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Bioefficacy of insecticides against leafhopper (*Amrasca bigutulla bigutulla* Ishida) on okra crop

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Abstract
Field experiment was conducted during *kharif* 2016 to evaluate the efficacy of six insecticides viz. carbofuran 3% CG, thiamethoxam 25% WG, chlorantraniliprole 18.5% SC, quinalphos 25% EC, buprofezin 25% SC and cypermethrin 25% SC against leafhopper prevailing in okra agroecosystem. Among all the treatments thiamethoxam 25%WG @ 25 g a.i./ha was found to be most effective against leafhopper (71.67% and 72.59% reduction over control after first and second spray, respectively) this was followed by buprofezin 25% SC @ 200 g a.i./ ha and quinalphos 25%EC @ 200 g a.i./ha while carbofuran 3% CG @ 1000 g a.i./ha was least effective among all. Similarly, chlorantraniliprole 18.5% SC @ 25 g a.i./ha treated plot gave the maximum yield.

Keywords: bioefficacy, insecticides, leafhopper, Okra

Introduction
Okra *Abelmoschus esculentus* L. is also one of the most commonly grown vegetable crop. It is known by different names in different parts of the world. It is commonly known as Bhindi in India. It is a short duration crop grown throughout India. Okra is one of the major cash crops in the country. It is of the economic importance, being the export-oriented crop and usually accounts for about 60% of the total fresh vegetables export Pierce, 1987 [8].
India occupies first position in terms of okra production with an area of 530.8 thousand hectare and production of 63.50 lakh tonnes Anonymous, 2013 [2]. Okra occupies 3.3 thousand hectare area in Uttarakhand Anonymous, 2016 [3]. Andhra Pradesh is a leading state with an area of 74.25 thousand hectare, producing 1113.81 thousand MT with a productivity 15 MT/ha thus, accounting for 18% of the total okra production, followed by West Bengal which contributes 14% to the total production Anonymous, 2013 [2].
Okra is cultivated for its immature and edible fruits. Immature fruits or pods are generally harvested and are used as vegetable, thus forming the important component of human diet. It is a rich source of vitamins and mineral matters.
Okra is severely attacked by insect pests. Insect-pests infestation is the prime and the most limiting factor in the successful cultivation of okra. The crop is attacked by several insect-pests like *Earias vittella* Fabricus, *Helicoverpa armigera* Hubner, *Bemisia tabaci* Gennadius, *Amrasca bigutulla bigutulla* Ishida, *Aphis gossypii* Glover, *Sylepta derogata*, *Mylabris pustulatus*, *Oxycarenus hyalinipennis* and *Tetranychus urticae*. However, the key insect-pests causing the economic losses in okra are: leaf hopper, fruit borer, whitefly, thrips and shoot and fruit borer Solangi and Lohar, 2007 [10]. The insect-pests result in 48.97% reduction in the pod yield Kanwar and Amita, 2007 [5]. In the Tarai region of Uttarakhand, *Amrasca bigutulla bigutulla* is one of the regular and major pests of okra.
To control leafhopper many insecticides have been recommended and suggested. Thus, the present study was undertaken to evaluate the efficacy of some insecticides against this major pest of okra.

Materials and Methods
Field experiment was carried out at the Vegetable Research Centre, GBPUAT, Pantnagar, Udham Singh Nagar (Uttarakhand) during the *kharif* season, 2016. Arka Anamika variety of okra was sown on 30th July, 2016 in plots of size 5 × 4 m^2 with a spacing of 60cm X 40cm. Each plot consisted of six rows with eleven plants in each row. All the agronomic practices recommended to raise the okra crop were followed uniformly in each experimental plot.

The experiment was laid out in a randomized block design (RBD) with seven treatments and four replications. Seven treatments included carbofuran 3% CG @ 1000 g a.i./ha, thiamethoxam 25% WG @ 25 g a.i./ha, chlorantraniliprole 18.5% SC@ 25 g a.i./ha, quinalphos 25% EC @ 200 g a.i./ha, buprofezin 25% SC @ 200 g a.i./ ha, cypermethrin 25% SC @ 50 g a.i./ ha and an untreated plot. The population of leafhopper was taken on three leaves *viz.* each from upper, middle, and lower portion of plant on randomly selected five plants excluding the border rows from each plot. Each insecticide was sprayed two times in the experimental plot. First insecticidal spray was done when plants had attained 50% flowering while the second spray was imposed 21 days after the first spray. Knapsack sprayer fitted with hollow cone nozzles was used to spray the insecticides. The efficacy of different insecticides at different doses against leafhopper was recorded. The population of the pest was recorded 1 day before the application of the insecticides and after 3, 7 and 10 days of spray. Reduction over control was calculated by using the following formula Maji *et al*., 2015 [7].

Reduction over control (%) = Population in control plots — Populations in treatment plot / Population in treatment plot x 100

Data collected was transformed to the square root values and analyzed by ANOVA under randomized block design.

