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Ashutosh Saini
P.G. Student, Department of Agriculture Entomology, BRDPG College Deoria, Uttar Pradesh, India

Rajnish Kumar
Professor & Head, Department of Agriculture Entomology, B R D P G College Deoria, Uttar Pradesh, India

Shailendra Kumar Mishra
Ph.D., Research Scholar, Department of Agriculture Entomology (BUAT), Banda, Uttar Pradesh, India

Ankit Kumar Mishra
Ph.D., Research Scholar, Department of Agriculture Entomology (BUAT), Banda, Uttar Pradesh, India

Brajrajsharan Tiwari
Ph.D., Research Scholar, Department of Agriculture Entomology, (BUAT), Banda, Uttar Pradesh, India

Sandeep Singh
P.G. Student, Department of Agriculture Entomology, (BUAT), Banda, Uttar Pradesh, India

Corresponding Author:
Ashutosh Saini
P.G. Student, Department of Agriculture Entomology, BRDPG College Deoria, Uttar Pradesh, India

Efficacy of novel insecticides against sucking insect pests of okra (*Abelmoschus esculentus* L. Moench)

Ashutosh Saini, Rajnish Kumar, Shailendra Kumar Mishra, Ankit Kumar Mishra, Brajrajsharan Tiwari and Sandeep Singh

Abstract
The present investigation was carried out in randomized block design (RBD) during *Kharif* 2021 at the experimental field, BRDPG College, Deoria, Uttar Pradesh. Six treatments including an untreated check were evaluated against pests of okra in randomized block design. Overall efficacy of the insecticides against sucking insect pests in current investigation revealed that beta-cyfluthrin 8.49% + imidacloprid 19.81% @1 ml/liter and thiamethoxam 25 WG @ 0.5 g/liter was found most effective. The treatment lambda-cyhalothrin 4.6% + chlorantraniliprole 9.3% @1 ml and fipronil 5% SC @ 2 ml/liter were found next in order of effectiveness, while neem gold 2% @ 2 ml/liter and neem oil 3% @3 mll/liter were comparatively least effective in population reduction of sucking insect pests.

Keywords: Whiteflies, Jassid, RBD, effectiveness

1. Introduction
Vegetables constitute an important item of our food, supplying vitamins, carbohydrates and minerals needed for a balanced diet. Their value is important especially in under developed and developing countries like India. Okra (*Abelmoschus esculentus* L. Moench) popularly known as Bhindi or Lady's finger is an important vegetable crop grown in India. It is a polyploidy, belong to family Malvaceae with 2n=8x=72, 144 chromosomes. It is an often-cross pollinated crop, occurrence of out crossing to an extent of 4-19 percent with the maximum of 42.2 percent being noticed with insect assisted pollination. In India, it is grown both in summer and rainy seasons (Lal and Sinha, 2005) [13]. In Uttar Pradesh Varanasi, Jaunpur, Gazipur, Chanduli, Gorakhpur, Deoria and Kushinagar are the major okra producing district. These tender okra pods/fruits are used as vegetable, a good source of vitamins (A, B and C), proteins, minerals and an excellent source of iodine, linoleic acid, an essential fatty acid, has also been reported to be present, abundantly in okra seed oil (Chin and Nushirwan, 1990) [4].

72 species of insects have been recorded on okra (Rao and Rajendran, 2003) [20] of which sucking pests comprising aphids (*Aphis gossypii* Glove.), leaf hopper (*Amrasca biguttula* Ishida) and whitefly (*Bemisia tabaci* Gen.) caused significant damage to the crop. Now a day's severe attacks of mealy bugs are Sean to infest okra in eastern part (Deoria) of Uttar Pradesh.

Krishnaiah (1980) [12] reported about 40 to 56 percent losses in okra due to leafhopper. There is a reduction of 49.8 and 45.1 percent in height and number of leaves, respectively due to attack of leaf hopper (Rawat and Sadu, 1973) [21]. The whitefly *Bemisia tabaci* (Gen.) is of considerable importance because not only does it cause damage by direct feeding, but also transmits yellow mosaic virus. Sastry and Singh (1974) [26] reported 93.80 percent yield loss in okra. Whitefly besides causing direct damage, acts as a vector of yellow vein mosaic virus (YVMV), which is a major constraint for okra cultivation (Neeraja, *et al.*, 2004) [7].

