Study the novel insecticides for the control of sucking pests and pink bollworm in cotton

ABSTRACT

The study investigated ~~that~~ the effectiveness of various novel insecticides for controlling sucking pests and pink bollworm in cotton cultivation over a three-year period. The treatments were evaluated based on their impact on aphids, jassids, thrips, whiteflies and pink bollworm populations**.** During 2018-19, 2019-20 and 2020-21 years, among the tested novel insecticides, Fipronil + Imidacloprid @ 100g/ha has recorded the lowest population of thrips, jassids. Similarly, Fipronil+ Acetamiprid @ 1000 ml/ha has recorded the lowest aphid population whereas the incidence of pink bollworm was least in Lamdacyhalothrin + Chlorantraniliprole @ 200 ml/ha.

Keywords: Novel, Jassids, Thrips, Fipronil + Imidacloprid

INTRODUCTION

Cotton remains the dominant ~~fiber~~ fibre in the textile industry and is commonly referred to as the "king" of ~~fibers~~fibres. It is widely used in apparel production, accounting for approximately half of all textiles. Cotton's profitability and extensive cultivation make it the most prevalent non-food crop globally. The top cotton-producing countries in the 2022-23 period were China (59.80 lakh tonnes), India (52.00 lakh tonnes), the USA (31.96 lakh tonnes), and Brazil (29.46 lakh tonnes). These four countries contribute around 71% of the world's cotton production from approximately 64% of the global cotton-growing area (AICRP on cotton report for the year 2023)

During the 2022-23 period, cotton production in India is estimated to reach 337.23 lakh bales weighing 170 kg each. This production comes from an area of 130.49 lakh hectares with a productivity of 439 kg lint/ha. The current year saw a 5.5% increase in cotton cultivation area compared to the previous year, resulting in an 8.4% increase in production. Productivity also experienced a slight marginal increase from 428 to 439 kg per hectare. Gujarat, Maharashtra, and Telangana have been the major cotton-growing and producing states in India in recent years (2018-19 to 2022-23). On average, Maharashtra cultivated 43.78 lakh hectares, producing 79.54 lakh bales, while Gujarat cultivated 24.84 lakh hectares, producing 76.67 lakh bales. Telangana cultivated 20.47 lakh hectares, producing 53.59 lakh bales. These states accounted for approximately 33.79%, 19.16%, and 15.80% of the total cotton cultivation area, respectively, and contributed 24.22%, 23.75%, and 16.32% of the national output, respectively (Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, New Delhi)

In present investigation, combinations of 10 insecticides were compared against sucking pests like aphids, jassids, thrips and whiteflies. Results revealed that, incidence of jassids and thrips was low in the treatment wherein Fipronil + Imidacloprid @100 g ha^{-1} was sprayed. As novel of 10 insecticides were compared against pink bollworm, it is revealed that the incidence of PBW larvae/20 bolls was the least in the treatment, wherein Lambda cyhalothrin + Chlorantraniliprole @ 200 ml/ha was taken up.

MATERIALS AND METHODS

~~On farm~~On-farm trials on the bioefficacy of novel insecticides on the population of sucking pests and pink bollworm were conducted at the Agricultural Research Station (ARS), Adilabad during *Kharif*, 2018-19. For conducting trials on cotton, RCH-659 Bt-cotton hybrid was grown with maintaining line to line distance of 90cm and plant to plant 60 cm in a plot size of 5 x 5M. There were three replications in each treatment. All the recommended agronomic practices were followed in the field

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according to the recommendation for *Kharif* crops. The bioefficacy of novel insecticides ~~were~~ was evaluated against sucking pests and pink bollworm under field ~~condition~~conditions. The sucking pests population was recorded at randomly selected 10 plants per 3 leaves (top, middle, bottom) in each treatment field. The sucking population was observed the day before spray (DBS) and after 1, 3, 7, and 10 DAS. The observations of pink bollworm were recorded following the standard procedures. In each treatment and in each replication, five plants were selected randomly and tagged. The pre and post-count data of pink bollworm were recorded at 3, 7 and 10 days after each spraying (Divya *et al*., 2020).

The percentage damage in green fruiting bodies was worked out using the following formula:

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$$\% \ Pink \ bollworm \ damage = \frac{Damaged \ bolls}{Total \ bolls} \ X \ 100$$

The data thus obtained from field experiments were analyzed statistically by ANOVA at a 5 per cent level of significance.

