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Research Article

EVALUATION OF SOME SELECTED INSECTICIDES AGAINST LEGUME APHID, *Aphis craccivora* (KOCH) IN GREENGRAM

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Abstract: Greengram is a vital crop grown throughout India, which suffers from several insect pests. Among those aphids were considered economic important. In India insecticides are the frontline defense against insect pests. Hence the experiment was conducted to know the effective insecticide for the management of aphids in greengram. Experiment was conducted at Agricultural and Horticultural Research Station, Bhavikere, Karnataka, India, for two consecutive seasons of *Kharif* 2018 and 2019 to know the effect of insecticides against legume aphid, *Aphis craccivora* in greengram. The results of pooled data of two seasons revealed that imidacloprid 17.8 SL @ 0.3 ml/litre was found to be superior in reducing aphid population (2.56 per 5 cm twig) which was followed by thiamethoxam 25 WG @ 0.5 g/litre (3.56). Overall, the study revealed that insecticides were efficient in reducing the aphid population in greengram.

Keywords: *Aphids, Greengram, Insecticides, Imidacloprid and Thiamethoxam*

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Introduction

The greengram, *Vigna radiata* (L.) is widely grown in India. Presently about 90 per cent of world's greengram was produced in Asia alone [1]. India accounts for about 65 per cent of the world's acreage, 54 per cent of its global production and is the world's largest greengram producer [2]. Among the different constraints, insect pests are majorly influenced the greengram production. Greengram is attacked by 40 species of insect pests [3], but sucking insect pests such as aphids, jassids and whitefly are of the major importance [4]. These insect pests not only reduce the vigour of the plant by sucking the sap but also transmit the viral diseases and affect photosynthesis as well [5]. Among the insect pests, aphids are most economically important insect pest causing severe damage to several crops. Both nymphs and adults suck plant sap and cause severe damage from the seedling to harvesting stage [6]. The aphid, *Aphis craccivora* (Koch) (Aphididae: Homoptera) is a widely distributed species of insect pest prevalent throughout the country. It causes direct damage by feeding, which may induce plant deformation, reduction in plant height, bear few flowers and pods, the pods and seeds become shrivelled [7]. Indirect damage caused either by honeydew secretion this leads sooty mould, it inhibits photosynthesis of the plant and also the aphids were able to transmit the Urdbean Leaf Crinkle Virus (ULCV) from plant to plant [8]. Insecticides are the main weapons of defence against the aphids. Hence the present study was conducted to identify the effective insecticide for the management of aphids.

Material and Methods

The field experiment was conducted at AHRS, Bhavikere, University of Agricultural and Horticultural Sciences, Shivamogga, 577204, Karnataka, India during two seasons, *i.e*., *Kharif* 2018 and 2019. The field experiment was laid out in a Randomized Block Design (RBD) with eight treatments and replicated in thrice. The widely grown greengram variety KKM-3 was used to evaluate the insecticides against aphids.

The crop was raised according to the package of practices of UAHS, Shivamogga except for plant protection measures. The treatments were imposed at 30 and 45 days after sowing of the crop [Table-1]. The spraying was done by using hand-operated knapsack sprayer with a standard volume of water. Sufficient care was taken to avoid the drift problem to neighbouring treatments.

Observation on the aphid's population was made on 5 randomly selected tagged plants in each treatment. The aphids count was taken at top 5 cm twig of the greengram plant at a day before, seventh and fifteen days after spraying of insecticides. Data collected during the period of study were subjected to square root transformation before statistical analysis. Further, the data of both the seasons were pooled and analyzed to bring out valuable conclusions.

Table-1 *Details of the selected insecticides evaluated against legume aphid Aphis craccivora in greengram*

SN	Treatments details	Dose per liter	Trade name
1	Imidacloprid 17.8 SL	0.3 ml	Confidor
2	Acetamiprid 20 SP	0.3 g	Prias
3	Acephate 75 SP	1.0 g	Hilphate
4	Thiamethoxam 25 WG	0.5 g	Actara
5	Dinotefuron 20 SG	0.3 g	Token
6	NSKE 5 %	-	-
7	Dimethoate 30 EC	1.7 ml	Tafgor
8	Control	-	-

Results and discussion

Aphid population as influenced by different insecticides during *Kharif* 2018

A day before spraying, the aphid population ranged from 36.07 to 44.47 per 5 cm twig of the plant. Aphid populations were found to be statistically non-significant in pretreatment plots [Table-2]. In the first spray, at 7 days after treatment imposition, the lowest number of aphids per 5 cm twig were recorded in the imidacloprid 17.8 SL (8.93) followed by thiamethoxam 25 WG (9.63).

