Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(4): 525-528

Received: 13-05-2019
Accepted: 15-06-2019

Sumedha J Shejulpatil
Student, Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar Akola, Maharashtra. India

MN Kakad
Student, Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar Akola, Maharashtra, India

Gk Lande
Assistant Prof. Student, Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar Akola, Maharashtra India

Correspondence
Sumedha J Shejulpatil
Student, Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar Akola, Maharashtra, India

Effect of biopesticides with new generation insecticides against red spider mites on brinjal

Sumedha J Shejulpatil, MN Kakad and Gk Lande

Abstract
The present investigation entitled "Effect of biopesticides with new generation insecticides against red spider mites on brinjal" was carried out at the experimental farm of Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.) during the kharif season of 2014-2015 with a view to evaluate the management of red spider mite of brinjal using biopesticides and new generation insecticides. The treatments Azadirachtin 10000 ppm @ 2 ml/L + Thiamethoxam 25 WG @ 0.2 g/L followed by Azadirachtin 10000 ppm @ 2 ml/L + Imidacloprid 17.8 SL @ 0.12 ml/L, Thiamethoxam 25 WG @ 0.4 g/L, Imidacloprid 17.8 SL @ 0.25ml/L, Triazophos 40 EC @ 2ml/L, Azadirachtin 10000 ppm @ 2 ml/L + Triazophos 40 EC @ 1ml/L, Azadirachtin 10000 ppm @ 2 ml/L + Fenpropathrin 30 EC @ 0.75 ml/L and Fenpropathrin 30 EC @ 1.5 ml/L were found significantly effective in recording lower population of mites/leaf on brinjal.

Keywords: Thiamethoxam, biopesticides, red spider mites, brinjal.

Introduction

Brinjal is also called as aubergine eggplant (*Solanum melongena* L.) falling in the family Solanaceae. It is famous among small scale farmer and low income consumers so called as poor mans vegetable. Eggplant is well adapted to high rainfall and high temperatures, and is among the few vegetables capable of high yields in hot-wet environments (Hanson *et al*., 2006) [1]. Eggplant contains nutrients such as dietary fiber, folate, ascorbic acid, vitamin K, niacin, vitamin B6, pantothenic acid, potassium, iron, magnesium, manganese, phosphorus, and copper (USDA 2009) [2]; the nutrients that it contributes to the diets of the poor are especially important during times when other vegetables are in short supply. Though brinjal is a summer crop, it is being grown throughout the year under irrigated condition. Hence, it is subjected to attack by number of insect pests right from nursery stage to till harvesting (Regupathy *et al*., 1997) [3]. Among the insect pests infesting brinjal, the major ones are shoot and fruit borer, *Leucinodes orbonalis* (Guen.), whitefly, *Bemisia tabaci* (Genn.), leafhopper, *Amrasca biguttula biguttula* (Ishida), Epilachna beetle, *Henosepilachna vigintioctopunctata* (Fab.) and noninsect pest, red spider mite, *Tetranychus macfarlanei* (Baker and Pritchard). On vegetables alone, spider mites damage accounts for 10-15 per cent yield loss (Anonymous, 1991) [1]. Out of the 37 mite species known to feed on vegetable crops, six species are serious pests of the vegetable crops including brinjal in major part of the country (Gupta, 1991) [3]. Basu and Pramanik (1968) [2] ranked red spider mite as a major threat next to fruit and shoot borer. Mites are more destructive under dry conditions. Red spider mite, (*Tetranychus telarius* L.) preferred most brinjal as a host among vegetables. These are minute, polyphagous pests found in large colonies on underside of leaves covered with fine silky webs. Protonymph is the most active feeding stage. As a result of their feeding white specks appear on the leaves and these specks colease and appears as white patches (Fig 2). Later the entire affected leaf becomes discoloured and dries away and thus result into arrest of growth of plant. Elimination of this pest before flowering and fruit set is important. After fruit formation, mites can feed and lay eggs under the calyx, making them difficult to eradicate.

The losses caused by spider mite are between related to the population level and stapes of infestation. The yield reduction of 13.64 and 31.09 per cent at Bangalore and Varanasi, respectively was estimated due to the red spider mite (Anonymous. 1991) [1]. It is, thus, amply obvious that unless adequate, appropriate and effective measures are adopted to control these

Pest menace, brinjal production will suffer a serious setback resulting into the considerable yield loss.

