Evaluation of Conventional and Experimental Insecticides for Control of Western Flower Thrips in Head Lettuce

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Abstract

Studies were conducted in small plot field trials to evaluate the efficacy of several experimental and conventional insecticide chemistries against western flower thrips in head lettuce. Results from two trials using new experimental compounds showed that several insecticides have potential for management of thrips populations. All of the products appear to be good candidates for thrips control and had efficacy against adults and nymphs. Success and Fipronil consistently provided comparable control to the standard Lannate/Ammo. In the trial evaluating conventional compounds, Orthene/Mustang and Lannate/Ammo combinations provided the best control of both adult and nymphs. Plant size and temperature may be important factors contributing to the efficacy of these products.

Introduction

Western flower thrips, *Frankiniella occidentalis*, have rapidly become important pests in head lettuce production. This thrips species is polyphagous and appears to have a wide host range in most vegetable producing areas. They primarily occur in large numbers on lettuce during the cooler growing parts of the season (Jan-Mar), and can build up to high numbers very rapidly. Adults often migrate onto lettuce crops during the winter months as weeds and other host plants dry down or are harvested. Under mild-warm temperatures, thrips reproduce quickly on lettuce. Thrips are considered a pest because of the cosmetic damage they cause to cap leaves on lettuce heads and the contamination in mature heads by thrips adults and nymphs. Grower tolerance for thrips damage and contamination has recently become very low in naked and film wrapped head lettuce. Consequently, PCAs treat often to prevent thrips from becoming established on heads before harvest. In the past few years, it has become more difficult to maintain thrips numbers at low levels. This may be in part due to their cryptic nature, hiding in the leaf margins and low in the plant allowing them to avoid many of the contact insecticides used for control. Because thrips control in lettuce has become important just recently, not much is known about their management. This study was conducted to determine the efficacy of conventional and new insecticide compounds against thrips in spring lettuce under variable population pressure and growing conditions.

Materials and Methods

Experimental Insecticides: Two field trials were conducted at the University of Arizona Yuma Agricultural Center. Lettuce 'Van guard' was direct seeded 8 Nov in the 1st trial and 22 Nov in the 2nd trial into double row beds on 42 inch centers. Plots consisted of 4 beds, 60 feet long with a two bed buffer between the plots. Plots were arranged in a randomized complete block design with four replications. Treatments for both trials consisted of the following compounds:

Treatment	Rate lbs (AI)/acre
1.Lannate +Ammo	0.75 +0.10
2. Alert 2SC	0.15
3. Alert 2SC	0.10
4. Success	0.13
5. Success	0.07
6. Mesurol	0.5
7. Fiprinil	0.05
8. Untreated control	--

The foliar treatments were applied in 40 GPA total volume at 160 psi. A spreader/sticker was used (Latron at 0.25% v/v). Three, disc-type cone nozzles were used per bed. Two applications were made in each trial; 22 and 29 January in trail 1; and 11 and 24 February in trial 2.Evaluation of thrips control was based on the number of live adults and nymphs per plant sampled from the center 4 rows of each replicate at intervals following each application. Numbers of thrips from 5 plants per replicate were recorded on each sample. Samples were taken by removing plants and beating them vigorously against a screened pan. Inside of the pan was a sticky trap to catch the dislodged thrips. See Table 1 for explanation of plant sizes at each sample. Sticky traps were then taken to the laboratory where adult and immature thrips were counted. Percentage reduction of thrips compared with the untreated control was calculated following the formula given by Henderson & Tilton (1955).

