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FIELD ASSESSMENT OF SELECTED INSECTICIDES AGAINST THRIPS, *THRIPS TABACI* (LINDEMAN) INFESTING OKRA

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A field experiment was conducted during the *Kharif* season at the Research Farm of the Department of Agricultural Entomology, College of Agriculture, Badnapur, to evaluate the efficacy of selected insecticides against thrips on okra (*Abelmoschus esculentus* L.). The experiment consisted of seven treatments, including six insecticidal treatments and an untreated control, arranged under field conditions. The treatments comprised Cyantraniliprole 10.26 OD @ 10 ml per 10 L of water (T₁), Thiamethoxam 25 WG @ 3 g per 10 L of water (T₂), Emamectin benzoate 5 SG @ 3 g per 10 L of water (T₃), Chlorantraniliprole 18.5 SC @ 2.5 ml per 10 L of water (T₄), Acetamiprid 20 SP @ 2 g per 10 L of water (T₅), and Cypermethrin 25 EC @ 3 ml per 10 L of water (T₆), while T₇ served as the untreated control.

ABSTRACT Pooled mean analysis indicated that Cyantraniliprole 10.26 OD (T₁) recorded the lowest thrips population (4.55 thrips per three leaves) and emerged as the most effective treatment. Acetamiprid 20 SP (T₅) with 4.65 thrips per three leaves and Thiamethoxam 25 WG (T₂) with 4.91 thrips per three leaves were found to be statistically at par with T₁, demonstrating consistent and comparable efficacy across both spray applications. In contrast, the untreated control registered the highest thrips population throughout the observation period. Based on these findings, Cyantraniliprole, Thiamethoxam, and Acetamiprid can be recommended for effective management of thrips in okra during the kharif season under field conditions.

Key words: Okra, *Abelmoschus esculentus*, *Thrips tabaci*, insecticide efficacy, field evaluation, cyantraniliprole, thiamethoxam, acetamiprid, thrips management, kharif season, integrated pest management.

Introduction

Okra (*Abelmoschus esculentus* L. Moench), commonly known as lady's finger or bhindi, is an important vegetable crop belonging to the family Malvaceae and is extensively cultivated in tropical and subtropical regions of the world. The crop is valued for its tender green pods, high nutritional content, and wide culinary acceptance. India ranks as the largest producer of okra globally, followed by countries such as Nigeria, Sudan, Pakistan, Cameroon, Iraq, and Ghana. In addition to its dietary importance, okra has long been recognized in traditional

medicine in Africa and India for the management of various ailments, and in recent years it has gained attention as a functional food owing to its rich phytochemical and nutritional profile.

Despite its economic and nutritional significance, okra production is severely constrained by several biotic stresses including fungi, bacteria, phytoplasma, viruses, nematodes, and a wide spectrum of insect pests (Sastry *et al.*, 2025). Insect pests constitute one of the major limiting factors in successful okra cultivation, often causing substantial quantitative and qualitative yield losses (Bhatt

and Karnatak, 2018). The crop is attacked by numerous insect species such as shoot and fruit borer, fruit borer, whitefly, leafhopper, aphids, leaf roller, blister beetle, dusky cotton bug, and red spider mite. Among these, thrips, whiteflies, and borers are considered key pests responsible for significant economic damage (Kumar *et al.*, 2017).

Thrips (Order: Thysanoptera; Family: Thripidae) are regarded as one of the most destructive insect groups affecting vegetable ecosystems worldwide. They damage crops by rasping and sucking plant tissues, leading to symptoms such as leaf curling, silverying, stippling, and distortion, which ultimately reduce photosynthetic efficiency and marketable yield. Thrips undergo gradual metamorphosis comprising six developmental stages: egg, two larval instars, pre-pupa, pupa, and adult. Both nymphs and adults inflict direct injury through feeding and oviposition, and indirect injury by transmitting tospoviruses, rendering produce unmarketable and resulting in considerable economic losses to growers. Although non-chemical approaches such as cultural, biological, and botanical control measures have shown promise, management of thrips in commercial vegetable production still largely depends on synthetic insecticides (Jamian *et al.*, 2024).