RESULTS AND DISCUSSION

Among the treatments, Fipronil + Imidacloprid 100g/ha demonstrated the lowest aphid population with 5.45, while Fipronil + Acetamiprid yielded the next most favourable results after Fipronil + Imidacloprid recorded an aphid population of 5.83. In contrast, Profenophos + Cypermethrin recorded the highest aphid population at 9.06. Following this, treatment Chlorophyriphos + Cypermethrin and Thiomethoxam + ~~Lambda cyhalothrin~~Lambda-cyhalothrin both exhibited comparable aphid populations, each at 8.16. among ~~the~~ all the treatments,

In the case of jassids, Fipronil + Imidacloprid demonstrated the lowest jassids population among ~~the~~ all the treatments, with a value of ~~5.45~~1.66. Thereafter Fipronil + Acetamiprid recorded the next best favourable results after Fipronil + Imidacloprid 100g/ha, recording a jassids population of ~~5.83~~1.83. In contrast, Profenophos + Cypermethrin recorded the highest jassid population with 2.68 among ~~the~~ all the treatments. Following this, treatment Chlorophyriphos + Cypermethrin with 2.57 recorded jassids population.

Regarding thrips, the lowest population was observed in the case of Fipronil + Imidacloprid with a value of 7.20. Following this trend~~,~~ yielded the next most favourable results after Fipronil + Acetamiprid, which recorded thrips population of 7.56. In contrast, the treatment Profenophos + Cypermethrin exhibited the highest thrips population at 10.13 among all the treatments. Subsequently, the Chlorophyriphos + Cypermethrin treatment recorded a thrips population of 9.93

When considering whiteflies, the lowest whiteflies population was observed in the case of Fipronil + Acetamiprid, which was also true for Fipronil + Acetamiprid, with a value of 5.38. Continuing this pattern, Fipronil + Imidacloprid recorded the next most favourable results after Fipronil + Imidacloprid, reporting a thrips population of 5.95. In contrast, the treatment Profenophos + Cypermethrin displayed the highest whiteflies population among all the treatments, recording a value of 9.25. Subsequently, the Chlorophyriphos + Cypermethrin treatment exhibited a population of whiteflies 9.14.

In the case of pink bollworm, Monocrotophos + Acephate (farmer practice) recorded the higher pest populations among all the treatments, with 22.83% damage. Subsequently, the Chlorophyriphos + Cypermethrin treatment showed 9.14 % damage. Following this pattern, ~~Lambda cyhalothrin~~Lambda-cyhalothrin + ~~Chlorantriniliprole~~ Chlorantraniliprole with 6.50% recorded the lowest damage among ~~the~~ all the treatments.

Fipronil + Imidacloprid and Fipronil + Acetamiprid consistently showcased lower pest populations, making them relatively more effective against the pests considered. It's evident that the choice of treatment greatly influences pest control outcomes, and a balanced approach considering both efficacy and potential environmental impacts is crucial for sustainable pest management in cotton cultivation.

The treatments varied in their effectiveness against different pests of cotton, Fipronil + Imidacloprid and Fipronil + Acetamiprid consistently demonstrated favourable results in terms of pest population control. Profenophos + Cypermethrin often resulted in higher pest populations, showcasing the importance of selecting treatments tailored to specific pest challenges for optimal pest management outcomes.

This finding is similar ~~with~~ to what Rohini and Prasad (2011) reported that in the case of cotton leafhopper, fipronil 5 SC @ 2 ml/L and imidacloprid 17.8 SL @ 0.4 ml/L were found to be promising. Kalyan et al. (2012) concluded fipronil 5 SC @ 40 g *a.i.*/ha, imidacloprid 70 WG @ 50 g *a.i.*/ha. Baraskar and Paradkar (2020) [4] observed that Fipronil 5% SC was found effective against the major sucking pests like ~~leafhopper~~ leafhoppers of Bt-cotton crop.

These findings are at par with Singh *et al.* (2002) and Singh *et al.* (2007) reported that fipronil @ 50g *a.i.* ha^{-1} at fortnightly ~~interval~~ intervals was found to be the best treatment against the leafhopper. Wadnerkar *et al.* (2003) reported that treatment with fipronil 5% SC @ 50-75g *a.i.* ha^{-1} was effective in lowering the population of thrips, aphids and ~~jassid~~ jassids infesting cotton. Jadhav *et al.* (2004) indicated that Fipronil 5% SC @100 g a.i. ha-1 resulted in 2.2 leafhoppers per leaf and 1.2 thrips per leaf at seven days after application. Present findings are in corroborative with Ghure *et al.* (2008) and Gosalwad *et al.* (2009) showed that the newer insecticides molecules i.e lambda-cyhalothrin, emamectin benzoate

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Table 1. Study the novel insecticides for the control of sucking pests and pink bollworm (Three years pooled) in cotton