Growers rely heavily on chemical pesticides to protect their eggplant crop. Pesticide misuse has adverse effects on the environment and human health and also increases the cost of production. Hence in order to know the simple, low-cost techniques which provide satisfactory, sustainable management and can help eggplant growers decrease their reliance on chemical pesticides this research was undertaken.

Materials and Methods

The experiment was laid out in randomized block design (RBD) with twelve treatments (Table 1) replicated thrice on the field of Department of Entomology Dr. PDKV, Akola during *kharif* 2014-15. The healthy seedling of variety Aruna of about 30 days old having uniform size were used for transplanting on the hills marked at 60 x 60 cm spacing and each gross plot size was 4.2 m × 3 m. The spraying was done during morning hours with the help of knapsack sprayer. Total five sprays were undertaken during crop growth period. The plots were sprayed as per treatment schedule. Pretreatment observations were recorded 24 hours before first spray and post treatment observations were recorded at 3, 7 and 14 days after each treatment spray on randomly selected five plants as number of mites/leaf from each net plot and from three leaves (top, middle and bottom) on randomly selected plants.

Table 1: Treatment details

Sr. No.	Treatments	Formulation	Concentration (%)	Doses (g or ml / L)
T 1	Azadirachtin	10000 ppm	10000 ppm (1% w/w)	2 ml
T 2	*Verticillium lecanii*	1.15% WP	1 x 10^8 cfu/g	4 g
T 3	Imidacloprid	17.8 SL	0.0045	0.25 ml
T 4	Thiamethoxam	25 WG	0.01	0.4 g
T 5	Triazophos	40 EC	0.08	2 ml
T 6	Fenpropathrin	30 EC	0.045	1.5 ml
T 7	Azadirachtin + *Verticillium lecanii*	10000 ppm + 1.15% WP	10000 ppm + 1 x 10^8 cfu/g	2 ml + 2 g
T 8	Azadirachtin + Imidacloprid	10000 ppm + 17.8 SL	10000 ppm + 0.0023	2 ml + 0.12 ml
T 9	Azadirachtin + Thiamethoxam	10000 ppm + 25 WG	10000 ppm + 0.005	2 ml + 0.2 g
T 10	Azadirachtin + Triazophos	10000 ppm + 40 EC	10000 ppm + 0.04	2 ml + 1 ml
T 11	Azadirachtin + Fenpropathrin	10000 ppm + 30 EC	10000 ppm + 0.023	2 ml + 0.75 ml
T 12	Untreated control		-	-

Results

The cumulative effect of 5 sprays of various treatments presented here which shows the population of mites/leaves of brinjal.

Cumulative effect of various treatments against mite population on brinjal crop after five sprays

At 3 Days after Spray Application

The data on mite population after five sprays was averaged and presented in Table 2. The cumulative average population of mites/leaf in all treated plots were significantly lower (1.73 to 3.82) than the untreated control plot (6.54). The lowest population (1.73) was recorded due to treatment (T9) Azadirachtin 10000 ppm @ 2 ml/L + Thiamethoxam 25 WG @ 0.2 g/L and it was statistically at par with treatments (T8) Azadirachtin 10000 ppm @ 2 ml/L + Imidacloprid 17.8 SL @ 0.12 ml/L (1.98 mites/leaf), (T4) Thiamethoxam 25 WG @ 0.4 g/L (2.22 mites/leaf), (T3) Imidacloprid 17.8 SL @ 0.25 ml/L (2.33 mites/leaf) and (T10) Azadirachtin 10000 ppm @ 2 ml/L + Triazophos 40 EC @ 1 ml/L (2.52 mites/leaf).

The next effective treatment was (T11) Azadirachtin 10000 ppm @ 2 ml/L + Fenpropathrin 30 EC @ 0.75 ml/L (2.70 mites/leaf) at par with (T5) Triazophos 40 EC @ 2 ml/L (2.96 mites/leaf), (T6) Fenpropathrin 30 EC @ 1.5 ml/L (3.10 mites/leaf), (T7) Azadirachtin 10000 ppm @ 2 ml/L + *Verticillium lecanii* 1 x 10^8 cfu/g @ 2 g/L (3.40 mites/leaf), (T1) Azadirachtin 10000 ppm @ 2 ml/L (3.59 mites/leaf) and (T2) *Verticillium lecanii* 1 x 10^8 cfu/g @ 4 g/L (3.82 mites/leaf) whereas highest population of mites recorded in (T12) untreated control (6.54 mites/leaf).

