



Evaluation of release technology for *Trichogramma chilonis* Ishii in the management of cotton bollworms

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ABSTRACT: Studies were carried out during 2003 and 2004 to find out the release technology of *Trichogramma chilonis* Ishii (weekly releases from July to October @ 1, 50, 000/ ha) for the management of cotton bollworms. Releases as tricho-card (100, 150 and 200 points/ ha) were compared with adult releases. On the basis of incidence of bollworms among fruiting bodies (17.63 and 16.79 %), green bolls (26.87 and 14.14%), parasitization of *Helicoverpa armigera* (Hübner) eggs (17.41 and 19.64%) and seed cotton yield (8.24 and 9.26 q/ ha). The releases as adult proved better. Releases at 200 points/ ha was better than releases at 100 and 150 points/ha

KEY WORDS: Bollworms, cotton, release technology, *Trichogramma chilonis*

INTRODUCTION

Cotton is an important crop of Punjab grown over an area of 4.52 lakh hectares with a production of 14.78 lakh bales of lint (Anonymous, 2005). The productivity has been declining for the last ten years due to increased severity of pest complex and failure of pest management system. *Earias insulana* (Boisdual), *E. vitalla* (Fabricius) and *Helicoverpa armigera* (Hübner) are serious bollworms inflicting colossal boll damage. These pests cause 30-90 per cent loss in yield (Singh *et al.*, 2001). The indiscriminate use of insecticides causes pest outbreaks, pest resurgence and residues in lint. There is a need to curtail the use of insecticides on cotton crop without adversely affecting the yield. Parasitoid movements within plant canopies are usually related to location of host eggs and the release points apart from other

variables (Smith, 1996). *Trichogramma chilonis* Ishii in Punjab is being integrated with the selective use of insecticides for the management of cotton bollworms (Brar *et al.*, 2003). The present studies were undertaken to evaluate release technology of *T. chilonis* in the management of cotton bollworms.

MATERIALS AND METHODS

The investigations were carried out at farmer's field at village Khuban (Distt. Ferozepur) for two years during 2003 and 2004. The egg parasitoid, *T. chilonis* was released at weekly interval 13 times during mid July to first week of October @ 1,50,000 per hectare. The parasitoid was released in the form of tricho-cards at 100, 150 and 200 points (one bit/ point) per hectare and compared with releases of adults and no release or control. For adult release, in the morning 7 days old

Table 1. Standardization of release points for *T. chilonis* on cotton at village Khuban, during 2003

Parameter	Releases of <i>T. chilonis</i> as (Tricho-cards and adults)				Control	CD(p=0.05)
	100 points/ha	150 points/ha	200 points/ha	Adults		
Incidence among fruiting bodies (%)						
Spotted bollworm	3.54 (10.74)	2.75 (9.43)	2.63 (9.26)	2.04 (8.13)	5.58 (13.51)	(1.40)
<i>Helicoverpa armigera</i>	26.64 (31.02)	22.30 (28.14)	18.85 (25.69)	15.59 (23.15)	43.36 (41.14)	(1.99)
Total	30.18 (33.26)	25.05 (29.44)	21.48 (27.58)	17.63 (24.79)	48.94 (44.38)	(2.21)
Incidence among green bolls (%)						
Spotted bollworm	5.80 (13.88)	5.23 (13.15)	5.00 (12.85)	4.30 (11.85)	7.47 (15.81)	(1.46)
<i>Helicoverpa armigera</i>	25.75 (30.46)	24.67 (29.73)	23.30 (28.82)	22.57 (28.34)	39.58 (38.95)	(1.73)
Total	31.55 (34.14)	29.90 (33.11)	28.30 (32.10)	26.87 (31.19)	47.05 (43.28)	(1.91)
Parasitisation of <i>H. armigera</i> eggs (%)						
	10.14 (18.13)	11.99 (19.96)	14.63 (22.24)	17.41 (24.52)	1.13 (4.29)	(3.14)
Yield (Q/ha)						
	6.80	7.10	7.62	8.24	2.75	0.40

Figures in the parentheses are arcsine $\sqrt{\text{Percentages}}$ transformations.

parasitized eggs were taken out of refrigerator and kept at room temperature in separate glass jars for each treatment. After emergence, the adults were released uniformly in rows 10 m apart. The plot size was 1000 m² for each treatment and it was subdivided into 10 parts to record observations. The incidence of spotted bollworm (*Earias* spp.) and American bollworm (*H. armigera*) was recorded among intact fruiting bodies (7 times) and green bolls (5-6 times) from five plants selected at random from each replication at weekly interval. Eggs of *H. armigera* (minimum 25) were collected (11-12 times) at weekly interval to record parasitization from each replication. The seed cotton yield was recorded from whole plot (100 m²) in each replication. The percent data were analyzed after arcsine transformation whereas; yield data were analyzed without any transformation.

RESULTS AND DISCUSSION

Incidence of bollworms

The incidence of spotted bollworms among intact fruiting bodies during 2003 (Table 1) was significantly low (2.04 to 3.54%) in all the release plots as compared to control (5.58 %). Similarly the incidence of *H. armigera* in release plots (15.59 to 26.64%) was significantly lower than control (43.36 %). The combined incidence of two bollworms in release plots (17.63 % to 30.18 %) was significantly lower than control (48.94 %). The lowest incidence (17.63%) was recorded in adult release and it was significantly lower than release in the form of tricho-cards. During 2004, there was no significant difference in incidence of both the bollworms individually among intact fruiting bodies (Table 2).

