Policy Research Journal
ISSN (E): 3006-7030 ISSN (P) : 3006-7022 Volume 4, Issue 3, 2026

EFFICACY OF DIFFERENT SYNTHETIC INSECTICIDES FOR THE MANAGEMENT OF ONION THRIPS (THYSANOPTERA: THRIPIDAE) AT DISTRICT SWAT, KHYBER PAKHTUNKHWA

Malika Fazal[1], Laiba Fazal*[2], Muhammad Ikram[3], Syed Zaheer Abbas[4], Muhammad Junaid[5], Bibi Asma[6]

[1*,2,3,4,6]*Department of Entomology, The University of Agriculture Peshawar, Pakistan*
[5]*Department of Entomology, Abdul Wali Khan University Mardan, Pakistan*

[*2]laibafazal301@gmail.com

DOI: http://doi.org/10.5281/zenodo.21391957

Keywords
Efficacy, Insecticides, Imidacloprid, Onion, Swat

Article History
Received: 31 January 2026
Accepted: 16 March 2026
Published: 30 March 2026

Copyright @Author
Corresponding Author: *
Laiba Fazal

Abstract
The study was initiated at farmer field in district Swat to examine various synthetic insecticides for the management of onion thrips. Randomized complete block design was followed with six treatments (including a control) via Diazinon, Diafenthiuron, Endosulfan, Imidacloprid and Flonicamid, replicated three times. Results indicated that the untreated plot had the highest percent infestation (20.46) and lowest yield (6398 kg/ha), while the plot treated with Diafenthiuron had the lowest mean percent infestation (6.0), which was statistically similar with plot treated with Imidacloprid (6.1). The plot treated with Imidacloprid has the highest yield (10267kg/ha) followed by Diafenthiuron (9866kg/ha). The cost benefit ratio was recorded highest in plot treated with Diafenthiuron (18.79) followed by imidacloprid (18.66). All the insecticides performed marvelously in managing thrips infestation.

Introduction

Onion is one of the most commercially significant vegetable crops cultivated in Pakistan. Ona total of 148408 hectares of land, 2075984 tons of onions produced throughout the country. In Khyber Pakhtunkhwa, onion was grown on 11974 hectares with an average yield of 223,957 tons (MINFA, 2019). The consumption of onions has increased globally due to their health advantages (Havey *et al.,* 2004; CSA, 2012).

Several sucking insect pests are responsible for onion damage. The most damaging insect to onions is *Thrips tabaci* (Thysanoptera: Thripidae), which is detrimental in both nymph and adult stages (Atwal, 1976). The infected leaves progressively get wrinkled, curled, and dried out. Heavy infection causes the plant to cease bulb growth and prevents the generation of flowers and seeds (Atwal, 1976). Thrips cause production losses of up to 59 percent and are widespread in all onion-growing regions (Waiganjo *et al.,* 2008).

Throughout the growing season, farmers use many pesticides for thrips management. The insect is prevalent on the plant's inner leaves and pupates in the soil, rendering the use of pesticidesineffective. Moreover, the pest has several generations that overlap (Alimousavil *et al.*, 2007; Nault and Shelton, 2010; Shelton *et al.*, 2006). Additionally, *Thrips tabaci* has exhibited resistance to several commonly used insecticides (Martin *et al.,* 2003). The excessive use of pesticides results in pesticide residues, pest resurgence, and pest resistance, which cause environmental contamination and the extinction of beneficial insects (Adilakshmi *et al.,* 2008).

For safe application, it is necessary to combine this pesticide with other control measures, such as plant extracts. Numerous plant extracts have shown broad-spectrum action and may thus replace commercial pesticides. Botanicals are effective and environmentally benign; thus, these botanicals should be used to combat issues caused

by other pesticides (Sohail *et al.*, 2015).
Botanicals and novel pesticides might be conveniently used to manage the pest at a low cost. Keeping in mind the significance of onion thrips, the purpose of this study was to assess theefficacy of botanicals and recently developed chemicals for the control of onion thrips.

