Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(5): 3259-3260
Received: 07-07-2018
Accepted: 09-08-2018

Gummadidala Chaitanya
M.Sc. (Ag.) Entomology student, Department of Entomology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, (U.P.), India

Ashwani Kumar
Associate proffesor, Department of Entomology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, (U.P.), India

Nawle Jayant Shyamrao
Student, Department of Entomology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, (U.P.), India

Correspondence
Gummadidala Chaitanya
M.Sc. (Ag.) Entomology student, Department of Entomology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, (U.P.), India

Efficacy of selected insecticides and neem products against jassids (*Amarsca biguttula biguttula*)] of okra [*Abelmoschus Esculentus* (L.) Moench]

Gummadidala Chaitanya, Ashwani Kumar and Nawle Jayant Shyamrao

Abstract
The present field studies were conducted during *kharif* 2017 to determine the efficacy of selected insecticides and neem products against jassids [(*Amarsca biguttula biguttula*)] of okra [*Abelmoschus esculentus* (L.) Moench]"at Central agriculture field, SHUATS (Sam Higginbottom University of Agriculture, Technology and Sciences), Allahabad, Uttar Pradesh (India). Studies revealed that Efficacy of selected insecticides and neem products against jassids revealed that maximum mean pest population recorded in control and all the treatments were found effective in reducing the population of jassids as compared to control, Imidacloprid 17.8SL was the most effective treatment indicating recorded lowest population of whitefly followed by Thiamethoxam 25WG, Acetamiprid 20% SP, Dimethote30EC, Lambda cyhalothrin5%EC, Neem oil and NSKE 5% was less effective among all insecticides. Fruit yield and C: B ratio were high in Imidacloprid 17.8 SL (1:4.05).

Keywords: okra, jassids, insecticides, neem products.

Introduction
In India, okra, Abelmoschus esculentus L. Moench (Malvaceae) is a commonly grown green vegetable cultivated throughout the year and it is ravaged by as many as 44 insect pests. Among the various insect pests, sucking pests like leafhopper, Amrasca biguttula biguttula Ishida and whitefly, Bemisia tabaci Gennadius pose a major threat, affecting the okra production. The yield loss due to leafhopper desapping in okra amounts to 54 to 66 percent (Satpathy *et al*., 2004) [9]. The whitefly is most notorious among top hundred insect pests having a pandemic distribution and damaging many important crops including vegetables, tubers, fiber crops and ornamentals (Touhidul and Shunxiang, 2007; Abdel- Baky and Al-Deghairi, 2008) [10, 1]. Apart from their direct damage by sucking plant sap, it is also known as the vector for deadly yellow vein mosaic virus. Due to its rapid movement from one plant to another, high reproductive potential and its living habitat, management of the pest is very difficult (Fouly *et al*., 2011) [4]. Farmers rely on conventional insecticides such as organophosphate; carbamate and synthetic pyrethroid to manage these sucking pests (Patel *et al*., 1997) [7]. The repeated use of systemic insecticides has resulted in the development of resistance in the insect pest, and disturbance to the agroecosystem by affecting the non targets (Dittrich *et al*., 1990) [3]. Hence, the present study was carried out to evaluate the efficacy of newer molecules with novel mode of action to find out a viable option for sustainable management of sucking insect pest of okra.

Materials and methods
The experiment was conducted during the kharif season 2017 at Central field, SHUATS, Allahabad. The okra seeds of variety vnr 22 (komal) were sown by dibbling method with spacing of 45 cm×30 cm by placing 2-3 seeds per hill. Gap filling and thinning was done to maintaining the optimum plant density and prevents competition among the plants. The experiment was laid out in randomized block design with eight treatments and three replications. The observations on the number of whiteflies were made, a day before followed by 3rd, 7th, 14th days after spraying of insecticides that are selected and data were recorded from three leaves each from top, middle and bottom leaves from the five randomly selected and tagged plants from each plot without disturbing the plants to minimize the observational errors. Population of white fly was recorded from each net plot and the population was worked out per three leaves. The data were subjected to statistical analysis. the results were expressed as white fly population by number based. F test, c.d values are calculated in computer by using wasp software that was provided by ICAR in its web site.