Result and Discussion

Table 1 summarises the population of leafhopper on okra crop for individual treatment. It was evident from the results of first spray that all the treatments significantly reduced the leafhopper population when compared to the untreated plot. The best treatment was thiamethoxam 25%WG @ 25 g a.i./ha with 72.59 percent reduction over control. The next best treatment were buprofezin 25% SC @ 200 g a.i./ ha (67.27 % ROC), quinalphos 25%EC @ 200 g a.i./ha (61.42 % ROC), chlorantraniliprole 18.5% SC @ 25 g a.i./ha (58.18 % ROC), cypermethrin 25% EC @ 50 g a.i./ ha (51.42 % ROC). However, the least effective treatment was carbofuran 3% CG @ 1000 g a.i./ha (45.45 % ROC). Second spray was done 21 days after the first spray. The results from the second spray also revealed the minimum leafhopper population in thiamethoxam 25%WG @ 25 g a.i./ha with 71.67 percent reduction over control. The next best treatment were buprofezin 25% SC @ 200 g a.i./ ha (69.37 % ROC), quinalphos 25%EC @ 200 g a.i./ha (65.97 % ROC), chlorantraniliprole 18.5% SC @ 25 g a.i./ha (61.36 % ROC), cypermethrin 25% EC @ 50 g a.i./ ha (47.20 % ROC). However, the least effective treatment was carbofuran 3% CG @ 1000 g a.i./ha (40.04 %ROC).

The data collected after the two insecticidal application showed that thiamethoxam 25%WG @ 25 g a.i./ha and buprofezin 25% SC @ 200 g a.i./ ha gave highest reduction in the pest population (Fig 1).

The yield of the marketable fruit varied from 5.54 to 10.81 T/ ha. The Maximum yield was obtained from the plot treated with chlorantraniliprole 18.5% SC (10.81 T/ ha) followed by thiamethoxam 25% WG (9.63 T/ ha). This was further succeeded by carbofuran 3% G (8.50 T/ ha), buprofezin 25% SC (8.02 T/ ha), cypermethrin 25% EC (7.44 T/ ha), quinalphos 25% EC (7.83 T/ ha). Furthermore, the lowest yield was recorded in the untreated plot (5.54 T/ ha).

The present findings are in collaboration with Anand *et al*., 2013 [1] who found the variation in mean population of leafhopper from 5.13 to 4.95, 4.41 to 4.85 and 4.84 to 4.76 after first, second and third spray of thiamethoxam 25WG @ 35 g a.i. ha^{-1} depicting thiamethoxam 25WG @ 35 g a.i. ha^{-1} to be most efficient in reducing the leafhopper population when compared to the other treatments. Saha *et al*., 2014 [9] recorded the percent reduction in the leafhopper population to be 76.13% and 90.55% respectively in the plots treated with thiamethoxam 25 WG @ 0.003%. Chowdary *et al*., 2010 [4] also recorded the maximum marketable fruit yield (11.60 T/ ha) in okra with chlorantraniliprole (rnyaxypyr) 20 SC @ 30 g a.i./ ha as against the control plot (4.83 T/ ha). Mahata *et al*., 2014 [6] recorded that among the eight treatments chlorantraniliprole 18.5 SC @ 27.75 g a.i./ ha gave the maximum yield (150.80 q/ ha) as the treatment.

Table 1: Efficacy of insecticides against the population of leafhopper, *A. bigutulla bigutulla* (Ishida) on okra after insecticidal spray during *kharif*, 2016

Treatment	Dose (g a.i. ha^{-1})	Population of leafhopper/ 3 leaf (Ist Spray)					Population of leafhopper/ 3 leaf (IInd Spray)					Yield (T/ha)
		PTC	3DAS	7DAS	10DAS	% ROC	PTC	3DAS	7DAS	10DAS	% ROC	
Carbofuran 3% CG	1000	7.13	4.19(2.17)	4.20(2.17)	4.24(2.18)	45.45	6.99	5.41(2.43)	5.42(2.43)	5.46(2.44)	40.04	8.50
Thiamethoxam 25%WG	25	7.26	2.10(1.61)	2.09(1.62)	2.15(1.64)	72.59	3.48	2.57(1.75)	2.59(1.76)	2.63(1.77)	71.67	9.63
Chlorantraniliprole 18.5% SC	25	7.78	3.21(1.92)	3.21(1.94)	3.27(1.95)	58.18	5.57	3.52(2.00)	3.51(2.00)	3.54(2.01)	61.36	10.81
Quinalphos 25%EC	200	7.09	2.96(1.86)	2.97(1.86)	3.02(1.87)	61.42	5.28	3.09(1.89)	3.10(1.89)	3.131.90)	65.97	7.83
Buprofezin 25% SC	200	7.00	2.51(1.73)	2.52(1.73)	2.56(1.75)	67.27	4.53	2.78(1.81)	2.79(1.81)	2.83(1.83)	69.37	8.02
Cypermethrin 25% EC	50	7.35	3.73(2.05)	3.72(2.05)	3.76(2.06)	51.42	7.65	4.80(2.30)	4.81(2.30)	4.84(2.31)	47.20	7.44
Untreated	-	7.63	7.68(2.85)	7.72(2.86)	7.75(2.87)		9.06	9.11(3.06)	9.13(3.10)	9.16(3.11)		5.54
SEm±	-	0.087	0.025	0.048	0.043	-	0.784	0.057	0.047	0.052	-	0.135
CD at 0.05%	-	NS	0.077	0.143	0.129	-	NS	0.171	0.140	0.155	-	0.416

