

## Bio-intensive management of internode borer (*Chilo sacchariphagus indicus* Kapur) and stalk borer (*Chilo auricilius* Dudgeon)

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ARTICLE INFO	ABSTRACT
<p><b>Original Research Article</b> Received on April 20, 2016 Accepted on May 28, 2016</p> <p><b>Article Authors</b> Arun Baitha, Ram Ji Lal, B. L. Maurya, Rashmi Nigam</p> <p><b>Corresponding Author Email</b> <a href="mailto:arunbaitha@rediffmail.com">arunbaitha@rediffmail.com</a></p>	<p>A field trial was conducted at IISR research farm, Lucknow (var. CoLk 8102) with egg parasitoid, <i>Trichogramma chilonis</i>, larval parasitoid, <i>Cotesia flavipes</i> and pupal parasitoid, <i>Tetrastichus howardi</i> against sugarcane internode and stalk borer in RBD with a plot size of 72sq.m. The incidence of internode borer ranged from 2.34 to 4.91% in treated plot as compared to control (7.87%) in August, however during October incidence ranged from 2.14 to 6.86%. At harvest, minimum incidence of internode borer (5.62%) was observed in <i>T. chilonis</i> followed by <i>C. flavipes</i> (7.52%) released plots. The released parasitoids are more active in the field for its parasitisation and multiplication which result a reduction in the incidence of INB in released plots where as beyond October the prevailing low temperature, appeared to be non-conductive for its mating and field parasitisation. The incidence of stalk borer during August and October was low (1.03- 5.54%). At harvest minimum incidence (5.55%) was observed in <i>C. flavipes</i> followed by <i>T. howardi</i> release plots (10.92%) as against 17.24% in control. Removal of dry leaves and late shoots was observed to reduce the damage by migratory borer larvae in August and October. The results indicates that parasitoids (egg, larva and pupal) play a significant role in the management of INB and SB to check the spread and lowering the incidence of this pests. It is suggested that a working of these parasitoids can be exploited in programmes for management of sugarcane stalk and internode borer.</p>
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Heavy losses are caused to sugarcane cultivation in India by not less than 12 species of borers. They attack different parts of the sugarcane plant; some species damage the top and some the stem, while others attack the underground plants. The more destructive amongst these borers are those attacking the sugarcane stem (Gupta, 1960). Internode borer, *Chilo sacchariphagus indicus* and stalk borer, *Chilo auricilius* are one of the major destructive borers distributed in all cane growing states in peninsular and subtropical India, respectively (Agrawal, 1964, David *et al.*, 1979, Easwaramoorthy and Nandagopal, 1986, Srikant and Kurup, 2011). These borers are limiting factors in increasing sugarcane production and insecticides play a significant role in containing borers. Insecticides have also limitations in the management of internode and stalk borer as dense canopy of sugarcane, overlapping broods and migratory habit of larvae pose practical problems.

In this scenario bio-control option becomes more in the light of the commercial nature of sugarcane crop, which offers advantages like a less disturbed agro-ecosystem, continuous availability of the hosts for bio-agents. Sugarcane borers (internode borer and stalk borer) have been recorded parasitizing parasitoids, *Trichogramma chilonis*, *Telenomus dignus*, *Cotesia flavipes* and *Tetrastichus howardi*, widely distributed in U.P., Bihar, Haryana, Punjab, A.P., Karnataka, Odisha and Tamil Nadu (Tanwar and Varma, 2000, Baitha and Maurya, 2012, Poovarsi and Jeyabal, 2014). The parasitoids parasitizing the different life stages of the borers (egg, larva and pupa) can be gainfully utilized though targeted release of particular parasitoids synchronising the favourable borer stage. The present study was undertaken to manage INB and SB in sugarcane agro-ecosystem through bio-agent.