Material and Methods

Onion thrips, *Thrips tabaci*, Lind were the focus of an experiment conducted in 2023 at farmer field in district Peshawar, with the aim to modify synthetic insecticides for their control. For this purpose, Red Onion (Adama variety) seedlings were purchased from local market. Randomized Complete Block Design was used with six treatments via Diazinon 60EC (40 mg/L), Confidor® Imidacloprid 200SL (0.6ml/L), Thionex® Endosulfan 35EC (350g/l), Flonicamid 50WG (0.3g/L), and Diafenthuron 50WP (0.6g/L). including control, replicated 3 times. Row-to-row spacing was maintained at 50cm,while plant-to-plant spacing was maintained at 10cm.

Data Collection

To compare the population of onion thrips before and after spraying, 5 plants were chosenat random, and the population was recorded at regular intervals. The pre-spray data were collected 24 hours prior to spraying and then after weekly interval. The thrips were counted, and their mean was calculated. When the thrips population per plant reached 15-20, plant extracts and pesticides were applied. To determine the efficacy of each pesticide and plant extract, the number of thrips on five randomly chosen plants from each replication was recorded.

Data Analysis

Statistical software (Statistix 8.1) was used to examine the collected data. ANOVA(Analysis of Variance) was created to test the significance of difference between variables by using the following formulas:

$$Reduction\ efficacy\ \% = \frac{Control\ count - Post\ spray\ count}{Control\ count}\ x\ 100 Yield\ (kg/ha) = \frac{Pods\ weight\ (kg)}{Area\ harvested\ (\mathrm{m2})}\ x\ 1000$$

Cost Analysis

The method of Hussain *et al.* (2022) was used to calculate the cost-benefit ratio in order to determine the most beneficial therapy in terms of cost of control compared to its benefit. The formula used was:

$$Cost\ Benefit\ Ratio = \frac{Estimated\ net\ benefit}{Total\ expenditure}$$

Statistical Analysis

The acquired data were analyzed using an ANOVA, and the means were separated using the LSD (Least Significant Difference) test at a 5% significance level**.**

Results

Mean infestation of onion thrips/plant

Thrips are a constant problem in all onion-growing regions. Table 1 indicated that before spray application, all the treatments was found statistically similar with each other. After one week of spray application, the maximum number of thrips plant^{-1} (17.70) was found in control plot followed by Flonicamid (8.36), while the minimum number of thrips plant^{-1} (6.16) was found in Imidacloprid which was statistically in line with plot treated with Endosulfan (6.30). After two weeks of spray, the control plot recorded maximum Thrips infestation (20.43 plant^{-1}) followed by Diazinon (5.30 plant^{-1}). The plot treated with Endosulfan recorded minimum Thrips infestation (3.40 plant^{-1}) which was statistically similar with Diafenthiuron (3.43 plant^{-1}), Imidacloprid (3.53 plant^{-1}) and Flonicamid (4.06 plant^{-1}) respectively. Similar trend was observed after three weeks of spray application. The highest Thrips infestation plant^{-1} was observed in untreated plot (23.10) followed by Diazinon (7.90) which was statistically similar with Flonicamid (7.60). The lowest Thrips infestation plant^{-1} was recorded in plot treated with Imidacloprid (5.73) which was statistically in line with Endosulfan (6.03) and Diafenthiuron (6.36) respectively. Data recorded after four weeks indicated the dominance of Flonicamid with lowest Thrips infestation plant^{-1} (3.10) which was statistically similar with Diafenthiuron (3.16) and Imidacloprid (3.20), followed by Endosulfan (4.33) and Diazinon (4.86), statistically found in line with each other. The highest Thrips infestation plant^{-1} was noted in control plot (24.10). Data recorded after five weeks indicated the lowest Thrips infestation plant^{-1} was noted in

plot treated with Diafenthiuron (6.43) which was statistically similar with Imidacloprid (6.96) and Endosulfan (7.00) respectively, followed by Flonicamid (7.26). The highest Thrips infestation plant^{-1} was noted in untreated plot (26.13). After six weeks of spray application, minimum number of Thrips plant^{-1} was recorded in Diafenthiuron (3.20) followed by Flonicamid (4.23). The highest Thrips plant^{-1} was recorded in untreated plot (18.70). After seven weeks of spray application, the lowest population Thrips plant^{-1} was observed in Diafenthiuron treated plot (1.10) which was statistically in line with Imidacloprid (1.50) followed by Endosulfan (2.20), Diazinon (2.60) and Flonicamid (2.63) respectively, which were statistically similar with each other. The highest population of Thrips plant^{-1} was noted in control (17.06). Mean infestation of Onion Thrips plant^{-1} demonstrated supremacy of Diafenthiuron treated plot having Thrips population plant^{-1} (6.0) which was statistically similar with Imidacloprid (6.10) and Endosulfan (6.30) followed by Flonicamid (6.75). The highest Thrips population plant^{-1} was observed in control plot (20.46).

