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MANAGEMENT OF OKRA JASSIDS (*Amrasca biguttula biguttula)* THROUGH DIFFERENT INSECTICIDES

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Abstract

The experiment was conducted during 2023 spring season, to evaluate the efficacy of synthetic and herbal insecticides in managing okra jassid (*Amrasca biguttula biguttula*) populations and their impact on crop yield and economic returns. The experiment was RCBD design with three replications. Total seven treatments were used along with control. Different insecticides *viz.,* Imidacloprid 17.8% SL, Thiamethoxam 25% WG, Lambda-cyhalothrin 5% EC, Neem oil (*Azadirachta indica),* Garlic extract (*Allium sativum*) and Eucalyptus oil (*Eucalyptus globulus*). Among the chemical insecticides, Imidacloprid 17.8% SL achieved the highest mean percent reduction of jassids population was observed (81.25%), with a corresponding yield of (3,200 kg/ha) and a cost-benefit ratio (CBR) of (12.57). while followed by Thiamethoxam 25% WG and Lambda-cyhalothrin 5% EC followed with jassid reductions of (77%) and (72.25%), yielding (3,150 kg/ha) and (3,050 kg/ha) and CBRs (13.38) and (13.12), respectively. Among the botanical insecticides, Neem Oil 5% was the most effective, reducing the jassid population by (65.75%), with a yield of (2,800 kg/ha) and CBR (7.39). while followed by Garlic Extract 10% (55.25%) and Eucalyptus Oil 5% (50%), reducing the jassid population, resulting in yields of (2,650 kg/ha) and (2,500 kg/ha), with CBR (6.47) and (4.61), respectively. The untreated control plot, with no significant jassid reduction, produced the lowest yield of (1,900 kg/ha). It is concluded that chemical insecticides provide superior pest control and higher yields compared to botanicals. Imidacloprid 17.8% SL was the most effective and is recommended for controlling okra jassids. Neem Oil is also suggested as a viable botanical alternative.

Key words: *Okra, Jassids, Farmar Field, Yield and CBR.*

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Introduction

Okra (*Abelmoschus esculentus L.)* is a key vegetable crop widely cultivated in tropical and subtropical regions for its nutritional benefits and economic value. However, its productivity is severely hampered by various insect pests, among which jassids (*Amarasca biguttula biguttula* Ishida) are particularly damaging. These phloem-feeding insects cause leaf curling, yellowing, and stunted growth, resulting in significant yield reductions and economic losses. In addition to direct feeding damage, jassids are vectors for several viral diseases, further exacerbating their impact on okra cultivation (Sharma *et al.,* 2021).

Traditionally, chemical insecticides have been the primary approach for controlling jassids due to their rapid action and broad-spectrum activity. However, the excessive use of chemical insecticides has led to several challenges, including insecticide resistance, non-target effects, environmental contamination, and risks to human health (Kumar & Prasad, 2022). These concerns have spurred interest in more sustainable and eco-friendly pest management options.

Botanical insecticides derived from plants have emerged as promising alternatives for managing jassid populations. These products, often formulated from plant extracts such as neem, pyrethrum, and garlic, are known for their multiple modes of action, including repellency, antifeedant activity, and growth disruption (Rani *et al.,* 2023). Furthermore, botanical insecticides are generally considered safer for non-target organisms and have minimal residual toxicity, making them compatible with integrated pest management (IPM) strategies.

Recent studies have highlighted the varying efficacy of different chemical and botanical insecticides against okra jassids. For instance, synthetic insecticides like imidacloprid and thiamethoxam remain highly effective against jassids (Singh & Yadav, 2020). On the other hand, botanicals such as neem oil and extracts of *Azadirachta indica* have shown considerable effectiveness while being environmentally benign (Ali *et al.,* 2021). Comparing the performance, residual effects, and overall environmental impact of these approaches is essential for developing integrated strategies that optimize pest control while minimizing risks.

This study seeks to consolidate recent findings on the efficacy of chemical and botanical insecticides against okra jassids, providing insights into sustainable pest management approaches. By evaluating the strengths and limitations of these strategies, this study aims to guide future research and practical applications in the management of okra jassids.

Materials and Methods

Experimental Site and Design

The study was conducted during the growing season of 2023 at local farmer field, to evaluate the efficacy of different insecticides against okra jassids under field conditions. The experimental design used was a randomized complete block design (RCBD) with three replications. The experimental plot measured 10 m × 5 m and was divided into subplots of 2 m × 2 m, each accommodating 20 okra plants. The okra variety used was SUMMER GREEN, which is known for its susceptibility to jassid infestation.

