



## Large-scale evaluation of bio-intensive management for leaf folder and stem borer on basmati rice

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**ABSTRACT:** Bio-intensive pest management of leaf folder and stem borer was demonstrated on basmati rice at village Karni Khera (District Ferozepur), Punjab over 60 hectares during 2002-2005. Bio-intensive management package included one application of cartap hydrochloride, (Padan @ 25 kg / ha) and seven weekly releases of *Trichogramma chilonis* and *T. japonicum* @100000 / ha each starting from 30 days after transplantation. The mean per cent leaves folded (2.02), dead hearts (3.05), white ears (5.45) and yield (43.99 q / ha) in BPIM were on par with chemical control, (mean per cent leaves folded (1.77), dead hearts (2.62), white ears (4.48) and yield (44.83 q / ha)), and both the treatments were significantly better than control. The cost: benefit ratio was 1: 4.01 and 1: 4.68 for bio-intensive management practice and chemical control, respectively.

**KEY WORDS:** Basmati rice, BIPM, rice leaf folder, stem borer, *Trichogramma chilonis*, *T. japonicum*

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### INTRODUCTION

In Punjab, rice is cultivated in 26.47 lakh hectares with a total production of 104.37 lakh tones. Rice is attacked by 385 species of insects causing 31.5-86.0 per cent losses in yield (Gunathilagaraj and Kumar, 1997). Out of these, white backed planthopper *Sogatella furcifera* (Horvath), brown planthopper, *Nilaparvata lugens* (Stal), stem borer, *Scirpophaga incertulas* Walker and leaf folder, *Cnaphalocrocis medinalis* (Guenee) cause considerable yield loss (Dale, 1994; Kushwaha, 1988). Broad-spectrum, persistent pesticides are generally used for control of these pests, but they greatly reduce the number of natural enemies and

disrupt their potential as pest regulatory agents. The well-documented side effects of indiscriminate use of insecticides have made it imperative to study indigenous parasitoids and their role in control of insect pests of rice. Hence, the present study was conducted to evaluate the egg parasitoids on large scale against leaf folder and stem borer of basmati rice. Six releases of *T. chilonis* and *T. japonicum* starting 30 days after transplanting proved effective for the control of leaf folder and stem borer on coarse rice (Brar *et al.*, 1999; Brar *et al.*, 2001). The bio-intensive management technology was evaluated on basmati rice at village Karni Khera (District Ferozepur), Punjab, for four years during 2002 to 2005 over an area of 60 hectares.

| Year | Varieties      | Chemical Control  |
|------|----------------|---|
| 2002 | Pusa Basmati-1 | Two applications of Padan 4 G (@ 25 kg / ha and<br>1 spray of monocrotophos 36 SL (@ 1.4 l / ha |
| 2003 | Sugandh-2      | One applications of Padan 4 G (@ 25 kg / ha and<br>2 spray of monocrotophos 36 SL (@ 1.4 l / ha |
| 2004 | Pusa Basmati-1 | Three applications of Padan 4 G (@ 25 kg / ha   |
| 2005 | Basmati-386    | Three applications of Padan 4 G (@ 25 kg / ha   |

## MATERIALS AND METHODS

The experiment was conducted with recommended varieties of basmati rice, i. e., Pusa Basmati-1, Sugandh-2 and Basmati-386 during different years. The plot size for bio-intensive management was 10 to 20 hectares, for chemical control it was 2 hectares and 0.4 hectare for untreated control with six replications. In bio-intensive management, the treatments given were one application of cartap hydrochloride (Padan 4 G (@ 25 kg / ha) 30 days after transplanting and thereafter seven releases of egg parasitoids, *T. chilonis* and *T. japonicum* (@ 100000 / ha each at weekly interval. In chemical control the treatments given are listed below.

## RESULTS AND DISCUSSION

The per cent leaves folded was significantly lower in bio-intensive management practice fields and chemical control as compared to untreated control during all the years, i. e., from 2002 to 2005. Over the four years, the percent leaf folder incidence was significantly lower in chemical control except for the year 2004 when it was lower in bio-intensive management fields. The mean leaf folder incidence during 2002-2005 was significantly lower in bio-intensive management fields (2.02%) and chemical control (1.77%) compared to control (7.44%), however, bio-intensive management was on par with chemical control (Table 1 and Fig. 1).

The per cent dead hearts were significantly lower in bio-intensive management practice fields and chemical control fields during all the years. During 2002-2004, the per cent dead hearts in bio-intensive management practice fields were on par

with chemical control fields, whereas during 2005, the incidence was significantly lower in chemical control fields (1.45%) than bio-intensive management practice fields (2.25%). The mean dead hearts were significantly lower in bio-intensive management practice fields (3.05 %) and chemical control (2.62 %) than control (13.95 %) (Table 1 and Fig. 2).