## MATERIALS AND METHODS

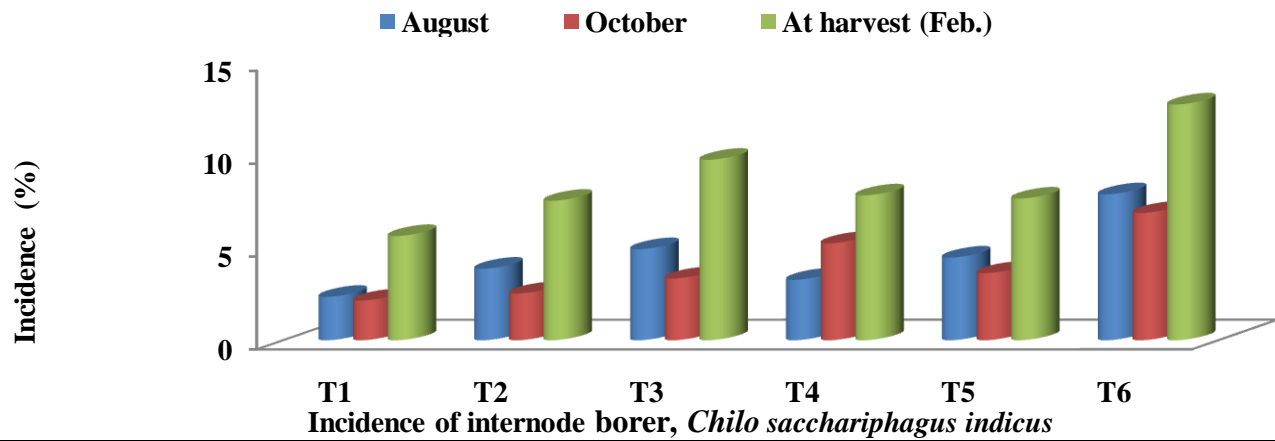
A field trial was conducted at IISR research farm, Lucknow (var.CoLk 8102) with egg parasitoid, *Trichogramma chilonis*, larval parasitoid, *Cotesia flavipes* and pupal parasitoid, *Tetrastichus howardi* against sugarcane stalk and internode borer in RBD with a plot size of 72 sq.m. There was a buffer plot (72 sq.m) between the treatment plots. The treatments were: release of laboratory reared *T. chilonis* @50,000 adults/ha from July to October at 10 days interval; *C. flavipes* @500 gravid females/ha from July to October at 7 days interval; *T. howardi* @5000 adults/ha in each month (July to October) and removal of dry leaves and late shoots in September and October. Observations on the incidence of internode and stalk borer were made in August, October (by counting the damaged cane and total cane in two rows in each sub plot) and by splitting the canes at time of harvesting (February). The data were analysed statistically using Analysis of Variance (ANOVA).

## RESULTS AND DISCUSSION

The incidence of internode borer ranged from 2.34 to 4.91% in treated plot as compared to control (7.87%) in August, however, during October incidence ranged from 2.14 to 6.86%. At harvest, minimum incidence of internode borer (5.62%) was observed in *T. chilonis* followed by *C. flavipes* (7.52%) released plots (Fig.1). The released parasitoids are more active in the field for its parasitisation and multiplication which result a reduction in the incidence of INB in released plots, where as beyond October the prevailing low temperature, appeared to be non-conductive for its mating and field parasitisation. The probability of host counter by *C. flavipes* is influenced by factors such as the host range of parasitoid, the availability of the susceptible host stage and the mortality rate at oviposition and between host encounters. Parasites (egg parasitoids: *T. chilonis*, *Telenomus dignus* and larval parasitoid, *C. flavipes*) were recorded parasitise eggs (4.26 to 25.08 %) and larvae (4 to 14.27%) of internode

