P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(2): 2925-2928

© 2020 IJCS

Received: 13-01-2020

Accepted: 15-02-2020

Sunil Gocher

Department of Entomology,
S. K. N. Agriculture University,
Jobner, Rajasthan, India

BL Jat

Department of Entomology,
S. K. N. Agriculture University,
Jobner, Rajasthan, India

Manoj Kumhar

Department of Entomology,
S. K. N. Agriculture University,
Jobner, Rajasthan, India

Sarfraz Ahmad

Department of Plant Breeding &
Genetics, S. K. N. Agriculture
University, Jobner, Rajasthan,
India

Corresponding Author:**Sarfraz Ahmad**

Department of Plant Breeding &
Genetics, S. K. N. Agriculture
University, Jobner, Rajasthan,
India

Bio-efficacy of newer insecticides and bio-pesticides against sucking insect pest aphid (*Aphis craccivora* Koch) of groundnut

Sunil Gocher, BL Jat, Manoj Kumhar and Sarfraz Ahmad

DOI: <https://doi.org/10.22271/chemi.2020.v8.i2as.9194>

Abstract

To evaluate efficacy of newer insecticides and biopesticide against aphid, *Aphis craccivora* Koch experiment were carried out during *Kharif* 2018 at Agronomy farm, S.K.N. College of Agriculture, Jobner (Rajasthan). The experiment was laid out in Randomized Block Design (RBD) with nine treatments including untreated control on groundnut variety RG-382. All the insecticidal treatments were found significantly superior over the untreated control in aphid population in both the sprays. On the basis of mean per cent reduction in aphid population in two successive sprays the treatment of imidacloprid (81.94%) was found most effective against aphids, followed by thiamethoxam (79.87%) and acetamiprid (77.99%). The methyl demeton (72.79%), fipronil (70.54%) and acephate (68.60%) falls under moderately effective group and were differed significantly to each other. Biopesticides *Metarhizium anisopliae* (32.56%) and NSKE (47.97%) were proved least effective.

Keywords: Aphid, bio-efficacy, biopesticide, groundnut, insecticide, sucking insect pest

Introduction

Groundnut, *Arachis hypogaea* L. is grown on large scale in almost all the tropical and subtropical countries of the world. The major groundnut producing countries are India, China, Nigeria, U.S.A., Taiwan, Indonesia, Senegal, Ghana, Argentina and Brazil. Total cultivated area of groundnut in India is 49.70 lakh hectares with an annual production of 71.00 lakh tonnes and productivity of 1429 kg/ha^[2]. India occupies the first place in regard to acreage and second in production. Groundnut is important oilseed crop also known as peanut, earthnut, monkey nut, goober, pinda and manilla nut. Its oil primarily used in the manufacturing of vegetable oil (vanaspati ghee). Groundnut seed contains about 45 per cent oil and 26 per cent protein. Groundnut kernel as a whole is highly digestible. It is, in the first place about as concentrated a food as money can buy, one gram supplies 5.8 food calories. The biological value of groundnut protein is highest among the vegetable proteins and equals that of casein. Groundnuts are a good source of all B vitamins except B₁₂. They are a rich source of thiamin, riboflavin, nicotinic acid and vitamin E^[12]. With regard to minerals, phosphorus, calcium and iron are present in significant amount. The kernels are consumed either roasted or fried and salted.

The number of factors responsible for low productivity of groundnut includes adverse climatic conditions, poor quality seeds, diseases and insects which significantly affect both the quality and production of groundnut. Among these, insect pests are major limiting factor to reduce pod yield. As many as 52 species of insects and two species of mites have been recorded infecting the groundnut crop in India^[14]. The sucking insect pests viz., aphid, *A. craccivora*, leafhoppers, *E. kerri*, whiteflies, *B. tabaci* and thrips, *T. dorsalis* are most important^[3]. They suck the sap from tender parts of the plants, as a result plants wilted and dry up. Most of the species of sucking insects are also known to be vectors of diseases of groundnut. The Aphid, *A. craccivora* is a vector of groundnut rosette virus, peanut mottle virus and peanut stripe virus, cause yield losses up to 40 per cent^[5]. The damage is severe in drought situation when the crop is young. Both nymphs and adults pierce plant tissues to feed on sap. The damage done by aphid, leafhopper and thrips at these stages showed maximum reduction in potential yield of the crop. Therefore, the crop should be protected at proper stage from these pests^[13].

