# EVALUATION OF EFFICACY OF NEWER INSECTICIDES AGAINST TOBACCO CATERPILLAR *Spodoptera litura*AND CASTOR SEMILOOPER*Achaea janata OF CASTOR*


## ABSTRACT

An experiment was conducted to evaluate the efficacy of ten insecticides *viz*., spinetoram 11.7 SC @ 0.5 ml l$^{-1}$, cyantraniliprole 10.26 OD @ 1.2 ml l$^{-1}$, chlorantraniliprole 18.5 SC @0.3 ml l$^{-1}$, chlorfluazuron 5.4 EC @ 2.0 ml l$^{-1}$, azadirachtin 1 EC @ 1 ml l$^{-1}$, spinetoram 11.7 SC + azadirachtin 1 EC @ 0.5 ml l$^{-1}$ + 1 ml l$^{-1}$, cyantraniliprole 10.26 OD + azadirachtin 1 EC @ 1.2 ml l$^{-1}$ + 1 ml l$^{-1}$, chlorantraniliprole 18.5 SC + azadirachtin 1 EC @ 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$, chlorfluazuron 5.4 EC + azadirachtin 1 EC @ 2.0 ml l$^{-1}$ + 1 ml l$^{-1}$ and quinalphos 25EC @ 2.0 ml l$^{-1}$ along with an untreated control.Pooled efficacies of these treatments revealed that chlorantraniliprole 18.5 SC + azadirachtin 1 EC @ 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$ was found to be the most effective treatment which exhibited highest efficacy against *Spodoptera litura* (75.26 per cent reduction over control) and*Achaea janata* (82.31per cent ROC) followed by chlorantraniliprole 18.5 SC @ 0.3 ml l$^{-1}$ which recorded 68.80 % and 76.15 % ROC respectively. The least per cent ROCwas recorded in azadirachtin 1 EC (0.01 %) @ 1 ml l$^{-1}$.


*Keywords: Castor, Spodoptera litura, Achaeajanata, Chlorantraniliprole 18.5 SC, Azadirachtin 1 EC*


## 1. INTRODUCTION:

Castor, *Ricinus communis* (Linneaus) is mostly cultivated in the semi-arid and arid regions in India as a non-edible oilseed crop.It is cultivated in different countries on commercial scale, of which China, India and Brazil are the major castor growing countries accounting for 90 per cent of the world's production. Castor is cultivated in an area of 8.91 lakh ha in world and followed by India with 6.96 lakh ha in 2022-23. The production of castor is about 1.88 million metric tons and mean productivity of castor in 2022 is 1962 kg ha$^{-1}$ (www.statista.com). Gujarat is the major castor producing state accounting for 70 per cent area and 86 per cent production in the country followed by Rajasthan and Andhra Pradesh. Total area of castor in Andhra Pradesh in 2022-23 is 0.56 lakh ha and the total production is 0.37 lakh tonnes with a productivity of 536 kg ha$^{-1}$ (https://des.ap.gov.in). Insect pests, particularlytheimmature stages *S. litura* and *A. janata* cause great loss in the vegetative stage of the crop anddrastically causes yield losses.

In Andhra Pradesh castor is mainly grown in Rayalaseema region which receives minimum rainfall and frequent drought spells are most common. Apart from abiotic stress, castor crop is subjected to ravages of insect pests and damage caused by *S. litura* and *A. janata* considered as limiting factor for yield. Therefore, it is necessary to manage them to increase the productivity of castor. Application of newer molecules has an excellent opportunity in the management of various pests as they are eco-friendly, pest-specific and less persistent.However, information on the Bio-efficacy of the newer molecules against lepidopteran pests in castor is very limited

(Lakshminarayanamma *et al*. 2013).Hence the present study planned to evaluate the newer insecticides against lepidopteran defoliators on castor.

## 2. MATERIALS AND METHODS

An experiment was laid out in Randomized Block Design with eleven treatments and three replications in a plot size of 8m x 5m (Table 1). The seeds were dibbled with a spacingof 90cm × 45cm and all the recommended agronomic practices were followed except plant protection measures. The treatments were imposed when the pest reached economic threshold level (3-4 larvae plant$^{-1}$).

Insecticidal treatments were given thrice during the crop period *viz.,* at vegetative stage, at capsule formation stage and at capsule development stage with 30 days interval. Observations on the larval population counts of *S. litura* and *A. janata* were made one day before spraying and at one, three, five and fifteen days after spraying on ten randomly selected and tagged plants in each treatment. The post treatment counts of larvae from various treatments were used to calculate per cent reduction in population over control by using the following formula given by Abbott 1925.

$$\text{Population reduction over control(\%)} = \frac{\text{Population in untreated check - Population in treatment}}{\text{Population in untreated check}} \times 100$$

