Plant Archives Vol. 20 Supplement 1, 2020 pp. 3417-3420 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

STUDY OF THE EFFECT OF SOME NATURAL INSECTICIDES ON FENUGREEK INSECTS

Abdul-jabar Khalil Ibrahim

Plant Protection Department, Faculty of Agriculture, Mosul University, Mosul, Iraq.

Abstract

Field experiment were carried out during 2018 season to evaluate the efficiency of some natural control agents against some pest infesting fenugreek plants at sada farm in Mosul, Iraq. The side effects of these control agents against the predatory insects *Coccinella septempunctata* (L.) were also investigated.

In the study imidacloprid, methoxyfenozide and neem oils were the most effective increasing aphid (*Aphis craccivora* Koch) white fly (*Bemisia tabaci* (Genn.), *Thrips tabaci* Lind. numbers mineral oil, orange oil and Botany guard recorded the least reduction percentages.

Also imidacloprid proved to be the most toxic against *Coccinella septempunctata* (L.) followed by methoxyfenozide, mineral oil and neem oil. Botany guard and orange oil had the least side against *Coccinella septempunctata* (L.).

Introduction

Fenugreek (*Trigonella foenum-greecum* L.) is considered one of the most medicinal plants by insect pests. Aphid, (*Aphis craccivora* Koch), Whitefly *Bemisia tabaci* (Genn.) and (*Thrips tabaci* Lind) are the most common insects attacking fenugreek leaves.

The infestation by these insects causes either direct damage by sucking the plant sap or indirect damage by transmitting virus diseases (Georgios, 2002; Basu, 2006).

Prevention of economic losses requires knowledge of the most effective and safe compounds that can be used for pest control. Intensive researches have been carried out in recent years for evaluating novel insecticides that have new modes of action. Insect growth regulators and chloronicotinyl insecticides were use successfully to control several homopterous insect (Elbert *et al.*, 1998; Al-anbaki, 2016). Some plant oil extracts such as neem oil (Warther, 1979) and the aromatic compounds in some fruit tree, such as citrus (Moussa, 2005) have a repellent action to insects. On the other hand, biopesticides based on microbial agents such as fungus are generally capable of penetrating the insect directly and infect the insects (Ghulam *et al.*, 2016).

All the previous insecticide, categories have a wide array of modes of action and have selectivity to target insects, the represent an exiting opportunity for the effective control of many insect pests. The present study was initiated to evaluate six of these novel insecticide against some insects on Fenugreek plants in the field (aphid, whitefly), thrips and the predatory insect, *Coccinella septempunctata* (L.).

***Author for correspondence :** E-mail: jabarobadi@gmail.com

Materials and Methods

This experiment was carried out during the successive fall seasons of 2018 at the field in the Sada farm in Mosul, Iraq.

Seed of local variety cultivar of Fenugreek were sown in 5 of October. In each experiment, a randomized complete blocks design (R.C.B.D.), with three replicates (50 m^2 each), was used, each plot consisted of 6 rows, 5m long and 100 cm wide and the plant were allowed to grow at 50 cm spacing area. The insecticides were sprayed by sprinkler at arate of 100 liters per 2500 m^2 in at 2018 seasons. Control plots were sprayed only by tap water. (Kant *et al.*, 2017).

The different evaluated natural insecticides, names and rates used in this study are presented table 1.

The different of tested products was record by counting number of target insects (Aphid, Whitefly and Thrips) and the predators insect, on the fenugreek leaves

Table 1: Names and rates the tested natural insecticides.

Names	Rate / 100 liter water
Neem oil (0.15% Ec)	200 mL
Beauveria bassiana (100% Sc)	250 mL
Mineral oil (95% Ec)	500 mL
Imidacloprid (35% Sc)	500 mL
Methoxyfenozide (24% Sc)	500 mL
Orange oil	500 mL

per each replicate. Per and post treatment counts were done in early morning, leaves were collected in paper bags and transmitted to the laboratory for insect counting. The insects were counted using a stereoscopic microscope. Inspections were done before and after 3, 7, 10, 14 day from application.