Table-2 *Evaluation of selected insecticides against legume aphid, Aphis craccivora on greengram during Kharif 2018*

Treatments	Dosage	DBS	Mean number of aphids per 5 cm twig			
			First spray		Second spray	
			7 DAS	15 DAS	7 DAS	15 DAS
T_1 - Imidacloprid 17.8 SL	0.3 ml	40.40(6.39)	8.93(3.07)^{e}	9.93(3.22)^{c}	4.05(2.12)^{d}	2.67(1.78)^{d}
T_2- Acetamiprid 20 SP	0.3 g	36.87(6.10)	10.33(3.29)^{de}	11.13(3.40)^{bc}	5.29(2.38)^{bcd}	6.40(2.62)^{c}
T_3- Acephate 75 SP	1.0 g	37.87(6.19)	11.87(3.52)^{cd}	12.93(3.66)^{b}	5.09(2.32)^{cd}	6.47(2.63)^{c}
T_4- Thiamethoxam 25 WG	0.5 g	36.07(6.04)	9.63(3.18)^{de}	10.87(3.36)^{bc}	4.63(2.26)^{d}	2.73(1.80)^{d}
T_5 -Dinotefuron 20 SG	0.3 g	41.33(6.45)	11.27(3.43)^{cde}	11.80(3.50)^{bc}	5.11(2.34)^{bcd}	6.60(2.66)^{c}
T_6- NSKE 5%	-	38.27(6.22)	17.20(4.20)^{b}	17.53(4.24)^{ab}	7.66(2.82)^{b}	10.13(3.26)^{b}
T_7- Dimethoate 30 EC (standard check)	1.7 ml	44.47(6.70)	13.33(3.71)^{c}	14.00(3.79)^{ab}	7.20(2.77)^{bc}	8.40(2.97)^{bc}
T_8- Control	-	36.47(6.07)	39.47(6.31)^{a}	40.67(6.41)^{a}	41.07(6.44)^{a}	45.67(6.79)^{a}
F value		NS	*	*	*	*
SEM±		0.19	0.14	0.17	0.16	0.15
CD @ 0.05		-	0.42	0.50	0.48	0.45
CV (%)		5.24	6.21	7.19	9.43	8.20

*Numbers in the parenthesis are √(x+0.5) transformed values; * -Significant at (P≤0.05); NS- Non-significant; DBS-Day before spray; DAS- Days after spraying; Means followed by the same letter do not differ significantly by DMRT (P=0.05)*

Table-3 *Evaluation of selected insecticides against legume aphid, Aphis craccivora on greengram during Kharif 2019*

Treatments	Dosage	DBS	Mean number of aphids per 5 cm twig			
			First spray		Second spray	
			7 DAS	15 DAS	7 DAS	15 DAS
T_1 - Imidacloprid 17.8 SL	0.3 ml	41.40(6.46)	11.47(3.44)^{d}	12.67(3.62)^{c}	4.67(2.26)^{e}	2.47(1.72)^{f}
T_2- Acetamiprid 20 SP	0.3 g	41.67(6.49)	13.40(3.71)^{cd}	14.73(3.89)^{c}	5.67(2.47)^{de}	6.93(2.72)^{de}
T_3- Acephate 75 SP	1.0 g	39.27(6.30)	14.00(3.80)^{cd}	15.60(4.00)^{bc}	7.13(2.75)^{cd}	7.80(2.87)^{cd}
T_4- Thiamethoxam 25 WG	0.5 g	42.27(6.53)	12.47(3.60)^{cd}	13.60(3.74)^{c}	5.33(2.40)^{de}	5.00(2.32)^{e}
T_5 -Dinotefuron 20 SG	0.3 g	42.93(6.59)	14.93(3.92)^{cd}	16.53(4.10)^{bc}	7.67(2.85)^{cd}	8.53(3.00)^{cd}
T_6- NSKE 5%	-	42.67(6.56)	20.40(4.57)^{b}	21.40(4.67)^{b}	11.87(3.51)^{b}	12.33(3.58)^{b}
T_7- Dimethoate 30 EC (standard check)	1.7 ml	38.53(6.24)	15.67(4.01)^{c}	16.40(4.09)^{bc}	9.00(3.08)^{bc}	10.07(3.25)^{bc}
T_8- Control	-	40.33(6.38)	42.87(6.58)^{a}	43.47(6.63)^{a}	46.20(6.83)^{a}	47.07(6.90)^{a}
F value		NS	*	*	*	*
SEM±		0.23	0.16	0.25	0.16	0.14
CD @ 0.05		-	0.48	0.74	0.48	0.41
CV (%)		6.25	6.77	10.01	8.39	7.12