**Table 1Details of insecticides evaluated against *S. litura and A. janata* of castor during *rabi,* 2021-22**

| Treatments | Insecticides | Per cent concentration | Dose per litre |
|---|---|---|---|
| T1 | Spinetoram 11.7 SC | 0.0058 % | 0.5 ml l$^{-1}$ |
| T2 | Cyantraniliprole 10.26 OD | 0.0123 % | 1.2 ml l$^{-1}$ |
| T3 | Chlorantraniliprole 18.5 SC | 0.0055 % | 0.3 ml l$^{-1}$ |
| T4 | Chlorfluazuron 5.4 EC | 0.0108 % | 2.0 ml l$^{-1}$ |
| T5 | Azadirachtin 1 EC | 0.01 % | 1 ml l$^{-1}$ |
| T6 | Spinetoram 11.7 SC + Azadirachtin 1 EC | 0.0058 % + 0.01 % | 0.5 ml l$^{-1}$ + 1 ml l$^{-1}$ |
| T7 | Cyantraniliprole 10.26 OD + Azadirachtin 1 EC | 0.0123 %+ 0.01 % | 1.2 ml l$^{-1}$ + 1 ml l$^{-1}$ |
| T8 | Chlorantraniliprole 18.5 SC + Azadirachtin 1 EC | 0.0055 % + 0.01 % | 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$ |
| T9 | Chlorfluazuron 5.4 EC + Azadirachtin 1 EC | 0.0108 % + 0.01 % | 2.0 ml l$^{-1}$ + 1 ml l$^{-1}$ |
| T10 | Quinalphos 25EC | 0.05 % | 2.0 ml l$^{-1}$ |
| T11 | Untreated control | - | Water spray |

## 3. RESULTS AND DISCUSSION

Per cent reduction over untreated control in each spraying of*S. litura* and *A. janata*due to all the three sprayings werecalculated and the results are presented in the tables.

### 3.1 Tobacco caterpillar *Spodoptera litura*

#### 3.1.1 First Spray

The larval population of tobacco caterpillar, *S. litura*in all the treatments was uniform a day before application of treatments as indicated by the non-significant differences among the various treatments (Table 2).

The overall mean efficacy of insecticides after first application revealed that chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest per cent ROC *i.e.,* 76.03 per cent and was found to be the best treatment. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ with 68.72 and 66.67 per cent ROCrespectively and the treatments were statistically at par with each other. The next effective treatments in the descending order of efficacy were cyantraniliprole 10.26 OD (0.0123 %) @ 1.2 ml $l^{-1}$, spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) @ 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$ and spinetoram 11.7 SC (0.0058 %) @ 0.5 ml $l^{-1}$ with 62.79, 57.76 and 55.25 per cent ROC respectively and were statistically at par with each other. However, the above treatments *viz.,* cyantraniliprole 10.26 OD, spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) and spinetoram 11.7 SC were at par with cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %). Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ with 40.87 per cent ROC was least effective when compared to above treatments and was significantly different from other treatments.

**<u>3.1.2 Second Spray</u>**

One day before imposition of treatment, thelarval population varied from 2.00 to 3.66larvae per plant. However, there was significantdifference in the larval population among thetreatments (Table 2).

The overall efficacy of insecticides after second application revealed that, chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest per cent ROC *i.e.,*75.03 per cent and was found to be the best treatment. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ with 67.68 and 66.24 per cent ROCrespectively and the treatments were statistically at par with each other. The next effective treatments in the descending order of efficacy were cyantraniliprole 10.26 OD (0.0123 %) @ 1.2 ml $l^{-1}$, spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) @ 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$ and spinetoram 11.7 SC (0.0058 %) @ 0.5 ml $l^{-1}$ with 62.42, 60.03 and 59.24 per cent ROC respectively and were statistically at par with each other. However, the above treatments were at par with cyantraniliprole 10.26 OD. Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ (42.20 per cent) was least effective when compared to above treatments and was significantly different from other treatments

**<u>3.1.3 Third spray</u>**

One day before imposition of treatment, thelarval population varied from 2.00 to 3.66larvae per plant. However, there was significantdifference in the larval population among thetreatments (Table 3).

The overall efficacy of insecticides after third application revealed that, among the insecticidal treatments, the plots treated with chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest per cent ROC *i.e.,* 74.72 per cent and was found to be the best treatment. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ with 68.06 and 65.82 per cent ROC and the treatments were statistically at par with each other. The next effective treatment was cyantraniliprole 10.26 OD (0.0123 %) @ 1.2 ml $l^{-1}$ with 61.49 per cent reduction over control which was at par with cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$. The next effective treatment was spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) @ 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$ and spinetoram 11.7 SC (0.0058 %) @ 0.5 ml $l^{-1}$ with 57.76 and 54.63 per cent ROC and were statistically different from others. Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ with 40.90 per cent ROC was least effective when compared to above treatments. However, all the treatments were significantly superior over control.

When the mean per cent reduction of *S. litura* by various treatments over control was pooled for three sprays, chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest reduction of *S. litura* larval population and remained significantly superior over all the other treatments with 75.26 per cent ROC. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ with 68.80 and 67.85 per cent reduction over controlrespectively. Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ with 41.20 per cent reduction over control was least effective when compared to other treatments. However, all the treatments were significantly superior over control (Table 3).

**3.2 Castor semilooper*, Achaea janata***

**<u>3.2.1. First spray</u>**

One day before imposition of treatment, thelarval population varied from 1.07 to 2.03larvae per plant. However, there was significantdifference in the larval population among thetreatments (Table 4).

The overall efficacy of insecticides after first application revealed that, chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest per cent ROC *i.e.,* 83.63 per cent and was found to be the best treatment. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ with 77.11 and 73.36 per cent reduction over controlrespectively and the treatments were statistically at par with each other. The next effective treatments were spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) @ 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$, cyantraniliprole 10.26 OD (0.0123 %) @ 1.2 ml $l^{-1}$ and spinetoram 11.7 SC (0.0058 %) @ 0.5 ml $l^{-1}$ respectively. Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ with 53.42 per cent ROC was least effective when compared to above treatments. However, all the treatments were significantly superior over control.

