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# Potency of insecticidal combinations against bollworm complex of cotton

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**Abstract**
Effect of newer insecticidal combinations (acetamiprid + cypermethrin, acetamiprid + quinalphos and acetamiprid + chlorpyrifos) along with their sole counterparts on cotton square, boll and locule damage due to bollworm complex, their effect on natural enemies and yield was evaluated at Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra. An experiment comprised of fourteen treatments was laid out in randomized block design with three replications. Effectiveness of insecticides was judged on the basis of damage instigated by different bollworms to cotton squares, bolls and loculi on randomly selected plants. The per cent damage was worked out at 7$^{th}$ and 14$^{th}$ days after application of insecticides. During the entire period of experimentation, the results were quite promising and the mean results revealed that combination treatments acetamiprid + quinalphos (40+2000) g, acetamiprid + chlorpyrifos (40+2000) g and acetamiprid + cypermethrin (40+200) g a.i./ha were significantly superior in reducing damage due to bollworm in squares, bolls and loculi and increasing seed cotton yield per hectare. The combination product, acetamiprid + quinalphos (40+2000) g a.i./ha significantly reduced square damage due to *Helicoverpa armigera* (4.58 %) and *Earias vittella* (2.48 %), boll damage ( 3.76 %) due to bollworm complex at 14 days after second spray and locule damage ( 19.45 %) due to *Pectinophora gossypiella*. Similarly, acetamiprid + quinalphos (40+2000) g a.i./ha exhibited significantly highest seed cotton yield (14.79 q/ha). The overall result concludes that all the combinations performed better over their individual counterparts. However, the results on safety of combination products to natural enemies evidenced that all combi products along with their sole counterparts proved highly toxic.

**Keywords:** Insecticidal combinations, bollworm complex, *Helicoverpa armigera*, *Earias vittella*, cotton square, boll and locule damage

## Introduction

Cotton, the well-known "White Gold" finds its mention in the ancient Indian *Vedas*. The existence of cotton thread traced back to the *Rig-Veda* about 4000 B.C. India enjoys the distinction of being an earliest country in the world to domesticate cotton and utilize its fibre to manufacture fabrics. No agricultural commodity in the world exercised so profound influence on human and society as cotton has done from time immemorial. Even today it has maintained its prime place as king of fibres. Cotton plays an important role by providing lint, oil, protein and fuel. Besides this, globally it provides employment opportunities to millions of people. Cotton occupies the place of pride in Indian agriculture and economy by earning valuable foreign exchange. Cotton was cultivated in about 35.7 M hectares area across the world and in about 12.2 M hectares area in India (1). During 2014-15, the total cotton production in India was 400.00 lakh bales of 170 kg/bale with average productivity of 537 kg/ha (2). In Maharashtra cotton was grown in about 41.92 lakh ha area with the production of 85 lakh bales of 170 kg/bale and average productivity of 345 kg/ha during 2014-15 (2). At national level Maharashtra ranked first in area, second in production and eleventh in productivity (2).

One of the several factors, responsible for low productivity and quality deterioration of cotton, is the attack of various insect-pests right from time of planting till harvesting of the crop. Globally, 1326 insect-pests were reported on cotton (3), but in India it is attacked by 162 insects of which only about a dozen are very serious, causing 50-60 per cent loss of seed cotton (4). Among the various insect-pests infesting cotton, bollworm complex mainly *Helicoverpa armigera* Hub., *Earias vittella* Fab. and *Pectinophora gossypiella* Saunders are serious pests and considered to be the major constraint to crop production in almost all cotton growing zones. These insect–pests are not only responsible for yield losses of seed cotton but also deteriorate seed and lint quality.

The use of insecticides has played a major role in increasing cotton productivity for the last three decades. However, the indiscriminate and injudicious use of insecticides has led to many

problems including the resurgence of sucking pests, development of insecticidal resistance in some insects and residues in food stuff, consequence is that the chemical control has become less effective. Many times several insect-pests attack the crop simultaneously and it is difficult to control them with any one insecticide. To combat with these problems several approaches and strategies are being tried so as to get good control. One such approach is the application of combination of insecticides/ mixed formulations which has been reported to be an effective approach to delay development of resistance and resurgence. In this context, the present investigation was carried out to study the efficacy of newer insecticidal combinations (acetamiprid + cypermethrin, acetamiprid + quinalphos and acetamiprid + chlorpyrifos) along with their sole counterparts on cotton square, boll and locule damage due to bollworm complex, their effect on natural enemies and seed cotton yield.