Conventional Insecticides: A field trial was conducted at the University of Arizona Yuma Agricultural Center. Lettuce 'Van guard' was direct seeded 6 Dec into double row beds on 42 inch centers. Plots consisted of 4 beds, 60 feet long with a two bed buffer between the plots. Plots were arranged in a randomized complete block design with four replications. Treatments consisted of the following compounds:

Treatment	**Rate (product/acre)**
1. Pyrellin	2 pts
2. Neemix	1 pt
3. Lannate SP+Ammo 2.5EC	0.8 lbs + 5 oz
4. Orthene 75S + Mustang 1.5EW	0.95 lb + 4 oz
5. Endosulfan 3EC+Dimethoate 267	2 pts + 0.5 pt
6. Endosulfan 3EC+Karate1E	2 pts + 3.5 oz
7. Untreated	--

The foliar treatments were applied similar to the above study. Two applications were made on 12 and 24 Feb. Evaluation of thrips control was conducted similar to above.

Results and Discussion

Trial 1. Efficacy of Experimental Insecticides at low thrips densities. Thrips species in this study were predominantly western flower thrips, *Frankiniella occidentalis.* Both adult and nymph populations were low (<8 adults/ plant and < 15 nymphs/ plant) in the first trial. Lannate+ammo was used as the standard comparison. Although most treatments reduced thrips numbers lower than the untreated check, only the high rate of Success and Fiprinil appeared to provide adult suppression similar to Lannate/Ammo (@ 80 % reduction).Fipronil and Alert appeared to provide the greatest suppression of nymphs. Fipronil and Success provided the best control of total thrips when compared to the standard.

Trial 2. Efficacy of Experimental Insecticides at high thrips densities. Thrips species in this study were predominantly western flower thrips, *Frankiniella occidentalis.* Adult and nymph populations were moderate (<15 adults/ plant and < 10 nymphs/ plant) at the beginning of trial 2, but population growth was quite rapid throughout the test in the untreated blocks. Fipronil, Mesurol and Success provided suppression of adults similar to the standard. Thrips numbers in the Alert treatments were not different form the check. All products provided similar activity on nymphs and total thrips based on final counts (@70-80% reduction).

Trial 3. Efficacy of Conventional Insectcides: Thrips species in this study were predominantly western flower thrips. The number of adult thrips was high at the initiation of the test. The botanical products, Pyrellin and Neemix did not provide significant control as stand alone products. They appeared to be more effective on nymphs than on adults. In general, the Lannate and Orthene + pyrethroid combinations provided the best control (>80% reduction), and appear to be the best available choices for managing thrips in lettuce. However, the endosulfan combinations also provided fair control (>60% reduction), and could provide viable alternatives for rotation. Although all materials appeared to control nymphs better than adults, our data may not reflect the rapid development of nymphs or the immigration of adults from surrounding fields during the study.

Conclusions. All of the products appear to be good candidates for thrips control. Although Alert and Mesurol were inconsistent in these studies, they may work much better under different conditions and should provide alternatives for tank-mix combinations. Success and Fipronil may have a fit as stand alone products or as combinations used in rotation with the standard foliar materials presently used (ie. Lannate/Ammo). Plant size and temperature may be important factors contributing to the efficacy of these products. The larger the plant, the more difficult it is to obtain good coverage of underneath the leaf and near the base of the plant where nymphs inhabit. Also, higher temperatures drive thrips development, but may also influence their activity to more readily come in contact with the insecticides . Future studies with these products will focus on : (1) using them at reduced rates in combination with OP's and pyrethroids, (2) using them in a season long program approach, timing applications before thrips immatures become established Based on these results, even the most efficacious products appeared to maintain thrips populations at constant levels and not necessarily reducing their number. Thus, more work needs to be done to determine the proper timing of applications to achieves optimal control with the best available technology.

Table 1. Plant Size Parameters for the Two Experimental Insecticide Evaluations.

