Biological Forum – An International Journal **15(8a): 119-122(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Evaluation of Different Insecticides against White Fly, *Bemisia tabaci* (Gennadius) Infesting Black Gram

Mangal Sukhi Meena[1]*, Hari Prasad Meghwal[2], Laxman Singh Saini[3], Suresh Kumar Jat[2], Bal Kishan Patidar[2] and Devesh Parmar[1]

[1]Ph.D. Scholar, Department of Entomology, MPUAT, Udaipur (Rajasthan), India.
[2]Department of Entomology, College of Agriculture, Ummedganj-Kota, Rajasthan (Rajasthan), India.
[3]Ph.D. Scholar, Department of Entomology, SKNAU, Jobner- Rajasthan (Rajasthan), India.

(Corresponding author: Mangal Sukhi Meena)*
(Received: 10 June 2023; Revised: 23 June 2023; Accepted: 27 July 2023; Published: 15 August 2023)
(Published by Research Trend)

ABSTRACT: Black gram whitefly (*Bemisia tabaci*) is a significant pest that inflicts substantial yield losses in black gram crops by sap-sucking, inducing yellowing of leaves, and transmitting devastating plant viruses, making its effective management crucial for ensuring crop productivity. The present study was undertaken to determine the bio-efficacy of six insecticides *viz.*, Thiamethoxam 25 WG @ 100 g/ha, Acetamiprid 20 SP @ 100 g/ha, Chlorantraniliprole 18.5 SC @ 150 ml/ha, Imidacloprid 17.8 SL @ 125 ml/ha, Profenofos 50 EC @ 1250 ml/ha and Neem Seed Kernel Extract (NSKE) 5 Per cent @ 25 kg/ha against white fly of black gram crop. All the insecticidal treatments were found significantly superior in reducing the population of white fly as compared to control after 10 days of spray. Among all the treatments, Thiamethoxam 25 WG @ 100 g/ha was found most effective with minimum population (2.87 white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha (3.07 white fly/5 plant).

Keywords: Black gram, White fly, Bio-efficacy, Significantly, Insecticide.

INTRODUCTION

Black gram (*Vigna mungo* (L.) Hepper) stands as the third most significant pulse crop in India, following chickpea and pigeon pea. Recognized as both urd bean and the "queen of pulses," it owes its popularity to its exceptional nutritional value and adaptability to various cropping systems like mixed crop, intercrop, and sole cropping due to its short growth cycle. Its composition includes 24% protein, 3.2% minerals, and 59.6% carbohydrates. Per 100g of split daul (Nene, 2006), it contains 154 mg calcium, 9.1 mg iron, and 38 mg β-carotine. It can fix 30 to 60 kg per ha of nitrogen contingent on soil and environmental factors (Panikkar *et al*., 1990). During various growth stages of black gram, numerous insect pests emerge, although around twelve of them cause significant harm (Singh and Singh 1977). Pest-related losses account for an annual average of 2.5 to 3.0 million tonnes of pulses, with a monetary impact of nearly Rs. 6,000 crores attributed to damage inflicted by the insect pest complex (Reddy, 2009). Among these pests, the gram pod borer (*Helicoverpa armigera* Hubner) and spotted pod borer (*Maruca vitrata* Geyer) inflict considerable damage to grain legumes, including seed and pod damage (Patro and Behera 2014). However, the whitefly *Bemisia tabaci* Gennadius, a major sap-sucking pest, significantly affects black gram plants. Found in tropical, subtropical, and temperate regions, both nymphs and adults extract sap from the underside of leaves using their piercing and sucking mouthparts. This sap-sucking leads to yellow spots, crinkling, curling, and eventually drying of the leaves. Furthermore, the insect acts as a carrier of various viruses, and its honeydew secretion promotes the growth of black sooty mold, which impedes photosynthesis and decreases yield. In contemporary times, the market offers a range of novel chemicals, including growth regulators and neonicotinoids, known for their efficacy in pest control and minimal impact on non-target organisms. The evaluation of these chemicals for their effectiveness against crop pests is imperative. With this in mind, this study delves into the occurrence of whitefly in black gram and explores ecologically viable management approaches. The goal is to offer recommendations to farmers in the Humid South Eastern Plain zone, while considering the agro-climatic conditions of Rajasthan. Given the severity of the pest and the economic significance of the crop, this investigation aims to assess the impact of various novel insecticides against whitefly in real-world field conditions.