## Materials and Method

The field trails comprised of fourteen treatments, replicated thrice in Randomized Block Design (RBD) were conducted during *Kharif* season of year 2004-05 and 2005-06 under rainfed conditions at the Experimental Farm of Department of Agril. Entomology, VNMKV, Parbhani (MS), India. Popular cotton hybrid Ganga (PHH-316) was sown in plot size of 4.5 x 4.2 sq. m with a spacing of 90 X 60 cm. All the package of practices was followed to raise a good crop except plant protection. Five plants randomly selected in each plot were tagged with label card. The treatment spray was given in the morning hours with knapsack sprayer. The plants were treated with sufficient care to cover whole of the plant surface. Due care was taken to avoid the drift during spray from one treatment plot to others. The first treatment spray was given as soon as bollworm crossed ETL i.e. 5 per cent infestation in fruiting bodies or shed material and subsequent spraying was given at 15 days interval. The observations on infested squares and green bolls were recorded before spraying, 7 days and 14 days after spraying. The total number of fruiting bodies, infested and healthy was counted and per cent infestation was recorded. Damage due to American bollworm and spotted bollworm in fruiting bodies (squares) was recorded separately. However, loculi with clear round holes on septa were recorded from the five randomly selected plants at each picking and per cent locule damage due to pink bollworm was worked out. Safety of insecticides to natural enemies was evaluated by collecting ten larvae from five randomly selected plants per treatment per replication after each spray and observed for emergence of natural enemies. Seed cotton yield was recorded from each treatment separately and converted to hectare basis. The generated data was subjected for statistical analysis (5).

## Result and Discussion

### Effect of newer insecticidal combinations on square damage due to *Helicoverpa armigera*

The pooled data revealed that the results before the application of insecticides were non-significant. The square damage before imposing treatments ranged from 10.03 – 12.06 per cent. All the insecticidal treatments were found significantly superior in reducing square damage due to *H. armigera* over untreated control.

### After first spraying

The analysis of pooled means indicated that the combination of acetamiprid + quinalphos (40+2000) g a.i./ha recorded significantly lowest square damage due to *H. armigera* at 7 DAS (3.20 %) and 14 DAS (6.72 %) followed by acetamiprid + chlorpyrifos (40+2000) g a.i./ha ( 3.49 and 6.92 % at 7 and 14 DAS) and acetamiprid + cypermethrin (40+200) g a.i./ha (3.93 and 6.92 % at 7 and 14 DAS). However among sole insecticides, the treatment quinalphos 500 g a.i./ha noticed 7.65 per cent squares damage at 7 DAS, whereas, acetamiprid 20 g a.i./ha noted 10.05 per cent squares damage due to *H. armigera* at 14 DAS.

### After second spraying

The pooled means exhibited similar trend of results during second spray. Significantly lowest square damage due to *H. armigera* was evidenced at 7 DAS (1.23 %) and 14 DAS (4.58 %) in the combination of acetamiprid + quinalphos (40+2000) g a.i./ha followed by acetamiprid + chlorpyrifos (40+2000) g a.i./ha (1.37 and 4.70 % at 7 and 14 DAS) and acetamiprid + cypermethrin (40+200) g a.i./ha (3.09 and 5.20 % at 7 and 14 DAS). However among sole insecticides, chlorpyrifos 500 g a.i./ha recorded significantly lowest square damage due to *H. armigera* (6.01 and 8.26 per cent at 7 and 14 DAS).

### Effect of newer insecticidal combinations on square damage due to *Earias vittella*

The data indicated that the results before the application of insecticides were non-significant. The square damage before imposing treatments ranged from 5.08 – 6.84 per cent. All the insecticidal treatments were found significantly superior in reducing square damage due to *E. vittella* over untreated control.

### After first spraying

The analysis of pooled means exhibited that the combination of acetamiprid + quinalphos (40+2000) g a.i./ha recorded significantly lowest square damage due to *E. vittella* at 7 DAS (0.65 %) and 14 DAS (3.05 %) followed by acetamiprid + chlorpyrifos (40+2000) g a.i./ha (0.98 and 3.25 % at 7 and 14 DAS) and acetamiprid + cypermethrin (40+200) g a.i./ha (1.52 and 3.90 % at 7 and 14 DAS). However among sole insecticides, quinalphos 500 g a.i./ha recorded 3.30 and 4.55 per cent damaged squares due to *E. vittella* at 7 and 14 DAS, respectively.

