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SCIRPOPHAGA EXCERPTALIS WALKER INFESTATION IN RELATION TO ITS NATURAL PARASITOIDS AND SUGARCANE CULTIVARS IN EASTERN UTTAR PRADESH

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The sugarcane top borer, *Scirpophaga excerptalis* Wlk. infestation in relation to its parasitoids and cultivars were studied in eastern Uttar Pradesh during 1987 to 1989. Of the two egg parasitoids and seven larval parasitoids recorded in the region, the most prevalent were *Telenomus dignus* Gahan and *Isotima javensis* Row., *Rhaconotus scirpophagae* Wlk. and *Glyptomorpha* (=*Stenobracon*) *nicevillei* Bingham as egg and larval parasitoids, respectively. The cumulative parasitisation by prevalent parasitoids could not suppress *S. excerptalis* population buildup through successive generations. Among the locally grown of the commercial cultivars screened, BO 91 was less infested by *S. excerptalis* and was found to be tolerant under field conditions as compared with cultivars; CoS 7918, Co 1148, CoJ 64 and CoS 770. Due to ineffectiveness of the existing natural enemy complex and non availability of multiplication technique of the host top borer and its parasitoids, growing tolerant varieties appeared to be only feasible strategy in the management of *S. excerptalis* in endemic area of the region.

INTRODUCTION

The sugarcane top borer, *Scirpophaga excerptalis* Wlk. is a regular pest of sugarcane in subtropical north India. Wide spread damage by this pest has been recorded in recent years. Increase in the area of sugarcane under well irrigated conditions, the growing of early maturing susceptible varieties, late harvest of the crop and increase in ratoon cropping are some of the contributing factors associated with an increase in the activity of the top borer in the eastern Uttar Pradesh in recent past (Kalra, 1980). A number of natural enemies have also been recorded regularly in different broods of top borer in the region (Anonymous, 1983; Pandey *et al.*, 1994) but their exact role in pest population suppression has not been investigated.

Chemical control of the top borer using the granular insecticides against the critical brood (Sandhu *et al.*, 1974) very often failed to contain the pest due to irregular appearance of specific brood in time and space as affected by the monsoon rains. In the circumstances, this study was carried out to investigate the impact of different natural parasitoids and sugarcane cultivars on field infestation of the top borer.

MATERIALS AND METHODS

The study was conducted during 1987 and 1989 at Sardarnagar (Gorakhpur), Uttar Pradesh on five sugarcane varieties (BO 91, CoS 7918, CoS 770, Co 1148 and CoJ 64) which were being grown commercially.

Observations were recorded on the infestation by top borer in 40 fields selected at random comprising 20 plant and 20 ratoon fields spread over seven villages. In each field of 0.5 ha two diagonals of 25 m were selected at random at two places after leaving the border line. All of the canes falling along these diagonals were examined for healthy and damage one to score the borer incidence.

Egg parasitoids were recorded on egg masses collected from the 1st, 2nd, 3rd and 4th broods of the top borer within the area. Individual egg masses collected from the field were kept in laboratory for emergence of parasitoids. Per cent parasitisation on individual egg basis could be not recorded exactly on numerical parameters due to overlapping pattern of eggs in egg masses and thickfelted hairs which cover the top borer egg masses.

Larval parsitoids were observed by collecting 500 infested sugarcane tops during the earmarked period from the earmarked area at exit hole stage (the stage before the emergence of moths) and kept in laboratory for emergence of parasitoids and recording parasitism. The parsitoids which emerged were got confirmed by the International Institute of Entomology, London.

RESULTS

In the present study, two egg and seven larval parasitoids were recorded in the region parasitising egg masses and larvae of S. excerptalis. Of the two egg parasitoids, *Telenomus dignus* Gahan alone parasitised 17.9 to 47.1% of egg masses in different broods of top borer. The other parasitoid, *Trichogramma chilonis* Ishii was found to parasitise 0.3 - 1.1% of egg masses alongwith *T. dignus* (Table I). In general, parasitisation level of the top borer egg masses remained low in 2nd brood, 18.20% as compared to 47.1, 37.9 and 45.1% in 1st, 3rd and 4th broods, respectively.

Table I : Per cent parasitisation of top borer egg masses in different broods (average of three years).