Among the various thrips species, onion thrips, *Thrips tabaci* (Lindeman), has emerged as a major pest of okra and several other crops. The species is highly polyphagous, with reports indicating an extensive host range exceeding 300 plant species across numerous botanical families. Its remarkable adaptability enables survival across diverse agro-climatic conditions and cropping systems, thereby establishing it as a persistent and economically important pest. In Hawaii alone, *T. tabaci* has been recorded on 66 plant species belonging to 25 families (Gill *et al.*, 2015), while its infestation has been documented on a wide array of vegetable crops including bean, cabbage, carrot, cucumber, garlic, kale, pea, pepper, potato, pumpkin, spinach, tomato, and turnip, among others (Din *et al.*, 2016). In okra, severe infestations of *T. tabaci* have been reported to cause yield losses ranging from 30 to 50 per cent (Nault and Shelton, 2012), and inadequate management during early crop growth stages may aggravate losses up to 54.04 per cent (Anitha and Nandihalli, 2008).

Chemical control remains the most widely adopted strategy for thrips management in okra due to its rapid knock-down effect and ease of application. However, indiscriminate and repeated use of conventional insecticides such as carbamates, organophosphates, and synthetic pyrethroids has led to the development of

insecticide resistance, pest resurgence, secondary pest outbreaks, and environmental contamination (Aravindaram *et al.*, 2026). These concerns necessitate the judicious selection and rotation of effective insecticidal molecules with due consideration to economic feasibility, ecological safety, and sustainability (Sadafale *et al.*, 2025 a,b,c).

In view of the increasing pest pressure of *T. tabaci*, its wide host adaptability, and the limitations associated with indiscriminate pesticide use, systematic evaluation of newer and comparatively safer insecticidal options under field conditions becomes imperative. Therefore, the present investigation was undertaken to assess the field efficacy of selected insecticides against onion thrips, *T. tabaci* (Lindeman), infesting okra and to compare their relative effectiveness for developing an efficient and sustainable pest management strategy.

Materials and Methods

Experimental site and season

The present investigation was carried out during the kharif season at the Research Farm of the Department of Agricultural Entomology, College of Agriculture, Badnapur, Maharashtra, India. The experimental location falls under the Central Maharashtra Plateau Zone and is geographically situated at 19°86'66" N latitude and 75°70'72" E longitude, with an altitude of 520 m above mean sea level. The region is characterized by semi-arid climatic conditions typical of the Deccan plateau, which are conducive for okra cultivation as well as thrips incidence.

Experimental design and crop details

The experiment was laid out in a Randomized Block Design (RBD) with seven treatments replicated three times. The test crop was okra (*Abelmoschus esculentus* L.) variety Parbhani Kranti, a widely cultivated and high-yielding cultivar. Each experimental plot measured 4.2 m × 5.4 m, and the crop was maintained at a spacing of 60 cm × 45 cm. Sowing was carried out on 13 July 2019, and all recommended agronomic and plant protection practices, except the experimental treatments, were followed uniformly throughout the cropping period.

Treatments and Insecticidal application

The experiment comprised six insecticidal treatments along with an untreated control. The treatments evaluated were:

- T₁**: Cyantraniliprole 10.26 OD @ 10 ml per 10 L of water
- T₂**: Thiamethoxam 25 WG @ 3 g per 10 L of water
- T₃**: Emamectin benzoate 5 SG @ 3 g per 10 L of water

T₄: Chlorantraniliprole 18.5 SC @ 2.5 ml per 10 L of water

T₅: Acetamiprid 20 SP @ 2 g per 10 L of water

T₆: Cypermethrin 25 EC @ 3 ml per 10 L of water

T₇: Untreated control (no insecticide application)

The first spray was imposed upon attainment of the Economic Threshold Level (ETL) of major insect pests, while the second spray was applied 15 days after the first application. Spraying was performed using a knapsack sprayer ensuring uniform coverage of foliage.

Observation recorded

Observations on thrips incidence were recorded one day before spraying and subsequently at 3, 5, 7, 10, and 14 days after each spray (DAS). For data collection, five plants were randomly selected from each plot, excluding border rows to eliminate edge effects. The population of both nymphs and adults of thrips was counted from three leaves per plant, representing the upper, middle, and lower canopy.