At 7 Days after Spray Application

The cumulative average population of mites/leaf in all treated plots were significantly lower (1.84 to 3.69) than the untreated control plot (6.23). The treatment (T9) Azadirachtin 10000 ppm @ 2 ml/L + Thiamethoxam 25 WG @ 0.2 g/L recorded least number of (1.84 mites/leaf) and it was statistically at par with treatments (T8) Azadirachtin 10000 ppm @ 2 ml/L + Imidacloprid 17.8 SL @ 0.12 ml/L (2.01 mites/leaf), (T4) Thiamethoxam 25 WG @ 0.4 g/L (2.14 mites/leaf), (T3) Imidacloprid 17.8 SL @ 0.25 ml/L (2.38 mites/leaf) and (T10) Azadirachtin 10000 ppm @ 2 ml/L + Triazophos 40 EC @ 1 ml/L (2.50 mites/leaf).

The next effective treatment was (T11) Azadirachtin 10000 ppm @ 2 ml/L + Fenpropathrin 30 EC @ 0.75 ml/L (2.77 mites/leaf) at par with (T5) Triazophos 40 EC @ 2 ml/L

Table 2: Cumulative effect of various treatments against mite population on brinjal crop after five sprays

Tr. No.	Treatment details	Formulation	Con (%),ml/Lg/L	Number of mite / leaf		
				3 DAT*	7 DAT*	14 DAT*
T1	Azadirachtin	10000 ppm	2ml/L	3.59 (1.89)	3.56 (1.89)	4.10 (2.02)
T2	*Verticillium lecanii*	1.15% WP	4g/L	3.82 (1.95)	3.69 (1.91)	4.26 (2.06)
T3	Imidacloprid	17.8 SL	0.0045	2.33 (1.52)	2.38 (1.54)	2.87 (1.69)
T4	Thiamethoxam	25 WG	0.01	2.22(1.49)	2.14 (1.46)	2.59 (1.60)
T5	Triazophos	40 EC	0.08	2.96 (1.71)	3.00 (1.73)	3.46 (1.86)
T6	Fenpropathrin	30 EC	0.045	3.10 (1.76)	3.10 (1.76)	3.64 (1.91)
T7	Azadirachtin+*Verticilliumlecanii*	10000ppm+1.15%WP	2ml/L + 2g/L	3.40 (1.84)	3.35 (1.82)	3.92(1.98)
T8	Azadirachtin + Imidacloprid	10000 ppm+17.8SL	2ml/L + 0.0023	1.98 (1.40)	2.01 (1.42)	2.41 (1.55)

T9	Azadirachtin+Thiamethoxam	10000 ppm +25WG	2ml/L + 0.005	1.73 (1.31)	1.84 (1.36)	2.16 (1.47)
T10	Azadirachtin + Triazophos	10000 ppm + 40 EC	2ml/L + 0.04	2.52 (1.57)	2.50 (1.58)	3.11 (91.76)
T11	Azadirachtin +Fenpropathrin	10000 ppm + 30 EC	2ml/L + 0.023	2.70 (1.63)	2.77 (1.65)	3.24 (1.80)
T12	Untreated control		-	6.54 (2.55)	6.23 (2.49)	6.70 (2.58)
	F test			Sig.	Sig.	Sig
	SE (M) ±			0.10	0.08	0.08
	CD at 5 %			0.31	0.23	0.25

* Figures in parenthesis are square root transformations. DAT – Days after treatment

