International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(2): 687-690

Received: 13-01-2018
Accepted: 17-02-2018

T Hemadri
Department of Entomology, College of Agriculture, University of Agricultural Sciences, Bangalore, V. C. Farm, Mandya, Karnataka, India

L Vijaykumar
Department of Entomology, College of Agriculture, University of Agricultural Sciences, Bangalore, V. C. Farm, Mandya, Karnataka, India

G Somu
Assistant breeder (Sorghum), All India co-ordinated research project on sorghum, Chamarajanagar, Karnataka, India

Sharanabasava
Department of Entomology, College of Agriculture, University of Agricultural Sciences, Bangalore, V. C. Farm, Mandya, Karnataka, India

Correspondence
T Hemadri
Department of Entomology, College of Agriculture, University of Agricultural Sciences, Bangalore, V. C. Farm, Mandya, Karnataka, India

Management of leafhopper, *Amrasca biguttula biguttula* (Hemiptera: Cicadellidae) in okra (*Abelmoschus esculentus*) through new insecticide molecules

T Hemadri, L Vijaykumar, G Somu and Sharanabasava

Abstract
A field experiment was conducted at college of Agriculture, V.C. Farm, Mandya, University of Agricultural Sciences, Bangalore during summer 2015 to assess the efficacy of different new insecticides against leafhoppers. The results revealed that application of imidacloprid 17.8 SL @ 0.5 ml/l was found superior over the other treatments with higher per cent reduction (85.21 per cent) of pest population, followed by acetamiprid 20 SP @ 0.5 g/l, thiamethoxam 25 WG @ 0.3 g/l, acephate 95 SG @ 0.3 g/l, clothianidin 50 WDG @ 0.25 g/l which recorded 84.21, 83.41, 77.48, 74.62 per cent reduction of pest population, respectively. The next insecticides which proven better were cyantraniliprole 10.26 OD @ 1 ml/l, oxydemeton methyl 25 EC @ 1.5 ml/l, imidacloprid 17.8 SL seed coating @ 4:20 ml/kg and thiamethoxam 25 WG seed coating @ 2:20 ml/kg which registered 60.25, 31.40, 22.14 and 17.23 per cent reduction, respectively.

Keywords: Leafhopper, Bio-efficacy, new insecticides, management

Introduction
Okra is medicinal plant of immense importance with large pharmacological applications. Besides having its own nutritional, medicinal and industrial properties, it has been used as an ingredient in many herbal formulations which are used for curing various ailments, in particular the regulation of blood pressure, fat, diabetes, chronic dysentery, genito-urinary disorders, simple goiter and ulcer (Adetuyi *et al*., 2008) [1]. Singh *et al*., [2] who reported that both nymphs and adults of leafhopper, *A. biguttula biguttula* (Ishida) suck the cell sap usually from the ventral surface of the leaves and while feeding, they inject toxic saliva in to the plant tissues and affected leaves turn yellowish and get curled. In recent years, various types of systemic and contact insecticides belonging to different chemical group were used as foliar spray, seed treatment, and granular formulations to overcome the pest problem. A number of new molecules are on the scene, therefore periodical evaluation for their comparative effectiveness is essential. In view of these the present investigation was initiated at College of Agriculture, V. C. Farm, Mandya.

Materials and Methods
The experiment was conducted during summer 2015-16, in a Randomized Block Design (RCBD) at College of Agriculture, V. C. Farm, Mandya with 10 treatments including an untreated control and three replications, using Arka Anamika variety of okra in a plot size of 6 m x 6 m. The crop was raised with a spacing of 60X30 cm, between rows and plants, respectively. Eight new molecules were tested along with the standard check, oxydemeton methyl 25 EC and untreated check against leafhopper of okra. Seeds were treated with two neonicotinoids *viz*., imidacloprid 17.8 SL and thiamethoxam 25 WG and sown separately at the time of sowing. Other seven insecticides were sprayed at 30 and 45 days after sowing by using high volume knapsack sprayer with a spray volume of 500 l/ha. The observation on number of leafhoppers was made a day before and after treatment imposition. In each treatment, the observations on population density of leafhopper, *A. biguttula biguttula* (Ishida) was recorded from three top, middle and bottom leaves of 10 designated plants.
Pre-count was taken a day before to spray and the post count observations on population density of leafhopper was recorded on 1, 7, and 14 days after spray.

The data was subjected to square root transformation. Further, the data on leafhopper each treatment was subjected to ANOVA (Gomez and Gomez [3]; Hosmand [4]) and means were separated by Tukey's HSD (Tukey [5]) for interpretation.

