https://doi.org/10.33451/florafauna.v31i1pp33-38

FLORA AND FAUNA ISSN 2456 - 9364 (Online)

2025 Vol. 31 No.1 PP 33-38 ISSN 0971 - 6920 (Print)

Comparative evaluation of insecticides against fruit borer, *Erias vittella* on okra during *Kharif* season

***Bikash Subba, Sanju Tamang and Dharmendra Kumar Janghel**

School of Agricultural sciences,
GD, Goenka University,
SOHNA-122103, GURUGRAM (HARYANA) INDIA
*Corresponding Author
E-mail : bikash.subba@gdgu.org

Received : 10.03.2025; ***Accepted*** : 08.05.2025

How to cite : Subba B, Tamang S, Janghel DK. Comparative evaluation of insecticides against fruit borer *Erias vittella* on okra during *Kharif* season. *Flora and Fauna* 2025. 31(1) : 33-38.

ABSTRACT

A field trial was conducted at the Uttar Banga Krishi Viswavidyalaya research farm in Pundibari, Cooch Behar, West Bengal, India, to evaluate the effectiveness of pesticides against jassid and fruit borer.Except for Neem, the remaining five of the insecticides displayed remarkable efficacy in suppressing fruit borer infestation and reducing damage. An organic insecticide, Agniastra @ 30 ml/L, proved highly effective in significantly suppressing fruit borer populations, resulting in a marketable okra yield of 11.84 t/ha. The use of chemical insecticides imidacloprid (30 g a.i./ha) and acephate (600 g a.i./ha) successfully reduced fruit damage and increased yields to 11.72 t/ha. Neem @ 3 g a.i./ha was the least effective, while Spinosad @ 90 g a.i./ha and Emamectin Benzoate @ 30 g a.i./ha demonstrated moderate effectiveness. Agniastra @ 30 ml/L is a promising option for controlling fruit borer damage due to its health benefits and its potential to produce chemical-free export-quality produce. Moreover, Agniastra @ 30 ml/L offers a practical and sustainable solution for safer, chemical-free export-oriented okra production.

Figure : 00 References : 33 Table : 01

KEY WORDS : Agniastra, Fruit Borer, Insecticide efficacy, Okra, Pest management

Introduction

Abelmoschus esculentus, a member of the Malvaceae family and native to Africa, is commonly known as 'Okra' or 'Bhindi' in India. It is cultivated in tropical and subtropical regions worldwide and is considered one of the most economically significant vegetable crops[23]. Owing to its high nutritional value, pleasing taste, and extended self-life after harvest, okra has emerged as a prominent player in India's export-oriented vegetable market. It constitutes an impressive 60% share of the country's fresh vegetable exports, trailing only behind onions, and represents 30% of the earnings from vegetable exports[30].

Despite its economic significance, okra faces numerous challenges, including both abiotic and biotic stresses, with insect pests posing a major obstacle. These pests, exhibiting polyphagous or oligophagous behavior, afflict the crop from its seedling to harvesting stages, leading to substantial yield losses. Okra is attacked by many pest species, but the primary ones are fruit borers such as *Earias insulana* and *Earias vittella*, along with the sucking pest jassid (*Amrasca biguttula* Ishida)[6,7,11,16,18,20,22]. These pests infest the crop throughout its growth stages, causing significant reductions in yield[34]. It has been reported that Fruit borers cause sole damage to 3.5% to 90% across various parts of the country[7,20,27,30,31]. The heavy infestation of pests necessitates a substantial reliance on insecticides, raising concerns about the toxic residues that may remain on the fruits upon harvest, particularly since they are often consumed with minimal cooking[2]. Furthermore, the presence of pesticide residues poses the risk of consignment rejection during export. It is worth noting that despite India being a leading country in okra production, its lack of share in exports is attributed to the failure to produce chemical residue-free produce, primarily due to reliance on synthetic pesticides.

