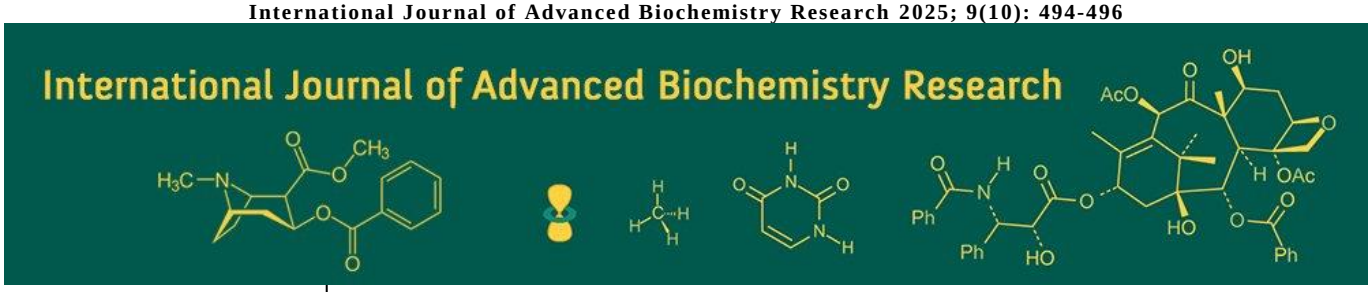

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Efficacy of different treatment schedules against black flies in citrus ecosystem

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Abstract
The present investigation therefore was undertaken to evaluate the effective control measure to tackle the prevailing pest problems with harmonious way. The treatment T6 (Thiamethoxam 25% WG drenching followed by Acetamiprid 20% SP and Chlorantraniliprole 18.5% SC) recorded the lowest pooled mean of 8.91 black flies per 15 cm twig, indicated superior and sustained control throughout the season. It was followed by T_5 (Imidacloprid 200 SL-Acetamiprid 25% WG-Cyantraniliprole 10.26% SC), which recorded 9.64 black flies per 15 cm twig. Moderate reductions were observed in T_4 (Buprofezin 25% SC-Azadirachtin 1%-Bt) and T_1 (Azadirachtin 10,000 ppm-bioagent sequence) and which recorded 10.49 and 10.50 black flies per 15 cm twig, respectively. The integrated approach of T_2 (sticky traps-NSKE 5%-fruit bagging) resulted in 10.84 black flies per 15 cm twig, while T_3 (botanical sequence with Bt) registered the highest pest population among treated plots with 12.25 black flies per 15 cm twig. The untreated control (T_7) maintained the highest infestation, with a pooled mean of 38.21 black flies per 15 cm twig, indicating the severity of pest buildup in the absence of management. Overall, chemical sequences had provided the most consistent and effective control of black flies, while botanical and biological treatments offered moderate but eco-friendly suppression when integrated into pest management strategies.

Keywords: Black flies, Buprofezin 25% SC

Introduction
Citrus is one of the most prominent fruit crops globally, originating from Southeast Asia and belonging to the family Rutaceae and subfamily Aurantiodeae. Over time, citrus cultivation has expanded widely and today thrives in tropical and subtropical climates. India stands as the sixth-largest producer of citrus fruits worldwide, following Brazil, China, the USA, Spain, and Mexico. Among the fruit crops cultivated in India, citrus ranks third after mango and banana.

Among citrus fruits, sweet orange (*Citrus sinensis* L. Osbeck) is highly prized for its appealing taste, nutritional value, and commercial importance. It is extensively cultivated in India, particularly in states such as Andhra Pradesh, Maharashtra, Telangana, Karnataka, Punjab, and Rajasthan. According to recent data, India has approximately 200.7 thousand hectares under sweet orange cultivation, producing around 3.4 million metric tonnes with an average productivity of 6.8 MT/ha.

Despite its nutritional and economic value, sweet orange production is frequently threatened by insect pest infestations, which lead to significant quantitative and qualitative losses. A wide range of pests attacks citrus crops, but among them, blackfly (*Aleurocanthus woglumi*), thrips (*Scirtothrips dorsalis*), aphids (*Toxoptera aurantii*), and leaf miner (*Phyllocnistis citrella*) are considered major pests in Jalna district.