Statistical analysis

The recorded data on thrips population were subjected to square root transformation ($\sqrt{x + 0.5}$) prior to statistical analysis to normalize variance. The transformed data were analyzed using Analysis of Variance (ANOVA) appropriate for Randomized Block Design, following the methodology described by Panse and Sukhatme (1967). Treatment means were compared at the appropriate level of significance.

Result and Discussion

The differential response of thrips population to various insecticidal treatments observed in the present study may be attributed to variation in their mode of action and persistence under field conditions.

Efficacy of selected insecticides against thrips after first spray

Table 1: Efficacy of selected insecticides against thrips after first spray.

Tr. No.	Treatments	Dose / 10 L	Average thrips / 3 leaves						
			1 DBS	3 DAS	5 DAS	7 DAS	10 DAS	14 DAS	Mean
T ₁	Cyantraniliprole 10.26 OD	10ml	19.73(4.47)	4.73(2.27)	4.87(2.31)	5.07(2.35)	6.13(2.52)	5.00(2.29)	5.16(2.35)
T ₂	Thiamethoxam 25 WG	3 g	20.80(4.60)	5.33(2.37)	5.53(2.39)	5.93(2.51)	6.27(2.56)	5.40(2.42)	5.69(2.45)
T ₃	Emamectine Benzoate 5 SG	3 g	19.00(4.41)	10.13(3.25)	10.53(3.31)	10.73(3.31)	11.80(3.50)	10.10(3.24)	10.66(3.32)
T ₄	Chlorantraniliprole 18.5 SC	2.5 ml	20.60(4.56)	17.33(4.21)	16.60(4.13)	17.13(4.18)	16.33(4.10)	10.40(3.30)	15.56(3.98)
T ₅	Acetamiprid 20 SP	2 g	15.13(3.95)	4.40(2.21)	4.87(2.30)	5.13(2.35)	5.73(2.45)	5.60(2.38)	5.15(2.34)
T ₆	Cypermethrin 25 EC	3 ml	16.67(4.11)	9.27(3.11)	8.07(2.89)	9.40(3.12)	9.40(3.14)	8.87(3.05)	9.00(3.06)
T ₇	Untreated check	-	19.00(4.34)	19.80(4.48)	18.20(4.32)	18.93(4.40)	19.67(4.49)	12.80(3.64)	17.88(4.27)
SE(m)±			0.367	0.225	0.230	0.205	0.232	0.227	0.22
CD at 5%			NS	0.692	0.710	0.631	0.716	0.699	0.69
CV (%)			14.61	12.44	12.91	11.09	12.38	13.53	12.47

One Day Before Spraying (Pre-treatment):

The pre-treatment observations on thrips population (Table 2) revealed no significant differences among treatments, indicating a uniform distribution of thrips across all experimental plots prior to insecticidal application. This confirmed the homogeneity of pest incidence before imposition of treatments.

Three Days After First Spray (3 DAS):

At 3 DAS, significant differences among treatments were observed. Treatment T₅ (Acetamiprid 20 SP) recorded the lowest thrips population (4.40 thrips per three leaves) and proved to be the most efficacious. It was statistically at par with T₁ (Cyantraniliprole 10.26 OD) with 4.73 thrips and T₂ (Thiamethoxam 25 WG) with 5.33 thrips per three leaves. Treatments T₆ (Cypermethrin 25 EC) with 9.27 thrips and T₃ (Emamectin benzoate 5 SG) with 10.13 thrips formed the next effective group and were statistically at par with each other. T₄ (Chlorantraniliprole 18.5 SC) recorded comparatively higher infestation (17.33 thrips per three leaves), while the untreated control (T₇) registered the highest population (19.80 thrips per three leaves).

Five Days After First Spray (5 DAS):

A similar trend was observed at 5 DAS. T₅ remained superior, recording the minimum thrips population (4.87 thrips per three leaves), and was statistically at par with T₁ (4.87 thrips), T₂ (5.53 thrips), and T₆ (8.07 thrips). T₃ (10.53 thrips per three leaves) exhibited moderate efficacy, whereas T₄ (16.60 thrips per three leaves) showed poor performance and was statistically at par with the untreated control (18.20 thrips per three leaves).

