Field Evaluation of Pyriproxyfen 10 EC for the Management of Sucking Insect Pests of Chilli (*Capsicum Annuum* L)

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ABSTRACT

Field investigations were carried out during the chilli growing season of 2024 under farmers' field conditions with the technical support of Krishi Vigyan Kendra, Hoshiarpur and Krishi Vigyan Kendra, Kapurthala (Punjab), to assess the bioefficacy of Pyriproxyfen 10 EC against major sucking insect pests of chilli (*Capsicum annuum* L.). The experiment was conducted at Village Chandsu Brahmna in District Hoshiarpur and Village Boolpur in District Kapurthala under natural infestation of aphids and whiteflies. Three treatments, namely Pyriproxyfen 10 EC @ 160 ml/acre, Malathion 50 EC @ 400 ml/acre and an untreated control, were evaluated. Pest population was recorded one day before spray and at 3, 7 and 10 days after spray. Pyriproxyfen 10 EC recorded the maximum suppression of aphid and whitefly populations, reducing aphids from 5.9 to 0.5 and whiteflies from 14.1 to 1.7 per three leaves at 10 days after spray. The lowest leaf curl incidence (2%) and the highest yield (67.8 q/acre) were also observed in Pyriproxyfen-treated plots. The treatment exhibited a comparatively safer effect on natural enemies, indicating its suitability for inclusion in integrated pest management strategies. The study concludes that Pyriproxyfen 10 EC is an effective option for managing sucking insect pests in chilli under Punjab conditions.

Keywords: Chilli, Pyriproxyfen, sucking insect pests, management

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the most important vegetable and spice crops cultivated widely in Punjab due to its high economic value and demand in fresh as well as processed forms. In the state, chilli is grown over an area of 10.61 thousand hectares with a total production of 21.42 thousand tonnes and an average productivity of 20.18 q/ha (Anonymous, 2022–23). Despite its commercial importance, the productivity of chilli remains relatively low, mainly due to the damage caused by insect pests and diseases.

Among the insect pests, sucking pests such as aphids (*Aphis gossypii* Glover) and whiteflies (*Bemisia tabaci* Gennadius) are considered the most destructive. These pests cause direct damage by sucking plant sap, resulting in leaf curling, yellowing, stunted growth and poor plant vigour. Whiteflies also act as vectors of viral diseases, particularly leaf curl virus, which further aggravates yield losses. Farmers often resort to frequent use of conventional insecticides for managing these pests, which leads to problems such as insecticide resistance, resurgence of pests, elimination of natural enemies and environmental contamination.

In recent years, the emphasis has shifted towards evaluating newer molecules that are effective, selective and comparatively safer to beneficial insects. Pyriproxyfen, an insect growth regulator, has shown potential against several sucking insect pests by interfering with their development and reproduction. Therefore, the present study was undertaken to evaluate the field performance of Pyriproxyfen 10 EC against major sucking pests of chilli under farmers field conditions with the technical involvement of Krishi Vigyan Kendra, Hoshiarpur and Krishi Vigyan Kendra, Kapurthala, Punjab**.**

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MATERIAL AND METHODS

A field experiment was conducted during the chilli growing season of 2024 under farmers' field conditions with the technical involvement of Krishi Vigyan Kendra, Hoshiarpur and Krishi Vigyan Kendra, Kapurthala (Punjab). The trials were laid out at Village Chandsu Brahmna (District Hoshiarpur) and Village Boolpur (District Kapurthala) under natural infestation conditions. The experiment was conducted in a Randomized Block Design (RBD) comprising three treatments and three replications at each location. Each experimental plot measured 5 m × 4 m, maintaining recommended spacing of 60 × 45 cm between rows and plants, respectively.The treatments included:

1. Pyriproxyfen 10 EC @ 160 ml/acre
2. Malathion 50 EC @ 400 ml/acre
3. Untreated control

Standard agronomic practices recommended by Punjab Agricultural University were followed uniformly across all treatments, including land preparation, nursery raising, transplanting, irrigation, fertilization, and intercultural operations. No plant protection measures other than the test insecticides were applied. The major sucking insect pests studied included:

- Aphid: *Aphis gossypii* Glover
- Whitefly: *Bemisia tabaci* Gennadius
- Thrips: *Thrips tabaci* Lindeman

