

Silverleaf whitefly – insecticide control trials

Report

Cotton Research and Development Corporation

Project No. CRDC 20C

Trials carried out by:

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Summary

Nine insecticide trials were carried out for control of silverleaf whitefly. The evaluation of control performance was greatly hampered by the considerable variation in whitefly numbers.

The insecticides acetamiprid, imidacloprid, pymetrozine and trizapentadiene and the mineral oils, DC Tron and Synertrrol gave evidence of good control. Bifenthrin showed variable efficacy.

Some rotation strategies (particularly beta-cyfluthrin followed by imidacloprid and bifenthrin followed by imidacloprid and imidacloprid + Synertrrol followed by beta-cyfluthrin + Synertrrol and bifenthrin + Synertrrol followed by imidacloprid + Synertrrol) were effective.

Introduction

A series of chemical trials have been completed in evaluating pesticides in controlling the silverleaf whitefly. This report is a record of the results from these trials and comments on the findings are discussed.

This first group of trials (trials 1 to 4) was designed to evaluate a number of chemicals that were already in use in agriculture practices. The aim was to screen as many compounds as could be handled in the shortest time in the hope of finding products that offered some control of the silverleaf whitefly and from these trials those chemicals exhibiting control would be further evaluated in more detail.

Trials 1 and 2.

Chemicals evaluated in these trials were;

- | | | |
|-----|-----------------|---------------|
| (a) | Nil treatment | |
| (b) | Synertrrol | Vegetable oil |
| (c) | Chlorfenapyr | Secure |
| (d) | Endosulfan | Thiodan |
| (e) | Mevinphos | Phosdrin |
| (f) | Acephate | Orthene |
| (g) | Imidachloprid | Confidor |
| (h) | Buprofezin | Applaud |
| (i) | Beta-cyfluthrin | Bulldock |
| (j) | Pirimicarb | Pirimor |
| (k) | Bifenthrin | Talstar |
| (l) | Thiodicarb | Larvin |

The first two trials (each 12 treatments x 3 randomised blocks) were set up in February 1997 on rockmelon crops. After the initial pre-treatment count and chemical application this trial was inundated with heavy rain. This had a major affect on the silverleaf whitefly population and no significant results were obtained. It is of interest that the adult whitefly population decreased to a level where they were undetectable following this heavy rain period.

The following series of trials were undertaken on "Okra", a plant of the Malvaceae family. This plant has a large leaf and the fruit are used as a vegetable. The plant is grown as a row crop and individual plants can grow to a height of over 2 metres. High populations of whitefly were recorded on this crop and it was considered a good crop to undertake the experiments on.

Trial 3 and 4.

Chemicals evaluated in these trials were:

- | | | |
|-----|-----------------|---------------|
| (a) | Nil spray | |
| (b) | Synertrol | Vegetable oil |
| (c) | Chlorfenapyr | Secure |
| (d) | Endosulfan | Thiodan |
| (e) | Mevinphos | Phosdrin |
| (f) | Acephate | Orthene |
| (g) | Imidachloprid | Confidor |
| (h) | Buprofezin | Applaud |
| (i) | Beta-cyfluthrin | Bulldock |
| (j) | Pirimicarb | Pirimor |
| (k) | Bifenthrin | Talstar |
| (l) | Methamidophos | Nitofol |

Trial 5.

This trial was designed to evaluate the rotation of different pesticides. This rotation of pesticides was considered to be necessary in developing a control strategy based on pesticides and at the same time helping to delaying the possible build up of silverleaf whitefly resistance to these products. The chemicals were applied a week apart.

Chemicals evaluated in this trial were;

- | | | | |
|-----|-----------------|---|-----------------------------|
| (a) | Chlorfenapyr | followed by
Esfenvalerate (Hallmark) | followed by
Imidacloprid |
| (b) | Imidacloprid | Beta-cyfluthrin | Buprofezin |
| (c) | Buprofezin | Bifenthrin | Imidacloprid |
| (d) | Beta-cyfluthrin | Imidacloprid | Bifenthrin |
| (e) | Nil spray | Nil spray | Nil spray |
| (f) | Methamidophos | Bifenthrin | Buprofezin |
| (g) | Bifenthrin | Imidacloprid | Beta-cyfluthrin |

Trial 6.

This trial also looked at the rotation of pesticides with the inclusion of oils. It had been suggested that some of the light oils could have some advantage in controlling this pest. The chemicals were applied a week apart.

Chemicals evaluated in this trial were;

- | | | |
|-----|----------------------------|-----------------------------------|
| | | followed by |
| (a) | Methomyl (Lannate) | Bifenthrin |
| (b) | Deltamethrin (Decis-forte) | Imidacloprid |
| (c) | Imidacloprid + Synerrol | Beta-cyfluthrin + Synerrol |
| (d) | Nil spray | Nil spray |
| (e) | Bifenthrin | Chlorpyrifos (Lorsban) + Synerrol |
| (f) | Bifenthrin + Synerrol | Imidacloprid + Synerrol |
| (g) | Buprofezin | Beta-cyfluthrin |
| (h) | Buprofezin + Synerrol | Beta-cyfluthrin + Synerrol |

Trial 7.

This trial was to evaluate a number of newer products known to exhibit some control on this pest based on data from overseas studies.

Chemicals evaluated in this trial were;

- (a) Trizapentadiene (Ovasyn)
- (b) Acetamiprid
- (c) Fenoxycarb (Insigar)
- (d) Pymetrozine (Chess)
- (e) Mineral oil (DC Tron)
- (f) Imidacloprid (Confidor)
- (g) Nil spray

Trial 8.

This trial was designed to re-evaluate the chemicals in trial 7.

Chemicals evaluated in this trial were;

- (a) Trizapentadiene
- (b) Acetamiprid
- (c) Fenoxycarb
- (d) Pymetrozine
- (e) DC Tron
- (f) Imidacloprid
- (g) Nil spray

Trial 9.

This trial was designed to re-evaluate some of the pesticides trialed earlier and where the sampling technique was questionable in the early trials.

Chemicals evaluated in this trial were;

- (a) Mevinphos
- (b) Acephate
- (c) Buprofezin
- (d) Endosulfan
- (e) Bifenthrin
- (f) Methomyl
- (g) Nil spray

RESULTS.

In evaluating the effectiveness of the chemicals, counts of silverleaf whitefly populations were made on the immature forms excluding the egg stage. Though the egg stage was counted it has not been used in the evaluations of these chemicals in this report.

Sampling was based on selecting a number of leaves from each plot and counting the number of insects on the underside of those leaves. As the populations could reach very high numbers a counting technique was employed where a number of 1 cm² areas, randomly selected, were counted on each leaf to determine silverleaf whitefly populations. All counts were undertaken in the laboratory under a microscope.

Analyses on the counts were performed using the average number of silverleaf whitefly per leaf as the unit of measurement. To help show the changes in population structure over time due to insect growth and also the effect of chemical treatments on these populations, figures are also shown.

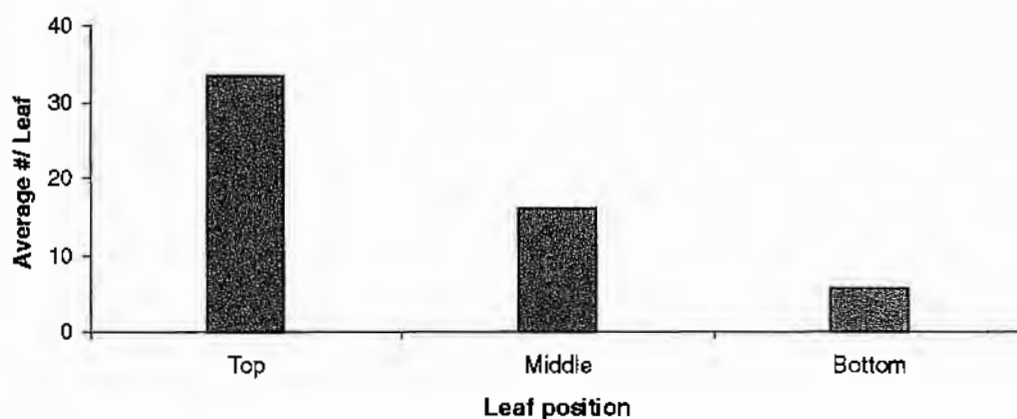
Trials 1 and 2.