These challenges need to be addressed through ecologically sound, cost-effective, and economically viable methods for controlling organic okra within production systems that prioritize the right quality for export purposes. In light of this, current investigations were undertaken to determine the efficacy of microorganism-derived insecticides, plant-based

© This work is licensed under CC BY - NC 4.0

botanical insecticides in comparison with chemical insecticides for promoting healthier and environmental friendly practices.

Materials and Methods

Field trials were conducted during the 2016 and 2017 *kharif* seasons, from May 15 to August 14 each year, at the Uttar Banga Krishi Viswavidyalaya Instructional Farm in Pundibari, Cooch Behar, West Bengal, India. The experimental site was located in the Terai region of West Bengal at an elevation of 43.0 meters above mean sea level, with coordinates 26°19’86" N latitude and 89°23’53" E longitude. The site features a medium-upland topography with a well-developed irrigation and drainage system. The experiment followed a Randomized Block Design (RBD) with six treatments and three replications.The six treatments included Emamectin benzoate (30 g a.i./ha), Spinosad (90 g a.i./ha), Acephate (600 g a.i./ha), Imidacloprid (30 g a.i./ha), Neem (3 g a.i./ha), Agniastra (30 ml/L), and an untreated control (T7). The Arka Anamika variety was directly sown in 4 × 3 m plots with a spacing of 60 × 30 cm. Jeevamrut (a crude microbial culture) was applied by diluting it with water as a substitute for conventional NPK fertilizers after the final soil tillage in the late afternoon at 14-day intervals. Additionally, four application rounds of insecticides applications were carried out at 15-day intervals.

Preparation and use of Jeewamrut : The process outlined[22] was followed to prepare the crude microbial culture, Jeevamrut. The ingredients used included 12 kilograms of fresh cow dung, 12 liters of cow urine, 2.5 kilograms of jaggery, 2.5 kilograms of chickpea flour, 1.5 kilograms of soil collected from an uncultivated area, and 200 liters of water. Initially, fresh cow dung was suspended in a mosquito net positioned above a drum containing 150 liters of water, allowing it to soak. After 48 hours, the cow dung within the mosquito net was manually squeezed to release its contents into the drum, followed by the addition of molasses, cow urine, chickpea dust and a handful of uncultivated soil. Over the following three days, the mixture was swirled three times daily, alternating between clockwise and anti-clockwise directions using a wooden or bamboo stick. After 4-5 days, the indigenous microbial culture was deemed ready for use. The application involved spreading the diluted microbial culture evenly across the plots, with application typically performed during late afternoon hours.

Preparation of Agniastra : The biopesticide Agniastra was formulated following the process[22]. The ingredients included four kilograms of neem leaves, 500 grams of garlic, 500 grams of green chili, 500 grams of tobacco powder, and 15 liters of cow urine. The ingredients were thoroughly mixed in a basin and then boiled for an hour. After boiling, the mixture was left to rest at room temperature for 48 hours. It was then filtered through a cloth and stored in bottles in a cool, dry place for up to three months.

Mulching : Mulching was carried out using a combination of paddy and mustard straw at a ratio of approximately 3:1 between the rows of crops grown in the plots. Chemical fertilizers were completely omitted in the plots managed under bio-accelerated farming utilizing indigenous microbial culture.

Data collection : Fruit borer data were collected weekly from 10 randomly chosen plants. At every harvest, evaluations were made on bore fruit determining the percent reduction in damaged fruit resulting from insecticide application.

Yield : Okra yield data were obtained from each plot and weighed on electrical balance. This yield was subsequently converted into kg/ha using the following formula below.

$$\text{Yield (kg/ha)} = \frac{\text{Yield of plot in kg x 10,000 m}^2}{\text{Area of subplot (m}^2\text{)}}$$

Data analysis : SAS software (Version 9.2) was used for data analysis. Each parameter was subjected to a one-way ANOVA, and mean comparisons were performed using the Least Significant Difference (LSD) test at a 5% significance level.