Seed Coating

Two insecticides belonging to neonecotinoides group viz., thiamethoxam 25 WG @ 2 ml was mixed in 20 ml of water meanwhile, imidacloprid 17.8 SL @ 4 ml was mixed in 20 ml of water separately, along with 2-3 ml of gum arabica and the slurry was mixed with one kilogram of okra seeds and carefully swirled well until all the seeds were uniformly coated with the insecticide. Further, the seeds coated with chemicals were shade dried for an hour and used for sowing. The observation on population density of leafhopper, *A. biguttula biguttula* (Ishida) was recorded on 30 and 45 days after sowing on three top, middle and bottom leaves of 10 designated plants.

The per cent reduction over untreated control was worked out using modified Abbot's formula given by Fleming and Ratnakaran [6].

$$P = \frac{100 \text{ X } 1 - (T_a \text{ X } C_b)}{(T_b \text{ X } C_a)}$$

Where,

P = Percentage population reduction over control; T_a = Population in treatment after spray

C_a = Population in control after spray; T_b = Population in treatment before spray

C_b = Population in control before spray

Results and Discussion

In the present investigation, eight new promising insecticide molecules were evaluated for their bioefficacy against leafhopper, *A. biguttula biguttula* under field conditions along with standard check oxydemeton methyl 25 EC @ 1.5 ml/l and an untreated control. In the present study it was observed that all the treatments proved their superiority over the untreated control. Both the seed coating chemicals *viz*., imidacloprid 17.8 SL (4:20 ml/kg), thiamethoxam 25 WG (2:20 ml/kg) recorded lower per cent reduction of 22.14 and 17.23, respectively and their efficacy were below the standard check i.e. oxydemeton methyl 25 EC @ 1.5 ml/l.

The mean data of all seven observations regarding the efficacy of different treatments against leafhoppers revealed that, imidacloprid 17.8 SL @ 0.5 ml/l was recorded least leafhopper population (2.47/3 leaves) with higher per cent reduction (85.21 per cent). The next best treatments were acetamiprid 20 SP @ 0.5 g/l, thiamethoxam 25 WG @ 0.3 g/l, acephate 95 SG @ 0.3 g/l, clothianidin 50 WDG @ 0.25 g/l, cyantraniliprole 10.26 OD @ 1 ml/l, oxydemeton methyl 25 EC @ 1.5 ml/l, imidacloprid 17.8 SL seed coating @ 4:20 ml/kg and thiamethoxam 25 WG seed coating @ 2:20 ml/kg which registered 84.21, 83.41, 77.48, 74.62, 60.25, 31.40, 22.14 and 17.23 per cent reduction, respectively (Fig. 1; Fig. 2). The superiority of imidacloprid 17.8 SL @ 0.5 ml/l against the leafhoppers as revealed in the present studies is in close agreement with reports of Razaq *et al.* [7] who reported that imidacloprid, acetamiprid and thiamethoxam proved to be the most effective in reducing jassid population in cotton. Similarly, Sinha *et al.* [8] reported that foliar spary of acetamiprid 20 SP @ 20 g a.i./ha and thiamethoxam @ 20 g a.i./ha @ 30 days of sowing were found most effective in reducing leafhopper population. Dhanalakshmi and Mallapur [9] also reported that the imidacloprid 200 SL @ 5.0 ml/l and acetamiprid 20 SP @ 0.2 g/l were the most effective against leafhopper. Similar results were obtained by Misra [10]; Shinde *et al.* [11]; Preetha *et al.* [12]. Begum and patil [13] who reported efficacy of imidacloprid 17.8 SL @ 40 g a.i./ha and was most effective against leafhoppers.

Further, Anitha and Nandihalli [14] also reported the effectiveness of imidacloprid 17.8 SL, acetamiprid 20 SP and oxydemeton methyl 25 EC. Likewise, Meena *et al.* [15] reported performance of imidacloprid 17.8 SL in reducing hopper population and was at par with acetamiprid 20 SP against leafhopper in okra. Likewise, Vijaykumar and Prabhuraj [12] also obtained excellent control of sorghum shoot bug through neonicotinoids.