Seven Days After First Spray (7 DAS):

At 7 DAS, T₁ (Cyantraniliprole 10.26 OD) recorded the lowest thrips population (5.07 thrips per three leaves) and emerged as the most effective treatment. T₅ (5.13 thrips) and T₂ (5.93 thrips) were statistically at par with

Table 2: Efficacy of selected insecticides against thrips after second spray,

Tr. No.	Treatments	Dose / 10 L	Average thrips / 3 leaves					Mean
			3 DAS	5 DAS	7 DAS	10 DAS	14 DAS	
T ₁	Cyantraniliprole 10.26 OD	10ml	3.47(1.97)	3.13(1.89)	4.00(2.08)	4.60(2.24)	4.47(2.22)	3.93(2.08)
T ₂	Thiamethoxam 25 WG	3 g	4.00(2.09)	2.93(1.79)	3.93(2.09)	4.40(2.20)	5.33(2.40)	4.12(2.11)
T ₃	Emamectine Benzoate 5 SG	3 g	8.07(2.91)	9.53(3.14)	9.73(3.19)	9.33(3.12)	8.67(3.00)	9.07(3.07)
T ₄	Chlorantraniliprole 18.5 SC	2.5ml	10.47(3.29)	11.07(3.38)	11.00(3.36)	10.53(3.31)	9.67(3.18)	10.55(3.30)
T ₅	Acetamiprid 20 SP	2 g	3.73(2.02)	3.60(2.01)	4.07(2.12)	4.87(2.31)	4.53(2.23)	4.16(2.14)
T ₆	Cypermethrin 25 EC	3ml	7.87(2.88)	7.60(2.85)	8.13(2.92)	9.20(3.08)	8.60(2.98)	8.28(2.94)
T ₇	Untreated check	-	13.20(3.68)	12.40(3.58)	12.93(3.66)	11.33(3.42)	11.53(3.45)	12.28(3.56)
SE(m)±			0.226	0.233	0.227	0.196	0.205	0.22
CD at 5%			0.697	0.717	0.701	0.605	0.632	0.67
CV(%)			14.54	15.13	14.19	12.11	12.79	13.75

T₁, indicating comparable efficacy. T₆ (9.40 thrips) and T₃ (10.73 thrips) constituted the next effective group, followed by T₄ (17.13 thrips). The untreated control continued to register the highest infestation (18.93 thrips per three leaves).

Ten Days After First Spray (10 DAS):

At 10 DAS, T₅ again registered the lowest thrips population (5.73 thrips per three leaves) and was statistically at par with T₁ (6.13 thrips) and T₆ (6.27 thrips). T₃ (11.80 thrips per three leaves) demonstrated moderate efficacy, whereas T₄ (16.33 thrips per three leaves) was the least effective among treated plots. The untreated control recorded the maximum thrips population (19.67 thrips per three leaves).

Fourteen Days After First Spray (14 DAS):

Observations at 14 DAS indicated continued significant variation among treatments. T₁ recorded the minimum thrips population (5.00 thrips per three leaves), followed by T₂ (5.40 thrips), T₅ (5.60 thrips), and T₆ (8.87 thrips), all of which were statistically at par with T₁. T₃ (10.10 thrips) and T₄ (10.40 thrips) were comparatively less effective and were statistically at par with the untreated control (12.80 thrips per three leaves) (Table 1).

Overall, the first spray results indicated that Cyantraniliprole, Acetamiprid, and Thiamethoxam consistently maintained lower thrips populations, whereas Chlorantraniliprole exhibited comparatively poor suppression.