The percent white ears were significantly lower in bio-intensive management practice fields and chemical control fields during all the years. During 2002 and 2003, the treatments of bio-intensive management and chemical control were on par with each other whereas during 2004 and 2005, chemical control treatment (4.55% and 3.40%) was significantly better than bio-intensive management treatment (7.32% and 4.20%). The mean white ears in chemical control (4.48%) were on par with bio-intensive management treatment (5.45%) and these were significantly better than control (Table 1 and Fig. 3).

The yield in bio-intensive management practice and chemical control was significantly higher than control in all the years. During 2002-2005, the yield in bio-intensive management was on par with chemical control except for the year 2005, when yield was significantly higher in chemical control (50.96 q / ha) than bio-intensive management (49.49 q / ha). The mean yield in bio-intensive management (43.99 q / ha) was on par with chemical control (44.83 q / ha) (Table 1 and Fig. 4).

The cost-benefit ratio was slightly higher in chemical control (1: 4.68) compared to bio-intensive management (1: 4.01), however, immense

**Table 1. Evaluation of BIPM for the control of stem borer and leaf folder in *Basmati* rice at village Karni Khera (District Ferozepur) in Punjab during 2002-2005**

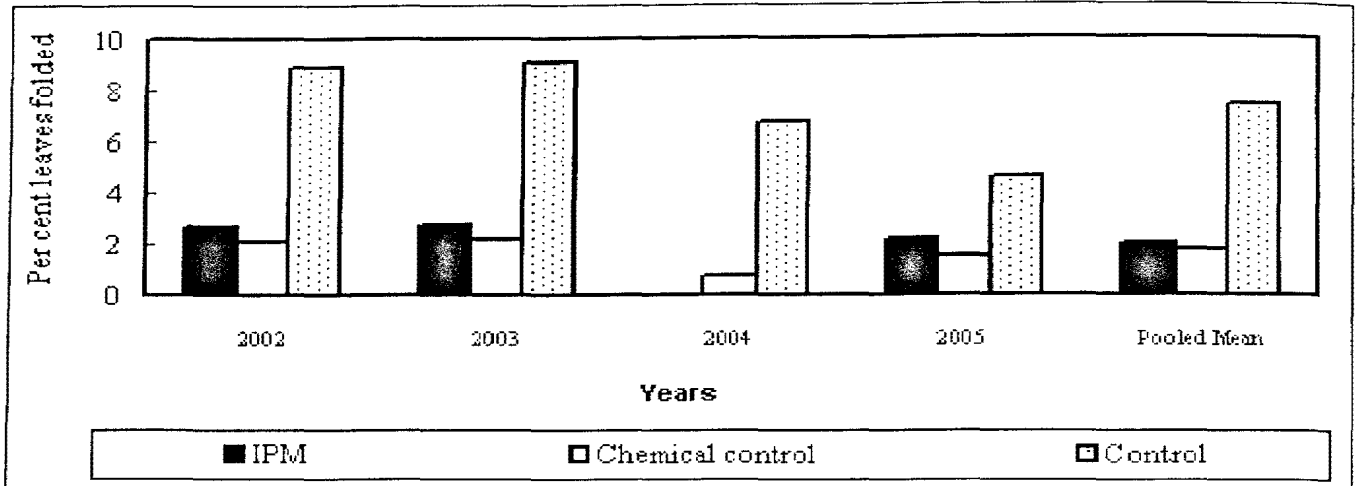
| Treatments Parameters    | Year | BIPM         | Chemicalcontrol | Control       | CD (P = 0.05) |
|--------------------------|------|--------------|-----------------|---------------|---------------|
| Incidence of stem borer  |      |              |                 |               |               |
| Per cent dead hearts     | 2002 | 4.60 (12.36) | 4.10 (11.65)    | 18.21 (24.32) | (1.12)        |
|                          | 2003 | 4.38 (12.07) | 3.95 (11.45)    | 17.65 (24.83) | (0.75)        |
|                          | 2004 | 0.97 (5.53)  | 0.97 (5.53)     | 14.71 (22.55) | (0.65)        |
|                          | 2005 | 2.25 (8.62)  | 1.45 (6.90)     | 5.22 (13.19)  | (0.35)        |
|                          | Mean | 3.05 (9.68)  | 2.62 (8.92)     | 13.95 (21.46) | (4.85)        |
| Per cent white ears      | 2002 | 5.20 (13.16) | 5.30 (13.29)    | 11.20 (19.53) | (0.49)        |
|                          | 2003 | 5.10 (13.04) | 4.66 (12.44)    | 10.74 (19.10) | (1.48)        |
|                          | 2004 | 7.32 (15.68) | 4.55 (12.31)    | 27.89 (31.87) | (0.20)        |
|                          | 2005 | 4.20 (11.82) | 3.40 (10.62)    | 10.95 (19.32) | (0.17)        |
|                          | Mean | 5.45 (13.43) | 4.48 (12.17)    | 15.19 (22.46) | (5.68)        |
| Incidence of leaf folder |      |              |                 |               |               |
| Per cent leaves folded   | 2002 | 2.70 (9.44)  | 2.10 (8.31)     | 8.90 (17.33)  | (0.45)        |
|                          | 2003 | 2.71 (9.47)  | 2.19 (8.50)     | 9.06 (17.51)  | (0.60)        |
|                          | 2004 | 0.00 (0.00)  | 0.75 (4.77)     | 6.75 (15.04)  | (0.91)        |
|                          | 2005 | 2.15 (8.42)  | 1.53 (7.09)     | 4.56 (12.31)  | (0.37)        |
|                          | Mean | 2.02 (7.85)  | 1.77 (7.58)     | 7.44 (15.70)  | (4.20)        |
| Grain yield (q / ha)     | 2002 | 50.60        | 52.50           | 43.80         | 2.20          |
|                          | 2003 | 49.49        | 50.96           | 43.24         | 1.07          |
|                          | 2004 | 53.25        | 52.73           | 36.00         | 5.26          |
|                          | 2005 | 22.65        | 23.15           | 16.55         | 0.12          |
|                          | Mean | 43.99        | 44.83           | 34.89         | 5.09          |
| Cost: benefit ratio      |      | 1:4.01       | 1:4.68          |               |               |