MATERIALS AND METHODS

During the *kharif* season of 2020, a field experiment conducted at the Agricultural Research Station located in Ummedganj-Kota, which is situated in the eastern part of Kota, Rajasthan. The research station is approximately 12 km away from Kota and has an altitude of 258 meters above mean sea level. The coordinates of the location are approximately 25˚11′0″ N latitude and 75˚50′0″ E longitude. The region falls under Agro-climatic Zone V, which is known as the Humid South Eastern Plain Zone of Rajasthan. The field experiment was laid out in a randomized block design with three replications. The

experimental plot had a size of 4.2 × 5.0 meters. Within each plot, the spacing between rows was set at 30 cm, while the spacing between individual plants was 10 cm. For the experiment, the black gram variety 'Pratap urd - 1' was selected and used for sowing. Throughout the cropping season, uniform agronomic practices were applied in the field. Insecticide spraying was carried out when the population density of pests crossed the economic threshold level (ETL). The spraying was performed using a Knapsack Sprayer, which is a portable device commonly used for applying pesticides or insecticides. Six different insecticides were evaluated for their effectiveness against the pod borer. The insecticides used in the experiment, along with their respective application rates, are as follows: Thiamethoxam 25 WG @ 100 g/ha, Acetamiprid 20 SP @ 100 g/ha, Chlorantraniliprole 18.5 SC @ 150 ml/ha, Imidacloprid 17.8 SL @ 125 ml/ha, Profenofos 50 EC @ 1250 ml/ha and Neem Seed Kernel Extract (NSKE) 5 Per cent @ 25 kg/ha. The insecticide spraying was carried out in two stages. The population of white fly was recorded on randomly selected and tagged Five plants in each plot from the three (one from top, middle and bottom) leaves at one day before and 3rd, 7thand 10thdays after each spray. The number of whitefly (nymphs and adults) was transformed in square root values for statistical analysis.

RESULT ANDDISCUSSION

A. Efficacy of different treatment against whitefly, Bemisia tabaci

The result revealed that all the treatments were significantly effective in reducing the population of whitefly (Table 1 and Fig. 1). Pre-treatment white fly population in all the treatments along with control ranged from 11.80 to 12.53 white fly/5 plant and there was no significant difference observed among all the treatments including control. However, the data on whitefly/leaf was also recorded on 3rd, 7th and 10th day after spray.

After 3 days of 1st spray the white fly population ranged from 5.33 to 8.80 white fly/5 plant in different treatments as compared to control (12.93white fly/5 plant).Among all the treatments, Thiamethoxam 25 WG @ 100 g/ha was found most effective with minimum population (5.33white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha(5.80white fly/5 plant), Imidacloprid 17.8 SL @ 125 ml/ha(6.27 whitefly/5plant), Chlorantraniliprole 18.5 SC @ 150 ml/ha(6.93white fly/5 plant), Profenofos 50 EC @ 1250 ml/ha (7.07white fly/5 plant) while, the treatment of NSKE 5 Per cent @ 25 kg/ha was found least effective with maximum population (8.80white fly/5 plant).

After 7 days of 1st spray the white fly population ranged from 3.40 to 8.60 white fly/5 plantin different treatments as compared to control (13.33 white fly/5 plant). Among all the treatments Thiamethoxam 25 WG @ 100 g/ha was found most effective with minimum population (3.40white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha(3.53 white fly/5 plant), Imidacloprid 17.8 SL @ 125 ml/ha(3.87 white fly/5 plant), Chlorantraniliprole 18.5 SC @ 150 ml/ha(4.47 white fly/5 plant), Profenofos 50 EC @ 1250 ml/ha (5.40 of white fly/5 plant) while, the treatment of NSKE 5 per cent @ 25 kg/ha was found least effective with maximum population (8.60 white fly/5 plant).