Results and discussion

The mean leafhopper population after the first spraying was lowest in the imidacloprid treated plots was (1.64) (Table 1). The second-best treatment was thiomethoxam (1.97). The present finding corroborates with Misra (2002) [6] who also reported that the superiority of imidacloprid among seven different insecticides used in the study. The lowest mean population in the second spraying was also recorded from the imidacloprid followed by thiomethoxam in both the sprays. The next best treatments Acetamiprid (2.25), dimethoate (2.52) and lambda cyhalothrin (3.021) were on par with each other.neem oil (4.006), NSKE 4.732 had shown the least effectiveness against the leaf hoppers in the two sparayings. Hence imidacloprid had given very good effective control in all the two sprayings. This is in accordance with the findings of Anitha (2007) [2] who found that the imidacloprid was superior in controlling leafhoppers in okra.

Table 1: Efficacy of selected insecticides and neem products against Whitefly on okra duringFigures in parentheses are square root transformed values; NS=Non significant, S= Significant

SI. No	Treatments	Number of leaf hoppers/3 leaves								
		First spray				Second spray				
		1DBS	3DAS	7DAS	14DAS	1DBS	3DAS	7DAS	14DAS	Overall mean
1	Untreated	7.120 (2.66)	7.220 (2.68)	7.580 (2.75)	8.120 (2.84)	10.180(3.19)	10.586(3.25)	11.010 (3.31)	11.216 (3.34)	9.282 (3.47)
2	Neem oil (Azadirachtin)	6.023 (2.45)	3.210 (1.79)	4.100 (2.02)	5.273 (2.29)	(7.513 2.74)	3.933 (1.98)	3.506 (1.87)	4.020 (2.04)	4.006 (2.01)
3	NSKE 5%	6.120 (2.47)	5.220 (2.28)	4.240 (2.05)	6.260 (2.50)	8.240 (2.87)	4.210 (2.05)	3.920 (1.97)	4.543 (2.13)	4.732 (2.17)
4	Thiomethoxam 25%wg	6.940 (2.63)	1.450 (1.20)	1.460 (1.19)	3.850 (1.96)	5.620 (2.37)	1.906 (1.38)	1.530 (1.23)	1.650 (1.28)	1.975 (1.40)
5	Diamethoate 30%EC	6.930 (2.63)	1.960 (1.40)	1.850 (1.36)	4.020 (2.00)	6.330 (2.51)	2.323 (1.52)	2.263 (1.50)	2.726 (1.65)	2.525 (1.58)
6	Imidacloprid 17.8%SL	6.800 (2.60)	1.260 (1.12)	1.330 (1.15)	3.500 (1.87)	5.260 (2.29)	1.193 (1.09)	1.110 (1.05)	1.460 (1.20)	1.645 (1.28)
7	Acetamprid 20% SP	6.900 (2.62)	1.720 (1.31)	1.620 (1.27)	3.920 (1.97)	6.203 (2.49)	2.133 (1.46)	1.886 (1.37)	2.060 (1.43)	2.225 (1.49)
8	Lambda cyhalothrin 5%EC	6.900 (2.62)	2.620 (1.61)	2.260 (1.05)	4.190 (2.04)	7.010 (2.64)	3.176 (1.78)	2.786 (1.66)	3.010 (1.73)	3.021 (1.73)
F- test		NS	S	S	S	S	S	S	S	S
S. Ed. (±)		0.236	0.144	0.187	0.148	0.148	0.085	0.275	0.223	0.964
C. D. (P = 0.05)		0.513	0.334	0.422	0.324	0.324	0.613	0.592	0.472	2.295

Conclusions

Satisfactory leaf hoppers control was achieved with imidacloprid, thiomethoxam, Acetamprid which are systemic and belong to the neonicotinoids group fallowed by dimethoate, lambda cyhalothrin, neemoil, and the least effective was NSKE 5%.

Acknowledgement

I am very thankful to our advisor and head of department for providing facilities to conduct study.

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