Insecticidal sprays were applied using a knapsack sprayer ensuring uniform coverage of the crop canopy. Observations on pest population were recorded from five randomly selected plants per plot, and three leaves per plant (top, middle, and bottom canopy) were examined. Observations were recorded one day before spray (BS) and at 3, 7, and 10 days after spray (DAS). The pest population was expressed as the average number of insects per three leaves. Leaf curl disease incidence was recorded as the percentage of infected plants. The population of natural enemies was also recorded and expressed as number per plant to assess the relative safety of treatments. Yield data were recorded from each plot at harvest and converted into quintals per acre (q/acre). The data obtained were subjected to statistical analysis using analysis of variance (ANOVA) appropriate for RBD. Treatment means were compared using the least significant difference (LSD) test at 5% level of significance to determine the effectiveness of treatments.

RESULTS AND DISCUSSION

Table 1. Mean bioefficacy of Pyriproxyfen 10 EC for the management of aphid in chilli (RBD, pooled over two locations)

Treatment	**Aphids / 3 leaves**				**Yield (q/acre)**
	BS	**3 DAS**	**7 DAS**	**10 DAS**	
Pyriproxyfen 10 EC @ 160 ml/acre	5.9	2.9	1.2	0.5	67.8
Malathion 50 EC @ 400 ml/acre	5.4	4.1	2.0	1.9	63.5
Control	5.2	6.8	6.3	7.0	55.1
SE (m) ±	0.21	0.18	0.12	0.10	1.85
CD (p=0.05)	NS	0.55	0.37	0.30	5.54

BS-Before spray, DAS-Days after Spray, NS- Non-significant

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Table 2. Mean bioefficacy of Pyriproxyfen 10 EC for the management of whitefly in chilli (RBD, pooled over two locations)

Treatment	**Whitefly / 3 leaves**				**Leaf curl incidence (%)**
	BS	**3 DAS**	**7 DAS**	**10 DAS**	
Pyriproxyfen 10 EC @ 160 ml/acre	14.1	5.4	3.4	1.7	2
Malathion 50 EC @ 400 ml/acre	13.0	9.0	6.8	3.3	8
Control	13.6	13.8	14.3	14.5	15
SE (m) ±	0.48	0.35	0.28	0.22	0.96
CD (p=0.05)	NS	1.05	0.84	0.66	2.88

BS-Before spray, DAS-Days after Spray, NS- Non-significant

Table 3. Mean population of natural enemies in chilli ecosystem under different treatments (average of two locations)

Treatment	**Natural enemies /plant (BS)**	**3 DAS**	**7 DAS**	**10 DAS**
Pyriproxyfen 10 EC @ 160 ml/acre	0.40	0.30	0.20	0.30
Malathion 50 EC @ 400 ml/acre	0.50	0.30	0.30	0.20
Control	0.80	2.00	2.50	2.40
SE (m) ±	0.05	0.09	0.11	0.10
CD (p=0.05)	0.15	0.27	0.33	0.30

BS-Before spray, DAS-Days after Spray

Effect of treatments on aphid population and yield of chilli

The pooled mean data (average of two locations) on aphid population revealed significant differences among treatments after insecticidal application, clearly indicating the superiority of Pyriproxyfen 10 EC over Malathion and untreated control (Table 1). Before spray, aphid populations were comparable among treatments, ranging from 5.2 to 5.9 aphids per three leaves, and the differences were found to be non-significant, indicating uniform infestation.

At 3 days after spray (DAS), Pyriproxyfen 10 EC @ 160 ml/acre recorded a significantly lower aphid population (2.9 aphids per three leaves) compared to Malathion (4.1 aphids per three leaves) and untreated control (6.8 aphids per three leaves). This declining trend continued at 7 DAS, where Pyriproxyfen recorded 1.2 aphids per three leaves, which was significantly lower than Malathion (2.0 aphids per three leaves) and control (6.3 aphids per three leaves). At 10 DAS, Pyriproxyfen exhibited maximum suppression of aphid population (0.5 aphids per three leaves), followed by Malathion (1.9 aphids per three leaves), whereas the population in untreated control increased progressively to 7.0 aphids per three leaves. The differences among treatments at post-treatment intervals were found to be significant as they exceeded the critical difference (CD) at 5% level. The effectiveness of Pyriproxyfen may be attributed to its insect growth regulating properties, which interfere with the development and reproduction of sucking pests, resulting in rapid and sustained suppression of aphid population. Similar effectiveness of Pyriproxyfen against aphids in okra has been reported earlier by Tathode *et al*. (2024).