**<u>3.2.2 Second spray</u>**

One day before imposition of treatment, thelarval population varied from 0.75 to 2.40larvae per plant. However, there was significantdifference in the larval population among thetreatments (Table 4).

The overall efficacy of insecticides after second application revealed that, chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest per cent ROC *i.e.,* 82.96 per cent and the treatment was found to be the best treatment. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ with 77.73 and 75.46 per cent ROCrespectively and the treatments were statistically at par with each other. The next effective treatments were spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) @ 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$, cyantraniliprole 10.26 OD (0.0123 %) @ 1.2 ml $l^{-1}$ and spinetoram 11.7 SC (0.0058 %) @ 0.5 ml $l^{-1}$. Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ with 50.69 per cent ROC was least effective when compared to above treatments. However, all the treatments were significantly superior over control.

**3.2.3 Third spray**

One day before imposition of treatment, thelarval population varied from 1.02 to 2.47larvae per plant. However, there was significantdifference in the larval population among thetreatments (Table 5).

The overall efficacy of insecticides after third application revealed that, plots treated with chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest per cent ROC *i.e.,* 82.45 per cent and was found to be the best treatment. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ with 78.63 and 76.83 per cent reduction over controlrespectively and the treatments were statistically at par with each other. The next effective treatments were spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) @ 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$, cyantraniliprole 10.26 OD (0.0123 %) @ 1.2 ml $l^{-1}$ and spinetoram 11.7 SC (0.0058 %) @ 0.5 ml $l^{-1}$respectively. Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ with 51.85 per cent ROC was least effective when compared to above treatments. However, all the treatments were significantly superior over control.

When the mean per cent reduction of *A. janata* by various treatments over control was pooled for three sprays, chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ recorded highest reduction of larval population and remained significantly superior over all the other treatments with 82.31 per cent ROC. The next effective treatments in the descending order of efficacy were chlorantraniliprole 18.5 SC (0.0055 %) @ 0.3 ml $l^{-1}$ and cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2ml $l^{-1}$ + 1 ml $l^{-1}$ with 76.15 and 74.78 per cent ROCrespectively. The next best treatments were spinetoram 11.7 SC (0.0058 %) + azadirachtin 1 EC (0.01 %) @ 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$ with 72.96 and was on par with cyantraniliprole 10.26 OD (0.0123 %) + azadirachtin 1 EC (0.01 %) @ 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$. The next effective treatments were cyantraniliprole 10.26 OD (0.0123 %) @ 1.2 ml $l^{-1}$ and spinetoram 11.7 SC (0.0058 %) @ 0.5 ml $l^{-1}$. Azadirachtin 1 EC (0.01 %) @ 1 ml $l^{-1}$ with 51.67 per cent ROC was least effective when compared to above treatments (Table 5).

The results are in accordance with Jayanth and Kumar(2022) who reported that chlorantraliprole 18.5 % SC + neem oil 1 %was found to be the most effective treatment against gram pod borer *H. armigera* in chickpea by recording 1.25 mean larval population.(Gadhiya *et al*.2014) who found that chlorantraniliprole was superior in reducing the incidence of *S. litura* in groundnut with the lowest leaf damage of 5.67 per cent. The results were also in confirmity with the findings of (Sreekanth *et al*. 2014). The studies are in accordance with (Manjunatha *et al*. 2015) who reported chlorantraniliprole was most effective (79.53 % mortality) in the control of castor semilooper.(Narayanamma *et al.*2013) who reported that chlorantraniliprole was found to be the most effective against *A.janata* (0.40 larvae plant$^{-1}$).(Duraimurugan and Lakshminarayana 2014) reported that chlorantraniliprole 18.5 SC was found to be the best treatment against *A. janata* (100 per cent ROC).(Ranganath *et al*.2020) reported that chlorantraniliprole 18.5 SC was found to be best treatment against *A. janata* (87.50 per cent ROC).

## 4. CONCLUSION

Among the newer insecticides evaluated against*S. litura* and *A. janata* of castor, it reveals that all the tested treatments were effective in reducing the infestation of *S. litura* and *A. janata* of castor over untreated control. Chlorantraniliprole 18.5 SC (0.0055 %) + azadirachtin 1 EC (0.01 %) @ 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$ recorded highest per cent reduction over control followed by chlorantraniliprole 18.5 % SC. The highest per cent reduction of *S. litura* and *A. janata*of castor in the treatmentchlorantraniliprole 18.5 SC + azadirachtin 1 EC @ 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$ might be due tothe combined mode of action of these two compounds compared to other insecticides. Rao and Dhingra (2000) reported antifeedant effect of neem and synthetic pyrethroids against *S. litura*. The novel mode of actions might have contributed for the superior efficacy of chlorantraniliprole with azadirachtin.Therefore, the combination of insecticides with neem formulations such as azadirachtin (0.01 %) fits very well into Integrated Pest Management programme.

