al., 2004). Data on the consistency of these noted yield differences for these particular chemistries are not available, although previous reseach involving Baythroid® under heavy insect pressure resulted in a large increase in hay yield compared to all other chemistries evaluated, and increases were not consistent with insect control (Rethwisch and Nelson, 2001).

This experiment was initiated to compare and determine if formulation of cyfluthrin would result in differences in control of insects associated with fall alfalfa production in the low desert.

Methods and Materials

An alfalfa field (var. = UC Cibola) in its third year of production on beds was selected for this experiment. Average plant height of tallest alfalfa was 17-18 inches at time of application. Treatments applied the afternoon of Oct. 4, 2004, with a Melroe SpraCoupe sprayer equipped with 8008VK nozzles set to deliver 25 gallons/acre. Plots were 8 beds wide (40 inch bed centers) by field length (approx. 1,200 ft), and treatments were replicated four times in a randomized complete block design.

Treatments included Baythroid® 2 at 2.4 and 1.6 oz./acre, and Renounce® 20WP at 3 and 2 oz./acre. This resulted in two equal and comparative levels of active ingredient for cyfluthrin (0.0375, 0.025 lbs/acre respectively). The lower active ingredient rate (0.025 lbs/acre) for both chemistries had Dimethoate 400 added to them at the rate of 1 qt/acre. No surfactant was used in this experiment.

Plots were sampled at one, four, seven and ten days post treatment. Sampling consisted of ten sweeps with a 15 inch diameter sweep net. Sweeps were a three foot long diagonal sweep across one bed in the center of the plots due to the bedded conditions, which did not allow for 180° sweeps typically used in non-bedded alfalfa. After sweeps were completed for each plot, net contents were transferred to a plastic container, returned to the laboratory, and then frozen. Container contents were later separated and insect numbers recorded. Data were analyzed (Statgraphics for Windows, Manugistics, Inc.) and means separated with Fisher's least significant difference.

Alfalfa harvest results were unable to be obtained due to a mistake in raking, resulting in windrows of mixed plots (four beds from each of two treatments) rather than eight beds of the same treatment. This precluded gathering data on the effects of threecornered alfalfa hopper and/or insecticide effects on alfalfa yields and/or quality in this experiment.

Results

Threecornered alfalfa hoppers

Numbers of threecornered alfalfa hoppers (*Spissistilus festinus* Say) were very abundant and increased as the study progressed. During this study, numbers of threecornered alfalfa hoppers (referred to as 3CAH hereafter) ranged from 7.8-53.2/sweep during the experiment in untreated plots, and averaged 22.6/three-foot long sweep in untreated alfalfa throughout the study (Table 1). All treatments resulted in significant reductions in 3CAH numbers, with overall reduction of 98.2% at one day post treatment, and slightly fewer 3CAH noted in the high rates of cyfluthin chemsitries than in the lower rate + dimethoate combination. Similar trends were noted through seven days post treatment. At seven days post treatment the high rates of cyfluthrin chemistries averaged 97.9% fewer 3CAH than the untreated check, while the lower rate of cyfluthrin + dimethoate combination treatments averaging 95.0% fewer 3CAH than the check.

Mean numbers of 3CAH increased between seven and ten days post treatment, and control was lessened in part due to alfalfa growth that was not present at time of application. Numbers of 3CAH were very similar by rate of cyfluthrin with little differences noted due to formulation. The high rate of cyfluthrin treatments (0.0375 lbs. active ingredient/acre) averaged 92.8% fewer 3CAH than the untreated plots, but the lower rate (0.025 lbs. a.i./acre) had twice as many 3CAH as the high rate and averaged 85.6% fewer 3CAH than the check (Table 1).

Empoasca spp. leafhoppers

Numbers of potato leafhopper complex leafhoppers were very low throughout the study, averaging less than one/sweep in the untreated check on all sample dates. All cyfluthrin treatments resulted in significant reductions of *Empoasca* leafhoppers at one day post treatment (Table 1). Numeric differences were noted between Baythroid® and Renounce® treatments at four days post treatment, with fewest leafhoppers noted in alfalfa treated with Renounce® (0.5/ten sweeps) while Baythroid® treated alfalfa had more (2.25/10 sweeps). No statistical differences existed between treated or untreated alfalfa on this sample date. Differences due to rate of cyfluthrin were not evident at four days post treatment.