After 10 days of 1st spray the white fly population ranged from 3.80 to 8.93white fly/5 plant in different treatments as compared to control. Among all the treatments Thiamethoxam 25 WG @ 100 g/ha was found most effective with minimum population(3.80white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha(4.07 white fly/5 plant), Imidacloprid 17.8 SL @ 125 ml/ha(4.20 white fly/5 plant), Chlorantraniliprole 18.5 SC @ 150 ml/ha(5.47 white fly/5 plant), Profenofos 50 EC @ 1250 ml/ha (5.53 white fly/5 plant) while, the treatment of NSKE 5 per cent @ 25 kg/ha was found least effective with maximum population (8.93 white fly/5 plant).

All Almost same trend of whitefly population was recorded on 3rd, 7th and 10th day after the second (Table 1). The order of effectiveness of these treatments was thiamethoxam > Acetamiprid > imidacloprid > Chlorantraniliprole > Profenofos > NSKE.

B. Pooled population of both spray

Pooled data of 1st and 2nd spray on white fly in black gram presented in Table 1 and Fig. 1 revealed that pre-treatment population (PTP) white fly varied from 11.80 to 12.53 white fly/5 plant in different treatment including control and there was no significant difference was found among the treatments including control.

Population of white fly after 3 days of both sprays revealed that all the treatments were found significantly effective in reducing the population of white fly as compared to control (14.17 white fly/5 plant). Among all the treatments, Thiamethoxam 25 WG @ 100 g/ha was found significantly superior with minimum population (4.27 white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha(4.67 white fly/5 plant), Imidacloprid 17.8 SL @ 125 ml/ha (5.07 white fly/5 plant), Chlorantraniliprole 18.5 SC @ 150 ml/ha(5.97 white fly/5 plant), Profenofos 50 EC @ 1250 ml/ha (6.23 white fly/5 plant) while, the treatment of NSKE 5 Per cent @ 25 kg/ha was found least effective with maximum population (8.50white fly/5 plant). The treatment of Thiamethoxam 25 WG @ 100 g/ha was statistically at par with Acetamiprid 20 SP @ 100 g/ha and Imidacloprid 17.8 SL @ 125 ml/ha. There was no significant difference found among the treatments *viz.*, Chlorantraniliprole 18.5 SC @ 150 ml/ha and Profenofos 50 EC @ 1250 ml/ha.

After 7 days of both spray, among all the treatments, Thiamethoxam 25 WG @ 100 g/ha was found most effective with minimum population white fly (2.63 white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha (2.77 white fly/5 plant), Imidacloprid 17.8 SL @ 125 ml/ha (3.07 white fly/5 plant), Chlorantraniliprole 18.5 SC @ 150 ml/ha(4.90 white fly/5 plant), Profenofos 50 EC @ 1250 ml/ha (5.50 white fly/5 plant) while, the treatment of NSKE 5 Per cent @ 25 kg/ha was found least effective with maximum population (8.30white fly/5 plant). The

treatment of Thiamethoxam 25 WG @ 100 g/ha was statistically at par with Acetamiprid 20 SP @ 100 g/ha and Imidacloprid 17.8 SL @ 125 ml/ha. There was no significant difference found among the treatments *viz.*, Chlorantraniliprole 18.5 SC @ 150 ml/ha and Profenofos 50 EC @ 1250 ml/ha.

After 10 days of both sprays, all the treatments were found significantly superior in reducing the population of white fly as compared to control (15.30 white fly/5 plant). Among the various treatments Thiamethoxam 25 WG @ 100 g/ha was found most effective with minimum population white fly (2.87white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha (3.07white fly/5 plant), Imidacloprid 17.8 SL @ 125 ml/ha (3.33 white fly/5 plant), Chlorantraniliprole 18.5 SC @ 150 ml/ha (5.63 white fly/5 plant), Profenofos 50 EC @ 1250 ml/ha (5.83 white fly/5 plant) while, the treatment of NSKE 5 Per cent @ 25 kg/ha was found least effective with maximum population (8.83 white fly/5 plant). The treatment of Thiamethoxam 25 WG @ 100 g/ha was statistically at par with Acetamiprid 20 SP @ 100 g/ha and Imidacloprid 17.8 SL @ 125 ml/ha. There was no significant difference found among the treatments *viz.*, Chlorantraniliprole 18.5 SC @ 150 ml/ha and Profenofos 50 EC @ 1250 ml/ha. The order of effectiveness of these treatments was thiamethoxam > Acetamiprid > imidacloprid >Chlorantraniliprole>Profenofos> NSKE. It is evident from the above findings that all the treatments were effective in reducing whitefly population at different intervals after each spray in comparison to untreated control. The most effective treatment was thiamethoxam 25 WG @ 100 g/ha followed by Acetamiprid 20 SP @ 100 g/ha for the control of whitefly in present study and found the Thiamethoxam gave significantly good control (2.11 in 2012 and 2.69 in 2013 /6 plants) followed by Imidacloprid and Acetamiprid during both the seasons. Similar result was observed with Patidar and Akhilesh (2019) showed that thiacloprid 21.7 per cent SC was the most effective against whitefly followed by thiamethoxam 25 per cent WG on black gram. Reddy *et al.* (2020) showed that Imidacloprid 17.8 SL @ 0.4 ml/L, Jatropha oil @ 5per cent, Neem oil @ 3per cent, Bacillus turingiensis (BT) @ 1 kg/ha, NSKE @ 5per cent, Garlic Extract (GE) @ 1per cent, *Beauveria bassiana* @ 5 per cent was most effective on mung bean.