Trial 1		
Sample Date	**No. of leaves**	**Head size**
Jan 16	10-11	--
Jan 24	15-18	heading
Jan 28	16-19	2" diam.
Feb 4	19-22	3" diam

Trial 2		
Sample Date	**No. of leaves**	**Head size**
Feb 10	14-18	heading
Feb 17	16-21	2"
Feb 27	21-23	4"
Mar 6	22-24	6" (harvest)

Table 2. Plant size parameters in Conventional Insecticide Evaluation for each sample date

Sample Date	No. of leaves	Head size
Feb 11	13-14 leaves	--
Feb 18	17-18 leaves	early heading
2 Mar	21-22 leaves	2-3" diam

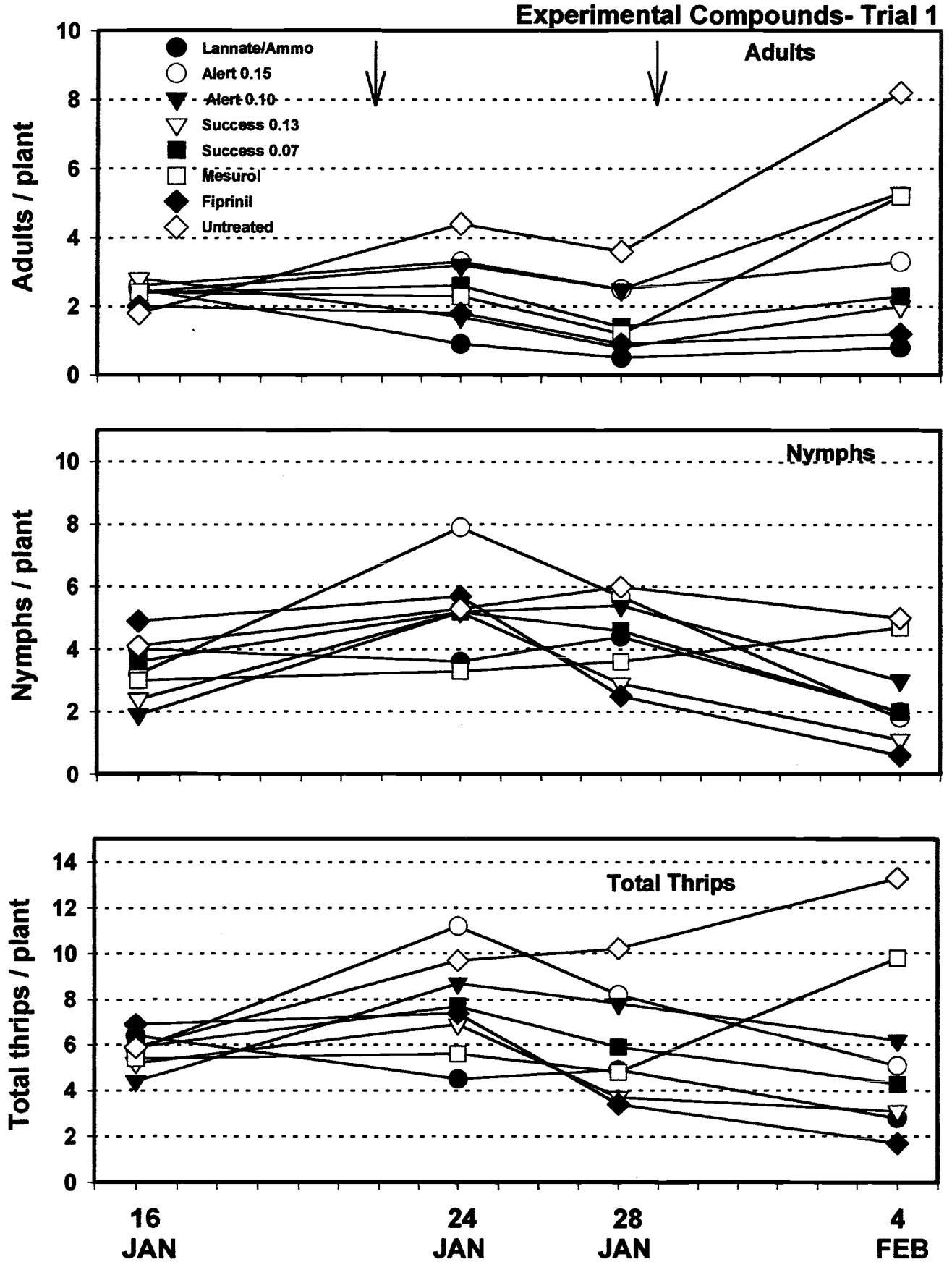


Figure 1. Mean adult, nymph and total thrips per plant following applications of experimental compounds on lettuce (arrows indicate date of application).