All cyfluthrin treated alfalfa had significantly fewer leafhoppers than untreated alfalfa at seven days post treatment but not at 10 days after application (Table 1). No differences due to formulation or rate were evident at seven days post treatment although slightly higher numbers of leafhoppers were noted at 10 days post treatment in the lower rate (0.025 lbs. a.i./acre) treatments that included dimethoate (3.75/ten sweeps) than the 0.0375 a.i./acre rate (2.75/ten sweeps).

Spotted alfalfa aphids

Spotted alfalfa aphids were present in low numbers (averaging less than 1.5/sweep) throughout the study, with highest numbers usually present in the 2.4 oz/acre rate of Baythroid® 2. This treatment resulted in significantly higher numbers of spotted alfalfa aphids than the untreated check at one, seven and ten days post treatment) and significantly more than the 3 oz./acre rate of Renounce® 20WP at one and seven days post treatment (Table 2). Lowest numbers of spotted alfalfa aphids noted at one day post treatment were in plots that included dimethoate in the treatment. No differences were noted at four days post treatment.

At seven days post treatment all treated alfalfa had significantly more spotted alfalfa than the untreated check, with these differences attributed to predacious of bigeyed bugs and damsel bugs which were present in untreated alfalfa at significanlty higher levels than cyfluthrin treated alfalfa (Table 4). More spotted alfalfa aphids were noted in cyfluthin treated alfalfa than untreated alfalfa at ten days post treatment, although with the exception of the 2.4 oz./acre rate of Baythroid® 2.

Cowpea aphids

Cowpea aphids were present in a patchy distribution at the beginning of this study. At one day post treatment highest numbers of cowpea aphids (193/ten sweeps) were noted from alfalfa receiving the 2.4 oz./acre rate of Baythroid® 2, with significantly fewer cowpea aphids noted in Renounce® treatments on this sample date (Table 2). Numbers of cowpea aphids were higher in the Baythroid® treated alfalfa than untreated alfalfa. It is unclear as to the reason why higher numbers of cowpea aphids existed in both Baythroid® treatments than the untreated check, however treatment means were not statistically different than the untreated check (Table 2). No differences existed at four and seven days post treatment as numbers of cowpea aphids were much reduced at these samples dates. At ten days post treatment numbers of cowpea ahids were lowerst in plots receiving some form of Renounce® 20WP, with about twice as many cowpea aphids present in Baythroid® chemistry treated plots. Slightly fewer cowpea aphids were noted for 0.025 lb./acre rate + dimethoate treatments than for the 0.0375 lb./acre active ingredient rates of cyfluthrin chemistries alone.

Pale striped flea beetles

Pale striped flea beetle adults were fairly abundant at time of application and averaged almost 2.4/sweep in the untreated check at one and four days after application. All treatments resulted in significantly fewer pale striped flea beetles than the untreated check on all sample dates (Table 3) with overall reduction of 97.8% noted at one day post treatment. At four days post treatment fewest flea beetles were noted in the cyfluthrin + dimethoate combination treatments than in the high rate (0.075 lbs. a.i./acre) treatments of cyfluthin alone, but these differences were not significant.

At seven days post treatment slighly fewer adult pale striped flea beetles were present in plots treated with Baythroid® 2 than with Renounce® WP, and all cyfluthrin treatments averaged 91.3% fewer flea beetles than then untreated check (Table 3). At ten days post treatment fewest flea beetles were noted in Renounce® treated alfalfa. Consistent effects due to dimethoate were not able to be detected on this sample date as on day four (Table 3).