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**Table 2.Efficacyofdifferentinsecticidesagainsttobaccocaterpillarafterfirst and second spraysduring *rabi*,2021-22**

| S.No. | Treatments | Dosage | percentreductionoftobacco caterpillarlarval populationovercontrol | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | First spray | | | | | | Second spray | | | | |
| | | | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per cent reduction | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per centreduction |
| $T_1$ | Spinetoram 11.7 SC | 0.5 ml $l^{-1}$ | 1.00 | 45.10$^{bc}$ (42.11) | 69.90$^{c}$ (56.69) | 60.00$^{cd}$ (50.61) | 47.15$^{cd}$ (43.31) | 55.25$^{cd}$ (48.01) | 1.45 | 45.33$^{bc}$ (42.18) | 70.27$^{c}$ (56.91) | 57.24$^{cd}$ (49.21) | 47.19$^{cd}$ (43.41) | 59.24$^{cd}$ (47.37) |
| $T_2$ | Cyantraniliprole 10.26 OD | 1.2 ml $l^{-1}$ | 0.90 | 53.92$^{ab}$ (47.19) | 78.64$^{bc}$ (62.51) | 67.27$^{bc}$ (55.10) | 52.85$^{c}$ (46.53) | 62.79$^{c}$ (52.58) | 1.33 | 52.00$^{abc}$( 46.14) | 78.38$^{bc}$ (62.26) | 65.13$^{bc}$ (53.77) | 51.69$^{c}$ (45.93) | 62.42$^{c}$ (51.62) |
| $T_3$ | Chlorantraniliprole 18.5 SC | 0.3 ml $l^{-1}$ | 0.93 | 57.84$^{a}$ (49.46) | 84.47$^{b}$ (66.93) | 71.82$^{b}$ (57.93) | 61.79$^{b}$ (51.79) | 68.72$^{b}$ (56.11) | 1.20 | 58.67$^{a}$ (49.99) | 83.11$^{b}$ (65.79) | 69.74$^{b}$ (56.60) | 60.67$^{b}$ (51.22) | 67.68$^{b}$ (56.13) |
| $T_4$ | Chlorfluazuron 5.4 EC | 2.0 ml $l^{-1}$ | 1.17 | 38.24$^{cd}$ (37.83) | 61.17$^{d}$ (51.45) | 53.64$^{d}$ (47.08) | 39.84$^{d}$ (39.02) | 47.08$^{e}$ (43.88) | 1.55 | 38.67$^{cd}$ (38.44) | 60.81$^{d}$ (51.16) | 51.32$^{d}$ (45.74) | 40.45$^{d}$ (39.47) | 49.17$^{e}$ (45.00) |
| $T_5$ | Azadirachtin 1 EC | 1 ml $l^{-1}$ | 1.30 | 28.43$^{d}$ (32.18) | 58.25$^{d}$ (49.75) | 44.55$^{e}$ (41.86) | 33.33$^{e}$ (35.13) | 40.87$^{g}$ (39.82) | 1.67 | 35.33$^{d}$ (36.47) | 56.08$^{d}$ (48.49) | 40.79$^{e}$ (39.59) | 33.71$^{e}$ (35.45) | 42.20$^{f}$ (43.99) |
| $T_6$ | Spinetoram 11.7 SC + Azadirachtin 1 EC | 0.5 ml $l^{-1}$ + 1 ml $l^{-1}$ | 1.00 | 47.06$^{b}$ (43.15) | 72.82$^{c}$ (58.57) | 62.73$^{c}$ (52.37) | 49.59$^{c}$ (44.71) | 57.76$^{c}$ (49.55) | 1.40 | 47.33$^{bc}$ (43.47) | 72.30$^{c}$ (58.23) | 59.87$^{c}$ (50.67) | 50.00$^{c}$ (44.93) | 60.03$^{c}$ (49.58) |
| $T_7$ | Cyantraniliprole 10.26 OD + Azadirachtin 1 EC | 1.2 ml $l^{-1}$ + 1 ml $l^{-1}$ | 0.83 | 56.86$^{a}$ (48.83) | (64.56) 90.29$^{a}$ | 70.91$^{b}$ (57.35) | 58.54$^{bc}$ (49.89) | 66.67$^{bc}$ (54.87) | 1.20 | 55.33$^{ab}$ (48.06) | 81.08$^{b}$ (64.21) | 66.45$^{b}$ (54.76) | 57.30$^{bc}$ (49.17) | 66.24$^{bc}$ (53.80) |
| $T_8$ | Chlorantraniliprole 18.5 SC + Azadirachtin 1 EC | 0.3 ml $l^{-1}$ + 1 ml $l^{-1}$ | 0.87 | 59.80$^{a}$ (50.60) | (71.87) 67.00$^{cd}$ | 78.18$^{a}$ (62.15) | 67.48$^{a}$ (55.48) | 76.03$^{a}$ (59.36) | 1.13 | 60.67$^{a}$ (51.15) | 88.51$^{a}$ (70.72) | 75.00$^{a}$ (60.01) | 66.29$^{a}$ (54.70) | 75.03$^{a}$ (58.85) |
| $T_9$ | Chlorfluazuron 5.4 EC + Azadirachtin 1 EC | 2.0 ml $l^{-1}$ + 1 ml $l^{-1}$ | 1.13 | 39.22$^{c}$ (38.77) | (54.93) 60.19$^{d}$ | 55.45$^{d}$ (48.13) | 40.65$^{d}$ (39.55) | 50.23$^{d}$ (45.22) | 1.62 | 40.00$^{c}$ (40.78) | 67.57$^{cd}$ (55.27) | 51.97$^{d}$ (46.08) | 42.13$^{d}$ (40.45) | 52.07$^{e}$ (46.82) |
| $T_{10}$ | Quinalphos 25EC (Check) | 2.0 ml $l^{-1}$ | 1.30 | 29.41$^{d}$ (32.84) | 60.19$^{d}$ (50.88) | 50.00$^{d}$ (45.00) | 38.21$^{d}$ (38.22) | 44.29$^{f}$ (41.78) | 1.67 | 37.33$^{d}$ (37.66) | 58.78$^{d}$ (50.02) | 48.68$^{de}$ (44.20) | 38.20$^{d}$ (38.12) | 47.77$^{e}$ (46.09) |
| $T_{11}$ | Untreated control | | 1.70 | - | - | - | - | - | 2.50 | - | - | - | - | - |
| SEm± | | | | 1.60 | 1.41 | 1.62 | 1.60 | 0.90 | | 1.39 | 1.45 | 1.61 | 1.65 | 0.76 |
| CD (5 %) | | | NS | 4.73 | 4.15 | 4.79 | 4.71 | 2.66 | NS | 4.09 | 4.27 | 4.75 | 4.88 | 2.25 |
| CV (%) | | | | 7.24 | 4.56 | 5.98 | 6.85 | 3.50 | | 6.11 | 4.73 | 6.13 | 7.12 | 2.98 |