### After second spraying

The pooled means of two seasons observed significantly lowest damage of *E. vittella* in squares at 7 DAS (0.49 %) and 14 DAS (2.48 %) with the combination of acetamiprid + quinalphos (40+2000) g a.i./ha followed by acetamiprid + chlorpyrifos (40+2000) g a.i./ha (0.54 and 2.51 % at 7 and 14 DAS) and acetamiprid + cypermethrin (40+200) g a.i./ha (1.82 and 3.19 % at 7 and 14 DAS). However among sole insecticides, quinalphos 500 g a.i./ha recorded 3.06 and 3.49 per cent damaged squares due to *E. vittella* at 7 and 14 DAS, respectively.

### Effect of newer insecticidal combinations on boll damage due to bollworm complex

The data indicated that the results before the application of insecticides were non-significant. The boll damage before imposing treatments ranged from 9.57 – 10.42 per cent. The analysis of pooled means indicated that all the treatments were found significantly superior in reducing boll damage due to bollworm complex over untreated control.

Amongst combination product, significantly lowest boll damage due to bollworm complex was noticed in acetamiprid + quinalphos (40+2000) g a.i./ha (0.62 and 3.76 % at 7 and 14 DAS) followed by acetamiprid + chlorpyrifos (40+2000) g a.i./ha (1.09 and 4.29 % at 7 and 14 DAS) and acetamiprid + cypermethrin (40+200) g a.i./ha (2.52 and 5.14 % at 7 and 14 DAS). However among sole insecticides, quinalphos 500 g a.i./ha recorded 4.83 and 8.08 per cent damaged bolls due to bollworm complex at 7 and 14 DAS, respectively.

The results of effectiveness of insecticidal combinations on square and boll damage due to bollworm complex are in close agreement with the findings of (6) who documented Celphos 405 a ready mix insecticide containing cypermethrin (5 %) and ethion (40%) (60 g + 480 g a.i./ha) significantly effective in reducing square and boll damage due to bollworm complex than ethion and cypermethrin alone. While Polytrin C-44 @ 700 a.i./ha (profenophos 40 % + cypermethrin 4%) proved most effective by recording lowest bollworm infestation (7). Amongst all combination products chlorpyrifos + spinosad @ 625 + 31.25 g a.i./ha was found to be most effective in reducing *H. armigera* infestation in fruiting bodies (8). While mixture of endosulfan (35 %) and cypermethrin (5%) EC @ 1.00, 1.25, 2.00 and 2.50 l/ha and Polytrin C-44 EC @ 0.5 l/ha documented effective control of *E. vittella* resulting in low square damage (9). Analogously, combination of synthetic pyrethroids performed better over their individual doses (10). However, all the doses of ready mix formulation Lancer Gold (51.8 % SP) (imidacloprid + acephate) significantly reduced bollworm infestation over control by individual counterparts (11). These results endorse the results of the present findings.

**Effect of newer insecticidal combinations on locule damage due to pink bollworm**

The analysis of pooled means indicated that all the treatments were found significantly superior in reducing locule damage due to pink bollworm over untreated control. Amongst combination product, significantly lowest locule damage was reported in acetamiprid + quinalphos (40+2000) g a.i./ha (19.45 %) followed by acetamiprid + chlorpyrifos (40+2000) g a.i./ha (21.18 %) and acetamiprid + cypermethrin (40+200) g a.i./ha (25.97 %). However among sole insecticides, quinalphos 500 g a.i./ha recorded 30.14 per cent damaged locule due to pink bollworm.

These results are in accordance with the findings of (9) who reported mixture of endosulfan 35 EC and cypermethrin 5 EC (@ 1.00, 1.25, 2.00 and 2.50 l/ha) and Polytrin C-44 EC @ 0.5 l/ha effective in controlling locule damage. While, Celphos 405 ready mix combination of cypermethrin (5%) and ethion (40 %) found significantly more effective in reducing locule damage (6). However, combi products Polytrin C-44, Nurelle-D and Reldon 50 EC proved highly effective treatments in reducing bollworm infestation in loculi (12).