TREATMENTS	~~Dose / ha~~Dose/ha	Three years pooled					Yield (kg/ha)
		Aphids (No./Leaf)	Jassids (No./Leaf)	Thrips (No./Leaf)	Whitefly (No./Leaf)	Pink bollworm (%)	
T_1: Acephate + Imidacloprid	1000 g	6.92 (2.81)	2.13 (1.77)	8.48 (3.08)	7.05 (2.83)	15.83	1908
T_2: Bufrofezin + Acephate	1250 g	7.28 (2.87)	2.18 (1.78)	8.53 (3.08)	7.64 (2.94)	18.94	2074
T_3: Fipronil + Acetamiprid	1000 ml	5.83 (2.61)	1.83 (1.68)	7.56 (2.92)	5.95 (2.63)	15.05	2181
T_4: Profenophos + Cypermethrin	1000 ml	9.06 (3.17)	2.68 (1.92)	10.13 (3.33)	9.25 (3.20)	22.83	2151
T_5: Chlorophyriphos + Cypermethrin	1000 ml	8.61 (3.10)	2.57 (1.89)	9.93 (3.31)	9.14 (3.18)	13.88	2250
T_6: Thiomethoxam + Lambda–cyhalothrin	200 ml	8.16 (3.03)	2.44 (1.85)	9.70 (3.27)	8.88 (3.14)	12.44	2092
T_7: Lambda cyhalothrin +Chlorantr~~i~~aniliprole	200 ml	7.70 (2.95)	2.38 (1.84)	9.36 (3.22)	8.52 (3.08)	6.50	2446
T_8: Fipronil + Imidacloprid	100 g	5.45 (2.54)	1.66 (1.63)	7.20 (2.86)	5.38 (2.52)	16.26	2244
T_9: Betacyfluthrin + Imidacloprid	625 ml	7.47 (2.91)	2.30 (1.82)	8.81 (3.13)	8.26 (3.04)	19.50	1838
T_{10}: Monocrotophos + Acephate (farmer practice)	800 ml + 1000 gm	6.70 (2.77)	2.04 (1.74)	7.98 (2.99)	6.85 (2.80)	23.11	1547
S.ed ±	-	0.66	0.20	0.79	0.70	1.76	189.16
CD at 5 %	-	1.40	0.42	1.67	1.47	3.73	400.48

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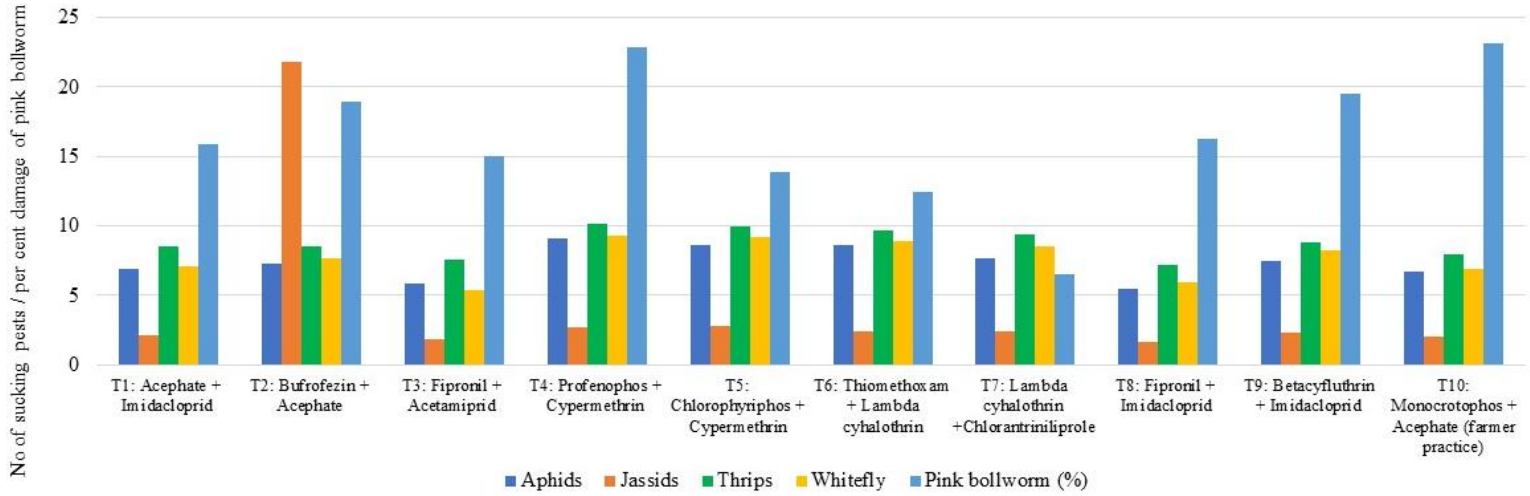

Fig.1 The graphical distribution of novel insecticides for the control of sucking pests and pink bollworm in cotton

CONCLUSION

Fipronil + Imidacloprid and Fipronil + Acetamiprid stood out as effective treatments for multiple pests, emphasizing the importance of tailored pest management strategies. The choice of treatment significantly influences pest control outcomes, underscoring the need for strategic decision-making to achieve optimal results in cotton cultivation

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Comment [D13]: Follow a common pattern

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