Table 1: Bio-efficacy of new insecticides against *A. biguttula biguttula*, summer 2015

S. No	Treatments	Dose (g a.i. /ha)	No. of leafhoppers/3 leaves								Per cent reduction over control
			I Spray				II Spray				
			DBS	1 DAS	7 DAS	14 DAS	DBS	1 DAS	7 DAS	14 DAS	
1	Cyantraniliprole 10.26 OD	102.7	7.60	3.13	2.30	4.73	4.73	3.13	2.33	4.60	60.25
			(2.85)	(1.91)^{a}	(1.67)^{ab}	(2.29)^{abc}	(2.29)^{abc}	(1.91)^{a}	(1.68)^{a}	(2.26)^{b}	
2	Clothianidin 50 WDG	125.0	7.67	3.00	2.20	4.13	4.13	3.20	2.37	4.53	74.62
			(2.86)	(1.87)^{a}	(1.64)^{ab}	(2.15)^{ab}	(2.15)^{ab}	(1.92)^{a}	(1.69)^{a}	(2.24)^{b}	
3	Acetamiprid 20 SP	100.0	7.73	2.60	1.93	3.80	3.80	2.83	1.97	4.13	84.21
			(2.87)	(1.76)^{a}	(1.56)^{ab}	(2.07)^{ab}	(2.07)^{ab}	(1.82)^{a}	(1.57)^{a}	(2.15)^{b}	
4	Acephate 95 SG	285.7	7.80	2.87	2.17	4.00	4.00	3.00	2.30	4.60	77.48
			(2.88)	(1.84)^{a}	(1.63)^{ab}	(2.12)^{ab}	(2.12)^{ab}	(1.87)^{a}	(1.67)^{a}	(2.26)^{b}	
5	Thiamethoxam 25 WG	75.0	7.33	2.73	2.07	3.93	3.93	2.87	2.13	4.20	83.41
			(2.80)	(1.80)^{a}	(1.60)^{ab}	(2.10)^{ab}	(2.10)^{ab}	(1.84)^{a}	(1.62)^{a}	(2.17)^{b}	
6	Thiamthoxam 25 WG (SC)	3.75	7.02	7.02	7.10	6.34	6.34	7.59	7.67	8.16	17.23
			(2.74)	(2.74)^{c}	(2.76)^{c}	(2.62)^{cd}	(2.62)^{cd}	(2.84)^{c}	(2.86)^{bc}	(2.94)^{d}	
7	Imidacloprid 17.8 SL (SC)	5.34	7.00	7.12	7.00	6.32	6.32	7.53	7.69	8.12	22.14
			(2.74)	(2.76)^{c}	(2.74)^{c}	(2.61)^{cd}	(2.61)^{cd}	(2.83)^{c}	(2.86)^{bc}	(2.94)^{d}	
8	Imidacloprid 17.8 SL	88.9	7.60	2.20	1.53	3.53	3.53	1.70	1.67	2.47	85.21
			(2.85)	(1.64)^{a}	(1.42)^{a}	(2.01)^{a}	(2.01)^{a}	(1.47)^{a}	(0.71)^{a}	(1.72)^{a}	
9	Oxydemeton methyl 25 EC	375.0	7.60	4.10	3.21	5.36	5.36	5.67	4.53	6.12	31.40
			(2.85)	(2.14)^{b}	(1.93)^{b}	(2.42)^{bc}	(2.42)^{bc}	(2.48)^{b}	(2.24)^{b}	(2.57)^{c}	
10	Untreated control	-	7.73 (2.87)	8.20 (2.95)^{d}	8..60 (3.02)^{d}	8.92 (3.07)^{e}	8.92 (3.07)^{e}	8.52 (3.00)^{d}	8.64 (3.02)^{d}	9.53 (3.17)^{e}	--

SE m± CD @ p= 0.05	NS	0.08 0.20	0.07 0.22	0.08 0.24	0.08 0.24	0.09 0.25	0.06 0.24	0.12 0.44	--

* DBS: Day before spraying; DAS: Day after spraying; NS: Non significant; SC: Seed coating; Values in the column followed by common letters are non-significant at p = 0.05 as per Tuckey's HSD (Tukey [5]); Figures in the parenthesis indicate √x+0.5 transformed values.