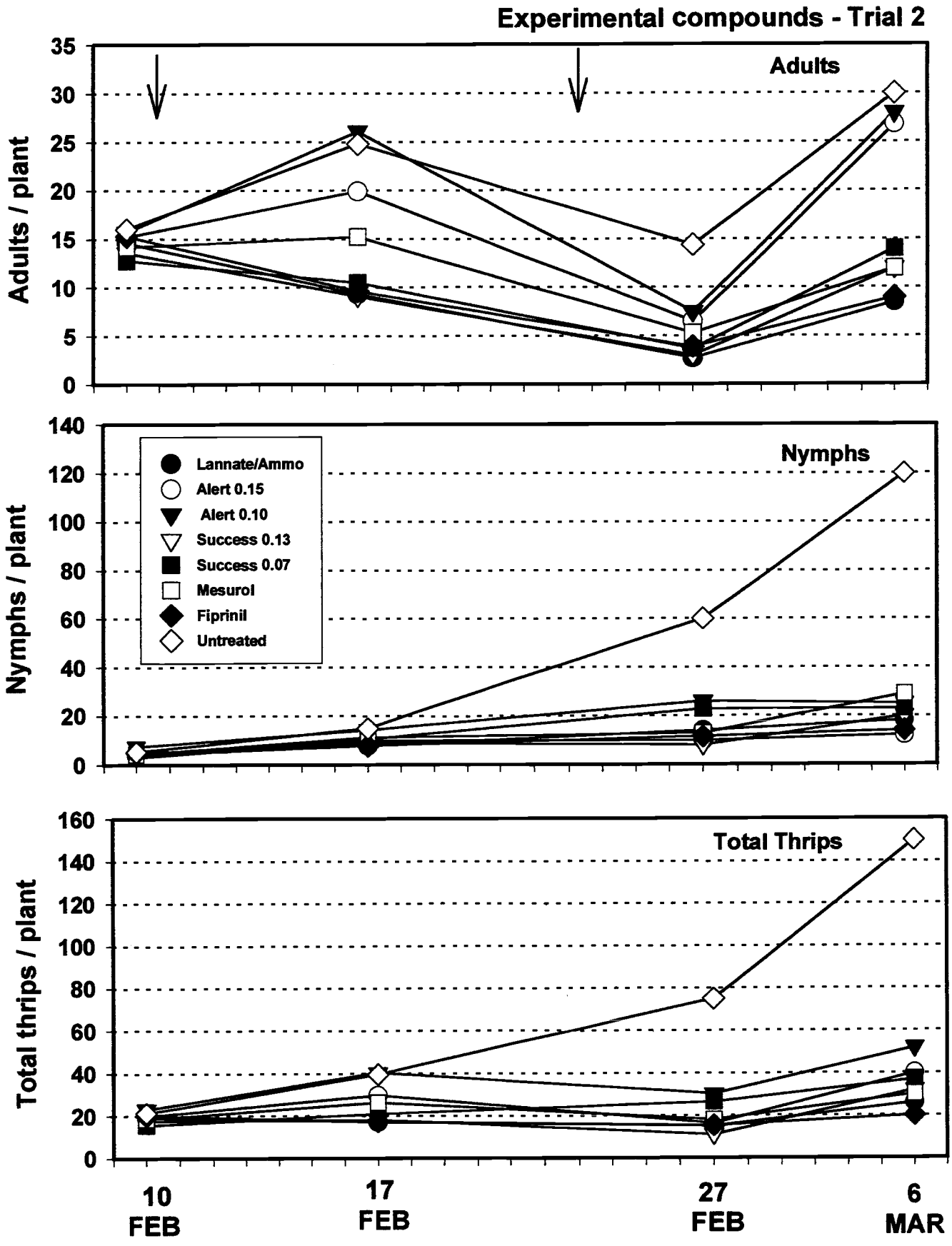