*Figures in parentheses are angular transformed values*

*PTC: Pre-treatment count*

*DAS: Days After Spraying*

| S.No. | Treatments | Dosage | percentreductionoftobacco caterpillarlarval populationovercontrol | |
|---|---|---|---|---|
| | | | Third spray | Pooled data |

**Table3.Efficacyofdifferentinsecticidesagainsttobaccocaterpillarafterthird spray and pooleddataduring *rabi,*2021-22**

| | | | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per cent reduction | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per centreduction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | Spinetoram 11.7 SC | 0.5 ml l$^{-1}$ | 1.55 | 44.94$^{bc}$ (42.02) | 70.63$^{c}$ (57.18) | 54.71$^{cd}$ (47.72) | 48.90$^{cd}$ (44.33) | 54.63$^{e}$ (47.74) | 1.33 | 50.78$^{cd}$ (45.48) | 73.63$^{cd}$ (59.11) | 56.94$^{e}$ (48.98) | 48.45$^{cd}$ (44.12) | 55.85$^{e}$ (49.29) |
| $T_2$ | Cyantraniliprole 10.26 OD | 1.2 ml l$^{-1}$ | 1.33 | 54.43$^{abc}$ (47.54) | 78.75$^{bc}$ (62.54) | 60.00$^{c}$ (50.76) | 53.85$^{c}$ (47.18) | 61.49$^{cd}$ (52.28) | 1.19 | 53.41$^{c}$ (46.94) | 78.59$^{c}$ (62.44) | 64.58$^{cd}$ (53.53) | 52.80$^{c}$ (46.58) | 61.98$^{c}$ (52.15) |
| $T_3$ | Chlorantraniliprole 18.5 SC | 0.3 ml l$^{-1}$ | 1.23 | 59.49$^{a}$ (50.43) | 83.75$^{b}$ (66.27) | 68.24$^{b}$ (55.79) | 61.54$^{b}$ (51.68) | 68.06$^{b}$ (56.63) | 1.12 | 57.32$^{b}$ (49.19) | 83.80$^{b}$ (66.03) | 69.68$^{b}$ (56.60) | 61.28$^{b}$ (51.54) | 68.80$^{b}$ (56.04) |
| $T_4$ | Chlorfluazuron 5.4 EC | 2.0 ml l$^{-1}$ | 1.72 | 38.61$^{cd}$ (38.41) | 63.13$^{d}$ (52.57) | 47.06$^{d}$ (43.31) | 37.36$^{e}$ (37.67) | 47.94$^{e}$ (45.44) | 1.48 | 38.10$^{d}$ (38.08) | 65.69$^{d}$ (54.14) | 50.23$^{fg}$ (45.13) | 39.13$^{d}$ (38.72) | 49.25$^{g}$ (44.57) |
| $T_5$ | Azadirachtin 1 EC | 1 ml l$^{-1}$ | 1.77 | 34.18$^{d}$ (35.77) | 58.13$^{d}$ (49.67) | 39.41$^{e}$ (38.88) | 32.97$^{f}$ (34.96) | 40.90$^{g}$ (42.25) | 1.58 | 33.17$^{e}$ (35.15) | 59.12$^{e}$ (50.25) | 40.56$^{h}$ (39.56) | 33.33$^{e}$ (35.26) | 41.20$^{i}$ (39.93) |
| $T_6$ | Spinetoram 11.7 SC + Azadirachtin 1 EC | 0.5 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.48 | 47.47$^{bc}$ (43.54) | 72.50$^{c}$ (58.40) | 58.82$^{c}$ (50.08) | 52.75$^{c}$ (46.56) | 57.76$^{d}$ (50.00) | 1.29 | 52.44$^{c}$ (46.42) | 76.20$^{c}$ (60.82) | 60.42$^{d}$ (51.01) | 50.93$^{c}$ (45.53) | 58.19$^{d}$ (49.71) |
| $T_7$ | Cyantraniliprole 10.26 OD + Azadirachtin 1 EC | 1.2 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.27 | 56.96$^{ab}$ (49.00) | 81.88$^{b}$ (64.80) | 65.88$^{bc}$ (54.26) | 59.34$^{bc}$ (50.39) | 65.82$^{bc}$ (54.61) | 1.10 | 56.54$^{bc}$ (48.75) | 81.51$^{bc}$ (64.55) | 65.93$^{c}$ (54.29) | 59.63$^{bc}$ (50.57) | 67.85$^{bc}$ (55.45) |
| $T_8$ | Chlorantraniliprole 18.5 SC + Azadirachtin 1 EC | 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.25 | 61.39$^{a}$ (51.58) | 90.00$^{a}$ (71.77) | 76.47$^{a}$ (60.98) | 67.03$^{a}$ (55.39) | 74.72$^{a}$ (59.40) | 1.08 | 60.73$^{a}$ (51.19) | 89.54$^{a}$ (71.13) | 76.39$^{a}$ (61.01) | 66.87$^{a}$ (54.93) | 75.26$^{a}$ (63.79) |
| $T_9$ | Chlorfluazuron 5.4 EC + Azadirachtin 1 EC | 2.0 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.70 | 39.87$^{c}$ (39.15) | 68.13$^{cd}$ (55.62) | 48.82$^{d}$ (44.32) | 42.86$^{d}$ (40.84) | 49.70$^{e}$ (46.63) | 1.48 | 40.73$^{d}$ (39.60) | 67.64$^{d}$ (55.33) | 51.62$^{f}$ (45.92) | 42.03$^{d}$ (40.40) | 50.33$^{f}$ (45.32) |
| $T_{10}$ | Quinalphos 25EC (Check) | 2.0 ml l$^{-1}$ | 1.85 | 33.54$^{d}$ (35.39) | 61.88$^{d}$ (51.86) | 46.47$^{d}$ (42.96) | 37.36$^{e}$ (37.68) | 44.63$^{f}$ (42.42) | 1.61 | 37.07$^{d}$ (37.50) | 63.50$^{e}$ (52.84) | 48.15$^{g}$ (43.94) | 37.89$^{d}$ (37.98) | 46.31$^{h}$ (42.88) |
| $T_{11}$ | Untreated control | | 2.60 | - | - | - | - | - | 2.27 | - | - | - | - | - |
| SEm± | | | | 1.44 | 1.47 | 1.69 | 1.80 | 0.71 | | 0.94 | 1.14 | 0.98 | 1.11 | 0.53 |
| CD (5 %) | | | NS | 4.25 | 4.35 | 5.00 | 5.31 | 2.08 | NS | 2.77 | 3.35 | 2.90 | 3.27 | 1.59 |
| CV (%) | | | | 6.36 | 4.75 | 6.60 | 7.68 | 2.74 | | 4.09 | 3.63 | 3.75 | 4.74 | 2.81 |