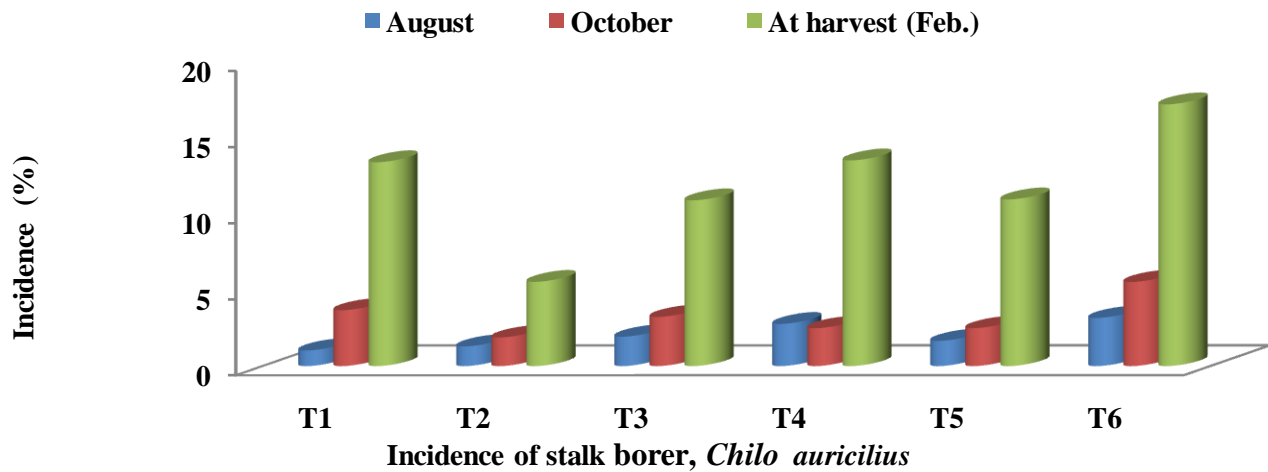
borer (Gupta 1954, Kalra and Srivastava 1966, Easwaramoorthy and Nandagopal 1986). The trials conducted earlier revealed that reduction of incidence of internode borer by release of egg parasitoid, *Trichogramma chilonis* and larval parasitoid, *C. flavipes* (Sithanantham *et al.*, 1973; Tanwar and Varma, 2002 and Tiwari *et al.*, 1996). The incidence of stalk borer during August and October was low (1.03-5.54%). At harvest minimum incidence (5.55%) was observed in *C. flavipes* followed by *T. howardi* release plots (10.92%) as against 17.24% in control (Fig. 2). Release of *Cotesia flavipes* was found to significant reduce incidence of stalk borer in released plot as compared to control in U.P. and Punjab (Shenhmar and Brar, 1996 and Tanwar and Varma 2000). The results of the trial conducted in Punjab (Varma *et al.*, 1991) indicated marginal reduction in the incidence of *C. auricilius* by inundative release of *T. chlonis*, however, it failed to reduce incidence in U.P (Tiwari *et al.*, (1996).

Inundative release of *T.howardi* was found to reduce incidence of stalk borer as compared to *T.chilonis* released plot (Fig.2). Alvarez *et al.*, (2005) reported that *Diatraea saccharalis* (Fab.) was successfully managed by release of *T. howardi* in Cuba. Removal of dry leaves and late shoots was observed to reduce the damage by migratory borer larvae in August and October. The late shoots and water shoots which serve as site of oviposition during winter months, if removed at periodic intervals may reduce the pest infestation in ratoon, autumn and spring panted canes (Varma and Mitra 1981). The borer larvae in latter stages of their development migrated to the standing crop from the late shoots. This resulted in increase in incidence and intensity of attack October onwards (Varma *et al.*, 1982). The results indicates that parasitoids (egg, larva and pupal) play a significant role in the management of INB and SB to check the spread and lowering the incidence of this pests. It is suggested that a working of these parasitoids can be exploited in programmes for management of sugarcane stalk and internode borer.



T<sub>1</sub>: *Trichogramma chilonis* @50,000 adults/ha; T<sub>2</sub>: *Cotesia flavipes* @500 gravid females/ha; T<sub>3</sub>: *Tetrastichus howardi* @5000 adults/ha; T<sub>4</sub>: Removal of dry leaves and late shoots; T<sub>5</sub>: *T.c.* + *C.f.*+*Tet.h.*+Removal of dry leaves and late shoots and T<sub>6</sub>: Control

**Fig 1. Incidence of internode borer, *Chilo sacchariphagus indicus*.**



T<sub>1</sub>: *Trichogramma chilonis* @50,000 adults/ha; T<sub>2</sub>: *Cotesia flavipes* @500 gravid females/ha; T<sub>3</sub>: *Tetrastichus howardi* @5000 adults/ha; T<sub>4</sub>: Removal of dry leaves and late shoots; T<sub>5</sub>: *T.c.* + *C.f.*+*Tet.h.*+Removal of dry leaves and late shoots and T<sub>6</sub>: Control

**Fig 2. Incidence of stalk borer, *Chilo Auricilius*.**

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