Table 2. Standardization of release points for *Trichogramma chilonis* on cotton at village Khuban, during 2004

Parameter	Releases of <i>T. chilonis</i> as (Tricho-cards and adults)				Control	CD(p=0.05)
	100 points/ha	150 points/ha	200 points/ha	Adults		
Incidence among fruiting bodies (%)						
Spotted bollworm	3.78 (11.20)	3.00 (7.55)	2.41 (8.93)	1.98 (8.08)	5.76 (13.89)	NS
<i>Helicoverpa armigera</i>	19.32 (26.06)	16.96 (24.31)	16.00 (16.01)	14.81 (22.62)	29.72 (33.02)	NS
Total	23.10 (28.71)	19.96 (26.43)	18.41 (23.89)	16.79 (19.15)	35.48 (36.54)	2.66
Incidence among green bolls (%)						
Spotted bollworm	6.24 (14.46)	5.71 (13.82)	5.22 (13.20)	3.96 (11.47)	6.76 (15.06)	0.11
<i>Helicoverpa armigera</i>	18.92 (25.77)	16.26 (23.77)	14.78 (22.60)	10.18 (18.60)	30.24 (33.35)	0.23
Total	25.16 (30.09)	21.97 (27.94)	20.00 (26.55)	14.14 (22.08)	37.00 (36.85)	0.38
Parasitisation of <i>H. armigera</i> eggs (%)						
	11.72 (20.01)	13.20 (21.29)	14.98 (22.75)	19.64 (26.29)	1.14 (6.13)	0.63
Yield (Q/ha)						
	6.00	7.12	7.86	9.26	5.08	0.93

Figures in the parentheses are arcsine $\sqrt{\text{Percentages}}$ transformations.

However, the combined incidence of two bollworms in release plots (16.79 to 23.10%) was significantly lower than control (35.48 %). Again significantly lowest incidence (16.79%) was recorded in adult release.

During 2003, the mean incidence of spotted bollworm (4.30 to 5.80%) and *H. armigera* (22.57 to 25.75%) among green bolls (Table 1) was significantly lower in release plots as compared to control. Similarly, the total incidence of bollworms in release plots (26.87 to 31.55 %) was significantly lower than control (47.05%). Lowest incidence (26.87 %) was recorded in adult release and it was significantly lower than all other treatments except releases at 200 points/ ha. Similarly, during 2004 the incidence of spotted bollworm and *H. armigera*

individually and total incidence in release plots was significantly lower than control (Table 2). The total incidence of two bollworms was lowest (14.14 %) in adult release plots and it was significantly lower than all other treatments. The incidence in plots where *T. chilonis* was released at 200 points/ ha was 20.00 per cent and it was significantly lower than releases at 100 and 150 points/ha. So the incidence of bollworms was lower in adult release followed by releases at 200 points/ ha.

Egg parasitism

During both the years, the parasitization of *H. armigera* eggs in the release fields was significantly higher than control (1.13-1.14%). Highest parasitism during both the years (17.41-

19.64 %) was observed in adult release and it was significantly higher than all other treatments except releases at 200 points (14.63%) during 2003 (Table 1 & 2). During 2003, the egg parasitism in plots with 200 points was significantly higher than releases at 100 points/ ha. However, during 2004, egg parasitism (14.98%) in plots with 200 points was significantly higher than both, 100 points/ ha and 150 points/ ha. Thus the adult releases increased egg parasitism significantly followed by 200-release points/ ha.

Yield

The seed cotton yield during 2003 (Table 1) in all the release fields was significantly higher (6.80 to 8.24 q/ha) than control (2.75 q/ha). Significantly highest yield was obtained in adult releases. The yield in 200 points / ha (7.62 q/ha) was significantly higher than releases at 150 points/ha and 100 points / ha. During 2004 (Table 2) the seed cotton yield in release fields except releases at 100 points / ha (6.00 q/ha) was significantly higher than control (5.08 q/ ha). Significantly highest yield (9.26 q/ ha) was obtained in adult releases.

On the basis of bollworm incidence, parasitization of *H. armigera* eggs and seed cotton yield, it can be concluded that releases of *T. chilonis* in the form of adults was better than releases as tricho cards. Releases as tricho-card, at 200 points/ ha was better than releases at 100 and 150 points/ ha. Earlier Stinner *et al.* (1974) reported variation in egg parasitism of *Heliothis* spp. by *T. pretiosum* at 9,42 and 256 release points/ ha. However, Yu and Byers (1994) reported that *T. brassicae* released from 25 points was as effective as releases from 49 points in controlling *Ostrinia nubilalis* (Hübner) in corn. Singh *et al.* (1994), Sohi *et al.* (1996), Brar *et al.* (2000) and Naiding (2004) reported that *T. chilonis* can go up to 10 m in cotton but the maximum parasitization was upto 2 m, this confirms the present findings that the parasitoid should be released at closer spacing.

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