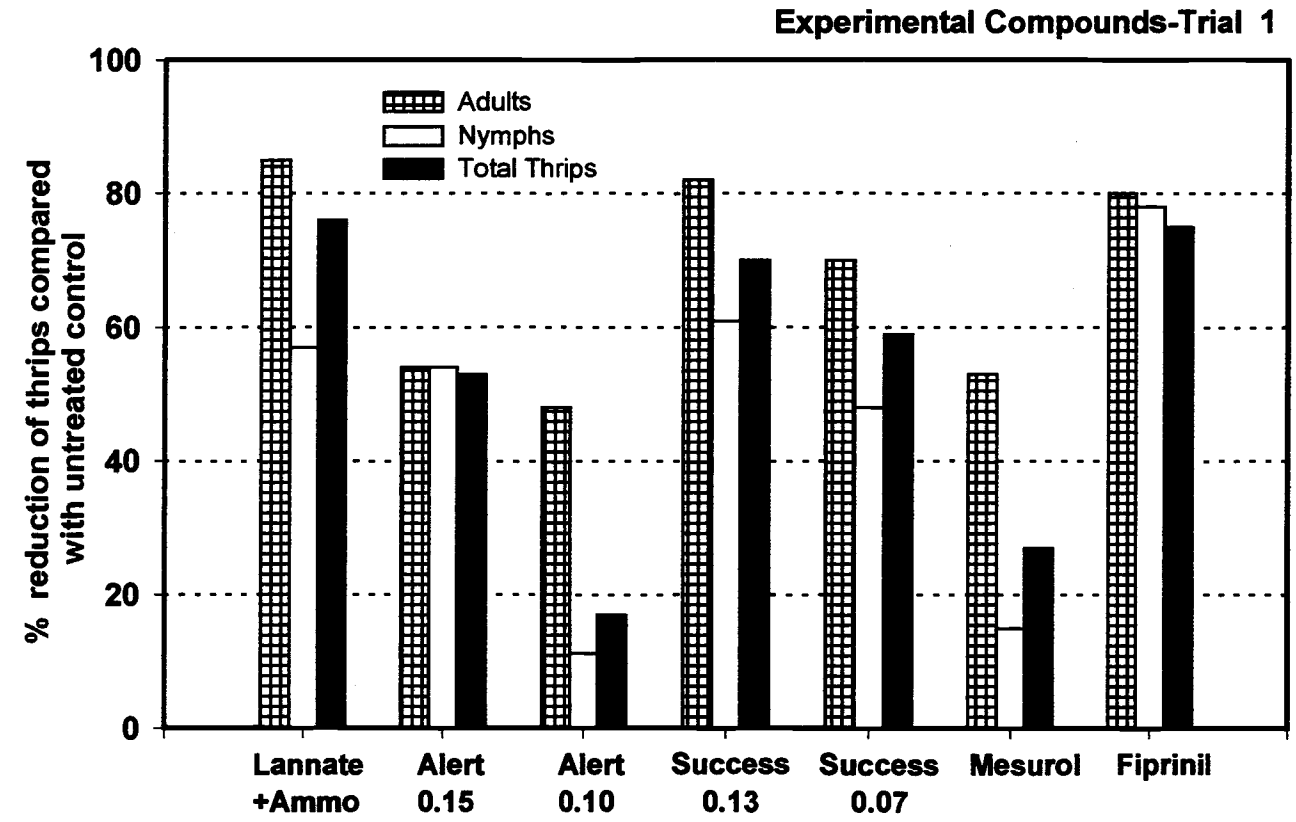