Leafminer flies

Adult leafminer fly species present in sweep net samples were *Liriomyza* spp. Attempts to determine species were not undertaken, although several species were present. *Liriomyza* species usually present are the vegetable leafminer *(L. sativae*) and a related species (*L. trifoliearum* Spencer). Treatment of alfalfa treated with the high rate of cyfluthrin did not result in significant differences of leafminer flies when compared with the untreated check at any sampling throughout the study (Table 3). Leafminer flies were slightly higher in Renounce® treated alfalfa at four days post treatment than Baythroid® counterpart treatments, however, usage of dimethoate resulted in almost twice as many adult flies. This may have been due to fewer minute pirate bugs (which are known to feed on leafminer immatures in mines) noted in dimethoate treated alfalfa at one day post treatment than the cyfluthrin only treatments (Table 6). Numerically more leafminer flies were noted in all treated alfalfa than the untreated check at four days post treatment, with only the Renounce® + dimethoate treatment resulting in significantly more leafminer flies on this sample date (Table 3).

Bigeyed bugs (*Geocoris* spp.)

Bigeyed bugs were numerous in this study, with as many as 3.3/sweep noted in the untreated check. At one day post treatment fewer big-eyed bugs were noted in plots treated with diemthoate and the low active ingredient rate of cyfluthrin than the high active ingredient rate of cyfluthrin alone, indicating that dimethoate or the combination of dimethoate + cyflythrin is more detrimental to bigeyed bugs than is cyfluthrin (Table 4). Differences in numbers of bigeyed bugs was noted to exist at four days post treatment associated with differing cyfluthrin formulation, with plots treated with Renounce® (3.0/ten sweeps) having very few bigeyed bugs (91% less than then untreated check) while the plots treated with Baythroid® were much higher (11.25/ten sweeps). Dimethoate did not appear to affect number of bigeyed bugs on this sample date, unlike the noted effects at one day post treatment.

At seven days post treatment fewest bigeyed bugs were noted in plots that had included dimethoate in the treatment (Table 4), although these levels were only slightly below those noted for the high active ingredient rates of cyfluthrin. Differences between chemistries were not evident at this sample date. At 10 days post treatment highest numbers of bigeyed bugs in treated plots was noted from the Baythroid® 2 treatment (6.25/ten sweeps) with lowest from the Baythroid® 2 + Dimethoate 400 treatment (1.75/ten sweeps) with all Renounce® treatments being between these levels (overall average of 4.625/ten sweeps). Numbers of bigeyed bugs in treated alfalfa was still significantly less than the untreated check (24.25/ten sweeps) at 10 days post treatment.

Damsel bugs

Cyfluthrin treatments resulted in significant reductions of damselbug numbers at all sample dates with the exception of four days after application when compared with untreated alfalfa (Table 4). At one day post treatment numerical differences in numbers of damselbugs due to formulation or rate were not evident, and treatments resulted in a 92.8% overall reduction. At four days post treatment numerically more damselbugs were noted in the lower rates of cyfluthrin + dimethoate combination treatments, with formulation effects also noted as numerically fewer damselbugs were noted in treatments containing Renounce® 20WP treatments (0.625/10 sweeps overall average) than from alfalfa treated with either Baythroid® 2 treatment (2.25/10 sweeps).

No damselbugs were collected in any sample from cyfluthrin treated alfalfa at seven days post treatment (Table 4). At ten days post treatment slightly higher numbers of damselbugs were again noted in alfalfa receiving Baythroid® 2 than comparative rates of Renounce® treatments, and overall cyfluthrin treatments resulted in 96.4% fewer damselbugs than the untreated check.

Alfalfa caterpillars

Alfalfa caterpillars were present in sweep samples only at one day post treatment. Significant differences were noted in their numbers due to cyfluthrin formulation, with Baythroid® treatments resulting in significantly fewer alfalfa caterpillars than Renounce® treatments (Table 5). Baythroid® treatments also had numerically fewer alfalfa caterpillars than the untreated check, but numbers of these insects from Renounce® treated alfalfa were higher than the untreated check. The reason for this observation is unclear, as no clear correlations were found to be associated with formulation effects on predacious insects (damselbug, bigeyed bugs, etc.) present.