Efficacy of selected insecticides against thrips after second spray,

Three Days After Second Spray (3 DAS):

At 3 DAS following the second spray, T₁ (Cyantraniliprole 10.26 OD) recorded the lowest thrips population (3.47 thrips per three leaves) and was found significantly superior over the untreated control. T₅ (Acetamiprid 20 SP) with 3.73 thrips and T₂

(Thiamethoxam 25 WG) with 4.00 thrips per three leaves were statistically at par with T₁, indicating comparable efficacy. Treatments T₆ (Cypermethrin 25 EC) with 7.87 thrips, T₃ (Emamectin benzoate 5 SG) with 8.07 thrips, and T₄ (Chlorantraniliprole 18.5 SC) with 10.47 thrips per three leaves exhibited moderate suppression but remained significantly superior to the untreated control (13.20 thrips per three leaves).

Five Days After Second Spray (5 DAS):

At 5 DAS, T₂ (Thiamethoxam 25 WG) proved to be the most effective treatment, recording the lowest thrips population (2.93 thrips per three leaves). T₁ (3.13 thrips) and T₅ (3.60 thrips) were statistically at par with T₂. T₆ (7.60 thrips per three leaves) demonstrated moderate efficacy, whereas T₃ (9.53 thrips) and T₄ (11.07 thrips) were comparatively less effective, although they remained superior to the untreated control (12.40 thrips per three leaves).

Seven Days After Second Spray (7 DAS):

At 7 DAS, T₂ again emerged as the most efficacious treatment with 3.93 thrips per three leaves, followed closely by T₁ (4.00 thrips) and T₅ (4.07 thrips), both of which were statistically at par with T₂. T₆ (8.13 thrips) and T₃ (9.73 thrips) formed the moderately effective group, while T₄ (11.00 thrips) was the least effective among treated plots, though still superior to the untreated control (12.93 thrips per three leaves).

Ten Days After Second Spray (10 DAS):

At 10 DAS, T₂ continued to maintain the lowest thrips population (4.40 thrips per three leaves) and was statistically at par with T₁ (4.60 thrips) and T₅ (4.87 thrips). Treatments T₆ (9.20 thrips), T₃ (9.33 thrips), and T₄ (10.53 thrips) were less effective and were statistically at par with the untreated control (11.33 thrips per three leaves).

Fourteen Days After Second Spray (14 DAS):

At 14 DAS, T₁ proved superior by recording the

Table 3: Pooled analysis of thrips (*Thrips tabaci* Lindeman) population in okra as influenced by different insecticidal treatment.

Tr. No.	Treatments	Dose / 10 L	Average thrips / 3 leaves			
			1 DBS	First spray	Second spray	Pooled mean
T ₁	Cyantraniliprole 10.26 OD	10ml	19.73(4.47)	5.16(2.35)	3.93(2.08)	4.55(2.21)
T ₂	Thiamethoxam 25 WG	3 g	20.80(4.60)	5.69(2.45)	4.12(2.11)	4.91(2.28)
T ₃	Emamectine Benzoate 5 SG	3 g	19.00(4.41)	10.66(3.32)	9.07(3.07)	9.86(3.20)
T ₄	Chlorantraniliprole 18.5 SC	2.5 ml	20.60(4.56)	15.56(3.98)	10.55(3.30)	13.05(3.64)
T ₅	Acetamiprid 20 SP	2 g	15.13(3.95)	5.15(2.34)	4.16(2.14)	4.65(2.24)
T ₆	Cypermethrin 25 EC	3 ml	16.67(4.11)	9.00(3.06)	8.28(2.94)	8.64(3.00)
T ₇	Untreated check	-	19.00(4.34)	17.88(4.27)	12.28(3.56)	15.08(3.91)
SE(m)±			0.367	0.22	0.22	0.22
CD at 5%			NS	0.69	0.67	0.68
CV (%)			14.61	12.47	13.75	13.11

minimum thrips population (4.47 thrips per three leaves), followed by T₅ (4.53 thrips) and T₂ (5.33 thrips), all of which were statistically at par with T₁. T₆ (8.60 thrips), T₃ (8.67 thrips), and T₄ (9.67 thrips) showed comparatively lower efficacy. The untreated control recorded the highest thrips population (11.53 thrips per three leaves) (Table 2).

Overall, the second spray results reaffirmed that Cyantraniliprole, Thiamethoxam, and Acetamiprid consistently provided superior and sustained suppression of thrips populations, whereas Chlorantraniliprole and Emamectin benzoate exhibited comparatively lower effectiveness under field conditions.