Figure 2. Mean adult, nymph and total thrips per plant following applications of experimental compounds on lettuce (arrows indicate date of applition).



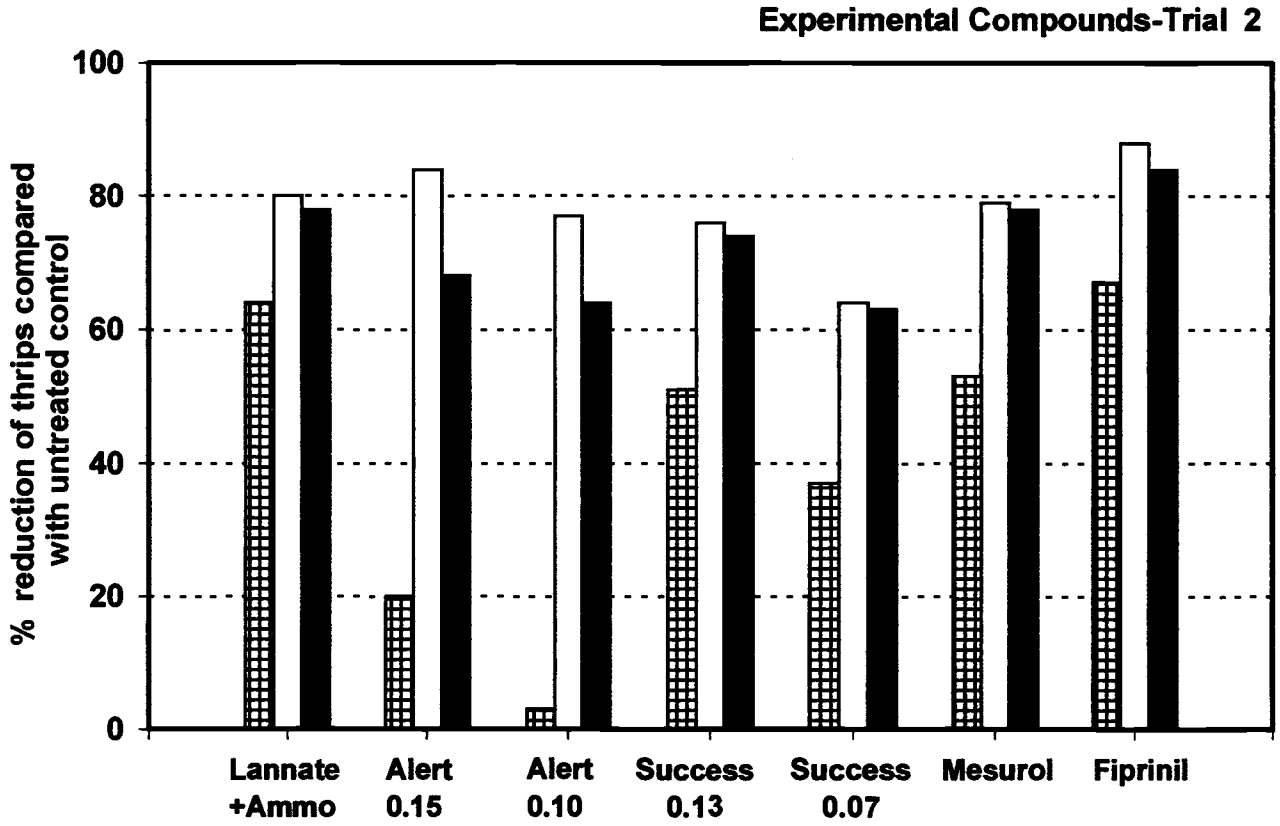
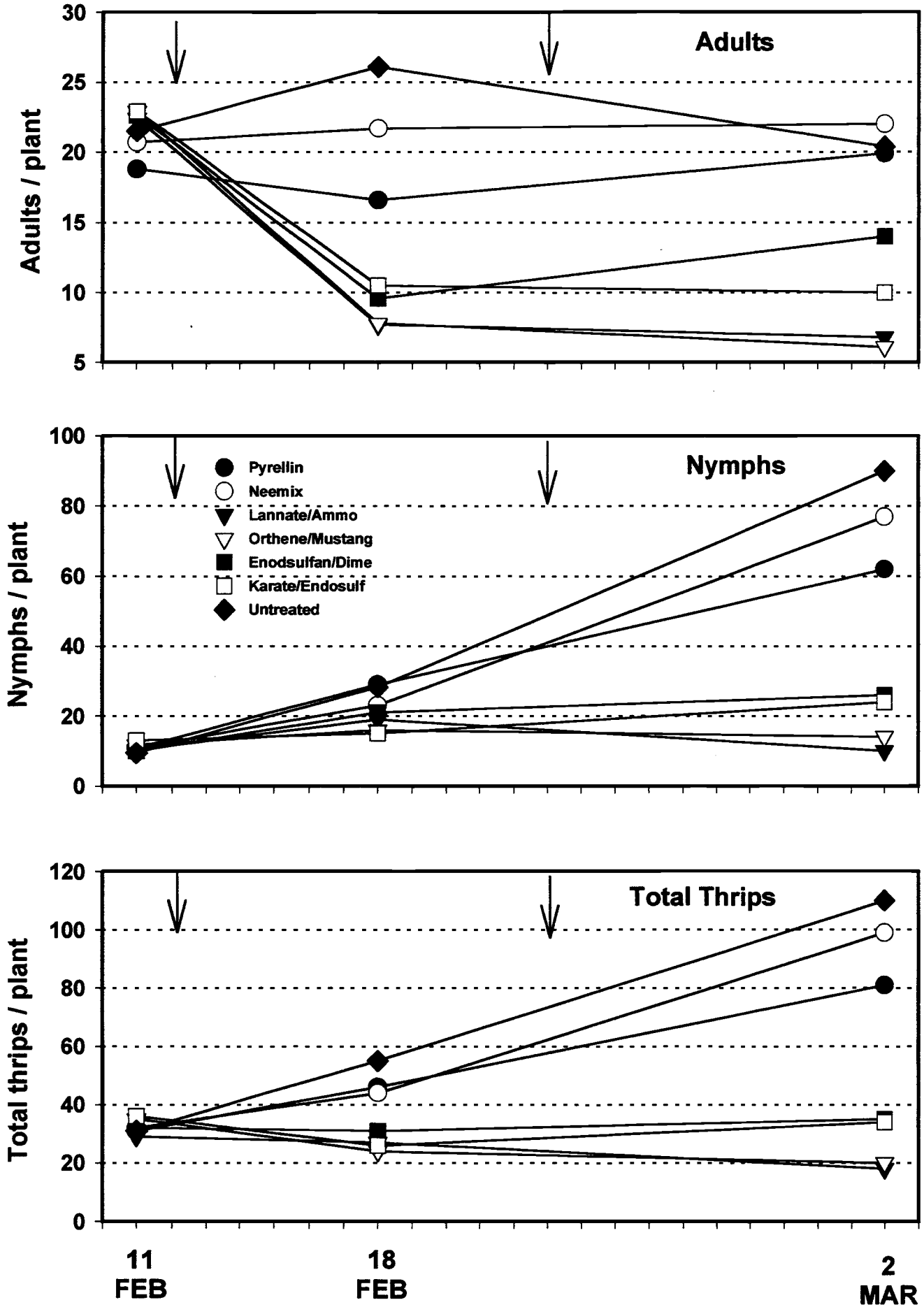