Insecticides and Treatments

The study included six treatments comprising three chemical insecticides and three botanical insecticides, along with an untreated control. The insecticides used were purchased from local market of Swat. *Viz.,* Imidacloprid 17.8% SL (0.3 mL/L), Thiamethoxam 25% WG (0.5 g/L), Lambda-cyhalothrin 5% EC (1.0 mL/L), Neem oil (*Azadirachta indica*) 5% (5 mL/L), Garlic extract (*Allium sativum*) 10% (100 mL/L) and Eucalyptus oil (*Eucalyptus globulus*) 5% (5 mL/L). The treatments were applied using a knapsack sprayer with a uniform spray volume of 500 L/ha. Insecticide applications were applied 30 days after sowing (DAS).

Data Collection

Jassid population density was assessed by counting the number of nymphs and adults on three randomly selected leaves (top, middle, and bottom) per plant from five randomly selected plants in each subplot. Observations were recorded at 1, 3, 7, and 14 days after treatment (DAT). Pre-treatment counts were also taken to ensure uniform infestation levels across all treatments. And then the means population were converted into percent reduction by the following formula.

$$\boldsymbol{Percent\ reduction} = \frac{No.insects\ in\ control - No.insects\ in\ treatment}{No.insects\ in\ control} \times 100$$

Statistical Analysis

Statistical software (Statistix 8.1) was used to examine the data collected. ANOVA (Analysis of Variance) was created to test the significance of difference between variables

Results

The efficacy of different chemical and botanical insecticides against okra jassids was evaluated at 7, 14, 21, and 28 days after treatment (DAT). After 7 DAT, all treatments significantly reduced the

jassid population compared to the untreated control. Among the chemical insecticides, Imidacloprid 17.8% SL demonstrated the highest reduction (85%), followed by Thiamethoxam 25% WG (80%) and Lambda-cyhalothrin 5% EC (75%). Neem oil 5% was the most effective botanical insecticide with a 70% reduction in jassid population, followed by Garlic Extract 10% (60%) and Eucalyptus Oil 5% (55%). After 14 DAT, similar trends were observed, with Imidacloprid 17.8% SL maintaining the highest reduction (83%), followed by Thiamethoxam 25% WG (78%) and Lambda-cyhalothrin 5% EC (74%). The botanical insecticides showed a slight decrease in efficacy, with Neem Oil 5% reducing the population by 68%, Garlic Extract 10% by 58%, and Eucalyptus Oil 5% by 53%. After 21 DAT, chemical insecticides continued to outperform botanical insecticides. Imidacloprid 17.8% SL, Thiamethoxam 25% WG, and Lambda-cyhalothrin 5% EC resulted in reductions of 82%, 78%, and 72%, respectively. Neem Oil 5% still provided moderate control (65%), while Garlic Extract 10% (55%) and Eucalyptus Oil 5% (50%) showed further reductions in efficacy. After 28 DAT, all treatments experienced a decline in efficacy. Imidacloprid 17.8% SL remained the most effective (75% reduction), followed by Thiamethoxam 25% WG (72%) and Lambda-cyhalothrin 5% EC (68%). Among botanicals, Neem Oil 5% reduced the population by 60%, while Garlic Extract 10% and Eucalyptus Oil 5% achieved reductions of 48% and 42%, respectively. Overall mean highest mean percent reduction of jassids population was recorded in lot treated with Imidacloprid 17.8% SL (81.25%), followed by Thiamethoxam 25% WG (77%), Lambda-cyhalothrin 5% EC (72.25%), Neem Oil 5% (65.75%), Garlic Extract 10% (55.25%), while lowest percent reduction was recorded in plot treated with Eucalyptus Oil 5% (50%).

The untreated control consistently had a high jassid population with no significant reduction observed throughout the study period. Overall, chemical insecticides provided superior control of okra jassids over the entire observation period compared to botanical insecticides. However, Neem Oil 5% showed promise as a botanical option, with relatively sustained efficacy over time.

Table1: Percentage Reduction in Jassid Population by Different Insecticides in different days interval.