In order to prevent infestation of insect pests and to produce a quality crop, it is essential to manage the pest population at appropriate time with suitable control measures. The chemical control has been suggested by many workers to combat with the sucking insect-pests of okra [Manjanaik *et al.*, (2002) [14], Mishra (2002) [15], Sinha and Sharma (2007) [28], Rohini *et al.*, (2012) [24] etc.] Most of the conventional chemicals are broad spectrum, persistent in nature and having long residual action. Ghosh and Chakraborty (2012) [10] reported that pest control by using biocontrol agent is an important component of Integrated Pest Management and organic farming. So, there is need of search of bio-control agents in specific times that can break the resistance and become eco-friendly.

The objective of the study was to formulate suitable management of sucking pests of lady's finger with the use of some new safe molecules and less harmful to beneficial insects.

2. Materials and Methods

The experiment was conducted during the *Kharif* season 2021 at Research farm, BRDPG College, Deoria. The okra seed variety of Vikrant were sown in the plot size of 2m × 2m area with 60 cm×30 cm spacing. The crop was raised with recommended management practices except plant protection measures. The treatment *viz*. fipronil 5% SC @2 ml/l, thiamethoxam 25 WG @ 0.5 g/l, Lambda-cyhalothrin 4.6% + Chlorantraniliprole 9.3% @1 ml/l, betacyfluthrin 8.49% + imdacloprid 19.81% @1 ml/l, Neem gold @2 ml/l and Neem oil @3 ml/l were applied thrice at 13 days interval.

Spraying was done with a knapsack sprayer. The data of target pests were recorded from randomly selected five plants in each plot. Observations of a total number of whitefly and jassid on lady's finger were recorded from five top young leaves of each plant per plot and converted to number of insect pests/leaf. First count was taken one day before first spray and post-treatment counts were recorded on 3, 7, 10 and 13 days after each spray. All the observations were recorded with the help of a hand lens (10X).

Statistical analysis

Data were analyzed by using SPSS software for analysis of variance following randomized block design (RBD) treatment means were separated by applying CD Test (critical difference) at 5% level of significance.

Table 1: Insecticidal treatments used in the experiments

Common name	Trade name	Concentration	Dose (ml/l)	Source of availability	Cost of insecticides (Rs/liter or kg)
Fipronil	Regent	5% SC	2 ml/lit	Bayer crop science Pvt. Ltd.	1485
Thiamethoxam	Tagxone	25 WG	0.5 gm/lit.		1388
Lambda cyhalothrin + chlorantraniliprole	Ampligo	4.6% +9.3%	1 ml/lit	Syngenta insecticide Ltd.	2160
Beta cyfluthrin + imidacloprid	Solomon	8.49% +19.18%	1 ml/lit.	Bayer crop science pvt ltd.	1960
Azadirachtin	Neem gold	0.15%	2 ml/lit.	SPIC Pvt. Ltd.	400
Neem oil	NSKE	3%	3 ml/lit.	Neem tree	200
Untreated check (water spray)					

3. Results and Discussion

Efficacy of insecticides against Whitefly (*Bemisia tabaci*)

The overall mean result presented in current investigation revealed that all the treatments were significantly superior over control. Among all the treatments betacyfluthrin 8.49% + imidacloprid 19.81% @ 1 ml/l (1.15 whitefly/L) and thiamethoxam 25 WG @0.5 g/l (1.39 whitefly/L) was found most effective, followed by next moderately effective treatment lambda-cyhalothrin 4.6% + chlorantraniliprole 9.3% @1 ml/l (1.42 whitefly/L) and fipronil 5% SC @ 3 ml/l (1.51 whitefly/L), while Neem gold @ 2 ml/l and Neem oil @3 ml/l were least effective among all treatments.

These findings are in accordance with the findings of Reddy *et al.* (2018) [22] and Rajawat *et al.* (2017) [19] reported that betacyfluthrin 8.49% + imidacloprid 19.81% was the most effective treatment indicating reduction in population of sucking pest (whitefly). Our findings also supported by that of Jain and Ameta (2006) [11] Ahmad (2009) [1], Cloyd (2011) [5] and Zote *et al.* (2018) [31], and who reported the better efficacy of insecticide mixture against arthropod pests.The present results are in close conformity with that of Ghosal and Chatterjee (2013) [9] and Raghuram *et al.* (2006) [18] who reported thiamethoxam 25 WG was among the best insecticide against whitefly. Vemuri *et al.* (2014) [30] and Reddy *et al.* (2018) [22] found lambda-cyhalothrin 4.6% + chlorantraniliprole 9.3% as best insecticide against whitefly are in partial agreement with present investigations.

Similar to present results Patil *et al.* (2009) [25], Kumar and Kumar (2020) [6] reported fipronil 5% SC resulted significant reduction in whitefly population. A significant result might attribute to broad spectrum nature of fipronil.