**Safety of newer insecticidal combinations to natural enemies**

The pooled data on natural enemies evidenced that all the newer insecticidal combinations and their sole counterparts were found highly toxic and failed to record any natural enemy. The present findings are parallel to the findings of (13) who reported lower and higher concentrations of acetamiprid harmful and toxic to *Trichogramma chilonis*. Whereas, neonicotinoids proved to be highly toxic to many natural enemies (14). However, in the laboratory studies quinalphos 0.05 per cent (72.50 %), chlorpyriphos 0.05 per cent (70.00 %) and cypermethrin 0.0075 per cent (67.50 %) were observed highly toxic to *T. chilonis* (15). Analogously, quinalphos and chlorpyrifos reported toxic to *T. chilonis* (16).

**Effect of newer insecticidal combinations on cotton yield**

Pooled data on seed cotton yield of two seasons ranged between 6.83 to 14.79 q/ha among the treatments. The treatment acetamiprid + quinalphos (40+2000) g a.i./ha recorded significantly higher yield (14.79 q/ha), followed by acetamiprid + chlorpyrifos (40+2000) g a.i./ha (14.28 q/ha) and acetamiprid + cypermethrin (40+200) g a.i./ha (13.84 q/ha). However among sole insecticides, quinalphos 500 g a.i./ha recorded (10.22 q/ha). These findings are supported with results of (11) who concluded that all the doses of ready mix formulation Lancer Gold (51.8 % SP) (imidacloprid + acephate) significantly reduced bollworm infestation over their individual counterparts and also registered higher seed cotton yield. However, in the investigation of (9) mixtures of endosulfan (35 %) and cypermethrin (5 %) EC @ 1.00, 1.25, 2.00 and 2.50 l/ha and Polytrin C-44 EC @ 0.5 l/ha recorded higher cotton yield than alone application.

The overall results indicated that newer insecticidal combinations (acetamiprid + cypermethrin, acetamiprid + chlorpyrifos and acetamiprid + quinalphos) proved highly effective in lowering squares, bolls and locule damage in cotton due to bollworm complex and increasing seed cotton yield, however, revealed highly toxic to the natural enemies. Hence, these combi products could be deployed for effective management of bollworm complex of cotton with the word of caution.

**Table 1:** Effect of newer insecticidal combinations on per cent square damage due to *Helicoverpa armigera* and *Earias vittella*