*Numbers in the parenthesis are √(x+0.5) transformed values; * -Significant at (P≤0.05); NS- Non-significant; DBS-Day before spray; DAS- Days after spraying; Means followed by the same letter do not differ significantly by DMRT (P=0.05)*

Table-4 *Evaluation of selected insecticides against legume aphid, Aphis craccivora on greengram (pooled data of 2018 and 2019)*

Treatments	Dosage	DBS	Mean number of aphids per 5 cm twig			
			First spray		Second spray	
			7 DAS	15 DAS	7 DAS	15 DAS
T_1- Imidacloprid 17.8 SL	0.3 ml	40.9(6.42)	10.20(3.26)^{e}	11.30(3.43)^{d}	4.36(2.19)^{e}	2.56(1.74)^{e}
T_2- Acetamiprid 20 SP	0.3 g	39.26(6.30)	11.86(3.51)^{cde}	12.93(3.66)^{cd}	5.48(2.42)^{de}	6.66(2.67)^{d}
T_3- Acephate 75 SP	1.0 g	38.56(6.24)	12.93(3.66)^{cd}	14.26(3.84)^{cd}	6.11(2.56)^{cde}	7.13(2.75)^{cd}
T_4- Thiamethoxam 25 WG	0.5 g	39.16(6.29)	11.05(3.39)^{de}	12.23(3.55)^{cd}	4.98(2.33)^{de}	3.86(2.07)^{e}
T_5 -Dinotefuron 20 SG	0.3 g	42.13(6.52)	13.10(3.68)^{cd}	14.16(3.81)^{cd}	6.38(2.61)^{cd}	7.56(2.83)^{cd}
T_6- NSKE 5%	-	40.46(6.38)	18.80(4.39)^{b}	19.46(4.46)^{b}	9.76(3.20)^{b}	11.23(3.42)^{b}
T_7- Dimethoate 30 EC (standard check)	1.7 ml	42.16(6.52)	14.50(3.86)^{c}	15.20(3.94)^{c}	8.10(2.92)^{bc}	9.23(3.11)^{bc}
T_8- Control	-	38.40(6.23)	41.16(6.45)^{a}	42.06(6.52)^{a}	43.63(6.64)^{a}	46.36(6.84)^{a}
F value		NS	*	*	*	*
SEM±		0.20	0.12	0.15	0.13	0.13
CD @ 0.05		-	0.35	0.45	0.37	0.37
CV (%)		5.52	5.09	6.21	6.93	6.64

*Numbers in the parenthesis are √(x+0.5) transformed values; * -Significant at (P≤0.05); NS- Non-significant; DBS-Day before spray; DAS- Days after spraying; Means followed by the same letter do not differ significantly by DMRT (P=0.05)*

However, the highest number of aphids was recorded in the untreated control (39.47), which was found to be inferior among the treatments. At 15 days after spraying of insecticides, the same trend was noticed. The highest number of aphids was noticed in the untreated plot (40.67), which is significantly differed from other insecticides tested. The lowest number of aphids per 5 cm twig was noticed in imidacloprid 17.8 SL (9.93) followed by thiamethoxam 25 WG (10.87). At, the second spray, the least aphid population at 7 days after the second spray was recorded in the imidacloprid 17.8 SL (4.05) treated plot and was closely followed by thiamethoxam 25 WG (4.63). In control, the aphid population was 41.07 per 5 cm twig of the greengram plant and significantly differed from the other treatments. Observations recorded at 15 days after the second spray indicated that, the lowest number of aphids was registered in the imidacloprid 17.8 SL (2.67) it was found to be closely followed by thiamethoxam 25 WG (2.73). The highest number of aphids (45.67) per 5 cm twig was recorded in the untreated plot, which was significantly high from all the insecticides tested [Table-2].