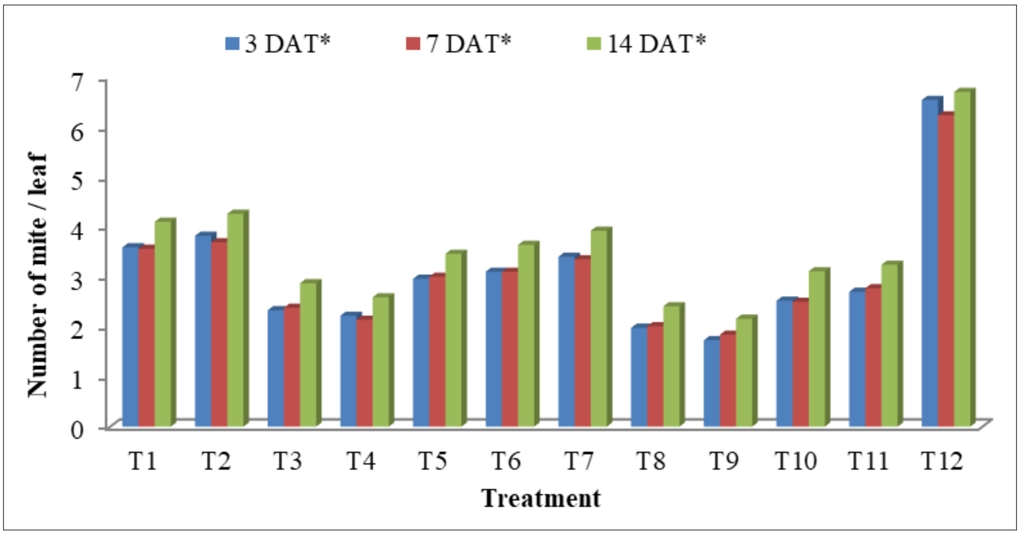

Fig 1: Cumulative Effect of various treatments against mite population on brinjal crop after five sprays

(3.00 mites/leaf), (T6) Fenpropathrin 30 EC @ 1.5 ml/L (3.10 mites/leaf), (T7) Azadirachtin 10000 ppm @ 2 ml/L + *Verticillium lecanii* 1 x 10^8 cfu/g @ 2 g/L (3.35 mites/leaf) and (T1) Azadirachtin 10000 ppm @ 2 ml/L (3.56 mites/leaf) except treatment (T2) *Verticillium lecanii* 1 x 10^8 cfu/g @ 4 g/L (3.69 mites/leaf) whereas highest population of mites recorded in (T12) untreated control (6.23 mites/leaf).

At 14 Days after Spray Application

The data at 14 DAT of cumulative average population of mites revealed that population of mites/leaf in all treated plots were significantly lower (2.16 to 4.26) than the untreated control plot (6.70). The lowest population of mites/leaf recorded due to treatment (T9) Azadirachtin 10000 ppm @ 2 ml/L + Thiamethoxam 25 WG @ 0.2 g/L (2.16 mites/leaf) and it was statistically at par with treatments (T8) Azadirachtin 10000 ppm @ 2 ml/L + Imidacloprid 17.8 SL @ 0.12 ml/L (2.41 mites/leaf), (T4) Thiamethoxam 25 WG @ 0.4 g/L (2.59 mites/leaf), (T3) Imidacloprid 17.8 SL @ 0.25 ml/L (2.87 mites/leaf) and (T10) Azadirachtin 10000 ppm @ 2 ml/L + Triazophos 40 EC @ 1 ml/L (3.11 mites/leaf).

The next best treatment was (T11) Azadirachtin 10000 ppm @ 2 ml/L + Fenpropathrin 30 EC @ 0.75 ml/L (3.24 mites/leaf) followed by (T5) Triazophos 40 EC @ 2 ml/L (3.46 mites/leaf), (T6) Fenpropathrin 30 EC @ 1.5 ml/L (3.64 mites/leaf), (T7) Azadirachtin 10000 ppm @ 2 ml/L + *Verticillium lecanii* 1 x 10^8 cfu/g @ 2 g/L (3.92 mites/leaf), (T1) Azadirachtin 10000 ppm @ 2 ml/L (4.10 mites/leaf) and (T2) *Verticillium lecanii* 1 x 10^8 cfu/g @ 4 g/L (4.26 mites/leaf) and these are at par with each other. Maximum average population of mites/leaf recorded in (T12) untreated control (6.70).