Beet armyworms

Beet armyworms were present in moderately low numbers throughout the study. Cyfluthrin treatments did result in significant reduction of beet armyworms at one day post treatment (Table 5). Slightly fewer beet armyworms were noted from Renounce® 20WP treated alfalfa than comparative Baythroid® 2 treatments, and further reductions were noted from combination treatments of dimethoate + low rates (0.025 lbs. a.i./acre) of cyfluthrin than the higher rate (0.0375 lb. active ingredient/acre) cyfluthrin only treatments (Table 5). No statistical differences were noted at four days post treatment, but lower numbers of beet armyworms were noted from Renounce® 20WP alfalfa than Baythroid® 2 alfalfa plots.

At seven days after application numbers of beet armyworms were significantly fewer in plots treated with 0.0375 lbs. a.i./acre than untreated alfalfa. (Table 5). No consistent trends were noted for formulation effects nor for dimethoate. Similar results were noted at 10 days post treatment. Reduction of beet armyworms by the 3 oz./acre rate of Renounce® 20WP was greatest (88.9%) on this sample date although overall control by this treatment prior to this date averaged under 70%.

South American bean thrips (*Caliothrips phaseoli)*

Bean thrips were present in low numbers, as were western flower thrips. Reliable data were able to be collected at the beginning of the experiment. After this point mistakes in recording data resulted in data combinations of western flower thrips and bean thrips and therefore reliable data for thrips by species were not available. At one day after application no treatment provided statistical differences in numbers of bean thrips from the untreated check (Table 6), although such differences were present for the treatments which resulted in the highest (4.5/ten sweeps for Baythroid® 2 + dimethoate) and lowest numbers (0.0/ten sweeps for Baythroid® 2 treatment) of bean thrips.

Minute pirate bugs (*Orius tristicolor*)

Minute pirate bugs are predators of small insects such as thrips, leafminer larvae and are also thought to feed on spotted alfalfa aphids, hence their populations may feflect that of prey abundance. No statistical differences were noted for minute pirate bugs in this study, although at one day post treatment about half as many minute pirate bugs were collected from dimethoate + cyfluthrin treated alfalfa than the higher rate of cyfluthrin only treatments which were similar to or greater than the untreated check (Table 6). No trends were noted for numbers of these insects until ten days post treatment when all treatments resulted in numerically more minute pirate bugs than the untreated check, and dimethoate treated alfalfa resulting slightly more of these insects than the higher rates of cyfluthrin alone.

Lygus bugs

Lygus bugs were present in moderate numbers throughout the study. At one day post treatment few differences were noted for numbers of lygus bug nymphs, although treatments containing dimehtoate had very few nymphs (Table 7). Reduction of adults was noted by treatments with cyfluthrin treatments by themselves resulting in about 45% reduction, with further reduction noted addition of dimethoated (Table 8) at one day after application. This was also noted in total numbers of lygus bugs.

At four days post treatment more small lygus bugs were noted in the treated alfalfa than in untreated alfalfa, as was the case in all but one (2.4 oz/acre rate of Baythroid® 2) cyfluthin containing treatment (Table 7). This was thought due to reduction of the larger beneficial insects that ate lygus bug nymphs in untreated plots. Fewer adult lygus bugs continued to be noted as a result of treatments (Table 8) although overall differences were not as great as the previous sample. No differences were noted for total numbers of lygus bugs (Table 8).

Significant differences existed for numbers of small lygus bug nymphs at seven days post treatment between treatments due to dimethoate content, with treatment not containing dimethoate being much higher than untreated or dimethoate plus cyfluthin combination treatments (Table 7). This was also true for large lygus bug nymphs at seven days post treatment. Adult numbers were similar, although all treated alfalfa had slightly higher numbers of adult lygus bugs. Examination of total lygus bug numbers (Table 8) noted that cyfluthin only treatments had 2-3x more lygus bugs than the untreated check, mostly due to the small nymph component.