As mentioned previously, this trial was undated with water following cyclonic weather and no results were possible.

Trials 3 and 4.

Counts of silverleaf whitefly in these trials were based on randomly selecting from each of the top and bottom of plants three leaves per plot and counting 6x1cm² sites per leaf. As this was the first major attempt at sampling immature silverleaf whitefly populations on Okra it was unforeseen that the position and age of the leaf would be critical as to the populations that would be encountered on that leaf. A later study showed the effect of leaf position on whitefly population (Fig. 1).

Figure 1: The numbers of nymphs and pupae of the silverleaf whitefly from different leaf positions (top, middle and bottom) on unsprayed Okra plants.



By randomly selecting leaves on the sampling dates the counts of silverleaf whiteflies varied considerably on each leaf within each treatment and this may have distorted the results.

Table 1. Average number per leaf of immature silverleaf whitefly recorded in trials 3 and 4.

Treat	2 day post-count				7 day post-count				14 day post	
	Trial 3		Trial 4		Trial 3		Trial 4		Tr. 3	Tr. 4
	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Top
A	38.2	9.3	34.0	21.7	11.4	5.7	28.7	1.7	11.0	46.7
B	15.2	11.4	24.3	7.3	5.7	3.8	12.3	8.7	5.6	28.6
C	8.8	9.1	29.3	15.3	17.2	7.7	1.33	13.0	3.2	10.7
D	21.1	6.6	148.3	37.0	5.6	8.9	264.7	9.3	12.3	70.0
E	11.1	7.0	18.0	30.0	7.6	3.6	18.0	7.0	13.3	16.3
F	14.4	11.4	4.0	13.3	8.8	7.4	49.3	8.0	8.7	9.3
G	5.2	7.8	54.3	10.3	4.3	4.8	12.3	8.7	6.6	8.0
H	19.4	7.8	20.7	12.0	9.6	6.8	41.0	12.0	9.3	13.3
I	6.1	10.0	12.0	27.0	8.2	7.1	11.7	14.3	14.8	4.3
J	21.3	16.1	28.3	27.0	7.3	4.9	16.0	7.3	8.1	13.0
K	23.7	11.2	112.7	38.3	7.4	7.9	21.7	12.3	2.2	14.7
L	24.1	8.2	34.0	12.0	10.1	12.1	22.0	14.0	7.7	18.3

There were no significant differences between the treatments.

In figures 2, 3 and 4 the number of eggs and each instar are shown for the post treatment (2, 7 and 14 days) counts in trial 3 on the top leaves. Figures 5 and 6 show these counts for the 2 and 7 day post treatment counts on the bottom leaves.

Figure 2: The average number of eggs and instars recorded for each treatment at the 2 day post count, top of plant leaves.

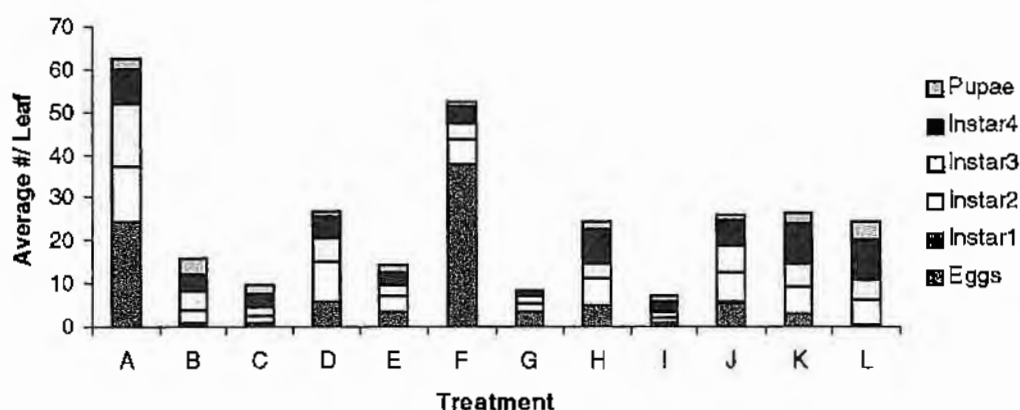


Figure 3: The average number of eggs and instars recorded for each treatment at the 7 day post count, top of plant leaves.

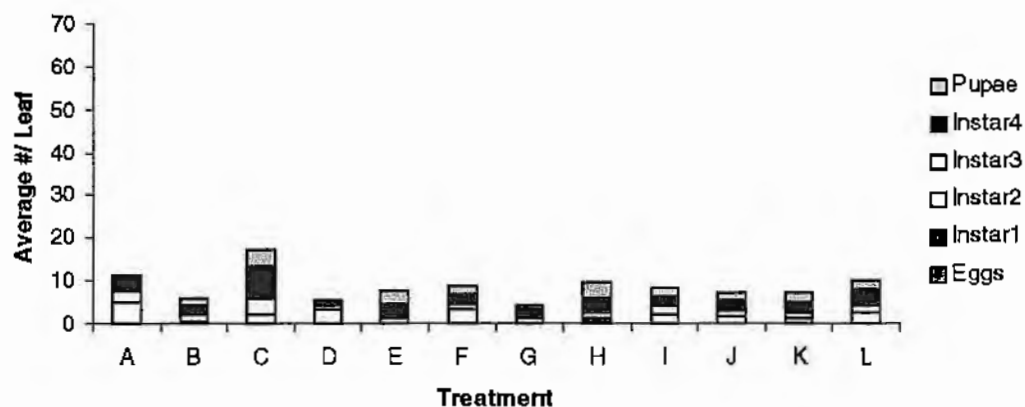


Figure 4: The average number of eggs and instars recorded for each treatment at the 14 day post count, top of plant leaves.

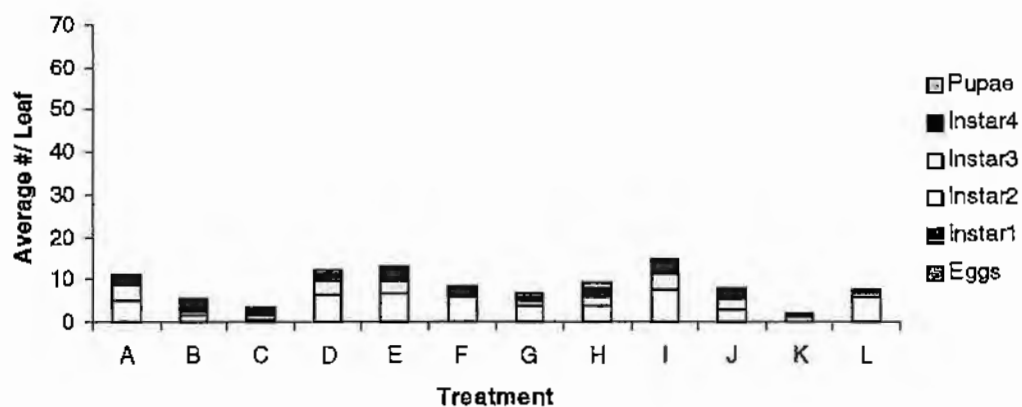


Figure 5: The average number of eggs and instars recorded for each treatment at the 2 day post count, bottom leaves of plant.