The citrus blackfly, (*Aleurocanthus woglumi*), is a destructive pest that can reduce yields by up to 80%, especially under severe infestations. It extracts sap from leaf tissues and secretes honeydew, which facilitates the growth of sooty mould, impairing photosynthesis and reducing fruit quality (Bhut & Jethva, 2017) [3]. It also contributes to "Kolshi" disease in oranges (Rajak & Diwakar, 1987) [7].

Nowadays, insect pests are becoming a major constraint in sweet orange cultivation, significantly reducing both yield and quality. Among them, sucking and chewing pests are of prime concern due to their direct damage as well as their role in disease transmission.

Therefore, it is essential to gather comprehensive information on the pest complex associated with sweet orange, especially under the changing climatic conditions of the region.

Materials and Methods

The present investigation therefore was undertaken to evaluate the effective control measure to tackle the prevailing pest problems with harmonious way. For evaluation of safer molecules seven treatments was imposed in three replications with untreated control. A single plant of sweet orange was selected for each treatment under Randomized Block Design (RBD). The treatment was imposed at vulnerable growth stages, viz., pre-flowering, flowering, fruiting, and observing the ETL of pest. The observations were recorded at 1day before 1st spray and 3, 7 and 14 days after subsequent sprayings. The data generated was exposed to appropriate statistical analysis recommended by (Gomez and Gomez, 1984).

Results and Discussion

This trial was conducted to evaluate the efficacy of seven treatments (T_1-T_7) against thrips in pomegranate fruit crop. Each treatment involved three sequential sprays and observation on thrips populations were recorded at 3, 7 and 14 days after each spray. Below are the mean thrips counts for each spray and the overall pooled mean efficacy.

Table 1: Treatment details showing the sequence of three sprays with corresponding bio-pesticides, insecticides, and doses applied per litre under different treatments

Tr. No.	1st Spray	Dose per L	2nd Spray	Dose per L	3rd Spray	Dose per L
T_1	Azadirachtin 10,000 ppm	3 ml	*Lecanicillium lecani*	4 gm	*Beauveria bassiana*	4 gm
T_2	Use of sticky traps (yellow & blue 4+2/plant)		NSKE	5%	Bagging of fruits & destruction of infected fruits.	
T_3	Sweet flag	1 gm	NSKE	5%	*Bt*	2 gm
T_4	Buprofezin 25% SC	1 ml	Azadirachtin 1%	3ml	*Bt*	2 gm
T_5	Imidacloprid 200 SL	0.5 ml	Acetamiprid 20 SP	2gm	Cyantraniliprole 10.26 SC	0.75 ml
T_6	Drenching of Thiamethoxam 25 WG	1.5 gm	Acetamiprid 20SP	2gm	Chlorantraniliprole 18.5 SC	0.75 ml
T_7	Untreated control		Untreated control		Untreated control	

First Spray Application

Data presented in table 2 showed that, after application of initial spray, all treatments were exhibited varying levels of effectiveness in controlling black fly populations at 3, 7 and 14 days after treatment. Treatment T_6 (soil drenching with Thiamethoxam 25% WG) found most effective against black fly with a mean of 13.13 black flies per 15 cm twig across the observation periods, followed closely by T_5 (Imidacloprid 200 SL) recording 15.11 black flies and T_4 (Buprofezin 25% SC) with 15.16 black flies. Treatment T_2 (sticky traps in yellow and blue) showed moderate performance with 15.60 black flies, while T_1 (Azadirachtin 10,000 ppm) resulted in 16.25 black flies. Treatment T_3 (sweet flag extract) noted relatively lower efficacy with 19.09 black flies per twig. The untreated control T_7 recorded the highest black fly population of 38.88, confirmed substantial natural pest buildup due to absence intervention. Among all treatments in first application, T_6 proved superior and T_1, T_2, T_4 and T_5 stood at par to T_6. The current observations correspond well with previous research by Patil *et al.* (2016) [6] reported that imidacloprid 17.8 SL at 0.005% concentration achieved a 76.77% reduction in citrus blackfly populations 14 days after application in sweet orange orchards. This performance was comparable to thiamethoxam (79.54%) and slightly lower than acephate (81.25%), indicating imidacloprid's effectiveness in managing citrus blackfly infestations. These findings concur with Tarale et al. (2024) [8], whose 2023-24 Akola field trials showed that chemical control using Imidacloprid (0.5 ml/L) achieved the greatest reduction in citrus blackfly (*Aleurocanthus woglumi*).