Similar results as were noted at ten days after application as were noted at seven days post treatment, although distinct differences existed. Fewer lygus bug nymphs were collected from alfalfa treated with dimethoate than other treatments, however numbers of nymphs in the untreated check were similar to the cyfluthin only treatments (Table 7). No differences existed for adult lygus bugs at 10 days post treatment (Table 8) and total lygus bug numbers were very similar to that of nymphs.

Wolf Spiders (Lycosidae)

No statistical differences existed for numbers of spiders in this study at any sample date. At one day after application numerically fewer spiders were noted from alfalfa receiving dimethoate containing treatments, as cyfluthin only treatments were very similar to the untreated check (Table 9). All treatments had fewer spiders than the untreated check at four days post treatment, with no spiders noted at seven days post treatment. Spiders were not collected from plots treated with Baythroid® 2 at ten days post treatment although they were present in untreated and Renounce® treated alfalfa. Fewer spiders were noted in the 3 oz./acre rate of Renounce® 20WP than in the 2 oz./acre rate + dimethoate at 10 days post treatment, but these means were both less than that of untreated alfalfa.

Wasps (multiple species)

A number of wasp species were noted in sweep net samples, representing a number of host insects. For this study, they were grouped together, but had a wide range of genera and hosts. Wasps noted as being present in collected samples included parasitoids of cowpea aphids (*Lysiphlebis testaceipes*), several species of *Liriomyza* parasitoids (*Chyrsacharis*, etc.), and other parasitic wasps.

At one day post treatment significant differences existed for total wasps existed only between the Baythroid® 2 treatments, with highest numbers of wasps (6/ten sweeps) noted in the 2.4 oz./acre treatment but only 0.5/ten sweeps for the 1.6 oz./acre + dimethoate combination treatment (Table 9). The exact reason for these differences is unknown but may be realted to dimethoate usage, as the Renounce® + dimethoate combination treatment also resulted in significantly fewer wasps than the 2.4 oz/acre rate treatment of Baythroid®. Numbers of wasps in the 2.4 oz rate may correspond to the numbers of cowpea aphids as they were also highest in the 2.4 oz/acre rarte of Baythroid® 2 at one day after application (Table 2), however, then high humbers of wasps would also have been expected in the 1.6 oz rate + dimethoate which also had higher numbers of cowpea aphids than other treatments on this date.

No significant differences were noted at four days post treatment, although at seven days after application all treatments had more wasps than the untreated check. This indicates that predacious insects may also be feeding on parasitic wasps. Slightly higher numbers of wasps were noted in cyfluthin only treatments, with about 15% fewer wasps noted from alfalfa treated with dimethoate + cyfluthrin. Slightly higher numbers of wasps continued to be noted in cyfluthrin only treated plots than combination treatments at ten days after application, although these numbers were similar to slightly less than the untreated check (Table 9).

Clover leafhopper and related species (other than *Empoasca* spp.)

All treatments resulted in significantly fewer leafhoppers at one day post treatment (Table 10) with dimethoate containing treatments having slightly fewer leafhoppers than the cyfluthrin only treatments. At four days post treatment all treatments still resulted in significantly fewer leafhoppers than the untreated check, however the lower rate of cyfluthrin + dimethoate treatment combinations had about 2.5x more leafhoppers than the high rate of cyfluthrin treatments. Similar population means existed at seven days post treatment although statistical differences did not exist on this sample date. Treatments resulted in statistical differences of leafhoppers when compared with the untreated check at ten days post treatment but trends among treatment means were not discernable.

Literature Cited

Rethwisch, M.D., and J.E. Nelson. 2001. Effects of various insecticides on early fall alfalfa insects and related crop yield and quality. Pp. 9-24. In University of Arizona College of Agriculture and Life Sciences Forage and Grain Report, Series P-128. M. Ottman, ed. 82 pp.

Rethwisch, M.D., P. Hayden, B. Hayden and B. J. Griffin. 2002. Insecticidal effects on cowpea aphids and their parasitoids, blue alfalfa aphids, and alfalfa weevils in 2002. Pp. 33-40. In University of Arizona College of Agriculture and Life Sciences Forage and Grain Report, Series P-132. M. Ottman, ed. 95 pp.