Table.1 Mean infestation of Onion thrips plant^{-1} at different weeks interval

Treatments	Mean infestation of Onion Thrips Plant^{-1}								
	Pre-Spray count	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	Mean
Diafenthiuron	16.80a	7.53c	3.43c	6.36c	3.16c	6.43cd	3.20e	1.10cd	6.0cd
Flonicamid	16.73a	8.36b	4.06c	7.60b	3.10c	7.26c	4.23d	2.63b	6.75b
Endosulfan	16.33ab	6.30d	3.40c	6.03c	4.33b	7.00c	4.80c	2.20b	6.30bc
Diazinon	16.53a	7.20c	5.30b	7.90b	4.86b	8.13b	5.93b	2.60b	7.31b
Imidacloprid	16.56a	6.16d	3.53c	5.73c	3.20c	6.96c	5.16c	1.50c	6.10cd
Control	16.46a	17.70a	20.43a	23.10a	24.10a	26.13a	18.70a	17.06a	20.46a
LSD (0.05)	0.3417	0.5776	0.7643	0.8630	0.7254	0.6994	0.3961	0.4999	0.6050

Different letters indicates that the treatments are significant at P value (0.05).

Yield and Cost Analysis

Table 2 indicated that maximum yield was obtained from plot treated with Imidacloprid (10267) followed by Diafenthiuron (9866) while the lowest yield was obtained from untreated plot (6398). Cost analysis showed that the plot treated with Diafenthiuron has the highest CBR ration (18:79) followed by Imidacloprid (18:66) while the lowest CBR was obtained from Endosulfan (15:44),

Table.2 Yield & Cost Analysis of different treatments against Onion Thrips

Treatments	Yield (kg/ha^{-1}) A	Gross Income (Rs) B	Cost of control ha^{-1} (Rs.) C	Return over control (Rs) ha^{-1} D	Estimated net benefit(Rs) ha^{-1} E (D-C)	C: B F (D/C)
Diafenthiuron	9866b	197320	10500	197320	186820	18:79
Flonicamid	9249c	184980	11200	184980	173780	16:51
Endosulfan	9246c	184920	11970	184920	172950	15:44
Diazinon	9244c	184880	11560	184880	173320	15:99
Imidacloprid	10267a	205340	11000	205340	194340	18:66
Control	6398d	127960				

Discussion

The aim of the study was to determine the efficacy of synthetic insecticides in combating this pest. Randomized complete block design (RCBD) with three replicates was used to carry out the experiment. A total of five plants from each row

were picked at random. When the thrips population reached ETL, the use of pesticides began.It was shown that the insect population was not statistically significant before spray application across all treatments. These results were consistent with those of Hussain *et al.* (2022). Thrips populations began to rise in February and peaked in April. Another group that came to a similar conclusion was Hussain *et al.* (1997). The sudden decline in the thrips population couldbe the result of several factors, including crop maturity, leaf hardening, and the thrips' migration to other crops. Similar results were reported by Hussain *et al.* (1997), Hyder *et al.* (1987).

Comparing the effectiveness the insecticides, the Diafenthiuron-treated patch had the smallest average population. Consensus was reached between Deole *et al.* (2018) and these findings. Diafenthiuron50 WP at 300 g.a.i/ha was shown to be the most efficient in lowering the thrips population on onion. According to a study conducted by Zala *et al.* (2014). Best results against onion thrips werealso seen while using the drug Imidacloprid. These results corroborated those of Das *et al.* (2017).Imidacloprid sprays were most effective against onion thrips in all three treatments. These resultsare consistent with those of Singh and Kumar (2011) and Kidd *et al.* (2011), who also found that Imidacloprid was effective at reducing thrips populations (1991). The yield obtained from using Imidacloprid was significantly higher. Waiganjo (2004) and Das *et al.* (2001) also reported a result that was very similar. It was also shown that Imidacloprid had the highest CBR (18:66).

Infestations of onion thrips are notoriously challenging to eradicate because the mobile stages typically reside in the inner leaves, where they are less likely to come into contact with insecticide residues. Considering these factors, we undertook the current study to assess existing literature and address the obstacles it has revealed.