Note: Padan 4 G @ Rs.260 / 5 kg, Monocrotophos 36 SL @ Rs. 250 / lt, Tricho card @ Rs.30/ card, price of basmati rice @ Rs.1500 / q

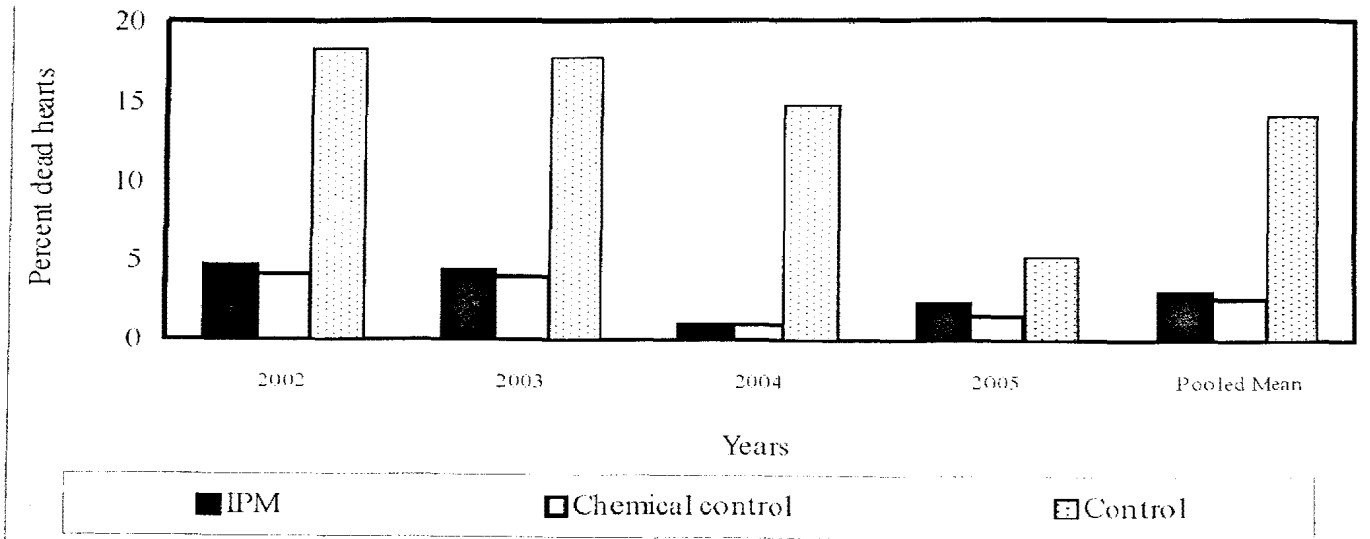
environmental benefit accrues from such management.