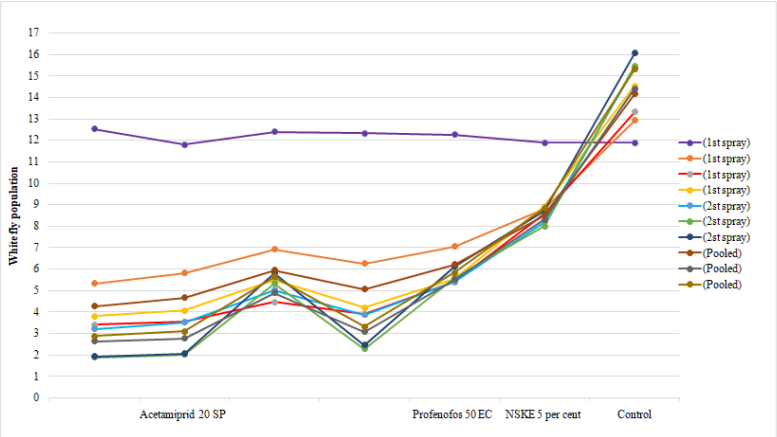

Fig. 1. Bio-efficacy of insecticides against white fly (*B. tabaci*) in black gram during *kharif*, 2020.

Table 1: Bio-efficacy of insecticides against white fly (*B. tabaci*) in black gram during *kharif*, 2020.

Tr. No.	Treatment detail	No. of white fly/5 plant (1st spray)				No. of white fly/5 plant (2st spray)			No. of white fly/5 plant (Pooled)		
		PTP	3 DAT	7 DAT	10 DAT	3 DAT	7 DAT	10 DAT	3 DAT	7 DAT	10 DAT
T_1	Thiamethoxam 25 WG @ 100 g/ha	12.53 (3.57)□	5.33 (2.40)	3.40 (1.96)	3.80 (2.06)	3.20 (1.92)	1.87 (1.53)	1.93 (1.55)	4.27 (2.16)	2.63 (1.75)	2.87 (1.80)
T_2	Acetamiprid 20 SP @ 100 g/ha	11.80 (3.49)	5.80 (2.50)	3.53 (2.00)	4.07 (2.12)	3.53 (2.00)	2.00 (1.58)	2.07 (1.59)	4.67 (2.25)	2.77 (1.79)	3.07 (1.85)
T_3	Chlorantraniliprole 18.5 SC @ 150 ml/ha	12.40 (3.59)	6.93 (2.71)	4.47 (2.22)	5.47 (2.43)	5.00 (2.34)	5.33 (2.40)	5.80 (2.51)	5.97 (2.53)	4.90 (2.31)	5.63 (2.47)
T_4	Imidacloprid 17.8 SL @ 125 ml/ha	12.33 (3.58)	6.27 (2.58)	3.87 (2.08)	4.20 (2.14)	3.87 (2.09)	2.27 (1.66)	2.47 (1.70)	5.07 (2.33)	3.07 (1.87)	3.33 (1.92)
T_5	Profenofos 50 EC @ 1250 ml/ha	12.27 (3.57)	7.07 (2.72)	5.40 (2.43)	5.53 (2.45)	5.40 (2.41)	5.60 (2.46)	6.13 (2.57)	6.23 (2.57)	5.50 (2.45)	5.83 (2.51)
T_6	NSKE 5 per cent @ 25 kg/ha	11.87 (3.51)	8.80 (3.04)	8.60 (3.01)	8.93 (3.07)	8.20 (2.95)	8.00 (2.91)	8.73 (3.04)	8.50 (3.00)	8.30 (2.96)	8.83 (3.05)
T_7	Control	11.87 (3.51)	12.93 (3.66)	13.33 (3.71)	14.53 (3.88)	15.40 (3.99)	15.47 (4.00)	16.07 (4.07)	14.17 (3.82)	14.40 (3.85)	15.30 (3.97)
	S.Em+	**-**	**0.08**	**0.07**	**0.09**	**0.08**	**0.07**	**0.08**	**0.05**	**0.05**	**0.06**
	C. D (P=0.05)	**NS**	**0.26**	**0.23**	**0.27**	**0.241**	**0.225**	**0.256**	**0.16**	**0.15**	**0.17**
	CV (%)	**-**	**5.20**	**5.10**	**5.86**	**5.35**	**5.36**	**5.52**	**5.28**	**5.23**	**5.89**