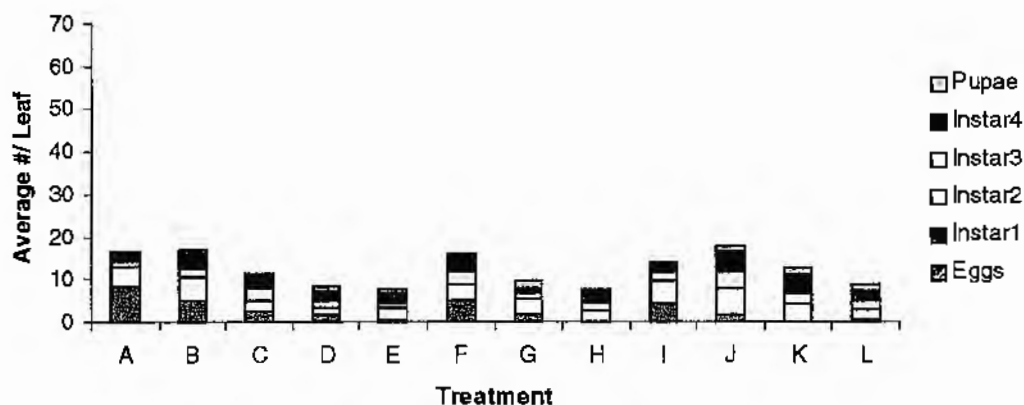
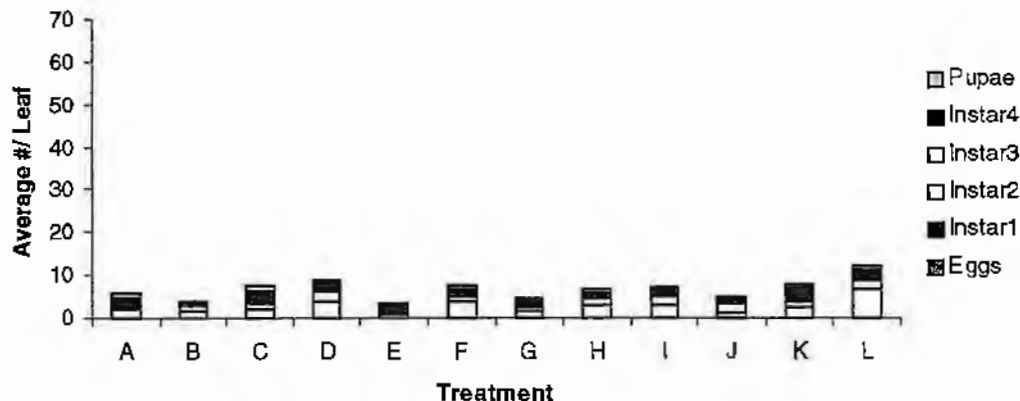


Figure 6: The average number of eggs and instars recorded for each treatment at the 7 day post count, bottom leaves of plant.



Trial 5.

This trial site was on a young Okra crop approximately 40cm tall. This allowed sampling of leaves for insect counts to be taken from leaves of similar age (where populations would be more uniform) and where good spray coverage was assured.

Counts of silverleaf whitefly were based on randomly selecting five leaves per plot from near the tops of plants and counting the numbers within 10x1cm² sites per leaf. The trial was 7 treatments X 3 randomised blocks (CRB).

Table 2. Average number per leaf of immature silverleaf whitefly instars recorded at the pre-treatment count.

Treat.	Eggs	1 st .instar	2 nd	3 rd .	4 th .	Pupa	Total
A	2.9	21.1	12.9	13.0	9.5	9.1	66
B	1.6	30.7	22.4	16.3	12.5	7.1	89
C	2.5	13.8	13.9	12.1	12.9	8.5	61
D	1.7	48.3	18.5	10.3	8.9	4.3	90
E	3.4	32.1	20.7	17.6	12.7	13.5	97
F	3.5	43.8	28.7	25.5	15.3	15.9	129
G	0.2	5.6	9.7	21.3	22.5	21.0	80

There were no significant differences between the treatments.

Figure 7: The average number of eggs and instars recorded for each treatment in pre-treatment counts.

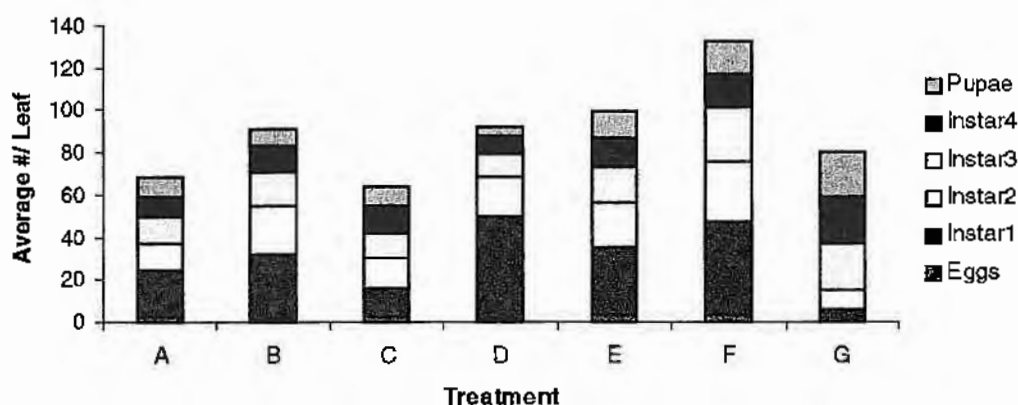


Table 3. Average number per leaf of immature silverleaf whitefly instars recorded at the 7 day post-treatment count.

Treat.	Eggs	1 st .instar	2 nd	3 rd .	4 th .	Pupa	Total
A	5.3	11.5	11.3	7.8	7.5	7.8	45.9
B	1.6	9.0	10.9	5.9	6.8	8.6	41.2
C	4.3	16.3	10.7	7.8	7.1	11.0	52.9
D	0.5	5.8	6.9	5.7	6.7	7.7	32.8
E	5.2	16.1	16.2	12.3	9.2	11.3	65.1
F	1.4	5.3	5.6	6.2	8.7	22.8	48.6
G	0.1	2.3	2.9	3.1	5.9	33.1	47.3

There were no significant differences between the treatments.

Figure 8: The average number of eggs and instars recorded for each treatment at the 7 day post count.

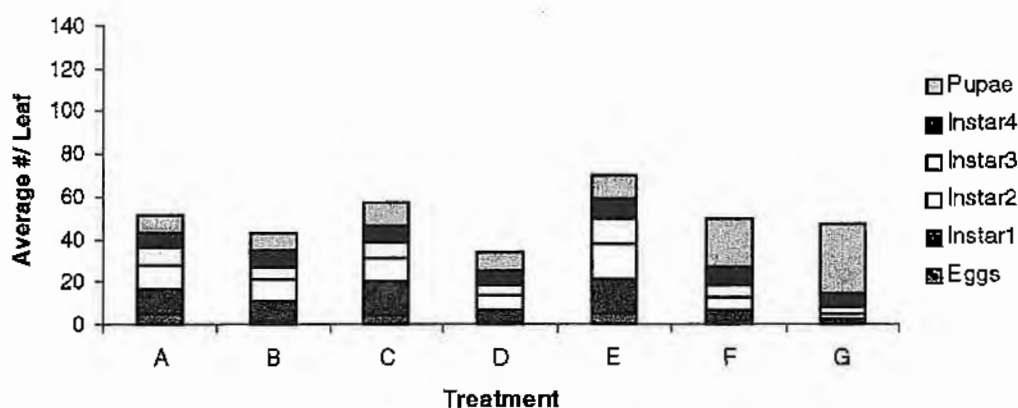


Table 4. Average number per leaf of immature silverleaf whitefly instars recorded at the 14 day post-treatment count.