Results

Across the applications, Agniastra @ 30ml/L consistently demonstrated the highest effectiveness in reducing the percentage of bored fruit across multiple application applications, followed by Imidacloprid @ 30g a.i./ha and Acephate @ 600g a.i./ha. In comparison, Neem @ 3g a.i./ha was less effective, while Spinosad @ 90g *a.i.*/ha and Emamectin Benzoate @ 30g a.i./ha provided moderate control. The untreated control group had the poorest performance, highlighting the importance of pest control measures in maximizing yield.

The pooled data over two years highlight the effectiveness of various treatments in reducing the percentage of bored fruit and increasing yield across multiple application applications. In the first application, Emamectin Benzoate @ 30g a.i./ha and Agniastra @ 30ml/L showed the significantly highest reductions in bored fruit, with reductions of 49.50% and 49.03%, lowering the bored fruit percentage to 5.35% and 5.33% respectively. This was followed by Imidacloprid at 30g a.i./ha (47.39%) and Acephate @ 600g a.i./ha (47.31%), which brought the bored fruit percentage down to 5.63%

TABLE-1: Effect of insecticide application on Fruit Borer infestation in okra and the corresponding reduction in damage percentage during *Kharif* Season of 2016-17

Treatments	I Application (Two-year pooled mean)		II Application (Two-year pooled mean)		III Application (Two-year pooled mean)		IV Application (Two-year pooled mean)		Yield (t/ha) (Pooled mean of two years
	% of bored fruit	Reducti-on %	% of bored fruit	Reducti-on %	% of bored fruit	Reducti-on %	% of bored fruit	Reducti-on %	
T1=Emame-ctin benzoate @ 30g *a.i.*/ha	5.35d (13.38)	49.50a (44.71)	10.47c (18.88)	42.80d (40.86)	7.10c (15.46)	45.66d (42.51)	2.03c (8.17)	65.72c (54.16)	10.55c
T2= Spinosad @ 90g *a.i.*/ha	5.59c (13.68)	46.70c (43.10)	10.71c (19.10)	42.81d (40.86)	7.94c (6.01)	44.14e (41.63)	2.41c (8.93)	59.65d (50.56)	11.04b
T3=Acephate @ 600g *a.i.*/ha	5.57c (13.64)	47.31b (43.46)	9.93d (18.37)	46.15b (42.79)	7.32c (16.05)	48.03b (43.87)	2.05c (8.22)	65.28c (53.90)	11.72a
T4=Imidac-loprid @ 30g *a.i.*/ha	5.63c (13.72)	47.39b (43.50)	10.11c (18.54)	44.51c (41.85)	7.46c (15.85)	47.44c (43.53)	2.06c (8.26)	66.94b (54.91)	11.72a
T5 =Neem @ 3g *a.i.*/ha	8.77b (17.22)	18.73d (25.65)	19.23b (26.01)	17.94e (25.06)	17.81b (24.96)	20.90f (27.21)	9.77b (18.22)	22.58e (28.37)	8.29d
T6=Agniastra @ 30ml/L	5.33 d (13.34)	49.03a (44.44)	7.15e (15.50)	53.02a (46.73)	4.16d (11.76)	58.60a (49.95)	0.97d (5.65)	68.50a (55.86)	11.84a
T7=Untreated	10.88a (1926)	-	27.79a (31.81)	-	30.52a (33.53)	-	19.17a (25.97)	-	7.45e
Pr>F	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
LSD	0.1558	0.5102	0.1379	0.5405	0.4727	0.2929	0.4296	0.6619	0.2980

Note: The percentage of bored fruit and the percentage decrease in bored fruit (values in parentheses) are angular transformed values. At the 5% probability level, means within a column that share the same letter are not significantly different.

and 5.57%. Neem @ 3g a.i./ha showed the lowest reduction of 18.73%, reducing bored fruit damage to 8.77%, indicating low efficacy.

