Efficacy of different Bio-pesticide and botanical against onion thrips (*Thrips tabaci* L.)

Abstract

The field experiment was conducted to evaluate efficacy of Bio-pesticide andbotanical 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 *Beauveriabassiana,* 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 extractemerged as the most effective treatment and recorded the least (2.07- 2.80) thrips /5 leaves.

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

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% (Soumia *et al.,* 2017). 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.(Diaz-Montana *et al.,* 2011) 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.

Materials and Methods

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.

Method of observations

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.

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 (1985). 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.

Results and Discussion

First Spray

Day before spray-

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

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.

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.

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.

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.

Overall 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.

Second spray

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

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 extractrecorded 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.

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 extractrecorded 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.

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.

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.

Discussion

Based on overall thrips /5 leaves, *Thrips tabaci*.Garlic extractand *Metarrhiziumanisopliae* (2.60 and 2.95 thrips /5 leaves) were found significantly superior treatment. The next better treatment was Neem oilandcastor oil (3.37 and 4.48 thrips /5 leaves) present observations were more or less similar to the results of earlier work by Castineiras et. al. (1996) reported 24 % mortality of 28 *Thrips palmi* when treated with *B. bassiana, M. anisopliae*, in that *L. lecanii* was most effective.found significantly superior treatment.

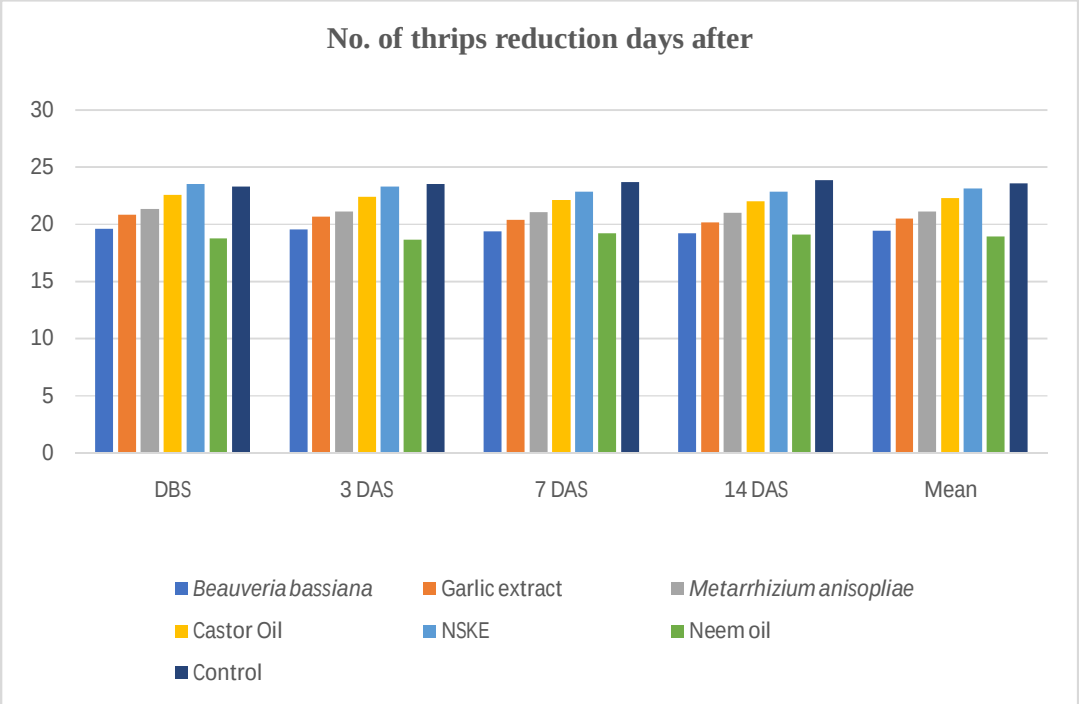
Conclusions

Two sprays of Garlic extractat an interval of 15 days starting at ETL i.e., 50 days after transplantation was found most effective after the 7^{th} 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.

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.



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**	----

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.