Treat.	Eggs	1 st .instar	2 nd	3 rd .	4 th .	Pupa	Total
A	0.5	4.3	2.9	1.1 ^a	5.6 ^{ab}	7.3 ^a	21.2 ^{ab}
B	1.0	1.6	1.9	1.5 ^a	3.2 ^{ab}	7.1 ^a	15.2 ^{ab}
C	0.7	7.1	2.7	2.1 ^a	5.3 ^{ab}	5.7 ^a	22.8 ^{ab}
D	0.1	0.3	0.9	1.3 ^a	2.4 ^{ab}	3.9 ^a	8.8 ^a
E	3.8	23.1	10.0	6.8 ^b	17.6 ^c	12.5 ^b	70.1 ^c
F	2.0	4.3	3.9	2.0 ^a	11.4 ^{bc}	12.3 ^b	33.9 ^b
G	0.2	0.3	0.4	0.3 ^a	1.9 ^a	4.8 ^a	7.7 ^a

Numbers followed by the same letter are not significantly different. $P = <0.05$

The Nil sprayed treatment had significant more 3rd. instar forms than all of the other treatments.

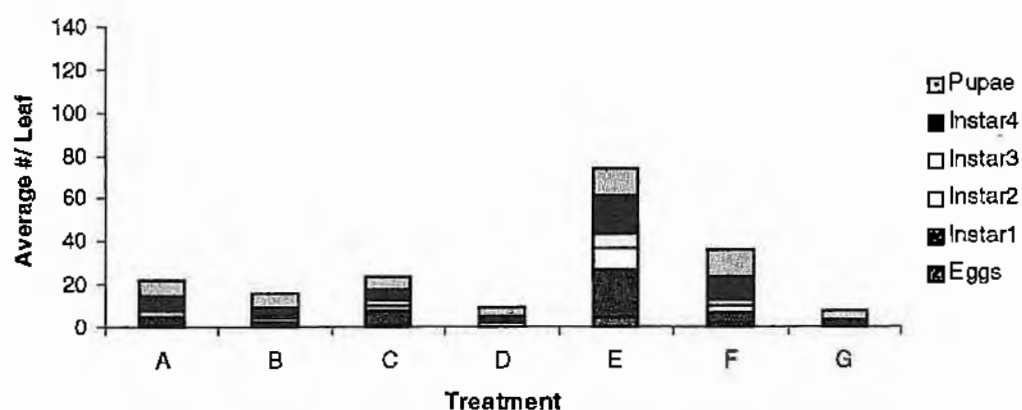
With the 4th. instar form the Nil spray treatment had a significantly higher population than all of the other treatments except the Methamidophos followed by Bifenthrin treatment and this latter treatment had a significantly higher population than the Bifenthrin followed by Imidacloprid treatment.

With the pupal stage the Nil spray treatment and the Methamidophos followed by Bifenthrin treatment had a significantly higher population than the other treatments.

Overall, when the total population is analysed it shows that the Nil spray treatment had a significantly higher population than all of the other treatments. At the same time Bifenthrin followed by Imidacloprid also reduced the population significantly more than Methamidophos followed by Bifenthrin treatment.

This trial was sprayed for the third time as outlined in the trial data but the sampling and subsequent counts were not taken.

Figure 9: The average number of eggs and instars recorded for each treatment at the 14 day post count.



Trial 6.

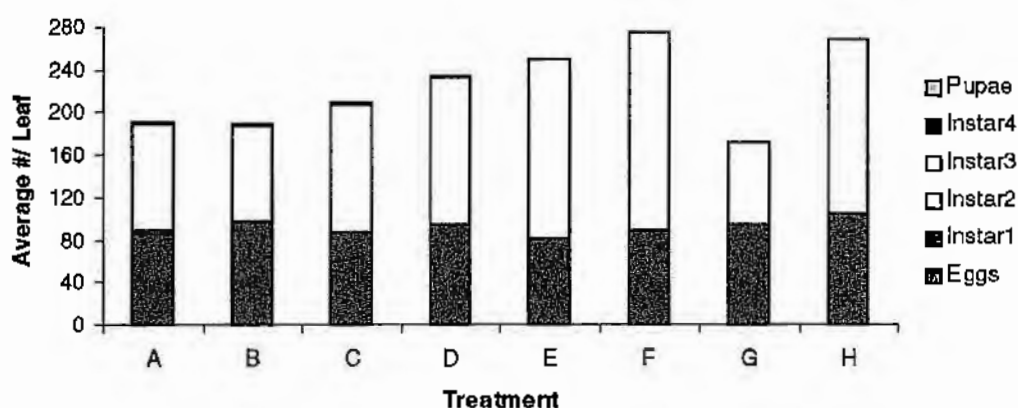
Counts of whitefly were based on the same method as trial 5 and the crop age was at a similar stage.

Table 5. Average number per leaf of immature silverleaf whitefly instars recorded at the pre-treatment count.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	86.3	3.3	100.0	0.5	0	0	104.0
B	97.2	0.1	90.0	1.1	0.3	0	92.0
C	88.4	0	120.0	0.5	0.5	0	120.0
D	93.9	0	139.0	0	1.5	0.5	141.0
E	80.9	0	169.0	0	0	0	169.0
F	89.7	0	186.0	0	0	0	186.0
G	94.9	0	78.0	0	0	0	78.0
H	105.2	0	163.0	0.6	0	0	163.0

There were no significant differences between the treatments.

Figure 10: The average number of eggs and instars recorded for each treatment in pre-treatment counts, top of plant leaves.



In counting this sample the separation of the instars was probably incorrect in labelling them 2nd. whereas they were probably 1st.

Table 6. Average number per leaf of immature silverleaf whitefly instars recorded at the 7 day post-treatment count.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	49.6	111.3	7.5 ^a	16.6	0.1	0	135.0
B	42.2	88.3	0.8 ^a	18.8	0	0	108.0
C	87.6	58.5	0 ^a	0.1	0	0	59.0
D	46.2	105.8	63.3 ^b	19.9	0.5	0	190.0
E	38.9	40.7	0.1 ^a	1.1	0	0	42.0
F	21.3	65.5	28.9 ^{ab}	16.5	1.3	0	112.0
G	62.4	120.4	0 ^a	8.1	0	0	129.0
H	48.8	105.2	0 ^a	0.3	0	0	106.0

Numbers followed by the same letter are not significantly different. $P = <0.05$

After the first pesticide application the second instar stage of this insect had a significantly higher population in the Nil sprayed treatment than all the other treatments except the Bifenthrin + Synertrrol treatment.

Figure 11: The average number of eggs and instars recorded for each treatment at the 7 day post count, top of plant leaves.