During the second application, Agniastra @ 30ml/L achieved the highest reduction in bored fruit, resulting in a 53.02% decrease and 7.15% fruit damage. This was followed by Acephate @ 600g a.i./ha and Imidacloprid @ 30g a.i./ha, which reduced bored fruit by 46.15% and 44.51%, respectively, leading to bored fruit levels of 9.93% and 10.11%. The effectiveness of Spinosad @ 80g a.i./ha and Emamectin Benzoate @ 30g a.i./ha decreased in the second application, with reductions of 42.81% and 42.80%, and resulting in bored fruit damage of 10.71% and 10.47%, respectively. Neem @ 3g a.i./ha recorded the lowest reduction of 17.94%. In comparison, the untreated control group exhibited a significantly higher percentage of bored fruit at 27.79%.

In the third application, Agniastra @ 30ml/L maintained its effectiveness, showing the highest reduction in bored fruit of 58.60%, and reducing bored fruit damage to 4.16%. This was followed by Acephate @ 600g a.i./ha and Imidacloprid @ 25g a.i./ha, which recorded reductions of 48.03% and 47.44%, decreasing bored fruit damage to 7.32% and 7.46%, respectively. Emamectin Benzoate @ 30g a.i./ha and Spinosad @ 90g a.i./ha achieved reductions of 45.66% and 44.14%, lowering bored fruit damage to 7.10% and 7.94%, respectively. Neem @ 3g a.i./ha recorded the lowest reduction at 20.90%. In contrast, the untreated control group exhibited a significantly higher percentage of bored fruit of 30.52%, underscoring the importance of these treatments in effective pest management.

During the fourth application, Agniastra @ 30ml/L remained highly effective, achieving a 68.59% reduction in bored fruit, leading to a notable decrease in the percentage of bored fruit, reducing it to 0.97% fruit damage. This was followed by Imidacloprid @ 30g a.i./ha, which achieved 66.94% significantly decreasing the percentage of fruit borer damage to 2.06%. Emamectin Benzoate @ 30g a.i./ha and Acephate @ 600g a.i./ha also performed well, achieving pest reductions of 65.72% and 65.28%, and reducing fruit damage to 2.03% and 2.05%, respectively. Neem @ 3g a.i./ha was the least effective, achieving only 22.58% reduction in pests and resulting in 9.77% fruit damage. The untreated control group continued to show a significantly higher percentage of bored fruit at 19.78%, highlighting the necessity of consistent pest management strategies.

Agniastra resulted in the highest yield increase at 11.84 t/ha, followed closely by Imidacloprid @ 3g a.i./ha and Acephate @ 600g a.i./ha, both achieving yields of 11.72 t/ha. Spinosad @ 90g a.i./ha produced a yield of 11.04 t/ha, while Emamectin Benzoate @ 30g a.i./ha yielded 10.55 t/ha. Among the insecticides tested, Neem @ 3g a.i./ha recorded the lowest yield at 8.29 t/ha, compared to the untreated control at 7.45 t/ha. These results demonstrate the effectiveness of these treatments not only in reducing pest damage but also in maximizing yield potential, ultimately contributing to improved crop productivity and economic returns.

Discussions

The current investigation demonstrated that four applications of Agniastra @ 30ml/L at 15-day application at 15-day intervals lowered the borer infestation level to 0.97%, compared to 19.57% in the untreated control, resulting in a yield of 11.84 t/ha.

This finding is supported by earlier researchers[33], they demonstrated that Agniastra @ 30ml/L at the same concentration reduced fruit borer damage by 54.05%, with a fruit infestation rate of only 1.75% after the third application, resulting in a yield of 12.21 t/ha. The high effectiveness of Agniastra @ 30ml/L is likely due to its multi-component composition, which targets various physiological processes in pests, leading to increased mortality and decreased infestation rates.

Similarly, imidacloprid at 30 g a.i./ha and acephate at 600 g a.i./ha, with yields of 11.72 t/ha, were the second most effective treatments. These chemical insecticides reduced the percentage of damaged fruit to 2.05% and 2.06%, respectively, compared to 19.17% in the untreated control.