Second Spray Application

Data tabulated in table 2 showed, the second spray given notable variation among treatment efficacy. Treatment T6 (Acetamiprid 20 SP) showed superior efficacy with the lowest mean of 6.66 black flies per twig. Treatment T5 (Acetamiprid 20 SP) also performed effectively with 7.52 black flies, while T_1 (*Lecanicillium lecanii)* achieved 7.85 black flies. Treatment T_2 (NSKE 5%) recorded 8.22 black flies and T_4 (Azadirachtin 1%) showed 9.91 black flies. Treatment T_3 (NSKE 5%) exhibited moderate control with 10.38 black flies per twig. The untreated control T_7 continued to show extremely high black fly pressure at 40.15, underscoring the critical need for pest management interventions. The current observations correspond well with previous research Patil S. K. (2016) [6] reported that acetamiprid 20 SP at 0.01% concentration effectively managed citrus blackfly populations in sweet orange orchards, contributing to improved fruit yield and quality. The study highlighted acetamiprid's role as a valuable tool in integrated pest management strategies for citrus blackfly control.

Third Spray Application

The data presented in Table 2 revealed that, during the third spray evaluation, treatment T_5 (Cyantraniliprole 10.26 SC) noted remarkable suppression in blackfly infestation and recorded 5.96 black flies per twig. Treatment T_2 (fruit bagging and destruction of infected fruits) recorded 6.55 black flies, while T_6 (Chlorantraniliprole 18.5 SC) showed 6.93 black flies. Treatment T_1 (*Beauveria bassiana*) resulted in 7.02 black flies, and T_3 (*Bt* formulation) recorded 7.76 black flies. Treatment T_4 (*Bt* formulation) showed 8.78 black flies per twig. The untreated control T_7 noted the highest infestation of black flies (38.60 black flies)

Table 2: Effect of different bio-rational and chemical treatments on the population of black flies per twig at various intervals after first, second, and third sprays, along with pooled mean values.

Tr. No.	Black flies per twig													
	1st Spray					2nd Spray				3rd Spray				Pooled Mean
	1 DBS	3 DAT	7 DAT	14 DAT	Mean	3 DAT	7 DAT	14 DAT	Mean	3 DAT	7 DAT	14 DAT	Mean	
T_1	35.00 (5.91)*	24.67 (4.97)	16.47 (4.05)	7.60 (2.74)	16.25 (3.92)	8.60 (2.93)	8.93 (2.96)	7.13 (2.67)	8.22 (2.85)	7.07 (2.66)	7.07 (2.65)	6.93 (2.63)	7.02 (2.65)	10.50 (3.14)
T_2	34.87 (5.90)	22.37 (4.72)	15.70 (3.96)	8.73 (2.86)	15.60 (3.85)	8.60 (2.93)	11.40 (3.37)	11.13 (3.33)	10.38 (3.21)	5.53 (2.32)	7.53 (2.74)	6.60 (2.55)	6.55 (2.54)	10.84 (3.20)
T_3	32.03 (5.65)	27.27 (5.21)	16.73 (4.08)	13.27 (3.64)	19.09 (4.31)	9.67 (3.10)	11.20 (3.29)	8.87 (2.89)	9.91 (3.09)	9.27 (3.00)	6.80 (2.60)	7.20 (2.65)	7.76 (2.75)	12.25 (3.38)
T_4	34.27 (5.80)	24.53 (4.95)	14.87 (3.85)	6.07 (2.44)	15.16 (3.75)	7.77 (2.79)	6.87 (2.61)	7.93 (2.81)	7.52 (2.74)	11.40 (3.32)	7.87 (2.80)	7.07 (2.65)	8.78 (2.92)	10.49 (3.14)
T_5	38.27 (6.17)	20.70 (4.52)	16.30 (4.03)	8.33 (2.85)	15.11 (3.80)	7.20 (2.65)	8.87 (2.95)	7.47 (2.73)	7.85 (2.78)	5.27 (2.29)	6.20 (2.47)	6.40 (2.51)	5.96 (2.42)	9.64 (3.00)
T_6	37.97 (6.16)	19.87 (4.44)	14.20 (3.67)	5.33 (2.26)	13.13 (3.46)	6.53 (2.53)	7.73 (2.77)	5.73 (2.38)	6.66 (2.56)	7.40 (2.71)	6.87 (2.62)	6.53 (2.55)	6.93 (2.63)	8.91 (2.88)
T_7	39.07 (6.25)	39.37 (6.27)	39.53 (6.29)	37.73 (6.14)	38.88 (6.23)	39.4 (6.27)	40.53 (6.36)	40.53 (6.36)	40.15 (6.33)	38.40 (6.19)	37.60 (6.12)	39.80 (6.31)	38.60 (6.21)	38.21 (6.26)
SE(m) ±	0.29	0.23	0.26	0.27	0.26	0.19	0.25	0.22	0.23	0.25	0.18	0.18	0.21	0.23
CD at (5%)	NS	0.73	0.81	0.85	0.80	0.59	0.78	0.70	0.69	0.79	0.56	0.56	0.64	0.71
CV (%)	8.41	8.28	10.72	14.69	11.23	9.95	12.72	12.00	11.56	13.94	10.16	10.16	11.42	11.40
DAT-Days after treatment * Data presented in parentheses indicate √(x+0.5) transformed value														