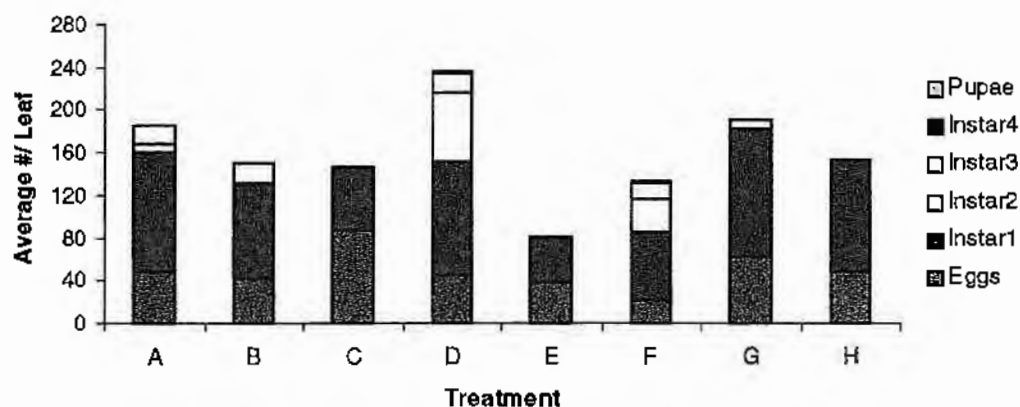


Table 7. Average number per leaf of immature silverleaf whitefly instars recorded at the 14 day post-treatment count.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	2.3 ^a	14.4 ^{ab}	6.9	2.0	1.7	0.2	25.2
B	3.1 ^a	8.3 ^a	1.8	0.1	0	0	10.2
C	1.2 ^a	3.5 ^a	0.9	0.9	0	0	5.3
D	6.5 ^b	27.3 ^b	13.4	3.3	1.2	0.3	45.5
E	2.3 ^a	12.3 ^a	4.9	0.5	0.3	0.5	18.5
F	1.6 ^a	0.9 ^a	0.1	0	0	0	0.9
G	1.4 ^a	9.5 ^a	7.2	2.2	1.4	0.1	20.4
H	1.4 ^a	4.7 ^a	1.0	0.3	0.1	0.1	6.2

Numbers followed by the same letter are not significantly different. $P = <0.05$

After the second application of pesticides there were differences between the treatments in the numbers of eggs and 1st. instar nymphs. The Nil spray treatment had significantly more eggs than the other treatments and again with the 1st. instar nymphs except it was not significantly different that the Methomyl followed by Bifenthrin treatment.

Figure 12: The average number of eggs and instars recorded for each treatment at the 14 day post count, top of plant leaves.

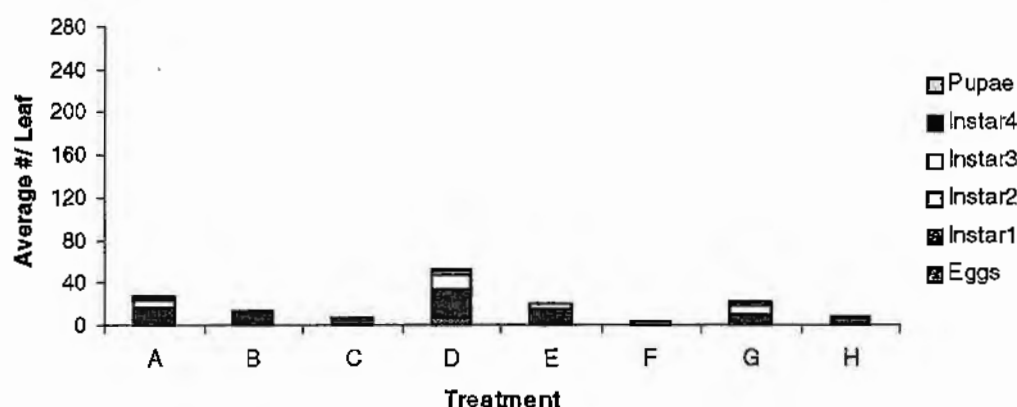


Table 8. Average number per leaf of immature silverleaf whitefly instars recorded at the 21 day post-treatment count on top leaves.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	101.0	43.6 ^{bc}	0.4	2.6 ^b	0	0	46.6 ^{bc}
B	125.0	19.9 ^{ab}	0	0 ^a	0	0	19.9 ^{ab}
C	44.0	5.6 ^a	0	0 ^a	0	0	5.6 ^a
D	128.0	71.0 ^c	0.1	5.7 ^c	0	0	76.8 ^c
E	144.0	18.2 ^{ab}	0.2	1.2 ^{ab}	0	0	19.7 ^{ab}
F	33.0	6.8 ^a	0	0.1 ^a	0	0	6.9 ^a
G	118.0	11.9 ^{ab}	0	1.0 ^{ab}	0.2	0	13.1 ^a
H	110.0	13.3 ^{ab}	0	0.1 ^a	0	0	13.4 ^{ab}

$P < 0.01$

Numbers followed by the same letter are not significantly different. $P = < 0.05$ unless other shown.

Two weeks following the second application there were significantly more 1st. instar nymphs in the Nil spray treatment compared to all the other treatments except the Methomyl followed by Bifenthrin treatment. This latter treatment had significantly more 1st. instar nymphs than the Imidacloprid + Synertril followed by Beta-cyfluthrin + Synertril treatment and the Bifenthrin + Synertril followed by Imidacloprid + Synertril treatments.

With the 3rd. instar nymphs the Nil spray treatment had significantly more nymphs than all the other treatments. Methomyl followed Bifenthrin had significantly more nymphs than the following treatments;

Imidacloprid + Synertril followed by Beta-cyfluthrin + Synertril,
Deltamethrin followed by Imidacloprid,
Bifenthrin + Synertril followed by Imidacloprid + Synertril and
Buprofezin + Synertril followed by Beta-cyfluthrin + Synertril.

With the total insect count the Nil spray treatment had significantly more insects than all the other treatments except the Methomyl followed by Bifenthrin treatment. This latter treatment had significantly more nymphs than the following treatments; Imidacloprid + Synertrrol followed by Beta-cyfluthrin + Synertrrol, Bifenthrin + Synertrrol followed by Imidacloprid + Synertrrol and Buprofezin followed by Beta-cyfluthrin.

Figure 13: The average number of eggs and instars recorded for each treatment at the 21 day post count, top of plant leaves.

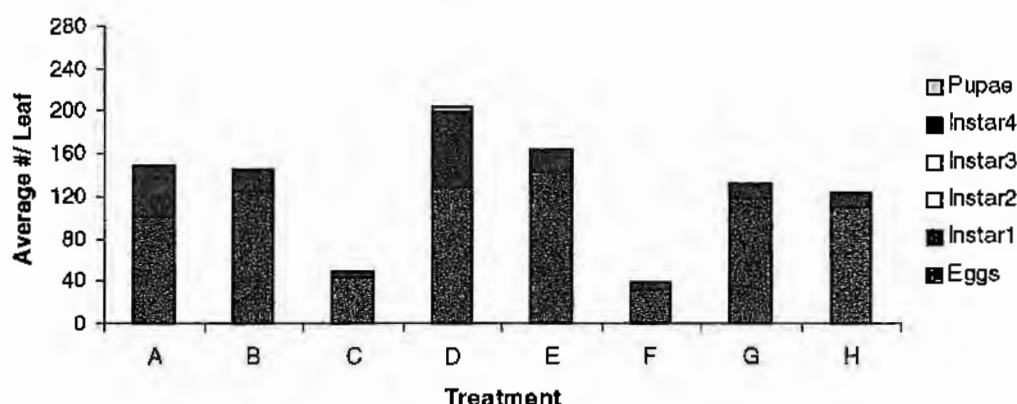


Table 9. Average number per leaf of immature silverleaf whitefly instars recorded at the 21 day post-treatment count on bottom leaves.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	22.8	28.3	7.4	2.9 ^{ab}	1.0 ^a	13.2	52.9 ^{bc}
B	6.6	6.3	0.6	0.6 ^{ab}	0.4 ^a	0.8	8.7 ^{ab}
C	6.0	2.7	2.0	0.3 ^a	0.4 ^a	0.3	5.8 ^a
D	0.7	8.8	13.6	13.6 ^c	17.4 ^b	41.1	94.4 ^c
E	12.7	15.3	10.9	6.2 ^b	2.2 ^a	7.1	41.8 ^{ab}
F	1.4	0.6	0.2	0.9 ^{ab}	0.9 ^a	0.7	3.2 ^a
G	5.8	25.0	12.0	0.7 ^{ab}	0.9 ^a	0.2	38.8 ^{ab}
H	3.7	5.3	1.1	0.9 ^{ab}	0.7 ^a	2.9	10.9 ^{ab}