Acephate works by disrupting the nervous system of pests, leading to paralysis and death, which explains its consistent effectiveness.Bansode et al. (2015)[3] observed 16.15% fruit infestation with Acephate @ 560 g a.i./ha, whereas our study recorded lower infestation levels (2.05-9.93%), resulting in 46.15-65.28% protection against fruit borer infestation with Acephate @ 600 g a.i./ha, contradicting earlier findings.

Comparable results were reported[17,25] which found that imidacloprid application resulted in the lowest incidence of fruit and shoot borer. It was also reported[13] that imidacloprid 17.8% SL led to the lowest fruit borer infestation, as indicated by the proportion of damaged fruits (5.58%), which is consistent with the findings of the present study. Conversely, another worker[9] found that imidacloprid at 30 g a.i./ha was less effective in reducing fruit borer incidence. The finding of the present study also align with earlier one[4] who observed that plots treated with imidacloprid at 40 g a.i./ha significantly reduced fruit damage, achieving a 57.58% decrease.

Following the fourth application, Spinosad at 90 g a.i./ha showed moderate effectiveness in controlling fruit borers and enhancing yields, as corroborated by various studies. This treatment led to a 59.65% reduction in fruit damage, with observed damage at only 2.41% compared to 10.71% in untreated plots, resulting in a yield of 11.04 t/ha. Similarly, Spinosad at 0.5 ml/L produced a yield of 7.75 t/ha, as reported earlier[19]. Additionally, Spinosad, which consists of spinosyn A and spinosyn D, has been shown[10,24] to be highly effective against *Earias vittella* and to exhibit larvicidal and ovicidal properties against lepidopteran pests such as *Helicoverpa armigera*.

The microorganism-based pesticide Emamectin

Benzoate at 30 g a.i./ha reduced fruit damage by 65.72%, yielding 10.55 t/ha with only 2.03% fruit damage. These findings corroborate earlier one[5], demonstrating the effectiveness of Emamectin Benzoate in controlling pest infestations and increasing crop yields. Additionally, Emamectin Benzoate at 0.36 g/L was found to be the most effective, followed by Spinosad at 0.5 ml/L, resulting in a yield of 8.92 t/ha. Previously it was[12] observed that Emamectin Benzoate 5 SG (200 g/ha) exceptionally efficacious insecticide, with only 12.51% fruit damage.

In the current investigation, Neem at 3g a.i./ha exhibited the least effectiveness, resulting in 22.58% reduction in fruit damage, with 9.77% of fruit being damaged, and a subsequent yield of 8.29 t/ha. Similarly, neem oil[32] demonstrated the lowest effectiveness in providing reductions percentages of 27.31%, 31.44%, and 35.88% of fruit damage. The earlier results[14] were similar to the present study, with observed damage of 39% in okra fruit with neem application, indicating it was the least effective among the tested pesticides. It was[15] also found inline results that Neem oil 0.03% EC brought down fruit borer infestation to 19.99% after 14 days.

The untreated control group consistently exhibited the highest level of bored fruit and minimum yield, emphasizing the importance of pest control measures. The lack of pest management in the control group leads to unchecked pest populations, resulting in severe crop damage and reduced productivity. This is consistent with the research[1], which found that untreated plots of different crops exhibited significantly higher insect damage and lower yields of 4.38 t/ha and 2.37 t/ha, respectively.

Okra, often consumed with minimal cooking, poses concerns due to potential toxic residues from synthetic insecticides. This study, conducted in an organic farming system, aimed to identify effective non-synthetic insecticides for high-quality okra production. Pest populations are typically lower in organic farming, facilitating easier pest management. Results consistently favored Agniastra @ 30ml/L for suppressing fruit borer infestation and yielding the highest marketable okra. Effective pest management strategies minimize fruit damage and increase crop yield, offering significant economic benefits.

Conclusions

Based on the findings of the current studies, Agniastra @ 30ml/L proves to be a viable and favorable option due to its exceptional effectiveness in pest control and its ability to increase productivity. Additionally, its compatibility with organic farming methods promotes the cultivation of chemical-free, high-quality okra suitable for export. Although it may result in a minor reduction in yield compared to alternative treatments, this drawback can be balanced by the cost-efficiency of inputs utilized in crop cultivation and pest management approaches.