*Figures in parentheses are angular transformed values*
*PTC: Pre-treatment count*
*DAS: Days After Spraying*

**Table4.Efficacyofdifferentinsecticidesagainstcastor semilooperafterfirst and second spraysduring *rabi*,2021-22**

| S.No. | Treatments | Dosage | percentreductionofcastor semilooperlarval populationovercontrol | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | First spray | | | | | | Second spray | | | | | |
| | | | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per cent reduction | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per centreduction |
| $T_1$ | Spinetoram 11.7 SC | 0.5 ml l$^{-1}$ | 1.30 | 56.82$^{cd}$ (47.74) | 76.32$^{d}$ (60.90) | 76.32$^{d}$ (60.90) | 71.88$^{d}$ (57.99) | 67.51$^{de}$ (54.96) | 1.37 | 56.17$^{bc}$ (48.56) | 75.00$^{c}$ (60.01) | 64.94$^{cd}$ (53.70) | 62.50$^{cd}$ (52.24) | 64.85$^{e}$ (53.52) |
| $T_2$ | Cyantraniliprole 10.26 OD | 1.2 ml l$^{-1}$ | 1.25 | 58.33$^{bcd}$ (48.63) | 78.29$^{cd}$ (62.22) | 78.29$^{cd}$ (62.22) | 72.92$^{c}$ (58.81) | 69.05$^{d}$ (55.90) | 1.27 | 57.41$^{bc}$ (49.26) | 77.08$^{c}$ (61.40) | 69.56$^{c}$ (56.52) | 65.00$^{c}$ (53.75) | 67.56$^{d}$ (55.10) |
| $T_3$ | Chlorantraniliprole 18.5 SC | 0.3 ml l$^{-1}$ | 1.07 | 68.18$^{ab}$ (54.69) | 86.18$^{b}$ (68.22) | 86.18$^{b}$ (68.22) | 80.00$^{b}$ (63.48) | 77.11$^{b}$ (61.24) | 1.18 | 68.52$^{a}$ (55.96) | 86.46$^{b}$ (68.60) | 79.70$^{b}$ (63.57) | 75.17$^{b}$ (60.16) | 77.73$^{b}$ (61.66) |
| $T_4$ | Chlorfluazuron 5.4 EC | 2.0 ml l$^{-1}$ | 1.43 | 49.24$^{e}$ (43.20) | 68.42$^{e}$ (55.81) | 68.42$^{e}$ (55.81) | 65.63$^{d}$ (54.16) | 60.22$^{f}$ (50.58) | 1.58 | 48.77$^{cd}$ (44.29) | 67.71$^{d}$ (55.37) | 59.87$^{de}$ (50.71) | 54.58$^{de}$ (47.63) | 60.14$^{f}$ (49.45) |
| $T_5$ | Azadirachtin 1 EC | 1 ml l$^{-1}$ | 1.63 | 41.67$^{f}$ (38.55) | 64.47$^{e}$ (53.41) | 64.47$^{e}$ (53.41) | 59.58$^{e}$ (50.53) | 53.42$^{h}$ (46.71) | 1.72 | 40.74$^{d}$ (39.65) | 63.54$^{d}$ (52.87) | 49.72$^{f}$ (44.85) | 47.00$^{e}$ (43.85) | 50.69$^{h}$ (45.29) |