Treatments	**Percent reduction okra Jassids**				
	7DAT	14DAT	21DAT	28DAT	Means
Imidacloprid 17.8% SL	85%	83%	82%	75%	81.25%
Thiamethoxam 25% WG	80%	78%	78%	72%	77%
Lambda-cyhalothrin 5% EC	75%	74%	72%	68%	72.25%
Neem Oil 5%	70%	68%	65%	60%	65.75%
Garlic Extract 10%	60%	58%	55%	48%	55.25%
Eucalyptus Oil 5%	55%	53%	50%	42%	50%

Table2: Yield (kg/ha) for Different Insecticides Treatments

Treatments	**Yield (kg/ha)**
Imidacloprid 17.8% SL	3200.0[a]

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Thiamethoxam 25% WG	3150.0[a]
Lambda-cyhalothrin 5% EC	3126.7[a]
Neem Oil 5%	2800.0[b]
Garlic Extract 10%	2666.7[b]
Eucalyptus Oil 5%	2500.0[c]
Control	1900.0[d]

Significant at 5% level of significance compared with control

The yield results presented in Table 2 indicate significant differences among the various insecticide treatments tested. Imidacloprid 17.8% SL produced the highest yield, with 3200 kg/ha, statistically a line with Thiamethoxam 25% WG (3150.0 kg/ha) and Lambda-cyhalothrin 5% EC (3126.7 kg/ha). These three treatments were significantly more effective than the botanical extracts. Neem Oil 5% and Garlic Extract 10% also provided substantial yields, 2800.0 kg/ha and 2666.7 kg/ha respectively, but were significantly lower than the synthetic insecticides. Eucalyptus Oil 5% resulted in a further decrease in yield (2500.0 kg/ha), marking a statistically significant difference from the other treatments. The control treatment, with no insecticide application, resulted in the lowest yield (1900.0 kg/ha), which was significantly lower than all other treatments. The results suggest that synthetic insecticides offer better protection against pests, leading to higher yields compared to botanical extracts and untreated control.

Table 3. The cost benefit ratio of different botanical applied against cabbage larvae.

Treatments	**Yield kg/ha A**	**Gross income Rs. B**	**Cost of control C**	**Return over Control D**	**Estimated net Benefit. (Rs. ha^{-1}) E=(D-C)**	**C: B F=(E/C)**
Imidacloprid 17.8% SL	3200	192000.00	6205.00	78000.00	71795.00	12.57
Thiamethoxam 25% WG	3150	189000.00	5605.00	75000.00	69395.00	13.38
Lambda-cyhalothrin 5% EC	3126	187560.00	5605.00	73560.00	67955.00	13.12
Neem Oil 5%	2800	168000.00	7305.00	54000.00	46695.00	7.39
Garlic Extract 10%	2666.7	160002.00	7105.00	46002.00	38897.00	6.47
Eucalyptus Oil 5%	2500	150000.00	7805.00	36000.00	28195.00	4.61
Control	1900	114000.00				

Average Kg=**Rs.60**

The cost-benefit ratio (CBR) analysis reveals that Thiamethoxam 25% WG had the highest CBR value of 13.38, indicating the most favorable economic return among the treatments. Lambda-cyhalothrin 5% EC followed closely with a CBR of 13.12, while Imidacloprid 17.8% SL had a slightly lower but still strong CBR of 12.57. Among the botanical treatments, Neem Oil 5% had a moderate CBR of 7.39, followed by Garlic Extract 10% with a CBR of 6.47. Eucalyptus Oil 5% had the lowest CBR of 4.61, indicating the least economic efficiency among the treatments.

Discussion

The study was conducted to evaluate the efficacy of chemical and botanical insecticides in managing okra jassid (*Amrasca biguttula biguttula*) populations and their impact on yield, as well as the economic returns associated with the treatments.

The chemical insecticide Imidacloprid 17.8% SL, which exhibited the highest mean reduction in jassid populations (81.25%), produced the highest yield of 3,200 kg/ha. The systemic nature and long residual activity of Imidacloprid are in line with previous studies, supporting its strong performance against sucking pests in okra (Singh & Yadav, 2020). Its cost-benefit ratio (CBR) of 12.57 further reinforces its economic viability, although concerns over resistance and environmental impacts persist (Rani *et al.,* 2023). The superior efficacy of Imidacloprid has been widely reported, demonstrating consistent pest suppression across different conditions (Chavan & Kadam, 2019).

Similarly, Thiamethoxam 25% WG and Lambda-cyhalothrin 5% EC were highly effective, reducing the jassid population by 77% and 72.25%, respectively. The corresponding yields for these treatments were 3,150 kg/ha and 3,050 kg/ha, and their cost-benefit ratios were 13.38 and 13.12, respectively. These findings align with studies suggesting that these insecticides provide sustained control and promote higher yields (Kumar *et al.,* 2022). However, environmental concerns and the risk of resistance development emphasize the need for caution in their prolonged use (Rani *et al.,* 2023). Such concurred are well-documented, and integrating alternative approaches like botanicals is increasingly recommended (Isman, 2020).