Rethwisch, M.D., M. Reay, L. Berger, E. Hawpe, J. Grudovich, R. Perez and D. Ramos. 2004. Comparisons of insecticides on fall alfalfa insect populations, and resultant hay yields and quality. Pp. 1-17. In University of Arizona College of Agriculture and Life Sciences Forage and Grain Report, Series P-140. M. Ottman, ed. 72 pp.

Acknowledgements

We thank Bayer CropScience for financial support which enabled this project to be conducted.

Table 1. Mean numbers of threecornered alfalfa hoppers and *Empoasca* spp. leafhoppers per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Three cornered alfalfa hoppers				*Empoasca* spp. leafhoppers			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	2.75a	4.75a	5.0a	21.5a	1.0a	2.75a	0.0a	2.75a
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	5.5a	12.75a	18.25a	42.0a	2.25ab	1.75a	0.25a	4.5a
Renounce® 20WP @ 3 oz	2.0a	4.75a	6.5a	18.0a	5.25 b	0.25a	0.25a	2.75a
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	3.75a	7.0a	8.75a	39.25a	1.0a	0.75a	0.25a	3.0a
Untreated check	191.25b	160.0 b	273.0 b	281.5b	8.75 c	4.00a	3.00 b	6.0a

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 2. Mean numbers of spotted alfalfa aphids and cowpea aphids per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Spotted alfalfa aphids				Cowpea aphids			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	13.25b	4.0a	14.75 c	12.5 b	193.0b	3.0a	6.5a	4.75ab
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	1.0a	5.5a	9.0 b	4.5ab	89.5ab	6.0a	2.5a	4.25ab
Renounce® 20WP @ 3 oz	3.5a	3.75a	6.25 b	8.75ab	32.75a	3.75a	0.75a	2.5ab
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	1.5a	6.25a	8.5 b	8.0ab	24.0a	2.5a	1.5a	2.00a
Untreated check	2.5a	2.75a	2.25a	1.75a	52.5ab	3.0a	2.25a	13.75 b

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 3. Mean numbers of pale striped flea beetles and adult leafminers per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Pale striped flea beetles				Adult leafminer flies			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	0.75a	1.25a	0.67a	0.75a	2.75a	5.0a	8.0a	3.0a
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	0.25a	0.25a	0.75a	1.75a	3.25a	10.0ab	5.25a	3.25a
Renounce® 20WP @ 3 oz	0.25a	1.75a	1.25a	0.25a	3.25a	7.5ab	3.75a	4.75a
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	0.5a	0.50a	1.25a	0.25a	6.0a	12.0 b	4.25a	3.0a
Untreated check	20.0b	27.75b	11.25b	7.75 b	4.5a	4.0a	6.75a	4.5a

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 4. Mean numbers of bigeyed bugs and damsel bugs per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Bigeyed bugs				Damsel Bugs			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	4.5a	11.25a	2.0a	6.25b	1.0a	1.25a	0.0a	1.0 b
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	1.25a	11.25a	0.75a	1.75b	0.0a	3.25a	0.0a	0.5 b
Renounce® 20WP @ 3 oz	6.75ab	3.0a	2.75a	4.5 b	0.25a	0.25a	0.0a	0.0 b
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	2.25a	3.5a	1.5a	4.75b	0.25a	1.0a	0.0a	0.25 b
Untreated check	15.75 b	33.0 b	13.75 b	24.25a	5.25 b	4.25a	6.75 b	12.25a

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 5. Mean numbers of alfalfa caterpillars and beet armyworms per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Alfalfa caterpillars				Beet armyworms			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	0.0a	0.0a	0.0a	0.0a	2.75a	1.75a	1.25a	1.25a
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	0.25ab	0.0a	0.0a	0.0a	2.5a	3.0a	2.25ab	1.0a
Renounce® 20WP @ 3 oz	2.5 c	0.0a	0.0a	0.0a	2.0a	1.0a	1.75a	0.5a
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	2.25 bc	0.0a	0.0a	0.0a	0.25a	2.0a	1.75a	2.25ab
Untreated check	0.75abc	0.0a	0.0a	0.0a	6.5 b	3.75a	4.25 b	4.5 b