Top borer brood	Egg masses under observation	Total parasitisation of egg masses (%)	Parsitisation (%) by species	
			T. dignus	*T. dignus* + *T. chilonis*
1st	365	47.12	47.12	
2nd	638	18.15	17.87	0.31
3rd	95	37.89	34.74	1.05
4th	285	45.12	44.10	1.02

Of the larval parasitoids observed, *Isotima javensis* Row., *Rhaconotus scirpophagae* Wlk. and *Glyptomorpha* (=*Stenobracon*) *nicevillei* Bingham were most abundant. The natural parasitisation by *I. javensis*, *R. scirpophagae* and *G. nicevillei* ranged from 0.7 to 14.3, 0.2 to 13.4 and 0.7 to 6.9%, respectively (Table II). The other four parasitoids *Temelucha* sp., *Pseudoshirakia* sp., *Elasmus zehntneri* Ferr. and *Spathius* sp., were found at low level. *Temelucha* sp. remained active during summer months (March to June) and its parasitisation ranged from 0.2 to 6.3%. Its parasitisation was higher in the 1st brood as compared with 2nd and 3rd broods. However, no parasitisation occurred in 4th brood of the top borer. The pararsitisation by *Pseudoshirakia* sp., *E. zehntneri* and *Spathius* sp., ranged from 0.4 to 4.5, 0.2 to 1.8 and 0.4 to 0.5%, respectively, during different broods.

Effect of sugarcane cultivars : The top borer infestation in the commercially grown sugarcane cultivars CoS 7918 and BO 91 ranged from 8.4 to 16.2 and 0.2 to 6.3% in 1987, and 13.0 to 33.8 and 4.2 to 10.0% in 1988, respectively (Table III). Cultivars CoS 770 and CoJ 64 recorded infestation level between 3.6 to 16.3 and 18.1 to 38.9% in 1987 and 1988, respectively. In both years the top borer infestation in susceptible varieties CoS 7918, CoS 770 and CoJ 64

exceeded the economy injury level (6.67%) whereas in the tolerant variety, BO 91 the infestation remained below or near the economy injury level. In 1989 also the tolerant variety BO 91 had the lowest infestation compared with susceptible CoS 7918 and Co 1148.

Table II : Top borer infestation and their parasitisation by different larval parasitoids in different years.

Year/ Brood	Average top borer infestation	Total larval parasitisation (%)	Parasitisation by individual parasitoids (%)						
			I.j.	R.s.	G.n.	Tem.	Pse.	E.z.	Spa.
1987 Ist	7.3	5.4	NR	NR	NR				
2nd	5.3	8.2	1.0	1.9	3.9	1.5	-	-	-
3rd	5.1	16.2	6.5	2.8	6.9	-	-	-	-
4th	12.0	28.3	8.4	13.4	5.6	-	0.9	-	-
1988 1st	13.5	7.1	0.8	-	-	6.3	-	-	-
2nd	11.0	9.0	2.8	5.6	3.7	4.4	-	-	0.5
3rd	13.2	15.2	5.2	5.6	3.7	0.2	0.4	0.3	0.4
4th	18.8	24.2	7.5	10.6	5.6	-	-	-	-
1989 1st	4.9	7.2	1.2	0.2	-	5.8	-	-	-
2nd	3.8	16.5	14.3	1.2	-	0.4	-	-	0.4
3rd	4.3	19.6	7.8	3.9	1.8	-	4.4	0.8	-
4th	10.1	14.4	0.8	6.7	0.7	-	4.5	1.8	-

NR=Not recoreded; I.j.=*Isotima javensis*; R.s.=*Rhaconotus scirpophagae*; G.n.=*Glyptomorpha nicevillei*; Tem.=*Temelucha* sp.; Pse.=*Pseudoshirakia* sp.; E.z.=*Elasmuszehntneri*; Spa.=*Spathius* sp.

Table III : Field infestation of top borer in plant crop of CoS 7918, BO 91, Co 770, CoJ 64 and Co 1148.

Year/ Variety		No. of fields observed	Av. top borer infestation in different broods (%)				
			I	II	III	IV	V
1987	CoS 7918	5	11.8	10.4	8.4	16.2	11.2
	BO 91	4	0.2	2.4	6.3	5.2	4.4
	CoS 770	5	3.7	3.6	12.7	14.9	16.3
1988	CoS 7918	7	13.0	17.4	21.8	33.8	24.5
	BO 91	7	6.4	4.2	10.0	9.3	6.3
	CoJ 64	5	33.1	18.1	28.7	33.8	38.9
1989	CoS 7918	6	0.2	1.0	5.8	11.2	NR
	BO 91	3	3.1	0.7	2.9	3.1	NR
	Co 1148	4	0.7	2.5	7.1	9.8	NR

NR=Not recorded.