Conflict of interest

The authors stated nothing about any conflict of interest.

References

1. Aarwe R, Pachori R, Sharma AK, Kurmi A. Rangare NR. Efficacy and economics of different insecticides against *Earias vittella* (Fabricius) on okra (*Abelmoschus esculentus* L. Moench). *International Journal of Chemical Studies*. 2017; **5**(2): 429-432.
2. Amjad A, Randhawa MA, Javed MS. Dietary intake assessment of pyrethroid residues from okra and eggplant grown in peri-urban areas of Punjab, Pakistan. *Environmental Science and Pollution Research.* 2020; **27**: 39693-39701.
3. Bansode AG, Patil CS, Jadhav SS. Efficacy of Insecticides against Shoot and fruit borer, *Earias vittella* F. infesting okra. *Pest Management in Horticultural Ecosystems*. 2015; **21**(1): 106-109.
4. Basavaraj SL, Channaveerswami AS. Evaluation of some insecticides against fruit and Shoot borer, *Earias vittella* (fab.) In seed production of okra (*Abelmoschus esculentus L.*). *The bioscan*. 2016; **11**(1): 373-376.
5. Bhemanna M, Patil BV, Hanchinal SG, Hosamani AC, Kengegowda N. Bioefficacy of emamectin benzoate (Proclaim) 5% SG against okra fruit borer. *Pestology.* 2005; **29**(2): 14-16.
6. Birah A, Srivastava RC, Kumar K, Singh PK, Bhagat S. Efficacy of pest management practices against pest complex of okra (*Abelmoschus esculentus*) in Andaman. *Indian Journal of Agricultural Science*. 2012; **82**: 470-472.
7. Chandra M, Subhag SR. Pest complex of Okra and population dynamics under Bundelkhand region, Uttar Pradesh. *Annals of Plant Protection Science*. 2012; **20**(2): 3013-3017.
8. Chaudhary HR, Dadeech LN. Incidence of insects attacking okra and the available losses caused by them. *Annals of Arid Zone*. 1989; **28**(3):305-307.
9. Dabhi MV, Koshiya DJ. Effect of abiotic factors on population dynamics of leaf hopper *Amrasca biguttula* (Ishida) in okra. *Advance Research Journal of Crop Improvement.* 2014; **5**(1):11-14.

