Journal of Experimental Agriculture International

Volume 46, Issue 10, Page 381-387, 2024; Article no.JEAI.124565
ISSN: 2457-0591
(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)

Efficacy of Different Bio-Pesticide and Botanical against Onion Thrips (*Thrips tabaci* L.)

Deepak Kumar Gocher [a*], A. K. Chaudhary [a], Pradeep Kumar [a] and Jatin Goswami [a]

[a] Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi, 284128, Utter Pradesh, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jeai/2024/v46i102960

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/124565

Original Research Article

Received: 28/07/2024
Accepted: 30/09/2024
Published: 14/10/2024

ABSTRACT

The field experiment was conducted to evaluate efficacy of Bio-pesticide and botanical against thrips on onion and was carried out at experimental Farm of Organic Research farm Karguwan Ji, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Utter Pradesh) during *Rabi* Season of 2022-2023. The Bio-pesticide and botanical evaluated were *Beauveria bassiana,* Garlic extract*, Metarrhizium anisopliae,* Castor oil*,* NSKE, Neem oil*,* were tested against onion thrips under field conditions along with untreated control. Two sprays were given at an interval of fifteen days starting at the ETL. The treatment with Garlic extract emerged as the most effective treatment and recorded the least (2.07- 2.80) thrips /5 leaves.

**Corresponding author: E-mail: deepakgocher0908@gmail.com;*

Cite as: *Gocher, Deepak Kumar, A. K. Chaudhary, Pradeep Kumar, and Jatin Goswami. 2024. "Efficacy of Different Bio-Pesticide and Botanical Against Onion Thrips (Thrips Tabaci L.)". Journal of Experimental Agriculture International 46 (10):381-87. https://doi.org/10.9734/jeai/2024/v46i102960.*

Keywords: Onion; thrips; efficacy; Bio-pesticide; botanical.

1. INTRODUCTION

Allium cepa L., also known as bulb onion or common onion, is a widely farmed bulbous vegetable in the Amaryllidaceae family. It is widely cultivated and commercialized in India and other countries, with its ability to withstand risks of rough handling and long-distance transport being crucial for its commercial success. Onions have unique properties that enhance the taste and flavor of meals and provide therapeutic benefits. “They are used in salads, sauces, soups, and pickles, and can be made into various products like onion paste, powder, oil, vinegar, sauce, pickled onions, wine, and beverages. The Germans refer to onions as the **"**Queen of Kitchens**"**. Recently, onions have grown in importance as a cash crop due to their excellent export potential. However, cultivation is highly technical and dependent on environmental variables like photoperiod and temperature. Onions face various biotic and abiotic factors that reduce crop output, with insect infestation being a critical factor. Common pests include red spider mite, eriophyid mite, bulb mite, cutworm, and leaf minor. Onion thrips, the most prevalent pest, reduces yield by 35-45%” [1]. Onion thrips, a key pest worldwide, has developed insecticide resistance, transmitted plant pathogens, and produced more generations at high temperatures. Over the past two decades, it has become a global concern in commercial onion production [2]. Farmers rely on chemical control for thrips control due to significant losses. However, indiscriminate pesticide application leads to resistance, residue, and recurrence, posing environmental and human threats. New generation pesticides have systemic action, potentially causing toxicity in the plant system, posing health risks (Mishra et al*.,* 2014). Ecofriendly management of onion thrips in Uttar Pradesh requires biopesticide and botanical.

2. MATERIALS AND METHODS

2.1 Experimental Details

A Field study was carried out at the experimental field, Organic Research Farm Karguwan Ji, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi, Utter Pradesh During the *Rabi* Season of 2022-2023. In the experiment used onion variety **“**Bhima Shweta**”** for transplanting. The experiment was laid out in a Randomized Block Design with seven treatments that were replicated three times. To raise the onion crop, the other recommended agronomical package of practises was followed during the crop duration.