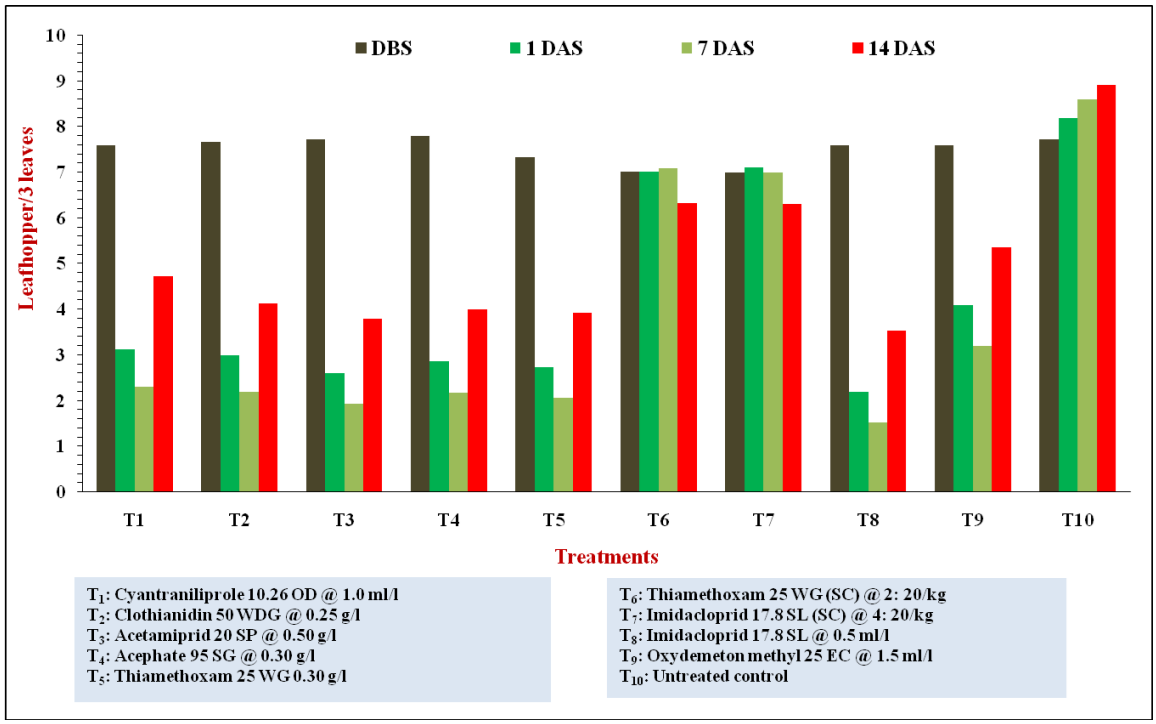

Fig.1: Bio-efficacy of new insecticides against leafhopper, *A. biguttula biguttula* on okra, summer 2015 (I Spray)

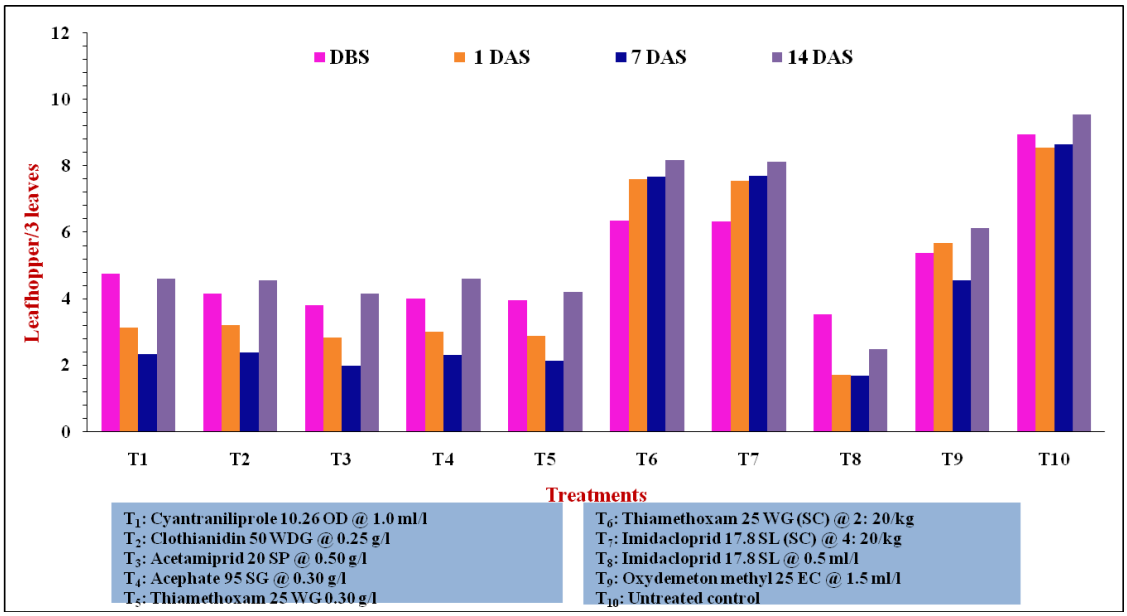

Fig. 2: Bio-efficacy of new insecticides against leafhopper, *A. biguttula biguttula*on okra, summer 2015 (II Spray)