Ghelani *et al.* (2014) [8] reported neem gold and Neem oil (NSKE) were effective treatments at 3 and 7 days after spray. Similar observation was recorded in present study which justify our results. Our findings are also in agreement with that of Rehman *et al.* (2015) [23] who reported lambda cyhalothrin and neem oil @ 5% concentration were equally effective against whitefly on okra.

Efficacy of insecticides against jassid (*Amrasca biguttula*)

Overall performance of the various insecticides against jassids in current investigation revealed that all the insecticidal treatments proved significantly superior over untreated check. Betacyfluthrin 8.49% + imidacloprid 19.81% and thiamethoxam 25 WG was found most effective over rest of the treatments. The treatments lambda-cyhalothrin 4.6% + chlorantraniliprole 9.3% and fipronil 5% SC were found moderately effective, while botanical insecticides were comparatively least effective in reduction of jassid population. The result is in close conformity with the findings of Zote *et al.* (2018) [31] and Ghosh *et al.*, (2013) [10]. Who also concluded that application of Solomon 300 OD and thiamethoxam 25 WG were most effective against jassid population. Similar to present results the effectiveness of thiamethoxam 25 WG against jassid in okra has also been reported by Sinha and Sharma (2007) [28] who reported the foliar spray of thiamethoxam 25 WG @ 20g a.i./ha. At 30 days of sowing was found effective in managing leaf hopper population in okra. Our findings agree with that of, Bharpoda *et al.* (2014) [2-3] found thiamethoxam 25 WG @ 0.0125% was significantly superior insecticide in reducing the population of leafhopper in cotton. The efficacy of thiamethoxam25 WG against okra jassid had also been reported by Nath and Sinha (2011) [16], Singh *et al.* (2014) [27], Patel *et al.* (1996) [17] concluded that neem seed kernel 5% showed a repellent effect against jassids. Bindu *et al.* (2005) [32] found that Achok (A neem product) provided effective control against jassids in okra crop, corroborating the efficacy of neem products in present investigation.

Table 2: Mean population of whitefly under different treatments

S.N.	Treatments	Population of whitefly at days after spraying (DAS)				
		Before Spraying	3 DAS	7 DAS	10 DAS	13 DAS
T_1	Fipronil 5% SC 2 ml/liter	1.75 (1.32) *	1.51 (1.22)	1.41 (1.18)	1.43 (1.19)	1.46 (1.20)
T_2	Thiamethoxam 25 WG @0.5 g/liter	1.60 (1.26)	1.39 (1.17)	1.28 (1.13)	1.29 (1.13)	1.32 (1.15)
T_3	Lambdacyhalothrin 4.6% + Chlorantraniliprole 9.3% @1 ml /liter	1.55 (1.24)	1.42 (1.19)	1.32 (1.15)	1.33 (1.15)	1.39 (1.18)
T_4	Betacyfluthrin 8.49% + Imidacloprid 19.8% @ 1 ml/liter	1.52 (1.23)	1.15 (1.07)	1.05 (1.02)	1.10 (1.04)	1.17 (1.08)
T_5	Neem gold 0.15% @ 2 ml/liter	1.63 (1.27)	1.56 (1.24)	1.52 (1.23)	1.52 (1.23)	1.59 (1.26)
T_6	Neem oil 0.3% @ 3 ml/liter	1.78 (1.33)	1.67 (1.29)	1.60 (1.26)	1.60 (1.26	1.69 (1.29)
T_7	Untreated check (Water spray)	1.50 (1.22)	2.21 (1.47)	2.71 (1.62)	2.93 (1.68)	3.16 (1.75)
S.E. (Mean)		0.031	0.060	0.077	0.081	0.081
C.D. (5%)		NS	0.186	0.241	0.251	0.254