Fig 2: Showing infestation of mites on brinjal leaves

Discussion

Results could not be compared with best combination of Azadirachtin 10000 ppm @ 2 ml/L + Thiamethoxam 25 WG @ 0.2 g/L and Azadirachtin 10000 ppm @ 2 ml/L + Imidacloprid 17.8 SL @ 0.12 ml/L for want of literature because there is lack of research work with combination of these biopesticide and chemical insecticide against mite population on crop

As regards the efficacy of (T4) Thiamethoxam 25 WG @ 0.4 g/L and (T3) Imidacloprid 17.8 SL @ 0.25 ml/L present finding are in confirmation with Varghese and Mathew, (2013) [8] who reported that spraying of Thiamethoxam 40 g a.i.ha-1 and Imidacloprid 20 g a.i.ha-1 recorded minimum mite population on chilli.

According to Naga *et al*., (2017) [5] the treatments of dicofol 18.5 EC (0.04%), thiamethoxam 25 WG (0.01%) acephate 75 SP (0.05%) and imidacloprid 17.8 SL (0.006%) existed in the middle order of effectiveness against mite population on okra. The treatments of NSKE (5%), azadirachtin 0.03 EC (0.00015%) and datura extract (1%) proved least effective followed by calotropis extract (1%).

Similarly for efficacy of (T6) Fenpropathrin 30 EC @ 1.5 ml/L present finding are in confirmation with Vinodkumar *et al*., (2009) [9] who reported that after application of fenpropathrin 10EC @ 2 ml/l recorded reduction in mite population over control in brinjal.

Conclusion

Over all it is seen from above investigation that the treatment Azadirachtin 10000 ppm @ 2 ml/L + Thiamethoxam 25 WG @ 0.2 g/L was significantly superior over untreated control but at par with Azadirachtin 10000 ppm @ 2 ml/L + Imidacloprid 17.8 SL @ 0.12 ml/L, Thiamethoxam 25 WG @ 0.4 g/L, Imidacloprid 17.8 SL @ 0.25ml/L, Triazophos 40 EC @ 2ml/L, Azadirachtin 10000 ppm @ 2 ml/L + Triazophos 40 EC @ 1ml/L, Azadirachtin 10000 ppm @ 2 ml/L + Fenpropathrin 30 EC @ 0.75 ml/L and Fenpropathrin 30 EC @ 1.5 ml/L . More or less similar trend was found on 7 DAT and 14 DAT.

References

1. Anonymous. Mites of agricultural importance in India and their management. Technical Bulletin No.1. All India Coordinated Research Project on Agricultural Acarology, UAS, Bangalore, 1991, 18.
2. Basu AC, Pramanik LM. Acaricidal tests of nine pesticides against two spotted spider mite, a serious pest of brinjal in West Bengal. Journal of Economic Entomology. 1968; 61:768-770.
3. Gupta, SK. The mites of agricultural importance in India with remark on their economic status In: Modern Acarology (Eds. Dushabek F. and Bukva U.), Academic Press, Itague, 1991, 509-522.
4. Hanson PM, Yang RY, Tsou SCS, Ledesma D, Engle L, Lee TC *et al*. Diversity in eggplant (*Solanum melongena*) for superoxide scavenging activity, total phenolics, and ascorbic acid. Journal of Food Composition and Analysis. 2006; 19(6-7):594-600.
5. Naga BL, Sharma A, Kumawat KC, Khinchi SK, Naga RP *et al.* Efficacy of pesticides against mite, *Tetranychus cinnabarinus* (Boisduval) of okra, *Abelmoschus esculentus* (L.) Moench International Journal of Chemical Studies. 2017; 5(3):248-254.
6. Ragupathy A, Palaniswami S, Chandramohan N, Gupta K. Guide on Crop Pests. Sooriya Desk Top, Coimbatore, 1997.
7. [USDA] United States Department of Agriculture. Eggplant (raw) – Nutrient values and weights for edible portion (NDB No: 11209). USDA National Nutrient Database for Standard Reference, 2008. Release 21. http://www.nal.usda.gov/fnic/foodcomp/search/ [accessed 7 April 2009].
8. Varghese TS, Mathew TB. Bioefficacy and safety evaluation of newer insecticides and acaricides against chilli thrips and mites. Journal of Tropical Agriculture. 2013, 51(1-2):111-115.
9. Vinodkumar S, Chinniah C, Muthiah C, Sadasakthi A. Field evaluation of certain newer acaricide /insecticide molecule for their bioefficacy against *Tetranychus urticae* Koch on brinjal. Karnataka Journal of Agricultural Sciences. 2009; 22(3):705-706.