Insecticides are used widely to control the insect pests of groundnut because of easy adoption, effectiveness and immediate control. But their indiscriminate and irrational use creates resurgence, resistance and residual problems. Hence in the present study some new insecticides and biopesticides were evaluated against one of the major sucking insect pest aphid, *A. craccivora* of groundnut.

Material and Methods

The present investigations were conducted at the Agronomy farm of S.K.N. College of Agriculture, Jobner (S.K.N. Agriculture University, Jobner) during *Kharif*, 2018. Total nine treatments viz. Imidachloprid 17.8 SL (0.005%), Thiamethoxam 25 WG (0.005%), Acephate 75 SP (0.05%), Fipronil 5 SC (0.01%), Acetamiprid 20 SP (0.004%), Neem Seed Kernel Extract-NSKE (5.00%), *Metarhizium anisopliae* 1.15 WP (1 gm/ l), Methyl demeton 25 EC (0.025%) and untreated control were used over groundnut variety RG-382. Each treatment was replicated thrice in Randomized Block Design (RBD). The plot size was 2.4 x 3.0 m², row to row and plant to plant distance were of 40 cm and 15 cm, respectively.

Application of insecticides

All the insecticides were applied as a foliar spray using knap sack sprayer in two intervals. The first spray was done at economic threshold level on 66 days after sowing and second sprays after 20 days of first spray when leafhopper population rebuilt. Utmost care was taken to check the drift of insecticides by putting polythene check screen around each plot at the time of spraying. The quantity of spray solution was 600 liters per hectare in each spray application.

Observations

The population of aphid on groundnut crop was recorded early in morning hours on three leaves per plant from five randomly selected and tagged plants in each plot. The mean percent reduction in the population of leafhopper obtained one day before and one, three, seven and ten days after spray were taken into consideration to calculate the per cent reduction in the population which was done by applying Abbott's formula [1]:

$$\text{Per cent control (Reduction)} = \frac{\{X - Y\}}{X} \times 100$$

Where,

X = Number living in the check

Y = Number living in the treated

X – Y = Number killed by the treatment

The data were then statistically analyzed by transforming the percentage data into angular transformation values [4].

Results and Discussion

In order to evaluate the bio-efficacy of newer insecticides and biopesticides for the control of insect pests on a specific crop, different criteria could be used. In the present investigation,

the insecticides and biopesticides against aphid, *A. craccivora* were evaluated on the basis of mean population reduction at one, three, seven and ten days after two successive sprays (table-1). Comparative effects of all these insecticides at different intervals over aphids population also represented in the figure 1.