| $T_6$ | Spinetoram 11.7 SC + Azadirachtin 1 EC | 0.5 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.17 | 64.39$^{abc}$ (52.32) | 83.55$^{bc}$ (66.11) | 83.55$^{bc}$ (66.11) | 76.56$^{bc}$ (61.10) | 73.11$^{c}$ (58.66) | 1.22 | 64.20$^{abc}$ (53.27) | 82.29$^{bc}$ (65.13) | 74.17$^{bc}$ (59.48) | 67.92$^{c}$ (55.74) | 72.25$^{c}$ (58.19) |
| $T_7$ | Cyantraniliprole 10.26 OD + Azadirachtin 1 EC | 1.2 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.05 | 65.91$^{abc}$ (53.26) | 84.87$^{b}$ (67.33) | 84.87$^{b}$ (67.33) | 78.13$^{b}$ (62.14) | 73.36$^{bc}$ (60.05) | 1.08 | 66.05$^{ab}$ (54.43) | 84.38$^{b}$ (66.73) | 77.86$^{b}$ (61.94) | 72.50$^{bc}$ (58.46) | 75.46$^{b}$ (60.16) |
| $T_8$ | Chlorantraniliprole 18.5 SC + Azadirachtin 1 EC | 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.07 | 69.70$^{a}$ (55.67) | 90.79$^{a}$ (72.40) | 90.79$^{a}$ (72.40) | 85.42$^{a}$ (67.59) | 83.63$^{a}$ (64.35) | 1.12 | 72.22$^{a}$ (58.29) | 92.71$^{a}$ (74.41) | 85.15$^{a}$ (67.44) | 80.42$^{a}$ (63.77) | 82.96$^{a}$ (65.43) |
| $T_9$ | Chlorfluazuron 5.4 EC + Azadirachtin 1 EC | 2.0 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.33 | 54.55$^{de}$ (46.31) | 73.68$^{de}$ (59.15) | 73.68$^{de}$ (59.15) | 68.23$^{d}$ (55.71) | 63.73$^{e}$ (52.84) | 1.47 | 51.23$^{c}$ (45.71) | 72.40$^{cd}$ (58.32) | 62.18$^{d}$ (52.06) | 56.25$^{d}$ (48.59) | 61.52$^{f}$ (51.07) |
| $T_{10}$ | Quinalphos 25EC (Check) | 2.0 ml l$^{-1}$ | 1.60 | 45.45$^{f}$ (40.84) | 66.45$^{e}$ (54.65) | 66.45$^{e}$ (54.65) | 63.54$^{d}$ (52.88) | 57.56$^{g}$ (48.97) | 1.70 | 43.21$^{d}$ (41.09) | 65.63$^{d}$ (54.12) | 54.80$^{e}$ (47.76) | 52.08$^{de}$ (46.19) | 56.34$^{g}$ (47.25) |
| $T_{11}$ | Untreated control | | 2.03 | - | - | - | - | - | 2.40 | - | - | - | - | - |
| SEm± | | | | 1.42 | 1.15 | 1.15 | 1.62 | 0.81 | | 1.49 | 1.02 | 1.61 | 1.74 | 0.80 |
| CD (5 %) | | | NS | 4.19 | 3.40 | 3.40 | 4.78 | 2.39 | NS | 4.40 | 3.00 | 4.74 | 5.14 | 2.36 |
| CV (%) | | | | 5.62 | 3.54 | 3.54 | 5.28 | 2.78 | | 5.80 | 3.15 | 5.49 | 6.26 | 2.79 |

*Figures in parentheses are angular transformed values*
*PTC: Pre-treatment count*
*DAS: Days After Spraying*

**Table5.Efficacyofdifferentinsecticidesagainstcastor semilooperafterthird spray and overall cumulative efficacy during*rabi*,2021-22**