DISCUSSION

The findings indicated that of the two egg parasitoids, *T. dignus* and *T. chilonis*, the latter was of little significance in the area. The prevalence of *T. chilonis*, though recorded throughout the country on *S. excerptalis* eggs, always remained at the low level, 4-5% (Gupta, 1954). Perhaps overlapping eggs in the egg masses and thickfelted hairs covering the top borer eggs, besides the size of ovipositor of the parasite are responsible for the low parasitisation in nature.

Samoedi & Wirioatmodjo (1986) also observed that *Trichgramma* exerted only a low influence on the top borer population in Indonesia. Hence, the presence of *T. chilonis* on *S. excerptalis* appears to be of little importance in keeping a check on top borer in subtropical north India.

The cumulative effects of natural enemy complex during different broods and their effect on top borer infestation are shown in Fig. 1. Inspite of an increase in parasitisation levels by different egg and larval parasitoids, there was a gradual build up of the top borer infestation in subsequent broods from the 2nd through the 4th broods. It shows that the existing natural enemy complex failed to suppress the top borer infestation in the region. In Punjab also, though larval parasitisation ranging between 28-60% in 1957-1961, it failed to suppress the top borer incidence which remained at 58 and 85% during the same period (Singh, 1964). Similarly, Samoedi (1988) in the West Java area, Indonesia reported that the natural enemy complex did not suppress the top borer population.

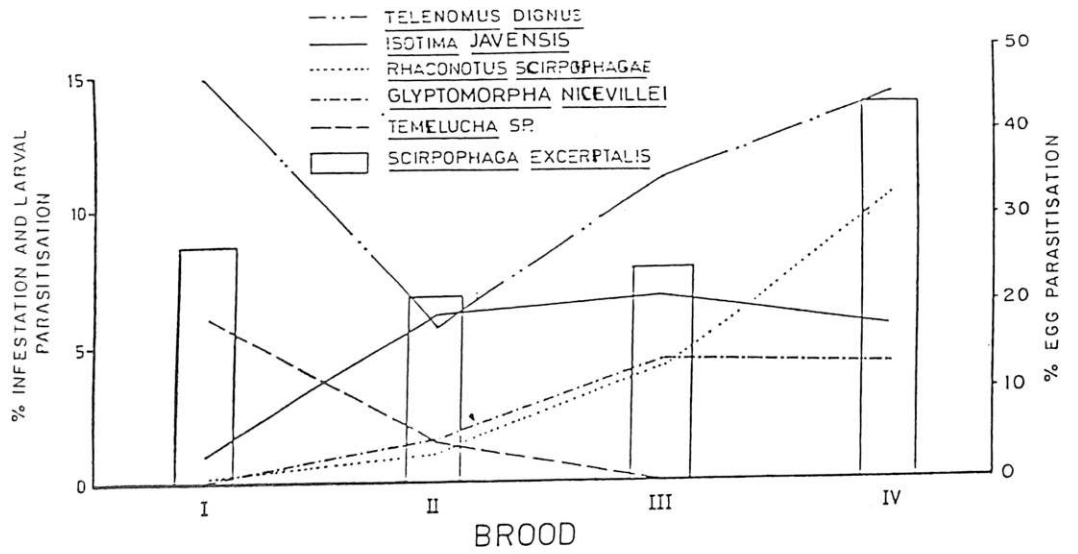

Fig. 1. Per cent infestation of *S. excerptalis* and its important natural parasitoids in different broods around Sardarnagar area (average of three years 1987-89).

A study of the behaviour of the top borer larva in host spindle indicated that the vulnerable stage of top borer accessible to the parasitoids lasts for a very short period which limits the effectiveness of parasitoids in endemic pockets. Moreover, in nature the larval parasitisation by *I. javensis*, *G. nicevillei*, *Temelucha* sp. and *Pseudoshirakia* sp. occurs only after the exit hole formation, by then the plant had already damaged (Singh *et al.*, 1984).

In the absence of culture technique for the mass propagation of eggs and larval parasitoids the opportunity for the biological control of the top borer seems to be remote at present. in the top borer endemic pockets in subtropical India, the growing of tolerant varieties may prove an effective management practice against this pest menace together with the use of granular insecticides like carbofuran and phorate (Sandhu *et al.*, 1974).

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