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 6. Mean numbers of bean thrips and minute pirate bugs per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Bean thrips				Minute pirate bugs			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	0.0a	NA	NA	NA	1.5a	3.0a	7.33a	4.5a
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	4.5 b	NA	NA	NA	0.75a	7.0a	3.5a	5.75a
Renounce® 20WP @ 3 oz	2.5ab	NA	NA	NA	2.0a	11.25a	4.0a	5.0a
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	1.25a	NA	NA	NA	1.0a	3.0a	5.75a	6.0a
Untreated check	2.0ab	NA	NA	NA	1.5a	5.0a	5.5a	2.5a

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 7. Mean numbers of lygus bug nymphs per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Small lygus nymphs				Large lygus nymphs			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	0.5a	1.25a	7.5ab	10.0 c	0.75a	1.25ab	5.2 b	4.25a
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	0.0a	0.75a	0.25a	2.25ab	0.0a	0.5a	0.0a	3.0a
Renounce® 20WP @ 3 oz	0.75a	1.25a	13.75 b	4.25abc	0.0a	2.0 b	4.0 b	7.0a
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	0.25a	0.50a	0.0a	1.0a	0.0a	1.0ab	1.5ab	1.75a
Untreated check	0.75a	0.00a	1.75a	8.5 bc	0.25a	0.75ab	2.0ab	6.5a

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 8. Mean numbers of adult and total lygus bugs per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Adult Lygus Bugs				Total Lygus Bugs			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	3.75ab	4.0ab	4.33ab	2.75a	5.0ab	6.5a	17.0ab	17.0 b
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	3.5a	5.75ab	4.5ab	2.0a	3.5a	7.0a	4.75a	7.25ab
Renounce® 20WP @ 3 oz	3.5a	2.75a	5.5 b	2.75a	4.25a	6.0a	23.25 b	14.0ab
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	2.75a	4.75ab	3.75ab	3.25a	3.0a	6.25a	5.25a	6.0a
Untreated check	6.75 b	6.75 b	3.25a	2.25a	7.75b	7.5a	7.0a	17.25 b

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 9. Mean numbers of spiders and parasitic wasps (of leafminers and aphids) per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Spiders				Wasps			
	Days after treatments applied							
Treatment and Rate/acre	1	4	7	10	1	4	7	10
Baythroid® 2 @ 2.4 oz	4.0a	0.75a	0.0a	0.0a	6.0a	6.75a	13.3ab	2.75a
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	1.75a	1.75a	0.0a	0.0a	0.5 b	9.25a	11.75ab	1.5a
Renounce® 20WP @ 3 oz	3.25a	3.0a	0.0a	0.75a	2.75ab	9.25a	18.0 b	3.5a
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	1.25a	2.75a	0.0a	1.5a	2.5 b	10.5a	15.5ab	2.0a
Untreated check	4.25a	8.0a	0.0a	2.5a	2.75ab	7.25a	6.75a	3.5a

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).

Table 10. Mean numbers of clover and other leafhoppers per 10 three-foot sweeps following insecticide application on Oct. 4, 2004.

	Clover leafhoppers			
	Days after treatments applied			
Treatment and Rate/acre	1	4	7	10
Baythroid® 2 @ 2.4 oz	2.5a	1.0a	0.0a	2.0a
Baythroid® 2 @ 1.6 oz + Dimethoate 400 @ 1 pt	1.5a	2.25a	0.5a	2.0a
Renounce® 20WP @ 3 oz	2.5a	0.75a	0.5a	1.0a
Renounce® 20WP @ 2 oz + Dimethoate 400 @ 1 pt	0.25a	2.0a	1.25a	3.0a
Untreated check	13.4 b	9.0 b	4.75a	10.0 b

Means in columns followed by the same letter are not statistically different at the P<0.05 level (Fisher's LSD test).