2.2 Methods of Observations

2.2.1 Evaluate efficacy of botanical and biopesticide

In each plot five plants were randomly selected and number of nymphs and adult’s thrips were recorded in central leaf axis one day before spraying and 3,7 and 14 days after each spray. two sprays were given at an interval of fifteen days starting from thrips incidence at ETL *i.e.,* 5-25 nymphs and adults/plant. The population of adult and nymph were counted by naked eyes and with the help of 10x magnification hand Lense.

2.3 Statistical Analysis

The data on average survival population of thrips was transformed into square root transformation ($\sqrt{x+5}$) was subjected to statistical analysis as suggested by Panse and Sukhatme [3]. The standard error (S.E.) and critical difference (C.D.) at 5% level of probability were calculated. The yield data was subjected to statistical analysis.

3. RESULTS AND DISCUSSION

3.1 First Spray

3.1.1 Day before spray

The mean data of the results revealed that number of thrips reduction per treatment ranged from 18.77 to 23.33 and there was no statically significant difference between the treatments (Table 1).

3.1.2 Three days after spray

Table 2 shows that the thrips' survival population three days after spraying was significantly lower and superior to the untreated control. The average survival per plant ranged from 18.70 to 23.30, compared to 23.53 in the untreated control.

Table 1. Efficacy of Bio-pesticides and botanicals against onion thrips, *Thrips tabaci*

No. of thrips reduction days after					
Treatment	**DBS**	**3 DAS**	**7 DAS**	**14 DAS**	**Mean**
Beauveria bassiana	19.63	19.57	19.43	19.28	19.48
Garlic extract	20.83	20.68	20.43	20.23	20.54
Metarrhizium anisopliae	21.37	21.17	21.10	21.06	21.18
Castor oil	22.56	22.43	22.17	22.07	22.31
NSKE	23.57	23.30	22.88	22.88	23.16
Neem oil	18.77	18.70	19.28	19.08	18.96
Control	23.33	23.53	23.73	23.87	23.62
C.D.	**2.5**	**2.69**	**2.25**	**2.38**	----
SE(m)	**0.81**	**0.87**	**0.75**	**0.79**	----

** Figure in parenthesis denote transformed value *DBS-Day Before Spraying *DAS-Day After Spraying*

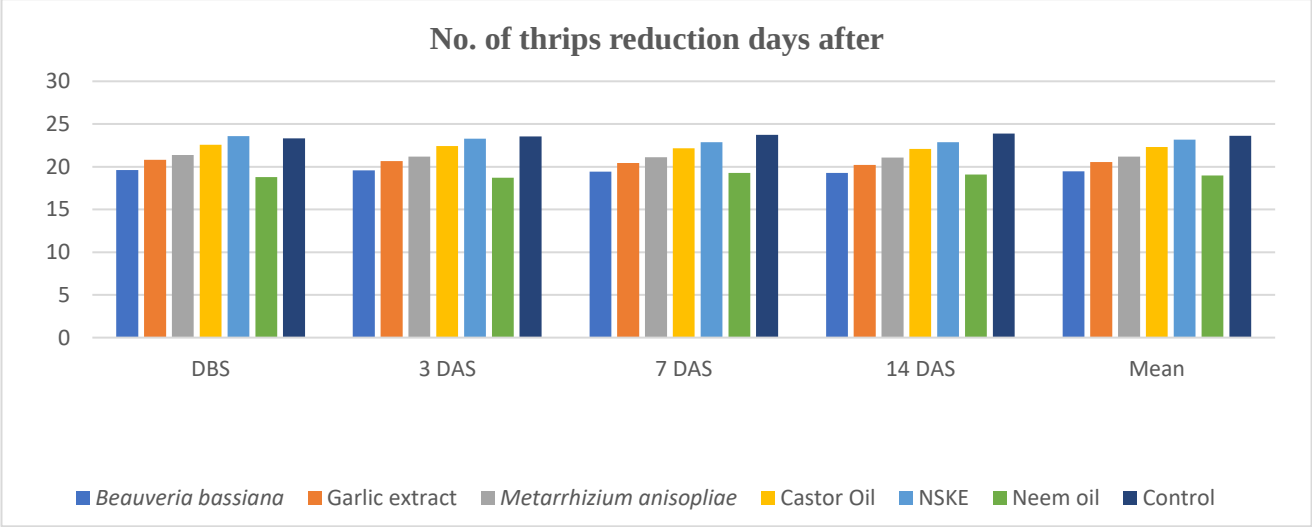

Fig. 1. Efficacy of Bio-pesticides and botanicals against onion thrips, *Thrips tabaci* L.