Percent population reduction of aphid, *Aphis craccivora* Koch

All the insecticidal treatments were found significantly superior over the untreated control in aphid population in both the sprays however, considerable difference were existed among them. The treatment imidacloprid 17.8 SL (81.94%) was found most effective followed by thiamethoxam 25 WG (79.87%) and acetamiprid 20 SP (77.99%) in both the spray and statistically were at par with each other in their efficacy. These results corroborate with that of Yadav *et al.* (2015) [15], reported that imidacloprid (0.005%) and thiamethoxam (0.005%) were effective against sucking insect pests, aphid, leafhopper and whitefly in cluster bean. The results were further conformity with those of Mutkule *et al.* (2018) [8] and Nigude *et al.* (2018) [9] who found that imidacloprid 17.8 SL was most effective for controlling of sucking insect pests on groundnut. Similarly, Pawar *et al.* (2016) [10] found imidacloprid, thiamethoxam and acetamiprid most effective against aphids, jassids and whitefly. Kolhe *et al.* (2016) [6] found imidacloprid (0.003%) and dimethoate (0.004%) significantly superior for controlling sucking insect pests of groundnut also support the present finding. The next effective treatment was methyl demeton 25 EC (72.79%) followed by fipronil 5 EC (70.54%) and acephate 75 SP (68.60%) which ranked in middle order of efficacy and were statistically found at par with each other however, methyl demeton also comparable with acetamiprid. Yadav *et al.* (2015) [15] found acephate (0.037%), profenophos (0.05%) and delat-cyhalothrin (0.008%) moderately effective against sucking insect pests, support the present results. In chilli, fipronil 5 SC was superior for controlling thrips, aphid and whitefly reported by Shinde *et al.* (2017) [11]. The bio-pesticides *Metarhizium anisopliae* 1.15 WP (32.56%) and neem seed kernel extract-NSKE (47.97%) proved to be least effective against aphid and were differed significantly with each other in their efficacy. The present investigation were in fully conformity with that of Yadav *et al.* (2015) [15] while partially corroborate with that of Krishna *et al.* (2015) [7] who reported bio-pesticide, NSKE (5%) was effective against thrips and leafhopper, however, it could not compete with synthetic insecticides.

Finally, on the basis of mean population reduction of aphid after first and second sprays the descending order of effectiveness of insecticides and bio-pesticides were as Imidacloprid 17.8 SL (0.005%) > Thiamethoxam 25 WG (0.005%) > Acetamiprid 20 SP (0.004%) > Methyl demeton 25 EC (0.025%) > Fipronil 5 SC (0.01%) > Acephate 75 SP (0.05%) > NSKE (5.0%) > *Metarhizium anisopliae* 1.15 WP (1 g/l).

Table 1: Bio-efficacy of different insecticides and biopesticides against aphid, *Aphis craccivora* Koch on groundnut

S. No.	Insecticides	Concentration (%) / dose	Per cent reduction of Aphid population days after spray									
			First Spray					Second Spray				
			One	Three	Seven	Ten	Mean	One	Three	Seven	Ten	Mean
1.	Imidacloprid 17.8 SL	0.005	82.54 (65.31)	86.35 (68.66)	83.15 (66.08)	74.48 (59.68)	81.63 (64.99)	80.10 (63.54)	85.16 (67.37)	87.50 (69.34)	76.20 (60.82)	82.24 (65.10)
2.	Thiamethoxam 25 WG	0.005	80.20 (63.68)	84.43 (67.14)	81.48 (64.95)	72.23 (58.23)	79.59 (63.22)	78.77 (62.59)	83.52 (66.09)	85.27 (67.45)	73.00 (58.74)	80.14 (63.65)
3.	Acephate 75 SP	0.05	68.35 (55.78)	74.10 (59.64)	72.74 (57.37)	61.73 (51.80)	68.73 (56.00)	66.46 (54.61)	72.76 (58.56)	74.36 (59.62)	60.30 (50.95)	68.47 (55.96)
4.	Fipronil 5 SC	0.01	71.30 (57.61)	76.42 (61.24)	72.20 (58.22)	63.27 (52.70)	70.80 (57.33)	68.35 (55.77)	74.60 (59.74)	76.12 (60.86)	62.00 (51.95)	70.27 (56.96)
5.	Acetamiprid 20 SP	0.004	77.26 (61.58)	82.12 (65.27)	80.53 (63.87)	70.42 (57.11)	77.58 (61.76)	76.50 (61.12)	81.46 (64.73)	83.67 (66.39)	71.92 (58.05)	78.39 (62.32)
6.	NSKE	5.0	43.78 (41.42)	55.67 (48.26)	49.32 (44.61)	40.37 (39.44)	47.29 (43.45)	44.57 (41.87)	52.00 (46.15)	58.20 (49.72)	39.80 (39.11)	48.64 (44.21)
7.	<i>Metarhizium anisopliae</i> 1.15 WP	1.0 g/ l	27.43 (31.54)	35.26 (36.43)	39.16 (38.74)	26.50 (30.98)	32.09 (34.50)	28.60 (32.29)	36.39 (37.10)	39.45 (38.90)	27.66 (31.70)	33.03 (35.07)
8.	Methyl demeton 25 EC	0.025	73.56 (59.13)	78.44 (62.65)	74.66 (59.36)	65.88 (54.28)	73.14 (58.81)	70.22 (56.97)	79.90 (61.29)	78.38 (62.30)	64.24 (53.31)	72.44 (58.37)
9.	Untreated	-	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)
	S. Em $\pm$		1.31	1.52	1.36	1.28	1.42	1.27	1.32	1.50	1.41	1.54
	CD (p=0.05)		3.97	4.61	4.11	3.89	4.31	3.86	4.00	4.54	4.28	4.67