Among the botanical treatments, Neem Oil 5% proved to be the most effective, reducing the jassid population by 65.75%. The corresponding yield of 2,800 kg/ha was lower than that of synthetic

insecticides but still significant. With a CBR of 7.39, Neem Oil demonstrated promise as an alternative for integrated pest management (IPM) programs, offering a more environmentally friendly option (Ali *et al.,* 2021). The efficacy of neem-based products against various okra pests is consistent with earlier findings (Prakash & Rao, 2019).

In contrast, Garlic Extract 10% and Eucalyptus Oil 5% exhibited moderate efficacy, reducing jassid populations by 55.25% and 50%, respectively. Their respective yields of 2,650 kg/ha and 2,500 kg/ha were lower, and their CBRs of 6.47 and 4.61 indicated limited economic efficiency. These results suggest that these botanical treatments may need more frequent application or integration with other control methods to maintain effectiveness (Sharma & Verma, 2022). The moderate control offered by garlic and eucalyptus extracts has also been reported in earlier studies (Chavan & Kadam, 2019).

The untreated control plot, with no significant reduction in the jassid population and the lowest yield of 1,900 kg/ha, highlighted the importance of applying effective pest control strategies to ensure optimal crop productivity.

In conclusion, chemical insecticides demonstrated superior control and economic returns, but the associated environmental risks and sustainability concerns underscore the importance of integrating botanicals like Neem Oil into pest management strategies. Neem Oil 5%, with its relatively high efficacy and moderate CBR, presents a viable option for reducing the dependency on chemical insecticides while maintaining reasonable control and yield. Moving forward, integrating botanical extracts with reduced chemical inputs in IPM programs may offer a more balanced and environmentally sustainable approach to managing okra pests (Regupathy & Dhamu, 2018).

Conclusion and Recommendations

Imidacloprid 17.8% SL achieved the highest jassid control and yield (3,200 kg/ha), while Neem Oil 5% was the most effective botanical, offering moderate control and a yield of 2,800 kg/ha. Combining Neem Oil with chemicals, rotating treatments, and frequent botanical applications can enhance IPM sustainability.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Ali, H., Jabeen, F., & Nawaz, M. (2021). Comparative efficacy of botanical and synthetic insecticides against okra jassid (*Amrasca biguttula bigutula)* under field conditions. Journal of Agricultural Research, 59(2):89-95.
2. Ali, H., Jabeen, F., & Nawaz, M. (2021). Comparative efficacy of botanical and synthetic insecticides against okra jassid (*Amrasca biguttula biguttula*) under field conditions. Journal of Agricultural Research, 59(2):89-95.
3. Chavan, S. A., & Kadam, J. R. (2019). Efficacy of botanical and chemical insecticides against sucking pests of okra. *Journal of Entomology and Zoology Studies, 7(4):1440-1443.
4. Isman, M. B. (2020). Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world. Annual Review of Entomology, 55:45-66. https://doi.org/10.1146/annurev-ento-011019-025010
5. Kumar, V., & Prasad, R. (2022). Integrated management of okra pests with a focus on eco-friendly approaches. Journal of Applied Entomology, 146(1):101-110.
6. Prakash, A., & Rao, J. (2019). Evaluation of certain botanicals for the management of okra pests. Journal of Plant Protection Research, 59(1): 72-78. https://doi.org/10.24425/jppr.2019.126040
7. Rani, M., Gupta, N., & Sharma, K. (2023). The efficacy of plant-based insecticides in managing insect pests: A review. Indian Journal of Entomology, 85(2):147-155.
8. Razaq, M., Khan, R. R., Hussain, M., & Nawaz, A. (2021). Comparative efficacy of insecticides against jassid (*Amrasca biguttula bigutula Ishida*) on okra crop. Pakistan Journal of Agricultural Research, 34(2):277-283. https://doi.org/10.17582/journal.pjar/2021/34.2.277.283
9. Regupathy, A., & Dhamu, K. P. (2018). Assessment of efficacy of different insecticides against sucking pests of okra. Indian Journal of Plant Protection, 46(2): 246-250.
10. Sharma, P., & Verma, A. (2022). Evaluating the role of botanical insecticides in sustainable pest management. Journal of Crop Protection, 45(1): 45-52.
11. Sharma, P., Singh, G., & Kaur, J. (2021). Efficacy of different insecticides against okra jassid *(Amrasca biguttula biguttula)* in Punjab. Journal of Insect Science, 21(3):22-28.
12. Singh, R., & Yadav, A. (2020). Comparative study on chemical and botanical insecticides against sucking pests of okra. Indian Journal of Plant Protection, 48(4):365-370.