10. Dandale HG, Rao NG, Tikar SN, Nirnbalkar. Efficacy of spinosad against cotton bollworm in comparison with some synthetic pyrethroids. *Pestology.* 2000; **24**(11): 6-10.
11. Das S, Pandey V, Patel HR, Patel KI. Effect of weather parameters on pest-disease of okra during the summer season in middle Gujarat. *Journal of Agro meteorology*. 2011; **13**(1): 38-42.
12. Dhaker R, Rana BS, Pinjara IM, Ganesh SP, Nagar R. Bio-efficacy of synthetic insecticide and biopesticide for the management of shoot borer and fruit borers of okra. *Journal of Entomology and Zoology Studies*. 2017; **5**(3): 169-172.
13. Dhar T, Bhattacharya S. Efficacy of imidacloprid and spinosad against pest complex of okra and tomato. *International Journal of Bio-Resource, Environment and Agricultural Sciences.* 2015; **1**(3):126-131.
14. Ghosh J, Ghosh SK, Chatterjee H, Senapati SK. Pest constraints of okra under terai region of West Bengal. *Indian Journal of Entomology.* 1999; 63(4):362-371.
15. Janu R, Kumar A. Field efficacy of selected insecticides against okra shoot and fruit borer [*Earias vittella* (Fabricius)]. *The Pharma Innovation Journal.* 2022; **11**(4): 1549-1551.
16. Karthik P, Venugopal S, Murthy D, Lokesh S, Karthik G, Sharmila U. Bioefficacy, phytotoxicity, safety to natural enemies and residue dynamics of imidacloprid 70 WG in okra (*Abelmoschus esculenta* (L) Moench) under open field conditions. *Crop protection.* 2015; **17**: 88-94.
17. Kodandaram MH, Rai AB, Halder J. Novel insecticides for management of insect pests in vegetable crops. *A Review of Vegetable Science.* 2010:37(2):109-123.
18. Kumar R, Sing PP. Population dynamics of Shoot borer and fruit borer *Earias vittella* on okra. *Indian Journal of Entomology*. 2021; **83**(4): 680-682.
19. Laichattiwar MA, Meena RS. Efficacy of various insecticides against okra shoot and fruit borer, *Earias vitella* (Fab.). *Journal of Entomological Resear*ch. 2014; **38**(2):121-124.
20. Mandal SK, Sattar A, Sah SB, Gupta SC. Prediction of okra shoot and fruit borer (*Earias vittella* Fab.) incidence using weather variables at Pusa, Bihar. *International Journal Agricultural Science.* 2006; **2**(2): 467-469.
21. Mohammad A, Alam SN, Miah MRU, Amin MR, Saif HB. Bio-Rational management packages of jassid and shoot and fruit borer of okra. *Bangladesh Journal of Agricultural Research*. 2018; **43**: 323-332.
22. Palekar S. The Philosophy of Natural Farming (Zero Budget of Natural Farming), First Edition, Ancient (Vedas) Agriculture Research, Development and Extension Movement. Lane No. 5, Namuna Peth, Amravati-444601, Maharashtra, India, 2005; 240-244 pp.
23. Pandita VK, Anand AS, Nagarajan RS, Sinha SN. Solid matrix priming improves seed emergence and crop performance in okra. *Plant Physiology.* 2010; **38**: 665-674.
24. Patil BV, Mujbar Rahman S, Srinivasa AG, Bhemanna M. Spinosad 48SC: an ideal insecticide in cotton IPM. *Pestology.* 1999; **13**: 3-6.
25. Rajashekhar M, Ravinder Reddy K, Raja Goud CH, Sreenivasa Rao CH, Manasa K. Study on validation of different IPM modules against bhendi shoot and fruit borer, *Earias vitella. International Journal of Agricultural Science and Research*. 2016; **6**(3): 259-266.
26. Rao S, Rajendran R. Joint action potential of neem with other plant extracts against the leaf hopper *Amrasca devastans* (Distant) on okra. *Pest Management and Economic Zoology*. 2003; **10**:131-136.
27. 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**: 252-254.
28. Satpathy S, Rai S. Efficacy of different pesticides and their combinations against jassid and borer of okra. *Vegetable Science.* 1999; **26(**1):78-81.
29. Sharma BR, Arora SK. Improvement in okra. In: KL Chadha (ed.) Advances in Horticulture. Malhotra Publishing House, New Delhi. 1993; **5**: 343-364.
30. Srinivasan K, Krishnakumar NK. Studies on the extent of loss and economic of pest management in okra. *Tropical pest management*. 1983; **29**: 367-370.
31. Srinivasan PM, Narayanaswamy PS. Experiments on the control of shoot and fruit borer, *Earias fabia* and *Earias insulana* on bhendi. *Madras Agriculture Journal*. 1960; **60**: 601-602.
32. Srivastava N, Srivastava AK, Mukerjee A, Gupta P, Singh SK. Efficacy of selected insecticides and neem oil against shoot and fruit borer (*Earias vittella* Fab.) on okra (*Abelmoschus esculentus* L.) *International Journal of Pharmacy and Life Sciences.* 2014; **5**(12):4096-4099.
33. Subba B, Chaudhuri N, Senapati SK. Evaluation of insecticides against jassid (*Amrasca biguttula biguttula* Ishida) and fruit borer (*Earias vittella* Fabricius) on okra during *pre-kharif* season. *The Pharma Innovation Journal.* 2022; **SP-11**(6): 556-560.