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Ecofriendly management of sugarcane top borer, *Scirpophaga excerptalis* walker with an egg parasitoid, *Trichogramma japonicum* in western Uttar Pradesh

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Abstract

Trichogramma japonicum against sugarcane top borer, *Scirpophaga excerptalis* wlk. was studied specially top borer 3rd brood in the experimental plot of sugarcane research center farm SRC, Muzaffarnagar during crop season, 2017-19 with Co 0118 variety. Among six treatments *T.japonicum* @50000 parasitized egg/ha showed superior result causing significant reduction in infestation of target pest in top borer 3rd brood infestation, respectively as compared to control pot, other treatments of *T.japonicum* also gave significant result over control, Percent incidence of *S.excerptalis* showed negative correlation with increase in number of *T.japonicum*, which indicates that it may be successfully utilized for the suppression of top borer under Western Uttar Pradesh condition.

Keywords: *Scirpophaga excerptalis*, *Trichogramma japonicum*, variety Co 0118 and sugarcane

Introduction

Sugarcane top borer (*Scirpophaga excerptalis* wlk) is unique among the moth bore in that it infects sugarcane during all the stages of crop growth. The damage and losses caused by top borer are due to the mortality of shoots and canes and also due to the arrest in growth of the latter. In Uttar Pradesh the yield losses assessed are 18.8 tonnes/ha at 55% incidence (Gupta and, 1959 and 30% losses when the incidence is heavy Rajani, 1960) [1]. The losses in sugar recovery are due to top borer infestation varies from 0.2-4.1 units (Raja Rao, 1953, Rajani, 1960) [1]. Loss due to top borer was recorded 22.4% in yield and 1.04% units in recovery at mid-season and 11.3% in yield and 0.6% units in recovery at late stage of cane maturity (K Ppandey *et al.* 2016). The tunneling of the first instar larva in to the midrib causes a white streak that turns reddish brown subsequently and become visible from the ventral surface of the midrib form an unique symptoms of attack (Huque and Agarwala, 1955). The larva bores it way to the central core of the spindle through the unfurled leaves, and a result rows of the shot holes become visible when the leaves unfold (Gupta 1959, Mukunthan 1985) [3]. As a larva feed by boring in to the narrow central core towards the growing point, it also nibbles the inner half of the leaf immediately surrounding the feeding region. This leaf dries up, become atrophid and turns dark brown forming the dead heart, when the fourth instar larva cuts the growing points, the leaf forming the deadheart is never served off transversely in the course of feeding by the larvae (Mukunthan 1985) [3].

In the tillering phase of the crop the attack shoot die resulting in the formation of side tillers, while in the grand phase, the crop growth is arrested and the crown with the dead heart completely dries and may be blown off leaving only a stamp. In grown up canes, the infestation results in dead heart formation, which induces spurting of the lateral buds giving a "bunchy top" appearance. Occasionally, top borer infestation induces aerial root formation (Singh *et al.* 1, 1980).

Sugarcane borers became a challenging pest of cane, due to its feeding inside the plant parts, where insecticidal sprays are difficult to reach indiscriminate use of pesticide kill the natural enemies resulting in flare up to pest population (Yousaf, 1996). Incorporation of biocontrol

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as component of integrated pest management of top borer acquires immense prominence in recent days. Among different biocontrol, agents the egg parasitoid, *T. japonicum* proved to be effective in regulating the pest population at egg stage (B. Bhavani, CH. VN arsimiha Rao, 2011) [4]. Management of top borer with egg parasitoid, *T. Japonicum* seems to have economic proposition because of the low-cost production. Whoever the present study was designed to evaluate the relative efficacy of different dose of egg parasitoid of *T. japonicum* against 3rd brood infestation of sugarcane top borer.

Material and methods

Field experiment was conducted at sugarcane research center SRC at Muzaffarnagar, during crop season 2017-19 to evaluate the relative efficacy of *T. japonicum* against sugarcane top borer in variety Co 0118 (early variety) planted during autumn season 2017-19. The experiment was land out in RBD with six treatments including control, in 3 replications as follows: -

- T₁: 20000 parasitized eggs /ha
- T₂: 30000 parasitized eggs /ha.
- T₃: 40000 parasitized eggs /ha.
- T₄: 50000 parasitized eggs /ha.
- T₅: 75000 parasitized eggs /ha.
- T₆: Control.

The plot size was 10*5.4 meter² with recommended dose of fertilizer for sugarcane cultivation in Western Uttar Pradesh were followed without application of insecticides.