Conclusion and Recommendation

From the above study, it was concluded that chemical insecticides Imidacloprid and Diafenthiuron offered far better outcomes than conventional pesticides and had a major impacton crop productivity. Thus, it is recommended to accommodate these in spray application for the successful management and better yield.

References

Adilakshmi, A., D.M. Korat and R.R. Vaishnav. 2008. Bio-efficacy of some botanical insecticides against pests of Okra. Karnataka J. Agri. Sci. 21(2): 290-292.

Alimousavil, S.A., M.R. Hassandokht and S. Moharramipour. 2007. Evaluation of Iranian onion germ plasms for resistance to thrips. Int. J. Agri. Biol. 9: 897-900.

Atwal, A.S. 1976. *Agricultural Pests of India and Southeast Asia*. Kalyani Publishers, Delhi. pp. 502.

CSA. 2012. *Report of Federal Democratic Republic of Ethiopia*. Statistical Report on Socio-Economic Characteristics of the Population in Agricultural Households, Land Use, Area and Production of Crops, Addis Ababa, Ethiopia. pp. 14.

Das, A.K., W. Hasan and S.K. Singh. 2017. Management of Onion Thrips, *Thrips tabaci* using Chemical and Bio-Pesticide for Quality Onion Production. Trends in Biosciences. 10(22): 4384-4388.

Deole, S. and Y.K. Yadu. 2018. Relative Efficacy of Different Insecticides on Chilli Thrips and their Natural Enemies. Int. J. Curr. Microbiol. App. Sci. 7(10): 1-11.

Havey, M.J., C.R. Galmarini, A.F. Gökçe. and C. Henson. 2004. Quality affecting soluble carbohydrate concentrations in stored onion bulbs and their association with flavor and health-enhancing attributes. Genome. 47: 463–468.

Hussain, R., A. Ihsan, N. Ullah, A.A. Shah, S.F. Shah, M. Usman and M.A. Khan. 2022. Appraisal of plant extracts and chemical control against Whitefly *Bemisia Tabaci*, (Genn)and its effect on associated natural enemies in Round Chili. Annals of the Romanian Societyfor Cell Biology. 26(1): 1121–1132.

Hussain, T., M. Iqbal, F. Ullah and M. Anwar. 1997. Population trends, varietal preference and chemical control of garlic thrips (*Thrips tabaci* L.). Sarhad J. Agri. 13: 175-180.

Hyder, M.F. and S.L. Sharif. 1987. Ecological aspects and developing methods of onion pest control. Bull. Ent. Soc. Egypt-

Eco. Series. 16: 119-126.

Martin, N.A., P.J. Workman and R.C. Butler. 2003. Insecticide resistance in onion thrips (*Thrips tabaci*) (Thysanoptera: Thripidae). New Zealand J. Crop Hort. Sci. 31: 99-106.

MINFA. 2019. *Agricultural Statistics of Pakistan*. Ministry of national food security and research. Government of Pakistan, Islamabad. pp. 1-10.

Nault, B. and A.M. Shelton. 2010. Impact of insecticide efficacy on developing action thresholds for pest management: a case study of onion thrips (Thysanoptera: Thripidae) on onion. J. Econ. Entomol. 103: 1315-1326.

Shelton, A.M., J.Z. Zhao, B.A. Naul, J. Plate, F.R. Musser and E. Larentzaki. 2006. Patterns of insecticide resistance in onion thrips (Thysanoptera: Thripidae) in onion fields in New York. J. Econ. Entomol. 99: 1798-1804.

Sohail, k., S. Jan, A. Usman, S.F. Shah, M. Usman, M. Shah, M.A. Mashwani and A. Mehmood. 2015. Evaluation of some botanical and chemical insecticides against the insect pests of okra. J. Entomol. Zool. Stud. 3(2): 20-24.

Waiganjo, M.M., J.M. Mueke and L.M. Gitonga. 2008. Susceptible onion growth stages for selective and economic protection from onion thrips infestation. Acta. Hort. 767: 193-200.

Zala, M.B., G.D. Bhut, C.C. Patel, L.V. Ghetiya, T.M. Bharpoda and P.K. Borad. 2014. Bio efficacy of Diafenthiuron 50 WP from new source against sucking pests in BT cotton. Indian J. Plant Prot. 42(4): 383-38