Aphid population as influenced by different insecticides during *Kharif* 2019

The day before treatment imposition, the aphid population was found to be 38.53 to 42.93 per 5 cm twig of the plant [Table-3]. The observations recorded at 7 days after treatment imposition, the lowest number of aphids was registered in the imidacloprid 17.8 SL (11.47) followed by thiamethoxam 25 WG (12.47). In the untreated plot, the highest number of aphids (42.87) per 5 cm twig was recorded, which was significantly higher among all the insecticides tested. Observations at 15 days after treatment imposition showed that least number of aphids was

recorded in the imidacloprid 17.8 SL (12.67) and it was closely followed by thiamethoxam 25 WG (13.6) and acetamiprid 20 SP (14.73). A higher population of aphids was recorded in untreated plot (43.47) per 5 cm twig of the greengram plant and significantly differed from all the insecticides tested. A similar trend was noticed at second spray also. Least aphid population at 7 days after the second spray was recorded in the imidacloprid 17.8 SL (4.67) treated plot followed by thiamethoxam 25 WG (5.33). In control, maximum aphid population (46.20 per 5 cm twig) was observed. Fifteen days after the second spray indicated that the lowest number of aphids was recorded in imidacloprid 17.8 SL (2.47) followed by thiamethoxam 25 WG (5.0). Untreated plot recorded 47.07 per 5 cm twig, and it was found to be significantly highest among all the treatments [Table-3].

Aphid population as influenced by different insecticides (Pooled data of 2018 and 2019)

Pre-treatment population of aphids was varied in a range of 38.4 to 42.16 per 5 cm twig. Aphid populations were found to be non-significant among the treatments [Table-4]. Least number of aphids was documented at 7 days after spraying in imidacloprid 17.8 SL (10.20), it was followed by thiamethoxam 25 WG (12.93). In the untreated plot, the aphid population was 41.16 per 5 cm twig of the greengram and was found to be highest among all the insecticides evaluated. After 15 days of treatment imposition, the lowest number of aphids per 5 cm twig was recorded in imidacloprid 17.8 SL (11.30) followed by thiamethoxam 25 WG (12.23) while, the highest number of aphid population (42.06) was noticed in the control plot. In the second spray, at 7 days after treatment imposition, the lowest number of aphids was documented in imidacloprid 17.8 SL (4.36) treated plot, it was closely followed by thiamethoxam 25 WG (4.98). In control plot, the highest numbers of aphids (43.63) per 5 cm twig of the greengram plant and it was found to be significantly inferior. The data recorded at 15 days after the second spray, revealed the significant difference among the treatments. The least aphid population at 15 days after second spray was recorded in the imidacloprid 17.8 SL (2.56) treated plot followed by thiamethoxam 25 WG (3.86). In control plot, the aphid population was 46.36 per 5 cm twig of the greengram [Table-4].

From the above results indicated that imidacloprid 17.8 SL @ 0.3 ml/litre and thiamethoxam 25 WG @ 0.5 g/litre were found to be effective in reducing the aphid population in greengram. However, all the insecticides evaluated were found to be effective in reducing the aphid population to some extent when compared to control plot. Imidacloprid 17.8 SL and thiamethoxam 25 WG belonged to the novel group of insecticides neonicotinoids. Neonicotinoids are the major class of insecticides, have outstanding potency and systemic activity for crop protection against sucking insect pests. They possess lower mammalian toxicity, less resurgence problems, environmental protection, pest management selectivity and less toxicity to natural enemies [9]. These groups of compounds are broad-spectrum, have systemic activity against sucking insect pests. They move to the growing tip of the plant and afford long-term protection from piercing-sucking insect pests [10]. These results were supported with the outcomes of Khutwad *et al*. (2002) [11] who reported higher efficacy of thiamethoxam and imidacloprid in greengram. Similarly, Justin *et al*. (2015) [12] showed the effectiveness of neonicotinoids in black gram. Kabir *et al*. (2014) [13] reported a higher efficacy of thiamethoxam against aphids in greengram. The higher efficacy of imidacloprid was also reported in cowpea by Khade *et al*. (2014) [14], Reddy *et al*. (2014) [15]. Similarly, Kumar *et al*. (2016) [16] and Hegde *et al*, (2020) [17] who reported that effectiveness of thiamethoxam and imidacloprid against green peach aphid, *Myzus persicae* in potato, and other researchers Kalleshwraswamy *et al*. (2009) [18] reported that imidacloprid was found to be effective against aphid vectors in papaya.