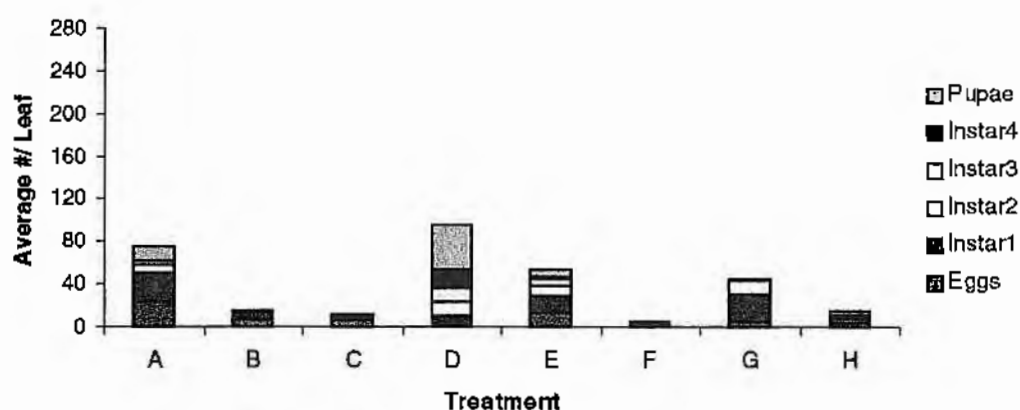
Numbers followed by the same letter are not significantly different. $P = <0.05$

Two weeks following the second application there were significantly more 3rd. instar nymphs in the Nil sprayed treatment compared to all the other treatments and Bifenthrin followed by Chlorpyrifos + Synertrrol treatment had significantly more nymphs than the Imidacloprid + Synertrrol followed by Beta-cyfluthrin + Synertrrol treatment.

With the 4th. instar nymphs the Nil sprayed treatment had significantly more nymphs than all of the other treatments.

In the total counts the Nil sprayed treatment had significantly more nymphs than all of the other treatments except the Methomyl followed by Bifenthrin treatment. This latter treatment had significantly more nymphs than the following treatments; Bifenthrin + Synerrol followed by Imidacloprid + Synerrol and Imidacloprid + Synerrol followed by Beta-cyfluthrin + Synerrol.

Figure 14: The average number of eggs and instars recorded for each treatment at the 21 day post count, bottom leaves of plant.



The comparisons between the top and bottom leaves, 21 days after the last spraying showed that there were no differences between the egg counts.

With the 1st. instar nymphs the Nil sprayed treatment had significantly more nymphs on the top leaves compared to all of the other treatments.

The 3rd. instar nymphs had significantly more nymphs on the bottom leaves for the following treatments;

Buprofezin followed by Beta-cyfluthrin compared to Bifenthrin followed by Chlorpyrifos + Synerrol and the Nil sprayed treatments.

The 4th. instar nymphs also had significantly more nymphs on the bottom leaves in all treatments compared to the Nil sprayed treatment.

Trial 7.

Counts of silverleaf whitefly were based on the same method as trial 5 and the crop age was at a similar stage. The trial design was 7 treatments X 3 blocks (CRB).

Table 10. Average number per leaf of immature silverleaf whitefly instars recorded at the pre-treatment count on top leaves.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	348.0	104.0	21.0	1.1	0	0	126.0
B	168.0	129.0	65.6	10.2	1.5	0	206.0
C	211.0	124.0	74.5	9.6	0.3	0	209.0
D	409.0	189.0	29.4	0.7	0	0	219.0
E	324.0	78.0	19.9	0.9	0	0	99.0
F	246.0	121.0	43.2	1.5	0	0	165.0
G	256.0	141.0	64.7	6.6	1.4	0	214.0

There were no significant differences between the treatments.

Figure 15: The average number of eggs and instars recorded for each treatment in pre-treatment counts.

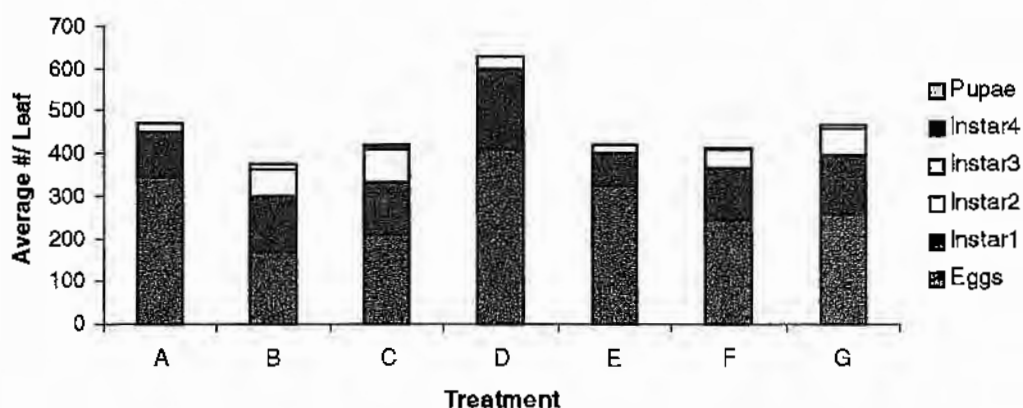


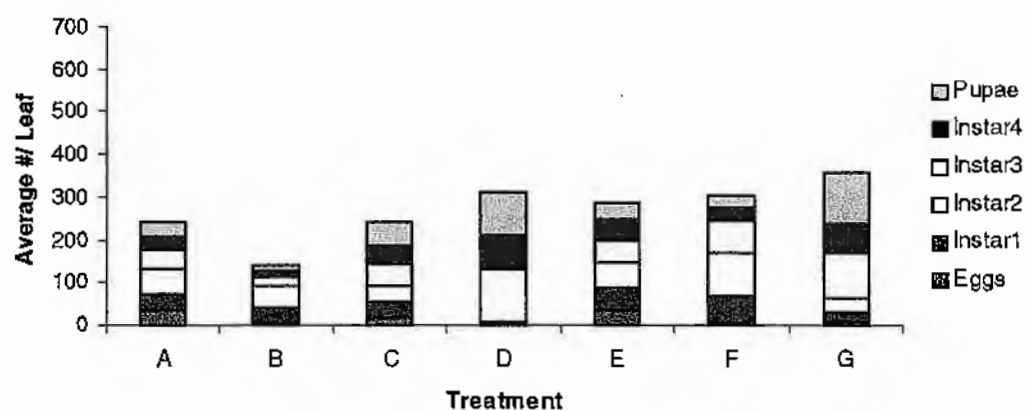
Table 11. Average number per leaf of immature silverleaf whitefly instars recorded at the 7 day post-treatment count on top leaves.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	33.2	37.0	62.0	44.3 ^{ab}	30.7	33.0	207.0
B	5.6	37.9	49.0	20.9 ^a	12.2	14.0	134.0
C	17.6	39.2	37.0	48.7 ^{ab}	41.0	58.0	224.0
D	2.7	2.7	2.0	123.2 ^c	82.2	98.0	308.0
E	33.1	57.5	56.0	52.1 ^{ab}	48.6	39.0	254.0
F	4.1	63.8	100.0	76.7 ^{abc}	30.6	30.0	301.0
G	8.1	19.3	35.0	104.9 ^{bc}	69.6	120.0	350.0

Numbers followed by the same letter are not significantly different. $P = <0.05$

The 3rd. instar nymph population was significantly higher in the Pymetrozine than Acetamiprid, Triazpentiadiene, Fenoxycarb and DC Tron treatments. Also the Nil spray treatment had significantly more nymphs than the Acetamiprid treatment.