| S.No. | Treatments | Dosage | percentreductionofcastor semilooperlarval populationovercontrol | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Third spray | | | | | | Pooled data | | | | | |
| | | | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per cent reduction | PTC | 1 DAS | 5 DAS | 10 DAS | 15 DAS | Mean per centreduction |
| $T_1$ | Spinetoram 11.7 SC | 0.5 ml l$^{-1}$ | 1.33 | 58.33$^{bc}$ (49.80) | 76.80$^{c}$ (61.20) | 66.67$^{d}$ (54.83) | 60.96$^{cd}$ (51.38) | 60.53$^{de}$ (54.15) | 1.34 | 56.58$^{cd}$ (48.79) | 76.02$^{de}$ (60.68) | 67.68$^{d}$ (55.37) | 62.92$^{cd}$ (52.49) | 66.49$^{d}$ (54.21) |
| $T_2$ | Cyantraniliprole 10.26 OD | 1.2 ml l$^{-1}$ | 1.35 | 61.31$^{bc}$ (51.60) | 78.35$^{c}$ (62.33) | 69.52$^{cd}$ (56.49) | 64.47$^{c}$ (53.42) | 61.42$^{d}$ (55.82) | 1.28 | 58.55$^{c}$ (49.94) | 77.88$^{d}$ (61.95) | 70.59$^{d}$ (57.18) | 65.45$^{c}$ (54.00) | 68.34$^{d}$ (55.62) |
| $T_3$ | Chlorantraniliprole 18.5 SC | 0.3 ml l$^{-1}$ | 1.17 | 70.24$^{a}$ (56.95) | 88.14$^{b}$ (69.90) | 80.95$^{b}$ (64.17) | 74.56$^{b}$ (59.92) | 78.63$^{b}$ (62.40) | 1.16 | 68.64$^{b}$ (55.94) | 86.99$^{b}$ (68.87) | 80.22$^{b}$ (63.62) | 74.78$^{b}$ (59.90) | 76.15$^{b}$ (61.79) |
| $T_4$ | Chlorfluazuron 5.4 EC | 2.0 ml l$^{-1}$ | 1.53 | 49.40$^{cd}$ (44.66) | 70.62$^{d}$ (57.18) | 61.43$^{e}$ (51.63) | 52.19$^{d}$ (46.26) | 56.75$^{e}$ (49.84) | 1.57 | 48.46$^{d}$ (44.13) | 68.96$^{g}$ (56.16) | 62.18$^{ef}$ (52.06) | 54.92$^{d}$ (47.82) | 59.75$^{f}$ (49.97) |
| $T_5$ | Azadirachtin 1 EC | 1 ml l$^{-1}$ | 1.70 | 42.14$^{d}$ (40.46) | 67.53$^{d}$ (55.26) | 53.81$^{f}$ (47.20) | 41.23$^{e}$ (39.91) | 51.85$^{g}$ (45.67) | 1.69 | 40.75$^{e}$ (39.67) | 65.24$^{i}$ (53.87) | 54.17$^{g}$ (47.40) | 46.24$^{e}$ (42.83) | 51.67$^{h}$ (45.91) |
| $T_6$ | Spinetoram 11.7 SC + Azadirachtin 1 EC | 0.5 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.08 | 65.48$^{ab}$ (54.06) | 84.02$^{bc}$ (66.40) | 74.48$^{bcd}$ (59.68) | 67.54$^{c}$ (55.31) | 63.90$^{c}$ (58.60) | 1.14 | 64.25$^{c}$ (53.31) | 83.27$^{c}$ (65.86) | 75.02$^{cd}$ (60.02) | 68.26$^{c}$ (55.73) | 72.96$^{c}$ (58.50) |
| $T_7$ | Cyantraniliprole 10.26 OD + Azadirachtin 1 EC | 1.2 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.07 | 67.26$^{a}$ (55.12) | 86.08$^{b}$ (68.40) | 76.95$^{bc}$ (61.34) | 72.37$^{bc}$ (58.29) | 76.83$^{b}$ (60.48) | 1.01 | 66.01$^{c}$ (54.36) | 85.13$^{bc}$ (67.41) | 77.63$^{c}$ (61.79) | 72.61$^{bc}$ (58.48) | 74.78$^{bc}$ (60.26) |
| $T_8$ | Chlorantraniliprole 18.5 SC + Azadirachtin 1 EC | 0.3 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.02 | 72.62$^{a}$ (58.48) | 92.78$^{a}$ (74.39) | 86.19$^{a}$ (68.41) | 81.58$^{a}$ (64.78) | 82.45$^{a}$ (65.86) | 1.03 | 71.27$^{a}$ (57.59) | 92.19$^{a}$ (73.78) | 85.59$^{a}$ (67.71) | 80.90$^{a}$ (64.16) | 82.31$^{a}$ (65.27) |
| $T_9$ | Chlorfluazuron 5.4 EC + Azadirachtin 1 EC | 2.0 ml l$^{-1}$ + 1 ml l$^{-1}$ | 1.43 | 52.98$^{c}$ (46.71) | 74.74$^{cd}$ (59.79) | 64.76$^{de}$ (53.59) | 55.70$^{d}$ (48.28) | 58.00$^{e}$ (51.96) | 1.39 | 52.19$^{d}$ (46.24) | 73.61$^{f}$ (59.08) | 64.93$^{de}$ (53.70) | 57.30$^{d}$ (49.19) | 63.00$^{e}$ (51.94) |
| $T_{10}$ | Quinalphos 25EC (Check) | 2.0 ml l$^{-1}$ | 1.65 | 44.64$^{d}$ (41.92) | 69.07$^{d}$ (56.08) | 59.52$^{e}$ (50.51) | 49.12$^{d}$ (44.50) | 54.22$^{f}$ (48.16) | 1.67 | 43.64$^{d}$ (41.34) | 67.10$^{h}$ (54.99) | 59.11$^{f}$ (50.26) | 52.11$^{d}$ (46.20) | 55.78$^{g}$ (48.14) |
| $T_{11}$ | Untreated control | | 2.47 | - | - | - | - | - | 2.30 | - | - | - | - | - |
| SEm± | | | | 1.50 | 1.17 | 1.68 | 1.79 | 0.78 | | 0.90 | 0.66 | 0.94 | 1.02 | 0.53 |
| CD (5 %) | | | NS | 4.41 | 3.44 | 4.96 | 5.28 | 2.31 | NS | 2.65 | 1.94 | 2.78 | 3.02 | 1.57 |
| CV (%) | | | | 5.70 | 3.52 | 5.64 | 6.53 | 2.70 | | 3.48 | 2.01 | 3.15 | 3.68 | 2.50 |

*Figures in parentheses are angular transformed values*
*PTC: Pre-treatment count*
*DAS: Days After Spraying*