The numbers of parasitized eggs were released by stapling *T. japonicum* cards on fortnight basis in each treatment as per need. These cards were stapled on lower (ventral) side of sugarcane leaves, due to direct exposure of sunlight. Infestation of sugarcane top borer was monitored fortnightly on the basis of randomly selected canes from each treatment. Which consisted 25 canes from each replication. Damaged plants from these selected samples by *Sexcerptalis* were counted and percent infestation was calculated on this way:-

Percent infestation = $\frac{\text{Damaged tillers} \times 100}{\text{Total tillers}}$

The percent reduction in infestation over control was calculated as follows:

Percent reduction = $\frac{\text{Damaged tillers in control plots} - \text{no. of tillers in treatment plots} \times 100}{\text{Damaged tillers in control plots}}$

First installation of cards with parasitized eggs for 3rd brood infestation, oriented doses were done on 15th June, 2018 and last installation on 30th October 2018. To evaluate the performance of the *T. japonicum*, and means infestation of top borer under study was compared in treatment plots with the control plots. Obtained data were statistically analysed by using analysis of variance.

Result and discussion

Perusal of data table (1) reveals a significant reduction in percentage infestation of sugarcane top borer which ranged from 2.46 to 3.83 % when 20000 *Trichogramma* parasitized eggs were released, and 1.80 to 2.38 % when 30000 parasitized eggs were applied, when 40000 parasitized eggs/ha were released 1.50 to 2.23 %, when 75000 *Trichogramma* parasitized eggs were released, 2.34 to 3.08 % maximum reduction 1.16 to 1.78 % of sugarcane top borer was observed, when 50000 *Trichogramma* parasitized eggs were applied per hectare in the experimental plots. Other doses of *Trichogramma* parasitized eggs showed significant differences over control or untreated. The result showed that maximum (3.83 %) infestation of *Sexcerptalis* present in the experiment was on 15.10.2018 followed by 1.65 % and 0.70 % on 30.09.2018 and 15.09.2018 respectively, when 20000 parasitized eggs/ha were applied. The minimum 1.78% was observed on 15.10.2018 followed 1.16 % and 0.76 % on 30.06.2018 and 15.07.2018 respectively, when 50000 *Trichogramma* parasitized eggs were applied against 3rd brood infestation of top borer.

The data clearly indicate that when the population of *Trichogramma japonicum* increased in the field due to successive releases, the infestation of top borer (*S. excerpptalis*) decreased in experimental plots, where 50000 and 75000 *Trichogramma* parasitized eggs were released, where as in plots where 30000 and 40000 parasitized eggs were applied, infestation increased gradually. The maximum 1.78 % reduction percentage was observed on 15.10.2018 when 50000 *Trichogramma* parasitized eggs were applied and minimum reduction percentage was 2.46 % on 30.06.2018 when 20000 *Trichogramma* parasitized eggs were applied, similar trends was also observed on in 3rd brood infestation of *S. excerpptalis* in the released plots.

Thus it may be concluded from the data that the population of *Trichogramma japonicum* directly proportional to the reduction percentage of *S. excerpptalis*; when the population of *Trichogramma japonicum* was low, infestation of *S. excerpptalis* remained high in 3rd brood infestation but as the concentration of *T. japonicum* parasitized eggs increased gradually the population of *S. excerpptalis* also decreased that indicated the superior performance of *T. japonicum* against top borer in case of 3rd broods infestation in the sugarcane crop. The present finding of the study indicated that the release of 50000 *T. japonicum* parasitized eggs/ha at an interval of 15 days that is 30th June to 15th October is effective against under Western Uttar Pradesh agroclimatic condition.

Table: Utilization of *T. japonicum* against sugarcane top borer (3rd brood) infestation.

S.n.	Incidence per cent (Date wise)								
	Date----	30.6.2018	15.7.2018	30.7.2018	15.8.2018	30.8.2018	15.9.2018	30.9.2018	15.10.2018
T ₁	20000, PE	2.46	1.78	1.37	0.98	0.36	0.70	1.65	3.83
T ₂	30000, PE	1.80	1.24	0.97	0.23	0.33	0.59	1.48	2.38
T ₃	40000, PE	1.50	1.08	0.93	0.23	0.14	0.49	1.40	2.23
T ₄	50000, PE	1.16	0.76	0.761	0.22	0.21	0.40	0.44	1.78
T ₅	75000, PE	2.34	1.76	1.31	0.16	0.08	0.69	1.00	3.01
T ₆	Control	3.33	2.11	1.64	1.31	1.13	1.18	3.89	4.90
	CV	13.964	15.6356	19.9901	80.6921	162.29	53.1616	54.8783	
	SE	0.2074	0.1612	0.1648	0.2988	0.4055	0.2548	0.6388	
	CD	0.4418	0.3436	0.3513	0.6368	Nil	Nil	1.3613	

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