Reduction percentages were calculated according to Henderson and Tilton equation, (1955).

The statistical analyses of all there corded data were conducted by the standard method of the randomized complete blocks design as illustrated using co-stat statistical the least significant difference test (L.S.D) was used to test the significance of the difference each other using one was Anova with LSD 0.05.

Results and Discussiion

The occurrence of different insects after applications were recorded in tables from 2 to 4 as reduction percentages for seasons of 2018.

Aphid (*Aphis craccivora* Koch)

Data presented in tables 2, show the reduction percentages recorded with different tested insecticides in 2018 seasons. The data revealed that reduction percentages for the most insecticides increased gradually after applications till 14 days post treatment.

Imidacloprid, methoxyfenozide and neem oil were the most effective in reducing aphid numbers with mean of redaction percentage, 99.22, 99.12 and 98.10 respectively. The mineral oil achieved 86.50% reduction of aphid numbers. Botany guard and orange oil achieved the least aphid reduction percentages of 79.49%, 75.63% respectively.

Lee *et al*., (1991) reported that neem oil contains effective compounds against insect pest either as antifeedant or as insect growth regulator that lead gradually to the death of treated insects. Beside the direct lethal effects of mineral oil, it seemed to interfere with the feeding activity as it coast the leaf surface of the treated plants and after aphid feeding behavior (Bell, 1980). Botany guard is known to be a formulation contains *Beauveria bassiana* spores which germinate on the insect integument and penetrate into the body cavity then multiply inside the insect producing lethal metabolites and the mortality occur 5-10 days after exposure (Kadir and Barlow, 1992).

The orange fruit oil is a repellent volatile oil which leads to insect starvation and then the death of pest (Moussa, 2005).

For periods the results showed the effect compounds lasted for 14 days of the treatment, it reached 93.92, 92.18, 88.86 and 83.81% for every 14, 10, 7 and 3 days respectively.

White flies (*Bemissa tabaci* Genn.)

Gradual reduction percentage to whitefly numbers as a result of treatment by different insecticides were recorded in study (Table 3) imidacloprid, neem oil and methoxyfenizide record the highest reduction percentages of whitefly numbers, botany guard, orange oil and mineral oil recorded the lest reduction percentages. The mean reduction in percentages of whiteflies were 97.56, 94.33, 90.93,86.76, 80.04 and 71.85 for Imidacloprid, methoxyfenozide, neem oil and mineral oil, Botany guard and orange oil, respectively.

These results are comparable with the results of many authors El-Bessony, (2003) reported that Imidacloprid gave good reduction percentages against whitefly after 84 hrs. of application also. In respect with *B. bassiana* Yousri *et al*., (1995) recorded a gradual reduction of whitefly population in tomato fields 1-day to 7-day after application of (*B. bassiana*) which in accordance with the record results in the present study.

For periods the results showed the effect compounds lasted for 14 days of the treatment, it reached 81.10, 86.48, 88.32 and 91.61% for every 3, 7, 10 and 10 days respectively.

Table 2: Relative efficiency of some natural insecticides on *Aphis craccivora* (Koch.) on Fenugreek after treatment with different control agents.

Treatment	% Relative efficiency				
	3 day	7 day	10 day	14 day	Mean
Botany guard	73.30 F	78.80 EF	80.50 E	85.36 E	79.49 C
Orange oil	63.36 G	72.80 F	81.60 E	84.86 E	75.63 D
Mineral oil	76.40 EF	84.30 E	91.80 D	93.50 CD	86.50 B
Imidacloprid	97.30 A-D	99.90 AB	100 A	100 A	99.22 A
Neem oil	95.10 A-C	98.20 AB	99.30 AB	99.80 AB	98.10 A
Methoxyfenozide	97.40 A-D	99.20 A-C	99.90 AB	100 A	99.12 A
Mean	83.81 C	88.86 B	92.18 A	93.92 A	

Means followed by the same alphabetical letter (s) do not significantly differ, using LSD test at 0.05 level of probability (in section one).