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Yield data also followed a similar trend and showed significant variation among treatments. The highest yield of chilli (67.8 q/acre) was recorded in Pyriproxyfen-treated plots, which was significantly superior to Malathion (63.5 q/acre) and untreated control (55.1 q/acre), as the differences exceeded the CD (5.54). The higher yield under Pyriproxyfen treatment can be directly linked to effective suppression of aphid population, resulting in improved plant vigour and reduced damage. These findings are in agreement with the observations of Sangle *et al*. (2017), who also reported increased yield of chilli with effective management of sucking pests. Overall, Pyriproxyfen 10 EC @ 160 ml/acre proved to be the most effective treatment in reducing aphid population and enhancing yield of chilli under field conditions

Effect of treatments on whitefly population and leaf curl incidence

The pooled mean whitefly population (average of two locations) exhibited significant differences among treatments after insecticidal application (Table 2). Prior to spray, the whitefly population ranged from 13.0 to 14.1 per three leaves and the differences were non-significant, indicating uniform pest distribution.

At 3 days after spray (DAS), Pyriproxyfen 10 EC @ 160 ml/acre recorded a significantly lower whitefly population (5.4 per three leaves) compared to Malathion (9.0 per three leaves) and untreated control (13.8 per three leaves). The trend persisted at 7 DAS, where Pyriproxyfen (3.4 per three leaves) was significantly superior to Malathion (6.8 per three leaves) and control (14.3 per three leaves). At 10 DAS, Pyriproxyfen achieved maximum suppression of whitefly population (1.7 per three leaves), followed by Malathion (3.3 per three leaves), whereas the population in untreated control increased up to 14.5 per three leaves. The differences among treatments at post-treatment intervals were found to be significant as they exceeded the critical difference (CD) at 5% level. The reduction in whitefly population was also reflected in leaf curl incidence. Pyriproxyfen-treated plots recorded the lowest leaf curl incidence (2%), which was significantly lower than Malathion (8%) and untreated control (15%). Since whitefly (*Bemisia tabaci* Gennadius) acts as a major vector of leaf curl virus, its effective management plays a crucial role in minimizing disease incidence and associated yield losses.

The superior performance of Pyriproxyfen may be attributed to its insect growth regulating action, which disrupts the life cycle and reproduction of whiteflies, leading to sustained population suppression. These findings are in conformity with earlier reports of Sangle *et al.* (2017), who observed the efficacy of newer insecticides against whitefly in chilli, and Jain *et al.* (2018), who also reported a significant reduction in whitefly population following insecticidal application. Overall, Pyriproxyfen 10 EC @ 160 ml/acre proved to be highly effective in reducing whitefly population and minimizing leaf curl incidence under field conditions.

Effect of treatments on natural enemies

The pooled mean population of natural enemies showed variation among treatments across observation intervals (Table 3). Before spray, the population ranged from 0.40 to 0.80 per plant. After application, Pyriproxyfen 10 EC @ 160 ml/acre maintained comparatively higher populations of natural enemies (0.20–0.30 per plant) than Malathion (0.20–0.30 per plant), while the untreated control recorded significantly higher populations (2.00–2.50 per plant) due to the absence of insecticidal intervention. The differences among treatments at post-treatment stages were found to be significant. The relatively higher survival of natural enemies in Pyriproxyfen-treated plots indicates its comparatively safer effect on beneficial insects as compared to conventional insecticide Malathion, suggesting its suitability for inclusion in integrated pest management programmes.

CONCLUSION

The present study clearly demonstrated that Pyriproxyfen 10 EC @ 160 ml/acre was highly effective in managing major sucking insect pests of chilli, particularly aphids (*Aphis gossypii*) and whiteflies (*Bemisia tabaci*), under field conditions. The treatment resulted in significant reduction in pest population, lower leaf curl incidence, and higher yield compared to Malathion and untreated control. In addition, Pyriproxyfen exhibited a comparatively safer effect on natural enemies, indicating its compatibility with integrated pest management (IPM) strategies. Therefore, Pyriproxyfen 10 EC can be recommended as an effective and eco-friendly option for sustainable management of sucking pests in chilli cultivation.

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