Figure 16: The average number of eggs and instars recorded for each treatment at the 7 day post count.



Trial 8.

Counts of silverleaf whitefly were based on the same method as trial 5 and the crop age was at a similar stage. The trial design was 7 treatments X 3 blocks (CRB).

Table 12. Average number per leaf of immature silverleaf whitefly instars recorded at the pre-treatment count on top leaves.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	6.8	187.0	87.9	15.3	1.7	0.7	293.0
B	2.7	154.0	50.5	7.4	0.1	0.1	212.0
C	5.1	219.0	57.3	6.1	0.2	0	283.0
D	2.0	191.0	90.6	15.9	0.7	0.1	298.0
E	9.9	115.0	52.3	10.0	0.2	0	178.0
F	0.4	90.0	87.5	23.9	1.5	0.1	203.0
G	1.6	139.0	91.9	22.8	2.6	0.5	257.0

There were no significant differences between the treatments.

Figure 17: The average number of eggs and instars recorded for each treatment in pre-treatment counts.

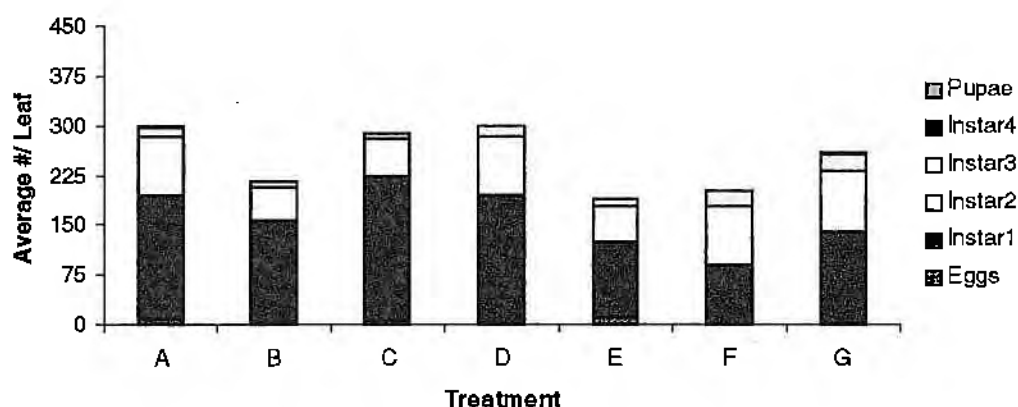


Table 13. Average number per leaf of immature silverleaf whitefly instars recorded at the 4 day post-treatment count on top leaves.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	0.5	53.0	31.3 ^a	3.4	0.6	0.1	89.0 ^a
B	0.7	62.0	31.5 ^a	7.5	0.9	0.4	102.0 ^a
C	0	135.0	96.1 ^{bc}	21.7	3.7	0.1	256.0 ^{ab}
D	0.9	63.0	57.5 ^{ab}	13.0	5.3	0.3	139.0 ^a
E	0	79.0	49.5 ^{ab}	12.3	2.9	0.1	144.0 ^a
F	18.9	121.0	79.9 ^{abc}	18.9	3.3	0.3	223.0 ^{ab}
G	3.9	258.0	133.8 ^c	23.1	4.7	0.1	419.0 ^b

Numbers followed by the same letter are not significantly different. $P = <0.05$

With the 2nd. instar nymphs the Nil sprayed treatment had significantly more nymphs than the Trizapentadiene, Acetamiprid, DC Tron and Pymetrozine treatments. Fenoxycarb also had significantly more nymphs than Trizapentadine and Acetamiprid treatments.

At the total count the Nil sprayed treatment had significantly more nymphs than Trizapentadiene, Acetamiprid, Pymetrozine and DC Tron treatments.

Figure 18: The average number of eggs and instars recorded for each treatment at the 4 day post count.

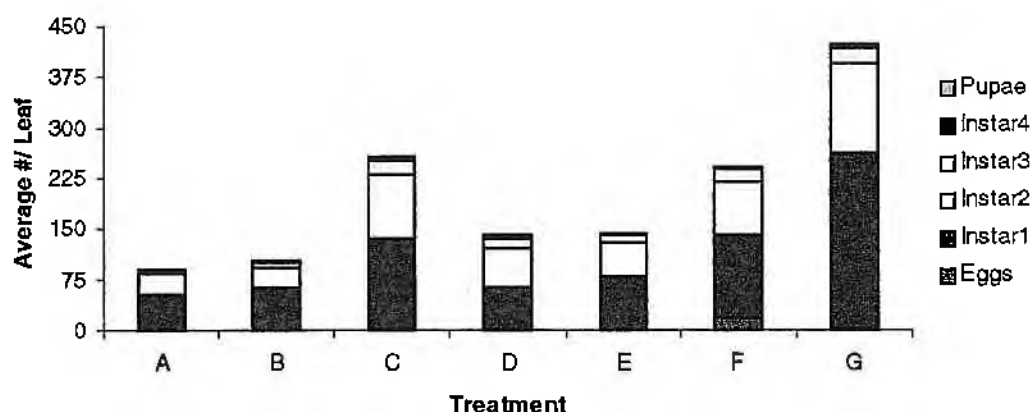


Table 14. Average number per leaf of immature silverleaf whitefly instars recorded at the 7 day post-treatment count on top leaves.

Treat.	Eggs	1 st .instar	2 nd .	3 rd .	4 th .	Pupa	Total
A	1.1	10.1 ^a	15.3 ^a	7.3 ^a	1.1 ^a	0.3	34.0 ^a
B	0.2	10.5 ^a	10.0 ^a	5.2 ^a	0.8 ^a	0.7	27.0 ^a
C	0.7	80.8 ^{bc}	87.1 ^{bc}	37.1 ^b	20.5 ^b	1.1	227.0 ^b
D	1.7	18.9 ^a	36.9 ^a	20.5 ^a	9.2 ^a	0.4	86.0 ^a
E	0.3	22.8 ^a	17.4 ^a	5.3 ^a	2.0 ^a	0	48.0 ^a
F	2.5	45.3 ^{ab}	41.9 ^{ab}	15.1 ^a	3.7 ^a	1.2	107.0 ^a
G	13.1	96.5 ^c	109.0 ^c	59.5 ^c	28.1 ^b	3.7	297.0 ^b

P=<0.05 P=<0.05

Numbers followed by the same letter are not significantly different. P = <0.01 unless show otherwise.

With the 1st. instar nymphs the Nil sprayed treatment had significantly more nymphs than all the other treatments except for the Fenoxycarb treatment. This latter treatment had a significantly higher population of nymphs than the Trizapentadiene, Acetamiprid, Pymetrozine and DC Tron treatments.