Table 2. Efficacy of Bio-pesticides and botanicals against onion thrips, *Thrips tabaci* L.

	No. of thrips reduction days after				
Treatment	**DBS**	**3 DAS**	**7 DAS**	**14 DAS**	**Mean**
Beauveria bassiana	4.47	4.33	4.60	4.73	4.53
Garlic extract	3.13	2.80	2.40	2.07	2.60
Metarrhizium anisopliae	3.27	3.27	2.80	2.47	2.95
Castor oil	4.60	4.60	4.40	4.33	4.48
NSKE	5.20	5.47	5.33	5.27	5.32
Neem oil	3.93	3.53	3.13	2.87	3.37
Control	35.40	35.53	35.90	36.03	35.72
C.D.	**1.09**	**1.04**	**1.16**	**1.10**	----
SE(m)	**0.35**	**0.34**	**0.38**	**0.37**	----

** Figure in parenthesis denote transformed value *DBS-day before spraying *DAS-day after spraying*

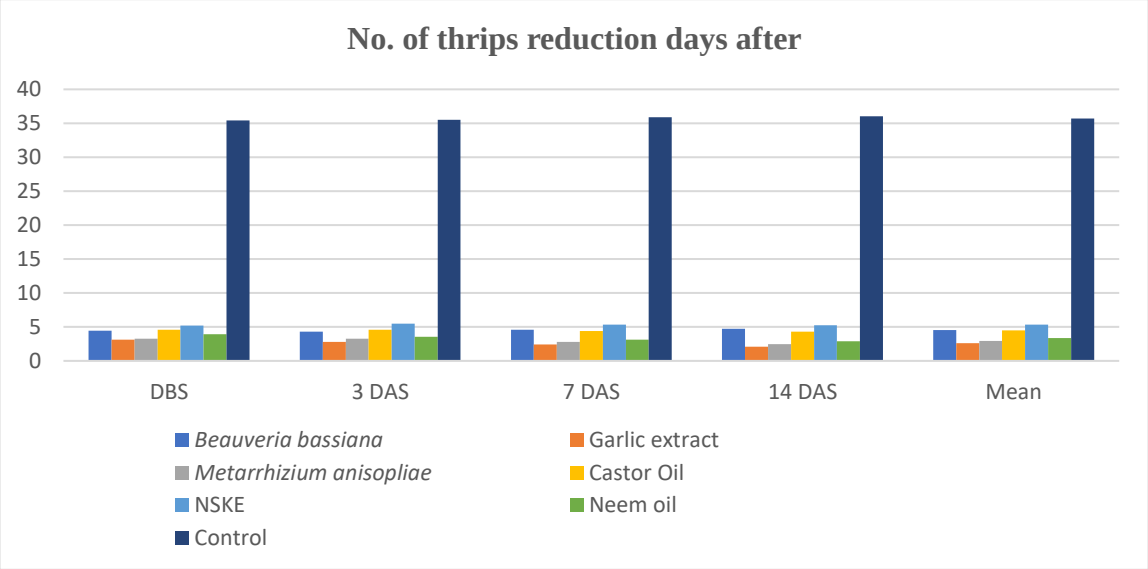

Fig. 2. Efficacy of Bio-pesticides and botanicals against onion thrips, *Thrips tabaci* L.