Pooled analysis of thrips, *Thrips tabaci* (Lindeman) population in okra as influenced by different insecticidal treatments

First Spray (Pooled Over Observation Period):

The pooled data following the first spray revealed significant differences among treatments. Cyantraniliprole 10.26 OD (T₁) recorded the lowest thrips population (5.16 thrips per three leaves) and emerged as the most effective treatment. Acetamiprid 20 SP (T₅) with 5.15 thrips per three leaves and Thiamethoxam 25 WG (T₂) with 5.69 thrips per three leaves were found to be statistically at par with T₁, indicating comparable efficacy in suppressing thrips population during the first spray period (Table 3).

Second Spray (Pooled Over Observation Period):

A similar trend was observed after the second spray, wherein Cyantraniliprole 10.26 OD (T₁) again recorded the minimum thrips population (3.93 thrips per three leaves). Thiamethoxam 25 WG (T₂) and Acetamiprid 20 SP (T₅) registered 4.12 and 4.16 thrips per three leaves, respectively, and were statistically at par with T₁, demonstrating sustained effectiveness across successive applications (Table 3).

Pooled Mean of First and Second Spray:

The overall pooled mean analysis of both sprays clearly demonstrated the superiority of Cyantraniliprole 10.26 OD (T₁), which recorded the lowest pooled thrips population of 4.55 thrips per three leaves. Acetamiprid 20 SP (T₅) with 4.65 thrips per three leaves and Thiamethoxam 25 WG (T₂) with 4.91 thrips per three leaves were statistically at par with T₁, highlighting their consistent and comparable effectiveness across both spray schedules.

The present findings are in close agreement with earlier reports. Bhosle *et al.*, (2009) and Raghuraman *et al.*, (2008) documented that thrips populations can be effectively managed using Acetamiprid 20 SP. Similarly, Abbas *et al.*, (2012) reported the efficacy of Acetamiprid against thrips in cotton ecosystems. Gaurkhede *et al.*, (2015) also observed significant reduction in thrips density with Acetamiprid 20 SP application. Furthermore, Lodaya *et al.*, (2017) evaluated Cyantraniliprole 10 OD and reported its excellent protective performance against thrips infestation. These corroborative findings substantiate the present results and reinforce the potential of Cyantraniliprole and Acetamiprid as reliable chemical options for thrips management in okra under field conditions.

Conclusion

The present investigation clearly demonstrated that the application of different insecticides significantly influenced the population dynamics of thrips (*Thrips tabaci* Lindeman) on okra under field conditions. Among the evaluated treatments, Cyantraniliprole 10.26 OD, Thiamethoxam 25 WG, and Acetamiprid 20 SP consistently recorded the lowest thrips populations following both the first and second sprays and emerged as the most effective insecticidal options. These treatments were statistically at par with one another at several observation intervals, indicating comparable

efficacy as well as persistence of action. In contrast, the untreated control plots consistently registered the highest thrips infestation throughout the experimental period. Based on the overall performance and pooled mean analysis, Cyantraniliprole, Thiamethoxam, and Acetamiprid can be recommended for effective management of onion thrips in okra during the kharif season. Nevertheless, their use should be incorporated within an integrated pest management (IPM) framework, combining cultural, biological, and need-based chemical interventions to ensure long-term sustainability, minimize environmental risks, and delay the development of insecticide resistance.

Author Contribution statement

This work was carried out in close collaboration among all authors, with Sonawane, S. T. serving as the principal and corresponding author. Sonawane, S. T. led the conceptualization and design of the study, execution of field experiments, data collection, statistical analysis, and primary drafting of the manuscript. Suradkar, A. L., Gaurav Vinod Rao Sadafale, Gadge, P. R. and Patil, B. V. contributed to data interpretation, technical guidance, critical review of the manuscript, and improvement of scientific content and structure. All authors participated in manuscript revision, read and approved the final version for publication, and agree to be accountable for all aspects of the work.

Conflict of Interest statement

The authors declare that they have no known financial or non-financial conflicts of interest that could have appeared to influence the work reported in this paper.

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