*Figure in parenthesis are square root transformed value
DAS = Day after spray

Table 3: Mean population of jassid under different treatments

S.N.	Treatments	Population of jassid at days after spraying (DAS)				
		Before Spraying	3 DAS	7 DAS	10 DAS	13 DAS
T_1	Fipronil 5% SC 2 ml/liter	1.41 (1.18) *	1.39 (1.17)	1.33 (1.15)	1.44 (1.19)	1.50 (1.22)
T_2	Thiamethoxam 25 WG @0.5 g/liter	1.33 (1.15)	1.27 (1.13)	1.21 (1.10)	1.33 (1.15)	1.40 (1.18)
T_3	Lambdacyhalothrin 4.6%+Chlorantraniliprole 9.3% @1 ml /liter	1.50 (1.22)	1.36 (1.16)	1.30 (1.141)	1.36 (1.16)	1.41 (1.18)
T_4	Betacyfluthrin 8.49% + Imidacloprid 19.8% @ 1 ml/liter	1.91 (1.35)	1.16 (1.06)	1.08 (1.02)	1.16 (1.06)	1.25 (1.10)
T_5	Neem gold 0.15% @ 2 ml/liter	1.83 (1.34)	1.61 (1.22)	1.51 (1.22)	1.61 (1.26)	1.66 (1.29)
T_6	Neem oil 0.3% @ 3 ml/liter	1.66 (1.28)	1.63 (1.27)	1.53 (1.23)	1.58 (1.25)	1.59 (1.26)
T_7	Untreated check (Water spray)	1.54 (1.23)	2.25 (1.48)	2.75 (1.63)	2.98 (1.70)	3.21 (1.77)
S.E. (Mean)		0.101	0.079	0.091	0.104	0.089
C.D. (5%)		NS	0.243	0.281	0.325	0.274

*Figure in parenthesis are square root transformed value
DAS = Day after spray

4. Conclusion

Efficacy of insecticides namely the treatments betacyfluthrin 8.49% + imidacloprid 19.81% @ 1 ml/l was found to be significantly effective against whitefly *B. tabaci* (Gennadius) and jassid *A. biguttula biguttula* (Ishida) as it recorded lowest population. The next effective treatments were thiamethoxam 25 WG @0.5 g/l, followed by lambda-cyhalothrin4.6% + chlorantraniliprole 9.3% @ 1 ml/l and fipronil 5% SC @ 2 ml/l. Whereas botanicals found least effective, but it was significantly superior to untreated check.

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6. References

1. Ahmad M, Iqbal Arif M. Resistance of Pakistani field populations of spotted bollworm *Earias vittella* (Lepidoptera: Noctuidae) to pyrethroid, organophosphorus and new chemical insecticides. Pest Management Science: Formerly Pesticide Science. 2009 Apr;65(4):433-9.
2. Bharpoda TM, Patel NB, Thumar RK, Bhatt NA, Ghetiya LV, Patel HC, *et al*. Evaluation of insecticides against sucking insect pests infesting Bt cotton BG-II. The bioscan. 2014;9(3):977-980.
3. Bharpoda TM, Patel NB, Thumar RK, Bhatt NA, Ghetiya LV, Patel HC, *et al*. Evaluation of insecticides against sucking insect pests infesting Bt cotton BG-II. The bioscan. 2014;9(3):977-80.
4. Chin AHG, Nushirwan Z. Properties of vegetable oils from some unemployed sources in Malaysis. Malaysian Agricultural Research and Development Institute Research Journal. 1990;18(2):261-265.
5. Cloyd RA. Pesticide Mixtures. Pesticides – Formulations, Effects, Fate, Prof. Margarita Stoytcheva (Ed.), ISBN: 978-953-307-532-7, In Tech, 2011. Available from: http://www.intechopen.com/books/pesticides-
6. Dudipalla Nihanth Kumar, Ashwani Kumar. Population dynamics and field efficacy of certain insecticides against Whitefly, *Bemisia tabaci* (Gennadius) on Okra. Journal of Entomology and Zoology Studies. 2020;8(6):1985-1988.
7. Neeraja G, Vijaya M, Chiranjeevi, Gautham B. Screening of Okra Hybrids against Pest and Diseases. Indian Journal of Plant Protection. 2004;32:129-131
8. Ghelani M, Kabaria B, Chhodavadia S. Field efficacy of various insecticides against major sucking pests of Bt cotton. J Biopesticides. 2014;7:27.
9. Ghosal A, Chatterjee ML. Bio efficacy of imidacloprid 17.8 SL against whitefly, *Bemisia tabaci* (Gennadius) in brinjal. Journal of Pharmacy & Pharmaceutical Sciences. 2013;5(1):37-41.
10. Ghosh S K, Tanmoy M, Supriya B, Chakraborty K. Field evaluation of cultivars and bio-efficacy of insecticides against pest complex of ladys finger [*Abelmoschus esculentus* (L.) Moench]. Journal of Applied Zoological Researches. 2012;23(2):117-124.
11. Jain KL, Ameta OP. Bioefficacy of imidacloprid and betacyfluthrin against insect pests of chilli. Pestology. 2006;30 (1):36-39.
12. Kishnaiah K. Methodology for assessing crop losses due to pests of vegetables Assessment of crop losses due to pest and disease. U.S.A Tech. 1980;33:259-26.
13. Lal OP, Sinha SR. Effect of Imidaclopril seed treatment along with some insecticidal sprayings against insect pests of Okra, Indian Journal of Entomology. 2005;67:328-333.