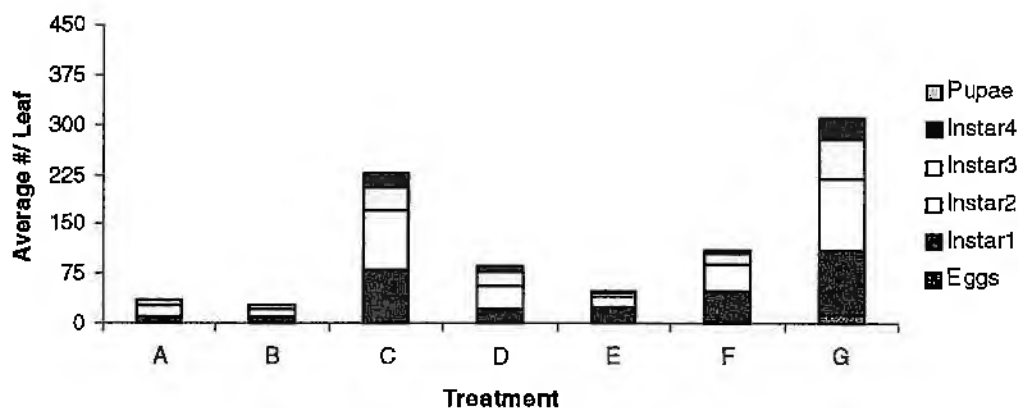
With the 2nd. instar nymphs the results were the same as for the 1st. instars.

With the 3rd. instar nymphs the Nil sprayed treatment had significantly higher populations than all the other treatments. The Fenoxycarb treatment had significantly higher populations than all the other treatments except the Nil sprayed treatment.

With the 4th. instar nymphs the Nil sprayed and Fenoxycarb treatments had significantly higher populations than all the other treatments.

With the total count of nymphs the result was the same as for the 4th. instar nymphs.

Figure 19: The average number of eggs and instars recorded for each treatment at the 7 day post count.



Trial 9.

Counts of silverleaf whitefly were based on the same method as trial 5 and the crop age was at a similar stage. The trial design was 7 treatments X 3 blocks (CRB).

Table 15. Average number per leaf of immature silverleaf whitefly instars recorded at the pre-treatment count on top leaves.

Treat.	Eggs	1 st .	2 nd .	3 rd .	4 th .	Pupa	Total
A	4.8 ^a	20.8	30.3	13.8	8.0	2.3	75.0
B	2.6 ^a	48.8	36.4	12.6	6.1	1.4	105.0
C	9.4 ^a	6.0	37.9	5.6	2.7	1.1	53.0
D	1.3 ^a	7.2	34.4	10.4	5.6	0.2	58.0
E	4.8 ^a	2.7	32.3	4.7	2.2	0.9	43.0
F	6.1 ^a	25.6	21.4	12.8	6.1	0.7	67.0
G	27.8 ^b	17.8	7.5	2.2	0.7	0	28.0

Numbers followed by the same letter are not significantly different. $P = <0.05$.

With the egg stage the Nil spray treatment had significantly more eggs than all of the other treatments.

Figure 20: The average number of eggs and instars recorded for each treatment in pre-treatment counts.

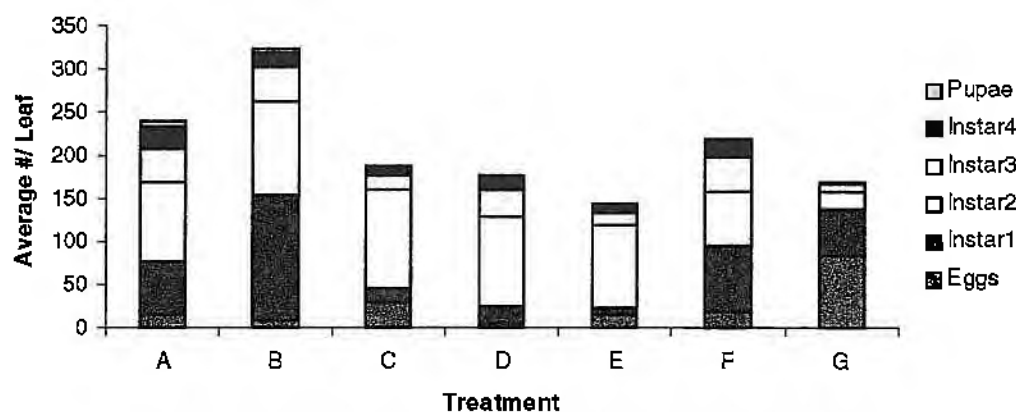


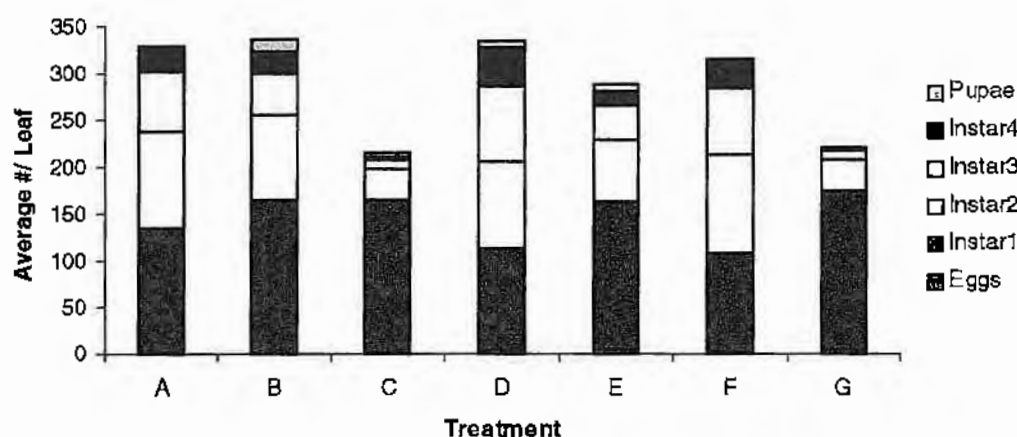
Table 16. Average number per leaf of immature silverleaf whitefly instars recorded at the 5 day post-treatment count on top leaves.

Treat.	Eggs	1 st .	2 nd .	3 rd .	4 th .	Pupa	Total
A	0.4	44.5	34.9 ^c	21.2	7.6	1.3	109.5
B	0.1	54.8	30.1 ^{bc}	14.8	7.8	4.4	112.0
C	0.3	54.5	11.0 ^a	3.5	1.1	1.3	71.4
D	1.0	36.8	30.5 ^{bc}	27.1	13.3	3.0	110.7
E	1.0	53.2	21.8 ^{ab}	12.4	5.4	2.6	95.4
F	0.7	35.5	35.0 ^c	23.9	9.8	0.4	104.5
G	1.4	57.3	10.8 ^a	3.0	1.1	0.0	72.2

Numbers followed by the same letter are not significantly different. $P = <0.05$.

With the 2nd. instar nymphs the Nil sprayed and Buprofezin treatments had significantly less nymphs than all the other treatments except the Bifenthrin treatment. The Bifenthrin treatment had significantly less nymphs than the Mevinphos and Methomyl treatments.

Figure 21: The average number of eggs and instars recorded for each treatment at the 5 day post count.



Discussion

The evaluation of control performance of chemicals in all these trials was greatly hampered by the considerable within-treatment variation in whitefly numbers. In any future work considerable attention will be given to overcoming this problem. However some assessments of efficacy can be made.

In trial 5 all the combinations gave some control with the best being beta-cyfluthrin followed by imidacloprid and bifenthrin followed by imidacloprid.

In trial 6 with the exception of methomyl followed by bifenthrin all the combinations gave some control and the best were imidacloprid + Synertril followed by beta-cyfluthrin + Synertril and bifenthrin + Synertril followed by imidacloprid + Synertril.

In trial 7 the insecticide acetamiprid gave good control and the mineral oil DC Tron showed considerable promise.

In trial 8, at 4 days post treatment a few of the insecticides were showing some control particularly acetamiprid and trizapentadiene. At 7 days all were giving good control except fenoxycarb. DC Tron performed very well in this trial.