Conclusion

Orka is growing round the year in Karnataka. Farmers are unaware of loss caused by leafhopper in okra due to the incidence of leafhoppers. To overcome the loss caused by the leafhoppers, the foliar application of new molecules such as imidacloprid 17.8 SL @ 0.5 ml/l, or acetamiprid 20 SP @ 0.5 g/l or thiamethoxam 25 WG @ 0.3 g/l can be used in the management of leafhopper in okra.

Acknowledgement

The authors are thankful to Dr. C. A. Viraktamath, Professor (Emeritus), Niche-Area of excellence on capacity building in taxonomy of insects and mites, UAS, GKVK, Bangalore, for identification of insect specimens and the thanks are also due to the final year B.Sc (Agri.) students of Hands on Training & E- learning (HOT) 2015-16 batch for their help.

References

1. Adetuyi FO, Osagie AU, Adekunle AT. Effect of postharvest storage techniques on the nutritional properties of Benin indigenous okra *Abelmoschus esculentus* (L.) Moench. Pakistan Journal of Nutrition. 2008; 7:652-657

2. Singh S, Choudhary DP, Sharma HC, Mahla RS, Mathur, YS, Ahuja DB, *et al*. Effect of insecticidal modules against jassid and shoot and fruit borer in okra. Indian Journal of Entomology. 2008; 70(3):197-199.
3. Gomez KA, Gomez AA. Statistical procedures for agricultural research with emphasis on rice. International Rice Research Institute, Los Banos, Philippines, 1984, 268.
4. Hosmand RA. Statistical Methods for Agricultural Sciences. Timber press, Portland, Oregon, USA, 1988, 405.
5. Tukey JW. The technical tools of statistics. American Statistician. 1965; 19:23-28.
6. Ratnakaran R. Evaluating single treatment data using Abbot's formula with modification. Journal of Economic Entomology. 1985; 78:1179.
7. Razaq M, Suhail A, Aslam M, Arif MF, Saleem MA, Ahmad Khan MH, *et al*. Evaluation of neonicotinoids and conventional insecticides against cotton jassid, *Amrasca devastans* (Dist.) and cotton whitefly, *Bemisia tabaci* (Genn.) on cotton. Pakistan Entomologist. 2005; 27(1):75-78.
8. Sinha SR, Rai singh, Sharma RK. Management of insect pests of okra through insecticides and intercropping. Annals of Plant Protection Sciences. 2007; 15(2):321-324.
9. Dhanalakshmi DN, Mallapur CP. Evaluation of promising molecules against sucking pests of okra. Annals of Plant Protection Sciences. 2008; 16(1):29-32.
10. Misra HP. Field evaluation of some newer insecticides against aphids (*Aphis gossypii*) and jassids (*Amrasca biguttula biguttula*) on okra. Indian Journal of Entomology. 2002; 64(1):80-84.
11. Shinde ST, Shetgar SS, Badgujar AG. Bio-efficacy of different insecticides against major pests of okra. Journal of Entomological Research Society. 2011; 35(2):133-137.
12. Preetha G, Manoharan T, Stanley J, Kuttalam S. Evaluation of imidacloprid against okra jassid, *Amrasca biguttula biguttula* (Ishida) and whitefly, *Bemisia tabaci* (Gennadius). Indian Journal of Entomology. 2009; 71(3)**:**209-214.
13. Begum K, Patil S. Evaluation of newer molecules of insecticides against sucking pests complex infesting okra. Indian Journal of Applied Research. 2016; 6(2):30-34.
14. Anitha KR, Nandihalli BS. Bioefficacy of newer insecticides against leafhopper and aphid in okra. Karnataka Journal of Agricultural Sciences. 2009; 22(3):714-715.
15. Meena RS, Laichattiwar MA, Raghuraman M, Sravan kumar V. Efficacy of different insecticides against leafhopper on okra, *Abelmoschus esculentus*. Indian Journal of Agricultural Allied Sciences. 2016; 2(1):32-34.
16. Vijaykumar L, Prabhuraj A. Bioefficacy of chemicals for seed treatment against sorghum shoot fly, *Atherigona soccata* and shoot bug, *Peregrinus maidis*. Annals of Plant Protection Sciences.2007; 15(2):312-315.