14. Manjanaik C, Jyothilakshmi S, Chandrappa H, Somasundra KM, Herle PS. Efficacy of insecticides and plant products (neem oil) against *Spodoptera litura* (Noctuidae: Lepidoptera) on groundnut in coastal zone. Environment and Ecology. 2002;20(1):105-108.
15. Mishra HP, Dash D. Efficacy of insecticides against okra jassid, *Amrasca biguttula* Ishida. Ann. Pl. Protec. Sci. 2002;10:230-232.
16. Nath Vishwa, Sinha SR. IPM in okra through neonicotinoides insecticides and their mixture. Ann. Pl. Protec. Sci. 2011;19:33-36.
17. Patel ZP, Patel JR. Effect of botanicals on behavioural response and on growth of the jassid (*Amrasca biguttula*). Indian Journal Plant Protection. 1996;24:1-2.
18. Raghuraman M, Gupta GP. Field evaluation of neonicotinoids against whitefly, *Bemisia tabaci* Genn. in Cotton. Indian Journal of Entomology. 2006;67(1):29-33.
19. Rajawat IS, Alam MA, Kumar A, Tiwari RK, Jaiswal SK. Efficacy of new molecules of insecticides against white fly *Bemisia tabaci* (Gennadius) and aphid *Aphis craccivora* (Koch) in Urdbean (*Vigna mungo* L.). Indian Journal of Agricultural Research. 2017;51(5):502-505.
20. Rao Srinivasa, Rajendran R. Joint action potential of neem with other plant extracts against the leaf hopper *Amrasca devastance* (Distant) on okra. Pest Management and Economic Zoology. 2003;10(1):131-6.
21. Rawat RR, Sahu HR. Estimation of losses in growth and yield of okra due to *Empoasca devastans* Dist and Earias spp. Indian Journal of Entomology. 1973;35(3):252-4.
22. Reddy BK, Paul A, Anitha N, George T, Amritha VS. Efficacy of insecticide mixtures against sucking pests of cowpea. J. Entomol. Zool. Stud. 2018;6(5):2246-50.
23. Nadeem M, Ayyaz M, Begum HA. Comparative efficacy of neem oil and lambdacyhalothrin against whitefly (*Bemisia tabaci*) and jassid (*Amrasca Devastans* Dist.) in okra field. Russian agricultural sciences. 2015 Jun;41:138-45.
24. Rohini A, Prasad NV, Chalam MS. Management of major sucking pests in cotton by insecticides. Annals of Plant Protection Sciences. 2012;20(1):102-6.
25. Patil SB, Udikeri SS, Matti PV, Guruprasad GS, Hirekurubar RB, Shaila HM, *et al*. Bioefficacy of new molecule fipronil 5% SC against sucking pest complex in Bt cotton. Karnataka Journal of Agricultural Sciences. 2010 May 26;22(5):1029-1031.
26. Sastry KSM, Singh SJ. Effect of yellow vein mosaic virus infection on growth and yield of okra crop. Indian phytopathology. 1974;27:294-297.
27. Singh DK, Sundar P, Umrao RS, Pal RK. Efficacy of insecticides as seed treatment against sucking pests of okra, (*Abelmoschus esculuntus*). Annals of Plant Protection Sciences. 2014;22(1):88-91.
28. Sinha SR, Sharma RK. Efficacy of neonicotinoids against okra insect pests. Pesticide research journal. 2007;19(1):42-4.
29. Sunil Ghosh Kr, Gautam Chakraborty. Integrated field management of *Henosepilachna vigintioctopunctata* (Fabr.) on potato using botanical and microbial pesticides. J Biopest, 5 (supplementary), 2012, 151-154.
30. Vemuri SB, Rao CS, Reddy AH, Swarupa S. Bio-efficacy and dissipation of newer molecules against white fly in okra. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2014;5(6):434-40.
31. Zote VK, Gajbhyie Salvi SP, Haldavnekar PC. Efficacy and evaluation of Solomon 300 OD (betacyfluthrin 90%+ imidacloprid 210%) for management of insect pest in cashew. Journal of Entomology and Zoology Studies. 2018;6(4):81-83.
32. Bindu K, Campos J, Nair MT, Sanchez A, Nair PK. Semiconducting AgSbSe2 thin film and its application in a photovoltaic structure. Semiconductor science and technology. 2005 Apr 5;20(6):496.