*Figures in parentheses are angular transformation values

Fig 1: Comparative efficacy of different treatments against aphid, *Aphis craccivora* Koch on groundnut

References

- Abbott WS. A method of computing the effectiveness of an insecticide. *Journal of Economic Entomology*. 1925; 18(2):265-267.
- Anonymous. Agriculture Statistics at a Glance, 2017. Directorate of Economics and Statistics, Department of Agriculture, Cooperation & Farmer's Welfare, Government of India. Krishi Bhawan (New Delhi), 2017, 79.
- David BV, Ramamurthy VV. Elements of economic entomology, Brillion Publication, 2015, 154-155.
- Gomez KA, Gomez AA. Problem data. Statistical Procedures for Agricultural Research (II edition), John Wiley and Sons, New York, 1976, 272-315.
- Khan MK, Hussain M. Role of coccinellid and syrphid predators in biological control of aphid. *Journal of Oil Seeds Research*. 1965; 9:67-70.
- Kolhe BD, Bhamare VK, Sawant CG. Efficacy of insecticides against jassid (*Empoasca kerri* Pruthi) and thrips (*Scirtothrips dorsalis* Hood) infesting groundnut. *Annals of Plants Protection Sciences*. 2016; 24(2):250-253.
- Krishna NK, Abdhul K, Shivamurthy NR. Evaluation of organic pesticides against thrips on groundnut. *Journal of Life Sciences*. 2015; 12(1):235-239.
- Mutkule DS, Patil PB, Jayewar NE. Management of major sucking pests of groundnut through some newer insecticides. *International Journal of Current Microbiology and Applied Sciences*. 2018; 6:281-288.

9. Nigude VK, Patil SP, Patil SA, Bagade AS. Management of sucking pests of groundnut with newer molecules of insecticides *Arachis hypogaea* L. International Journal of Current Microbiology and Applied Sciences. 2018; 7(1):566-569.
10. Pawar SA, Zanwar PR, Lokare SG, Dongarjal RP, Sonkamble MM. Efficacy of newer insecticides against sucking pests of okra. Indian Journal of Entomology. 2016; 78(3):257-259.
11. Shinde SR, Patil NM, Mhaska BM. Efficacy of some newer insecticides against sucking pests of chilli (*Capsicum annum* L.). Journal of Life Sciences. 2017; 14(3):284-287.
12. Singh C, Singh P, Singh R. Modern techniques of raising field crops. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, 2nd Edition: 2019, 295-296.
13. Singh TVK, Singh KM. Yield infestation relationship for groundnut jassid and thrips. Indian Journal of Entomology. 1991; 53(2):177-189.
14. Singh TVK, Singh KM, Singh RN. Groundnut pest complex: III. Incidence of insect pests in relation to agroclimatic conditions as determined by graphical super imposition technique. Indian Journal of Entomology. 1990; 52(4):686-692.
15. Yadav SR, Kumawat KC, Khinchi SK. Efficacy of new insecticide molecules and bioagents against sucking insect pests of cluster bean, *Cyamopsis tetragonoloba* (Linn.) Taub. Legume Research. 2015; 38(3):407-410.