The present findings are in conformity with the earlier work of Garg *et al.* (2002), who reported highest percentage of dead hearts and white heads in non-IPM (farmer's practice). Saikia and Parameswaran (2002) made field release of egg parasitoid, *T. chilonis* and application of Bt, buprofezin 25 WP, NSKE and monocrotophos 36

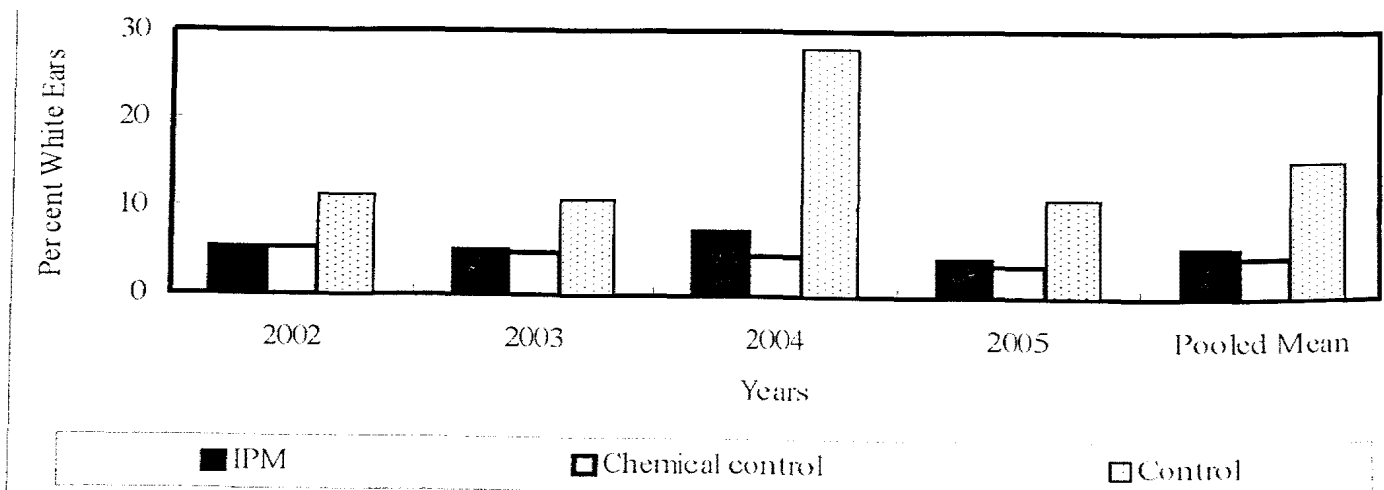
SL for the control of *C. medinalis* and reported that either 6 releases of *T. chilonis* alone or 4 releases of the egg parasitoid followed by application of Bt, NSKE and buprofezin, alone or in combination significantly reduced leaf folder damage and gave higher grain yield compared to untreated control. Sehrawat *et al.* (2002) in Haryana reported that integration of cartap hydrochloride and releases of *T. chilonis* proved effective in reducing leaf folder infestation with maximum grain yield. Beevi *et al.*



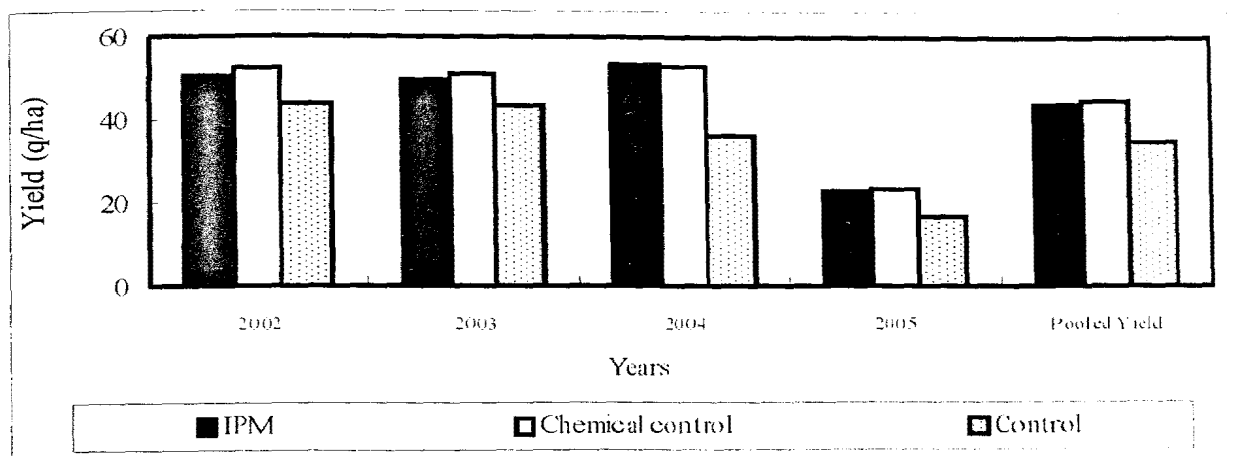
**Fig. 1. Leaf folder incidence in various treatment**



**Fig. 2. Per cent dead hearts in various treatments**



**Fig. 3. Per cent white ears in various treatments**



**Fig. 4. Yield (q / ha) of basmati rice in various treatments**

(2003) evaluated the effectiveness of releasing *Trichogramma* species for pest management in rice cultivar Jyothi and recorded 20.3 and 11.8% increase in the yield over untreated control and chemical control, respectively.

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