Pooled Mean Analysis

The pooled mean, representing overall efficacy across all three spray applications and observation periods. Treatment T_6 (Thiamethoxam drenching followed by Acetamiprid and Chlorantraniliprole sequence) demonstrated the best pooled (8.91 black flies per 15 cm twig). Treatment T_5 (Imidacloprid-Acetamiprid-Cyantraniliprole sequence) achieved the second-best result with 9.64 black flies and indicated effectiveness of this systemic insecticide rotation. Treatment T_4 (Buprofezin-Azadirachtin-Bt combination) recorded 10.49 black flies per 15 cm twig, while T_1 (Azadirachtin-bioagent sequence) showed 10.50 black flies. Treatment T_2 (sticky traps-NSKE-bagging approach) resulted in 10.84 black flies and T_3 (botanical sequence with Bt) recorded the highest among treated plots with 12.25 black flies per 15 cm twig, suggesting that purely botanical and biological approaches may require extended periods or supplementary applications for optimal efficacy. The untreated control T_7 maintained the highest pooled mean of 38.21 black flies per 15 cm twig.

Conclusion

In the first spraying, Thiamethoxam 25% WG (drenching) was the most effective in controlling blackflies, followed by Imidacloprid 200 SL and Buprofezin 25% SC, which also gave good suppression. Azadirachtin 1% EC (10,000 ppm) showed moderate results. Sticky traps (yellow and blue, 4+2 per plant) provided limited physical control, while Sweet flag (*Acorus calamus*) powder was the least effective during this round.

During the second spraying, Acetamiprid 20% SP recorded the highest reduction in blackfly population, followed by Azadirachtin 1% EC, which offered moderate control. NSKE 5% gave partial results, and *Lecanicillium lecanii* showed the lowest effectiveness in this application.

In the third spraying, Cyantraniliprole 10.26% OD was found to be the most effective treatment against blackflies. It was followed by *Beauveria bassiana* and the practice of bagging and destruction of infested fruits. *Bacillus thuringiensis* var. kurstaki 5% WP showed moderate suppression. Chlorantraniliprole 18.5% SC was less effective, and it ranked lowest in performance during this spray.

References

1. Anonymous. Horticultural Statistics at a Glance 2023. Ministry of Agriculture & Farmers Welfare, Government of India; 2023.
2. Anonymous. Horticultural Statistics at a Glance 2024. Ministry of Agriculture & Farmers Welfare, Government of India; 2024.
3. Bhut JB, Jethva DM. Citrus blackfly: A serious pest of citrus. J Entomol Res. 2017;32(4):411-417.
4. Gómez KA, Gómez AA. Statistical Procedures for Agricultural Research. 2nd ed. Hoboken: John Wiley & Sons; 1983. p. 1-630.
5. Gowda RS, Rachappa V. Bio-efficacy of insecticides against whitefly *Bemisia tabaci* (Gennadius) infesting watermelon. Pest Manag Hortic Ecosyst. 2022;28(1):64-67.
6. Patil SK. Management of citrus black fly (*Aleurocanthus woglumi* Ashby) with different insecticides in sweet orange. Bioinfolet. 2016;13(4):551-554.
7. Rajak RC, Diwakar MC. Incidence and impact of citrus blackfly and associated 'Kolshi' disease in Nagpur mandarin. Indian Phytopathol. 1987;40(3):400-403.
8. Tarale SD, Sadawarte AK, Ingle YV, Satpute NS, Undirwade DB, Shelke MS, Puri PR. Biological management of citrus blackfly (*Aleurocanthus woglumi*). Int J Adv Biochem Res. 2024;8(10S H):H2540.