Table 3: Relative efficiency of some natural insecticides on *Bemissa tabaci* (Genn.) on Fenugreek after treatment with different control agents.

Treatment	% Relative efficiency				
	3 day	7 day	10 day	14 day	Mean
Botany guard	71.10 GH	78.40 E-G	83.93 C-F	86.76 B-E	80.04 C
Orange oil	63.30 H	69.50 GH	73.70 F-H	80.93 D-G	71.85 D
Mineral oil	81.40 D-G	85.50 B-F	87.70 B-E	92.46 A-D	86.76 B
Imidacloprid	95.50 A-C	97.40 AB	100 A	97.06 AB	97.56 A
Neem oil	87.90 A-E	88.13 A-E	90.20 A-E	97.50 AB	90.93 A
Methoxyfenozide	87.40 A-E	100 A	94.43 A-C	95.00 A-C	94.33 A
Mean	81.10 C	86.48 B	88.32 AB	91.61 A	

Means followed by the same alphabetical letter (s) do not significantly differ, using LSD test at 0.05 level of probability (in section one).

Table 4: Relative efficiency of some natural insecticides on *Thrips tabaci* (Lind.) on Fenugreek after treatment with different control agents.

Treatment	% Relative efficiency				
	3 day	7 day	10 day	14 day	Mean
Botany guard	25.13 F-I	39.53 HI	40.86 HI	44.80 H-I	37.58 C
Orange oil	51.26 C-G	60.10 C-G	60.30 C-F	68.46 A-F	60.03 C
Mineral oil	61.60 C-G	72.20 A-E	69.43 A-F	69.80 A-F	68.25 B
Imidacloprid	56.16 D-G	73.16 A-E	74.26 A-D	75.86 A-C	69.86 B
Neem oil	53.60 E-H	75.26 A-E	69.43 A-F	79.60 A-C	69.47 AB
Methoxyfenozide	60.93 C-G	85.46 AB	89.16 A	92.50 A	81.51 A
Mean	51.44 B	57.61 AB	67.24 AB	71.83 A	

Means followed by the same alphabetical letter (s) do not significantly differ, using LSD test at 0.05 level of probability (in section one).

Table 5: The effect of period after treatment on the relative efficiency of some natural insecticides on *Coccinela septempunctata* (L.) numbers on Fenugreek.

Treatment	% Relative efficiency				
	3 day	7 day	10 day	14 day	Mean
Botany guard	12.60 H	10.63 H	14.60 F-H	17.80 F-H	13.90 C
Orange oil	12.86 H	13.26 GH	12.03 H	14.90 F-H	13.26 C
Mineral oil	28.76 EF	36.50 C-E	44.96 A-E	41.86 A-E	38.02 B
Imidacloprid	42.96 A-E	51.66 A-C	56.10 A	53.00 AB	50.93 A
Neem oil	28.30 E-G	36.33 C-E	35.36 DE	40.13 B-E	35.03 B
Methoxyfenozide	38.53 B-E	46.13 A-D	41.00 A-E	40.50 A-E	41.54 B
Mean	27.33 B	32.91 AB	34.00 A	34.69 A	

Means followed by the same alphabetical letter (s) do not significantly differ, using LSD test at 0.05 level of probability (in section one).

Thrips tabaci (Lind.)

Impact of methoxyfenzide, Imidacloprid, neem oil, mineral oil, orange oil and Botany guard against thrips on Fenugreek plants is presented in tables 4, methoxyfenzide revealed the highest thrips control in study with means of reduction percentages 81.51% and Imidacloprid, neem oil and mineral oil achieved 69.86%, 69.47% and 68.25% reduction in thrips numbers respectively orange oil showed the reduction in thrips numbers achieved 60.03% and Botany guard showed the least effective thrips control with means of reduction percentage 37.58%.

For periods the results showed the effect compounds lasted for 14 days of the treatment, it reached 51.44, 57.61, 67.24 and 71.83% for every 3, 7, 10 and 10 days respectively.