With the exception of *Beauveria bassiana* (19.57 thrips/ 5 leaves), the Neem oil treatment recorded the lowest number of thrips (18.70 thrips/ 5 leaves) and was clearly superior to the others. The following sequentially treatments, which included Garlic extract (21.68 thrips/ 5 leaves), castor oil (22.43 thrips/5 leaves), and NSKE (23.30 thrips/5 leaves), were shown to be substantially more successful than the untreated control at thrips population recording.

3.1.3 Seven days after spray

The average survival population of thrips after spraying showed significant differences between bio-pesticide treatments and the untreated control, with 19.28 to 22.88 thrips per five leaves compared to 23.73 thrips per five leaves in the untreated control.

The Neem oil treatment had the lowest thrips population (19.28 thrips/5 leaves), which was comparable to *Beauveria bassiana* (19.43 thrips/5 leaves). The next most effective treatments were NSKE (22.88 thrips/5 leaves), Castor oil (22.17 thrips/5 leaves), *Metarrhizium anisopliae* (21.10 thrips/5 leaves), and Garlic extract (20.43 thrips/ 5 leaves). above the untreated control, were proven to be effective therapies.

3.1.4 Fourteen days after spray

The average survival population of thrips in the range of 19.08 to 22.88 thrips per five leaves was recorded in all bio-pesticides treatments as against 23.87 thrips in the untreated control.

On the fourteenth day, the thrips population was found to be at its lowest under the treatment with (thrips/5 leaves). It was comparable to Neem oil, but (19.08 thrips/ 5 leaves). The following treatments performed the best: Castor oil (22.07 thrips/ 5 leaves), *Metarrhizium anisopliae* (21.06 thrips/ 5 leaves), Garlic extract (20.23 thrips/ 5 leaves), and NSKE (2.88 thrips/5 leaves). over the untreated control, were effective.

3.1.5 Over all mean effect

All the bio-pesticide treatments were found to be statistically significantly more effective than the untreated control (23.62 thrips/ 5 leaves). Among the different bio-pesticide treatments, Neem oil (18.96 thrips/ 5 leaves), *Beauveria bassiana* (19.48 thrips/5 leaves), Garlic extract (20.54 thrips/5 leaves), *Metarrhizium anisopliae* (21.18 thrips/5 leaves) and castor oil (22.31 thrips/ 5 leaves) were more effective than other treatments. And NSKE (23.16 thrips/5 leaves) was the next better treatment.

3.1.6 Second spray

The mean data of the results revealed that number of thrips reduction per treatment ranged from 3.13 to 35.40 and there was no statically significant difference between the treatments (Table 2)

3.1.7 Three days after spray

It could be seen from the data presented in Table.2 and depicted in Fig. 2 shows that all the bio-pesticides treatments were significantly superior over untreated control in reducing thrip population at three days after spray.

The treatment with Garlic extract recorded the lowest thrips population (2.80 thrips/ 5 leaves) and emerged as the most effective treatment over all other treatments except, *Metarrhizium anisopliae* (3.27 thrips/5 leaves). The next best treatments were Neem oil (3.53 thrips/plant), *Beauveria bassiana* (4.33 thrips/ 5 leaves), Castor oil (4.60 thrips/ 5 leaves) and NSKE (5.47 thrips/5 leaves). were found effective treatments which recorded the lowest survival thrips population over untreated.

3.1.8 Seven days after spray

Bio-pesticide treatments significantly outperformed untreated control in the lowest survival thrip population, with an average survival of 2.40-5.33 thrips per leaf, compared to 35.90 thrips in the untreated control.

The treatment with Garlic extract recorded the lowest thrips (2.40 thrips/5 leaves) which was found at par with the treatment of *Metarrhizium anisopliae* (2.80 thrips/ 5 leaves). However, the next best treatments with Neem oil (3.13 thrips/ 5 leaves), Castor oil (4.40 thrips/ 5 leaves), *Beauveria bassiana* (4.60 thrips/ 5 leaves) and NSKE (5.33 thrips/5 leaves). were superior over untreated control.