PTP= Pre-Treatment Population, DAT= Days After Treatment, *Figures in parentheses are $\sqrt{X+0.5}$ value

CONCLUSIONS

All the insecticidal treatments were found significantly superior in reducing the population of white fly as compared to control after 10 days of spray. Among all the treatments, Thiamethoxam 25 WG @ 100 g/ha was found most effective with minimum population (2.87 white fly/5 plant) followed by Acetamiprid 20 SP @ 100 g/ha (3.07 white fly/5 plant).

FUTURE SCOPE

To provide accurate recommendations for insecticide application, it is crucial to time the treatment after the pest population surpasses the economic threshold level (ETL). This approach ensures that insecticides are used with precision and not indiscriminately. By following this strategy, we can safeguard the natural enemies present in the fields, promoting a balanced ecosystem and effective pest management.

Authors' Contributions. Conceptualization and designing of the research work (HPM, MSM); Execution of field experiments and data collection (MSM, LSS, HPM): Analysis of data and interpretation (DP, SKJ, MSM); Preparation of original draft manuscript (LSS, SKJ, MSM): Review & editing of manuscript (MSM, SKJ).

Acknowledgment. Authors express sincere thanks to the major advisor for providing the financial and logistics support for conducting this research work and authors express special gratitude Department of Entomology, Dean College of Agriculture and the Director of Research, AU, Kota for providing necessary facilities and encouragement.

Conflict of Interest. None.

REFERENCES

Nene, Y. L. (2006). Indian pulses through the millennia. *Asian Agri- history*, (10), 179-202.

Patro, B. and Behera, P. (2014). Economics of new insecticide molecules against *Maruca testulalis* (Geyer) of black gram. *Journal of Plant Protection and Environment*, *11*(1), 68-71.

Panikkar, K. M., Jeswani, L. M. and Baldev, B. (1990). Advances in pulse production technology. Indian Council of Agricultural Research, New Delhi, P. 105-107.

Patidar, G. and Kumar, A. (2019) Efficacy of insecticides against *Bemisia tabaci* (Genn.) and *Spilosoma obliqua* (Wlk.) in black gram. *Indian Journal of Entomology*, *4*(80), 1591-1595.

Reddy, A. (2009). Pulses Production technology: Status and way farward. *Economic and Political Weekly*, *34*(52), 73-80.

Reddy, P., Tayde, A. R. and Rawat, J. K. (2020). Efficacy of certain bio-pesticides against sucking pests (White flies and leaf hoppers) of black gram. *Journal of Entomology and Zoology Studies*, *8*(1), 1048-1050.

Singh, K. M. and Singh, R. N. (1977). Succession of insect pests in green gram and black gram under Dryland condition at Delhi. *Indian Journal of Entomology*, *39*(4), 365-370.

How to cite this article: Mangal Sukhi Meena, Hari Prasad Meghwal, Laxman Singh Saini, Suresh Kumar Jat, Bal Kishan Patidar and Devesh Parmar (2023). Evaluation of Different Insecticides against White Fly, *Bemisia tabaci* (Gennadius) Infesting Black Gram. *Biological Forum – An International Journal, 15*(8a): 119-122.