PTC: Pre-treatment count; DAS: Days after spray; ROC: Reduction over control; Mean of four replications Values in parentheses are $\sqrt{x} + 0.5$ transformed values.

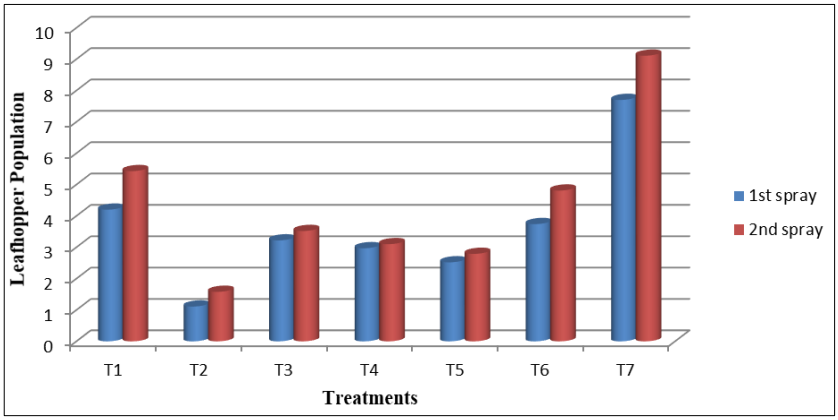

Fig 1: Efficacy of insecticides against the population of leafhopper, *A. bigutulla bigutulla* (Ishida) on okra after two insecticidal sprays during *kharif*, 2016

T1: Carbofuran 3% CG @1000 g a.i./ha, T2: Thiamethoxam 25%WG@25 g a.i./ha, T3: Chlorantraniliprole 18.5% SC@25 ml/ha, T4: Quinalphos 25%EC@ 200 ml/ha, T5: Buprofezin 25% SC @ 200 ml/ha, T6: Cypermethrin 25% EC @ 50 ml/ha, T7:Untreated Plot.

Conclusion

From the present study it can be concluded that thiamethoxam, buprofezin, quinalphos may be the potential chemicals for managing leafhopper population feeding on okra. However, carbofuran was ineffective in managing this pest. Therefore, these chemicals can be the potent component in IPM module for okra.

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References

1. Anand GKS, Sharma RK, Shankarganesh K. Efficacy of Newer Insecticides against Leaf Hopper and Whitefly Infesting Brinjal and its Effect on Coccinellids. Pesticide Research Journal 2013; 25(1):6-11.
2. Anonymous. Indian Horticulture Database 2013. pp. 152-159.
3. Anonymous. Horticulture Statistics Division, Department of Agriculture, Cooperation and Farmers Welfare. Ministry of Agriculture, 2016.
4. Chowdary, Bheemanna M, Kumar LR. Bioefficacy of rynaxypyr (Coragen) 20 SC against fruit borer *Helicoverpa armigera* (Hubner) in okra. International Journal of Plant Protection. 2010; 3(2):379-381.
5. Kanwar NA and Ameta OP. Assessment of loss caused by insect pests of okra (*Abelmoschus esculentus* (L.) Moench. Pestology. 2007; 31(5):45-47.
6. Mahata S, Das BC, Patra S, Biswas AK, Chatterjee ML, Samanta A. New diamaide Isecticides against fruit and shoot borer (*Leucinodes orbonalis* Geun.) in Brinjal. Pesticide Research Journal. 2014; 26(2):197-201.
7. Maji TB, Goswami TN, Das AB, Purkait P and Mukhopadhyay AK. Evaluation of buprofezin 70 DF an insect growth regulator for eco-friendly management of jassid (*Amrasca bigutulla bigutulla* Ishida) in okra, *Abelmoschus esculentus* (L.) Moench. Journal of Applied and Natural Science. 2015; 7(2):725-728.
8. Peirce LC. Characteristics, Production and Marketing. John Wiley and Sons, Canada, 1987, 399-401.
9. Saha T, Chandran N, Kumar R and Ray SN. Field Efficacy of Newer Insecticides against Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis* Guenee (Lepidoptera: Pyralidae) in Bihar. Pesticide Research Journal. 2014; 26(1):63-67.
10. Solangi BH, Lohar MK. Effect of some insecticides on the population of insect pests and some predators of okra. Asian Journal of Plant Sciences. 2007; 6(6):920-926.