| Sr. No. | Treatments | Dose g.a.i./ha | *H. armigera* (Pooled means of two seasons) | | | | | *E. vittella* (Pooled means of two seasons) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | After first spray | | | After second spray | | After first spray | | | After second spray | |
| | | | Pre-count | 7 DAS | 14 DAS | 7 DAS | 14 DAS | Pre-count | 7 DAS | 14 DAS | 7 DAS | 14 DAS |
| 1 | Acetamiprid 0.4%+ | 10+50 | 10.82 | 7.57 | 9.75 | 5.56 | 8.02 | 6.14 | 3.55 | 5.31 | 3.83 | 4.77 |
| | Cypermethrin 2% EC | | (3.35) | (2.83) | (3.19) | (2.51) | (2.91) | (2.57) | (1.98) | (2.40) | (2.07) | (2.28) |
| 2 | Acetamiprid 0.4%+ | 20+100 | 11.75 | 6.23 | 8.24 | 4.93 | 6.70 | 5.47 | 2.56 | 4.43 | 2.69 | 3.81 |
| | Cypermethrin 2% EC | | (3.48) | (2.58) | (2.93) | (2.31) | (2.67) | (2.42) | (1.81) | (2.21) | (1.76) | (2.05) |
| 3 | Acetamiprid 0.4%+ | 40+200 | 11.76 | 3.93 | 6.92 | 3.09 | 5.20 | 6.08 | 1.52 | 3.90 | 1.82 | 3.19 |
| | Cypermethrin 2% EC | | (3.49) | (2.09) | (2.68) | (1.86) | (2.35) | (2.55) | (1.48) | (2.08) | (1.33) | (1.88) |
| 4 | Acetamiprid 0.4%+ | 10+500 | 11.75 | 7.11 | 9.86 | 4.83 | 7.54 | 5.82 | 3.20 | 4.92 | 3.48 | 4.20 |
| | Quinalphos 20 % EC | | (3.49) | (2.75) | (3.20) | (2.30) | (2.83) | (2.50) | (1.89) | (2.32) | (1.98) | (2.15) |
| 5 | Acetamiprid 0.4%+ | 20+1000 | 13.62 | 5.57 | 8.62 | 2.99 | 6.16 | 5.08 | 1.85 | 3.83 | 1.70 | 3.37 |
| | Quinalphos 20 % EC | | (3.73) | (2.44) | (2.98) | (1.85) | (2.56) | (2.34) | (1.39) | (2.07) | (1.48) | (1.95) |
| 6 | Acetamiprid 0.4%+ | 40+2000 | 11.64 | 3.20 | 6.72 | 1.23 | 4.58 | 5.60 | 0.65 | 3.05 | 0.49 | 2.48 |
| | Quinalphos 20 % EC | | (3.47) | (1.92) | (2.64) | (1.30) | (2.24) | (2.46) | (1.01) | (1.86) | (0.98) | (1.70) |
| 7 | Acetamiprid 0.4%+ | 10+500 | 11.41 | 7.29 | 9.82 | 4.78 | 7.76 | 5.34 | 3.22 | 4.71 | 3.57 | 4.23 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chlorpyrifos 20 % EC | | (3.44) | (2.78) | (3.19) | (2.29) | (2.86) | (2.40) | (1.86) | (2.28) | (2.01) | (2.17) |
| 8 | Acetamiprid 0.4%+ | 20+1000 | 10.88 | 5.64 | 8.66 | 3.19 | 6.41 | 5.45 | 1.82 | 4.27 | 1.86 | 3.37 |
| | Chlorpyrifos 20 % EC | | (9.36) | (2.47) | (2.99) | (1.91) | (2.62) | (2.42) | (1.53) | (2.17) | (1.53) | (1.95) |
| 9 | Acetamiprid 0.4%+ | 40+2000 | 10.70 | 3.49 | 6.92 | 1.37 | 4.70 | 5.99 | 0.98 | 3.25 | 0.54 | 2.51 |
| | Chlorpyrifos 20 % EC | | (3.34) | (1.99) | (2.66) | (1.35) | (2.25) | (2.53) | (1.20) | (1.91) | (1.01) | (1.70) |
| 10 | Acetamiprid 20 SP | 20 | 10.86 | 9.24 | 10.05 | 8.28 | 8.87 | 6.20 | 4.65 | 5.54 | 4.34 | 4.99 |
| | | | (3.35) | (3.11) | (3.24) | (2.96) | (3.06) | (2.58) | (2.17) | (2.45) | (2.18) | (2.33) |
| 11 | Quinalphos 25 EC | 500 | 12.06 | 7.65 | 10.19 | 6.29 | 8.36 | 5.48 | 3.30 | 4.55 | 3.06 | 3.49 |
| | | | (3.51) | (2.84) | (3.26) | (2.60) | (2.98) | (2.41) | (1.84) | (2.23) | (1.87) | (1.95) |
| 12 | Chlorpyrifos 20 EC | 500 | 10.03 | 7.72 | 10.28 | 6.01 | 8.26 | 6.84 | 3.59 | 4.65 | 3.23 | 4.22 |
| | | | (3.23) | (2.86) | (3.27) | (2.54) | (2.95) | (2.68) | (1.93) | (2.26) | (1.92) | (2.16) |
| 13 | Cypermethrin 10 EC | 75 | 11.65 | 9.09 | 10.15 | 6.94 | 8.64 | 5.97 | 4.62 | 5.89 | 4.09 | 5.30 |
| | | | (3.46) | (3.08) | (3.26) | (2.72) | (3.01) | (2.51) | (2.26) | (2.52) | (2.13) | (2.39) |
| 14 | Untreated control | | 11.28 | 11.91 | 13.03 | 15.99 | 17.67 | 6.15 | 6.70 | 7.32 | 8.41 | 10.24 |
| | | | (3.48) | (3.51) | (3.67) | (4.05) | (4.25) | (2.56) | (2.79) | (2.79) | (2.98) | (3.26) |
| | **SE** | | **0.169** | **0.113** | **0.080** | **0.073** | **0.115** | **0.195** | **0.055** | **0.083** | **0.097** | **0.178** |
| | **CD** | | **N.S.** | **0.328** | **0.232** | **0.213** | **0.334** | **N.S.** | **0.159** | **0.241** | **0.281** | **0.516** |