3.1.9 Fourteen days after spray

Bio-pesticide treatments significantly improved thrip population per plant, with 2.07-2.47 thrips per 5 leaves compared to 36.03 thrips per 5 leaves in untreated control.

The last population of thrips was found in the treatment with Garlic extract (2.07 thrips/5 leaves). However, this treatment was found at par with *Metarrhizium anisopliae* (2.47 thrips/5 leaves). Whereas, the treatments with Neem oil (2.87 thrips/5 leaves), Castor oil (4.33 thrips/5 leaves), *Beauveria bassiana* (4.73 thrips/5 leaves) and NSKE (5.27 thrips/5 leaves), were found equally effective and significantly superior over untreated control.

3.1.10 Overall mean effect

All the bio-pesticide treatment was found statically significantly more effective than untreated control (35.72 thrips/ 5 leaves). Among the different bio-pesticides treatments, Garlic extract (2.60 thrips/ 5 leaves), *Metarrhizium anisopliae* (2.95 thrips/5 leaves) and Neem oil (3.97 thrips/ 5 leaves) were most effective than other treatment. Castor oil (4.48 thrips /5 leaves) and *Beauveria bassiana* (4.53 thrips/5 leaves) were the next better treatment. The present findings are confirmative with earlier research workers. Similarly, results were also obtained by Visalakshy and Krishnamoorthy [4] who reported that *M. anisopliae* recorded the lowest onion thrips population contributing to 58% reduction. Patil *et al.* [5], they reported that *M. anisopliae* 7.5 g recorded significantly lowest thrips population in onion. The present findings are in conformity with Fathy and Saad [6] reported that *M. anisopliae* caused the highest mortality rates in life stages of onion thrips, at 1x108 conidia/ml concentration. Kumar *et al.* [7] revealed that population of cotton thrips per 3 leaves was significantly lower in fipronil.

The present finding is confirmative with Vestergaard *et al.* [8] reported that treatment using *M. anisopliae* resulted in at least 94% mortality in Western flower thrips at 7 days post inoculation as compared to *V. lecanii* which shows 20-70% mortality under laboratory conditions. The present finding is corroborative with Bhojane *et al.* (2019) they reported that *L. lecanii* and *M. anisopliae* were found effective with 62.36 and 60.38% reduction in cucumber thrips population.

Kordy and Barakat [9] revealed Azadirachtin 0.03% showed 94.64% reduction in onion thrips population seven days after application. Elango *et al.* [10] reported that Azadirachtin 10000 ppm showed 40.83% mortality after 48 hrs of treatment while NSKE 5% showed 43.33% mortality against pomogrante thrips. Shinde *et al*. [11] concluded that Azadirachtin showed 73.23% reduction in chilli thrips population. Shruthi *et al*. found Azadirachtin and *L. lecanii* effective against thrips in tomato. Prema *et al.* [12] observed that NSKE 5% most effective against both nymph and adult with more than 40% mortality after 48 hrs of treatment in cotton. Saljoqi *et al*. [13] reported effectiveness of NSE 5% with reduced garlic thrips population up to 3.26 nymph and 2.69 adult/plant [14-16].

4. DISCUSSION

The study found that garlic extract and *Metarrhizium anisopliae* were significantly superior treatments for *Thrips tabaci*, followed by neem oil and castor oil. This finding is similar to a 1996 study by Castineiras et al., which reported a 24% mortality rate of Thrips palmi when treated with *B. bassiana*, *M. anisopliae*, and *L. lecanii*. The most effective treatment was found to be garlic extract.