Conclusion

Imidacloprid 17.8 SL @ 0.3 ml/liter and thiamethoxam 25 WG @ 0.5 g/liter were effectively reduced the aphid population in greengram. Hence, these chemicals may be utilized for the management of aphids in greengram.

Application of research

Effective management of aphid in greengram through insecticides

Research Category: Insect pest management, Plant Protection

Abbreviations: ml- mili litre, @- at the rate of, g-gram

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Study area / Sample Collection: AHRS, Bhavikere, UAHS, Shivamogga

Cultivar / Variety / Breed name: KKM-3

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References

[1] Laxmipathi G.C.L. (2015) *Pulses handbook*, 17-33.
[2] Singh P., Dubey N.K., Shukla R., Kumar A. and Prakash B. (2011) *Global scenario on the application of natural products in integrated pest management programmes*, 1,120.
[3] Mahalakshmi M.S., Sreekanth M., Adinarayana M. and Koteswararao Y. (2016) *International Research Journal of Natural and Applied Sciences*, 3, 134-139.
[4] Islam M.S., Latif M.A., Ali M. and Hossain M.S. (2008) *International Journal of Sustainable Agricultural Technology*, 5, 41-46.
[5] Sachan J.N., Yadava C.P., Ahmad R. and Katti G. (1994) *Agricultural Insect Pest Management, Common Wealth Publishers, New Delhi, India*, 45-48.
[6] Kotadia V.S. and Bhalani P.A. (1992) *Gujarat Agricultural University Research Journal*, 17, 161-164.
[7] Schepers A (1988) *Aphids- their biology, natural enemies and control. World Crop Pests, 2C. Elsevier, Amsterdam*, 89-121.
[8] Kumar P.C.H., Lokesh B.K., Naik M.K., Govindappa M.R., Guru G.R., Anitha P.D.C. and Chandrashekara (2014) *Journal of Biopesticides*, 7, 21-26.
[9] Kunkel B.A, Held D.W. and Potter D.A. (1999) *Journal of Economic. Entomology*, 92, 922-930.
[10] Kundoo A.A., Showket A., Dar M., Bashir M., Dar M.S., Gul S. and Gulzar (2017) *Journal of Entomology and Zoology Studies*, 6, 333-339.
[11] Khutwad D.S., Nakat R.V. and Chavan B.P. (2002) *Pestology*, 26, 57-59.
[12] Justin G.L.C., Anandhi P. and Jawahar D. (2015) *Journal of Entomology and Zoology Studies*, 3, 115-121.

[13] Kabir M.M., Hossain M.A., Farhat T., Yasmin S., Niaz and Farhat, R. (2014) *International Journal of Innovative Research and Development*, 3, 62-68.
[14] Khade K.N., Undirwade D.B., Tembhurne R.D. and Lande G.K. (2014) *Trends in Biosciences*, 7, 3212-3217.
[15] Reddy S.D., Pushpalatha M., Chowdary R.L. and Kumar R.L. (2014) *Bioinfolet*, 11, 853-854.
[16] Kumara B.B., Kalleshwaraswamy C.M., Ali S. and Kadian M.S. (2016) *International Journal of Agriculture Sciences*, 8, 2621-2625.
[17] Hegde K., Kalleshwaraswamy C.M. and Venkataravanappa V. (2019) *Pest Management in Horticultural Ecosystems*, 25, 156-164.
[18] Kalleshwaraswamy C. M., Krishna kumar N.K., Dinesh M.R., Chandrashekar K.N. and Manjunatha M. (2009) *Karnataka Journal of Agricultural Sciences*, 22, 552-553.