Figure 3. Percent reduction of adult, nymph and total thrips following 2 applications of experimental insecticides in lettuce, YAC, spring 1997.


Adults
Adults / plant
30
25
20
15
10
5
Nymphs
Nymphs / plant
100
80
60
40
20
0
Pyrellin
Neemix
Lannate/Ammo
Orthene/Mustang
Enodsulfan/Dime
Karate/Endosulf
Untreated
Total Thrips
Total thrips / plant
120
100
80
60
40
20
0
11
FEB
18
FEB
2
MAR

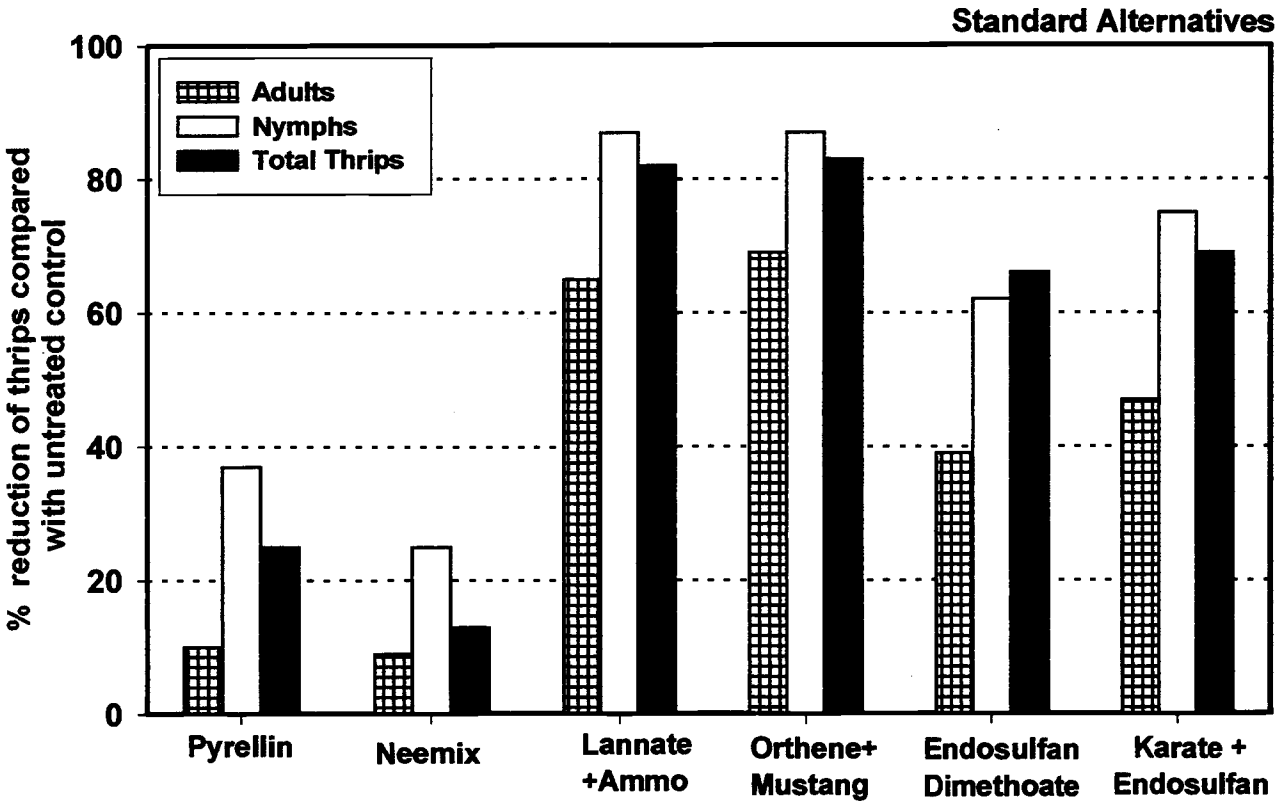


Figure 5. Percent reduction of adult, nymph and total thrips following 2 applications of standard insecticides in lettuce, YAC, spring 1997.