Coccinela septempunctata (L.)

When the integration between the natural enemies such as (*C. septempunctata* L.) and the chemical control is required, the impact of these chemical insecticides on the natural enemies must be studied. Therefore, the effects of the tested insecticides against the predatory insect, *C. septempunctata* (L.) in table 5. It is clear that Imidacloprid proved to be the most toxic against *C. septempunctata* followed by methoxyfenozide, mineral oil and neem oil, botany guard and orange oil had the least effects against *C. septempunctata* (L.). The means of reduction percentages of *C. septempunctata* (L.) caused by Imidacloprid, methoxyfenzide, mineral oil, neem oil, orange oil and Botany guard were 50.93, 41.54, 38.02, 35.03, 13.26 and 13.90 respectively.

Results obtained in the present study were comparable in part with the results of many authors.

References

Al-anbaki, H.M. (2016). Evaluate relative mortality some pesticides and biochemical to reduce the population density of whitefly *Bemisia tabaci* (Genn.) in beans and cucumber. *Diyala Journal of Agricultural Sciences.*, **8(2):** 41-49.

Basu, Ki Saikat (2006). Seed production Technology for fenugreek (*Trigonella foenum-graecum* L.). the Canadian prairies, department of biological sciences, University of Lethbridge, Lsthbridge Alberta, Canada, 203.

Bell, A.C. (1980). The use of mineral oil to inhibit aphid transmission of potato veinal necrosis virus: A laboratory and field experiment record of Agricultural Research. 28.

El-Bessomy, M.A. (2003). Effect of certain natural product compared with the chemical insecticide, imidacloprid against of whitefly infesting tomato plant. *J. pest. Cont.*

and Environ. Sci., **11(1):** 45-52.

Elbert, A., R. nauen and W. Leicht (1998). Imidacloprid a novel chloronicotinyl insecticide biological activity and agricultural importance. In: Ishaaya, I. Degeele, d. (Eds.), Insecticides with modes of action-mechanism and application. Springer, Berlin, Heidelberg, 50-73.

Georgios, A. (2002). Fenugreek the genus *Trigonella*, the edition published in the Taylor and Francis e-library, New York, USA and Canada, 195.

Ghulam, H., S. Tajwar, S. Muhammad, R. Shagufta and H.A. Azmat (2016). Arthropods associated with medicinal plants under field conditions in Sindh province of Pakistan *Journal of Entomdog and Zoology Studies.*, **4(1):** 516-520.

Henderson, C.F. and E.W. Tilton (1955). Tests with acaricide against the brown wheat mite. *J. Econ. Entomol*., **48:** 157-161.

Kant, K., N. Meena, B. Mishra, G. Lal, M. Vishal and D. Singh (2017). Population dynamics of Insect pests, natural enemies and pollinators of Fenugreek (*Trigonella foenum-graecum* L.). *International J. Seed prices.*, **7(1):** 65-59.

Kadir, A.A. and H.S. Barlow (1992). Pest management and the environment in 2000. C.A.B. International, Malaysia. 401.

Lee, S.M., A. Klocte, M.A. Barnaby, R.B. Yamasak and M.F. Balandrina (1991). Insecticide constituents of *Azadirachta indica* and *Melia azedarach* pages 293-304. In naturally occurring pest Bioregalators. P.A. Hedin (Editor). American Chemical Society Symposium Series, No. 449, Washington DC.

Moussa, A.G. (2005). Chemistry of Horticulture Plants. A text book, published by moussa, A.G. 259. (In Arabic).

Warthern, J.D. (1979). *Azadrachta indica* a source of insect feeding inhibitor and growth regulators. USDA, Agric. Rev. Man. ARM. NE, 4.

Yousri, H., A. Afawy, Y. Ahmed and T. El-Sharkawy (1995). Evaluation of some insecticides and natural biocides (*Beauveria bassinana*) against whitefly *Bemisia tabaci* on tomatoes. 8th Nat. Conf. of Pest and Did. Of Vegetables and Fruits in Egypt, **1:** 142-146.