*Figures in parentheses are Arc Sine transformed values DAS=Days after spray

**Table 2:** Effect of newer insecticidal combinations on cotton per cent boll and locule damage due to bollworm complex and yield of seed cotton

| Sr. No. | Treatments | Dose g.a.i./ha | Boll damage after second spray (Pooled means of two seasons) | | | Locule damage (Pooled means of two seasons) | Seed cotton yield (q/ha) (Pooled means of two seasons) |
|---|---|---|---|---|---|---|---|
| | | | Pre-count | 7 DAS | 14 DAS | | |
| 1 | Acetamiprid 0.4%+ | 10+50 | 9.60 | 5.15 | 8.17 | 35.62 | 10.28 |
| | Cypermethrin 2% EC | | (3.19) | (2.35) | (2.99) | (21.27) | |
| 2 | Acetamiprid 0.4%+ | 20+100 | 9.57 | 4.01 | 7.10 | 33.19 | 12.34 |
| | Cypermethrin 2% EC | | (3.05) | (2.08) | (2.89) | (19.73) | |
| 3 | Acetamiprid 0.4%+ | 40+200 | 10.35 | 2.52 | 5.14 | 25.97 | 13.84 |
| | Cypermethrin 2% EC | | (3.17) | (1.69) | (2.56) | (14.30) | |
| 4 | Acetamiprid 0.4%+ | 10+500 | 9.67 | 4.35 | 7.57 | 29.68 | 11.31 |
| | Quinalphos 20 % EC | | (3.08) | (2.19) | (2.84) | (17.44) | |
| 5 | Acetamiprid 0.4%+ | 20+1000 | 10.42 | 2.79 | 6.23 | 26.98 | 12.95 |
| | Quinalphos 20 % EC | | (3.16) | (1.79) | (2.64) | (15.77) | |
| 6 | Acetamiprid 0.4%+ | 40+2000 | 9.96 | 0.62 | 3.76 | 19.45 | 14.79 |
| | Quinalphos 20 % EC | | (3.06) | (1.00) | (2.08) | (11.06) | |
| 7 | Acetamiprid 0.4%+ | 10+500 | 9.68 | 4.56 | 7.89 | 31.64 | 10.75 |
| | Chlorpyrifos 20 % EC | | (3.08) | (2.24) | (2.92) | (18.78) | |
| 8 | Acetamiprid 0.4%+ | 20+1000 | 9.81 | 3.01 | 6.31 | 29.39 | 12.77 |
| | Chlorpyrifos 20 % EC | | (3.13) | (1.84) | (2.66) | (17.27) | |
| 9 | Acetamiprid 0.4%+ | 40+2000 | 9.73 | 1.09 | 4.29 | 21.18 | 14.28 |
| | Chlorpyrifos 20 % EC | | (3.18) | (1.47) | (2.27) | (12.29) | |
| 10 | Acetamiprid 20 SP | 20 | 9.69 | 6.68 | 8.75 | 42.50 | 8.30 |
| | | | (3.08) | (2.67) | (3.03) | (25.75) | |
| 11 | Quinalphos 25 EC | 500 | 10.05 | 4.83 | 8.08 | 30.14 | 10.22 |
| | | | (3.02) | (2.29) | (2.92) | (17.68) | |
| 12 | Chlorpyrifos 20 EC | 500 | 9.45 | 5.32 | 8.50 | 31.14 | 10.14 |
| | | | (3.03) | (2.40) | (3.00) | (18.29) | |
| 13 | Cypermethrin 10 EC | 75 | 10.10 | 5.91 | 8.89 | 35.77 | 9.47 |
| | | | (3.19) | (2.53) | (3.07) | (21.29) | |
| 14 | Untreated control | | 9.62 | 12.50 | 15.05 | 43.91 | 6.83 |
| | | | (3.06) | (3.59) | (4.14) | (26.76) | |
| | **SE** | | **0.125** | **0.154** | **0.052** | **1.279** | **0.614** |
| | **CD** | | **N.S.** | **0.448** | **0.153** | **3.710** | **1.780** |

*Figures in parentheses are Arc Sine transformed values DAS=Days after spray

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