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

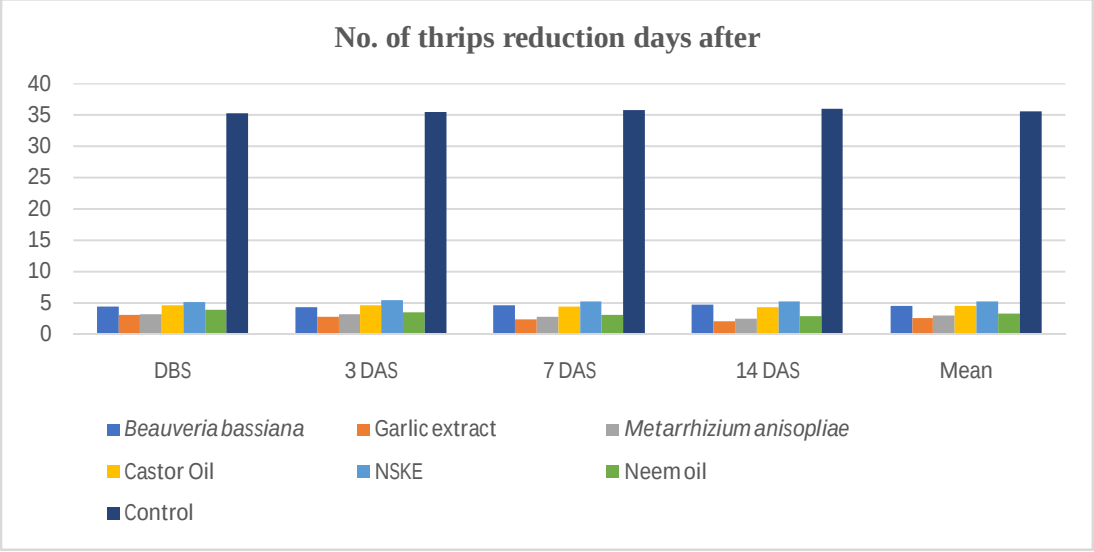


Fig. .2 Efficacy of Bio-pesticides and botanicals against onion thrips, *Thrips tabaci* L.

Reference

1. Ajay Kumar Das, Wajid Hasan and Suhil Kumar Singh. (2017) Management of onion Thrips, *Thrips tabaci* Using Chemical and Bio-Pesticide for Quality onion Production *Trends in Biosciences***10**(22), Print: ISSN 0974-8431.

2. Asma Sherwani, Peerzada Shafat Hussian, Malik Mukhtar and Shaheen Gul. (2020) Bionomics and Management of onion Thrips *Thripstabaci* (Lindeman) on onion Grown under Kashmir Conditions. *Int. J. Curr. Microbiol. App. Sci*.**9**(2): 2852-2859.

3. Bhatnagar, A. (2009). Efficacy and economics of insecticides and bio pesticides against thrips on potato. *Ann. Pl. Protec. Sci*.**17**: 501- 503.

4. D.K. Mishra, Gopesh Pathak, R.S. Tailor and Alok Deshwal. (2007) On Farm Trial: An Approach for Management of Thrips in onion. *Indian Res. J. Ext. Edu*. **7** (1), January 2007.

5. Dhaliwal, GS., Ram Singh and Chhillar, B. S. (2008) Essentials of agricultural entomology: 282-283.

6. Farman Ullah, Maraj-ul-Mulk, Abid Farid, Muhammad Qasid Saeed and Shahid Sattar. (2010) Population Dynamics and Chemical Control of onion Thrips (*Thrips tabaci*, Lindemann). *Pakistan J. Zool.*, vol. **42**(4), pp. 401-406.

7. Gomez, K.A. and Gomez, A.A. (1984) Statistical procedure for agricultural research. 2nd edition, Willey, Hoboken, 28-192.

8. Jackson, M.L., (1967). Soil chemical analysis. *Prentice- Hall of India Pvt. ltd*., New Delhi, 498p.

9. Maher Ahmed Moraiet1 and M. Shafiq Ansari. (2014) Population Dynamics of Onion Thrips, *Thrips tabaci*, on Onion Cultivars. *Journal of Agroecology and Natural Resource Management* Print ISSN: 2394-0786, Online ISSN: 2394-0794, Volume 1, Number 3; November-January, pp. 141-147.

10. Maniania, N. K. and Sithanantham, S. (2003). A field trial of the entomogenous fungus *Metarhizium anisopliae* for control of onion thrips, *Thrips tabaci. Crop Protec.*,**22**(3): 553–559.

11. Nazir, T. (2008). Bio-efficacy of organic insecticides against aphids, *Aphis gossypii* (Glover.) in *Bt* Cotton. *Nation.Symp. on "Bt- Cotton: Opportunities and Prospects.* 22.

12. Piper, C. S. (1967). Soil and plant analysis. Bombay Asia Publishing House.

13. Patel, B. H., Koshiya, D. J., Korat, D. M. and Vaishnav P. R. (2009). Evaluation of some insecticides against chilli thrips *Scirtothrips dorsalis* Hood. *Karnataka J. Agric. Sci.*, **22**(2) :(327-330).

14. Patil, S. D., Chandele, A. G., Wayal, C. B. and Game B. C. (2010). Efficacy of different newer chemicals and bio-insecticides against onion thrips in *kharif* season.*Int. J. Plant Prot.*, 2:227-230.

15. Ramarethinam, S., Marimuthu, S. Loganathan, S. and Murugesan, N.V. (2002). Potentials of entomopathogenic fungal based commercial formulations on some important pests of selected vegetable crops in India. *Pestology*, **26** (2): 1721.

16. SA Salunkhe, SA Nevgi and RB Kapare (2020) Evaluation of different insecticides and biopesticides against thrips (*Thrips tabaci* Lindeman) infesting onion. *Journal of Entomology and Zoology Studies* 2020; **8**(5): 795-796.

17. Tadele Shiberu and Mulugeta Negeri. (2014) Evaluation of insecticides and botanicals against Onion thrips, *Thrips tabaci* (L.) (Thysanoptera: Thripidae).

18. Yousra Mukhtar and Sajad Hussain Mir (2022). Population Dynamics of onion thrips, Thrips tabaci. *Indian Journal of Entomology online published Ref. No*. e22191, Doi. No. 10.55446/IJE.2022.660.