5. CONCLUSIONS

Two sprays of Garlic extract at an interval of 15 days starting at ETL i.e., 50 days after transplantation was found most effective after the 7th day of spraying for the control of onion thrips, *Thrips tabaci* L. The treatment with *Metarrhizium anisopliae* emerged as equally effective for the control of onion thrips. The biopesticides neem oil, castor oil and *Beauveria bassiana* give good results but least as compared to other biopesticides.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Soumia PS, Srivastava C, Dikshit HK, Guru Pirasanna Pandi G. Screening for resistance against pulse beetle, *Callosobruchus analis* (F.) in greengram (*Vigna radiata* (L.) Wilczek) accessions. Proceedings of the National Academy of

Sciences, India Section B: Biological Sciences. 2017 Jun;87:551-8.
2. Diaz-Montano J, Fuchs M, Nault BA, Fail J, Shelton AM. Onion thrips (Thysanoptera: Thripidae): a global pest of increasing concern in onion. Journal of economic entomology. 2011 Feb 1;104(1):1-3.
3. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers, pp 147-.()5. Indian Council of Agricultural Research, New Delhi; 1984.
4. Visalakshy GPN, Krishnamoorthy A. Comparative field efficacy of various entomopathogenic fungi against Thrips tabaci: prospects for organic production of onion in India, Acta Hort. 2012;933.
5. Patil VV, Kabre GB, Dixit SS, Desale SB. Evaluation of entomophathogenic fungi against onion thrips, *Thrips tabaci* (Lindeman), International Journal of Plant Protection. 2016;9(1):168-171.
6. Fathy DM, Saad ASM. Efficacy of entomopathogenic fungi on *Thrips tabaci* (L) and incidence of silvery top damage on onion plant, Qassim University. 2017;10(2):133-140.
7. Kumar V, Dhawan AK, Singh G. Bioefficacy of fipronil (jump 80 WG) against *Thrips tabaci* Lindeman on cotton, Journal of Insect Science. 2013;26(1):126-129.
8. Vestergaard S, Gillespie AT, Butt TM, Schreiter G, Eilenberg J. Pathogenicity of the hyphomycete fungi Verticillium lecanii and Metarhizium anisopliae to the western flower thrips, Frankliniella occidentalis, Biocontrol Science and Technology. 1995;5:185-192.
9. Kordy AM, Barakat AST. Improving efficiency of insecticides for controlling thrips insects (*Thrips tabaci* L.) infesting onion plants (*Allium cepa* L.) in Egypt, Middle East Journal of Agriculture Research. 2014;3(3):586-591.
10. Elango E, Sridharan S, Saravanan PA, Balakrishnan S. Efficacy of biopesticides against pomegranate sucking pests under laboratory condition, Efficacy of biopesticides against sucking pests, J Biopest. 2019;12(1):30-35.
11. Shinde BD, Sanap PB, Dahiphale AV. Eco-friendly management of chilli thrips, *Scirtothrips dorsalis* Hood, Journal of Plant Protection and Environment. 2014;11(2):39-42 ref.5.
12. Prema MS, Ganapathy N, Renukadevi P, Mohankumar S, Kennedy JS. Efficacy of different botanical extracts on Thrips palmi in cotton, Journal of Pharmacognosy and Phytochemistry. 2018;7(2):2824-2829.
13. Saljoqi AUR, Salim M, Ahmad I. Management of Garlic Thrips, Thrips tabaci Linderman. (Thysanoptera: Thripidae) through Different Pest Management Techniques in Garlic Crop, Sarhad Journal of Agriculture.2021;37(2):359-368.
14. Ajay Kumar Das, Wajid Hasan and Suhil Kumar Singh. Management of onion Thrips, *Thrips tabaci* Using Chemical and Bio-Pesticide for Quality onion Production Trends in Biosciences. 2017;10(22), Print: ISSN 0974-8431.
15. OS Mane, SM Galande, ND Tamboli and SG Bhalekar Efficacy of different botanical and biopesticide against onion thrips (*Thrips tabaci* L.).2021;SP-10(12): 656-663.
16. Shruti CR, Narabenchi GB, Asokan R, Patil HB, Nadaf AM, Bhat AS. Bio-efficacy of bio-pesticides, botanicals and new molecules of insecticides against thrips on tomato, Journal of Entomology and Zoology Studies. 2021;9(2):1268-1275.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/124565