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Field Performance of *Trichogramma chilonis* Against *Helicoverpa armigera* Under Varying Sowing Time and Varieties of Cotton

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ABSTRACT

The infestation of *Helicoverpa armigera* (Hub.) in two commercial cotton varieties NIAB-86 and NIAB-Karishma in early sown plots was maximum (18.27 and 16.23%) in 4th week of September, respectively. This infestation was suppressed up to 41.16 and 44.87% in NIAB-86 and NIAB-Karishma, respectively by *Trichogramma chilonis* Ishii releases. Whereas, in late sown plots under the same varieties, the infestation was higher (19.32 and 19.30%) and *T. chilonis* parasitoids suppressed the *H. armigera* population by 14.87 and 36.63% in 4th week of September. In September, the temperature and humidity were conducive for survival and activity of both cotton bollworm and parasitoids. It was concluded that *T. chilonis* can successfully be used against suppression of *H. armigera* in cotton.

Key Words: *Trichogramma chilonis*; *Helicoverpa armigera*; Cotton; Egg parasitoid

INTRODUCTION

Cotton is reported to be attacked by some 96 insects and mite pests in Pakistan (Younas *et al*., 1980), *Helicoverpa armigera* being the disastrous one. To achieve its effective control, often high quantities of chemicals have to be applied (Natwick, 1987). Its control is also difficult due to the concealed feeding habits of the its larvae in side the bolls (Toscano *et al*., 1974). Moreover, chemical control not only increases the cost of production but also is dangerous for the health of farmers and for environment.

One of the safe measures to evade such a situation is biological control. It is an alternate or an adjunct to chemical control, and has successfully been used to combat many pests including cotton bollworms, (Cock, 1985). *Trichogramma chilonis* Ishii, for the control of lepidopterous pests is practiced in more than 50 countries and used on 32 million hectares each year (Hassan, 1993). *Trichogramma* spp. have the great potential to control bollworms in cotton IPM (Verma & Shenhmar, 1998)

Encouraged by these findings, study was planned to control the *Helicoverpa armigera* population on two cotton genotypes viz., NIAB-86 and NIAB-Karishma under two sowing dates.

MATERIALS AND METHODS

The present study was conducted at the experimental field of Nuclear Institute for agriculture and Biology (NIAB), Faisalabad by planting two commercial varieties NIAB-86 and NIAB-Karishma under two sowing dates and three replicates in a Randomized Complete Block Design in year 2002. Row to row, and plant to plant distance were 0.762 m and 0.305 m-0.457 m, respectively.

The data on per cent cotton bollworm (*H. armigera*) infestation per plant from flowers, buds, squares and bolls on weekly basis was collected from July to October. In each treatment, five plants were selected, i.e., one plant per row at random for recording the pest population. The plants selected randomly were tagged to avoid repetition. The egg parasitoids *T. chilonis* were mass cultured on the eggs of *Sitotroga cerealella* in Entomology Laboratory of same institute. These parasitoid eggs were transported to the experimental area few hours before their emergence. Tricho cards were attached to the ventral sides of cotton leaves for release of parasites.

Egg parasitoid cards *T. chilonis* were installed in each replicate @ 6-8 cards having 24000 parasitoids approximately. Infestation of *H. armigera* was collected before and after a week of card installation. The data of bollworm were converted into per cent infestation per plant and analyzed by using analysis of variance to test the treatment differences by using DMR test at 5% probability level (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

The results have been presented in Tables I and II. The infestation of *H. armigera* Hub. in early sown NIAB-86 cultivar before parasitoid releases was minimum in July and gradually reached maximum up to 18.27% in 4th week of September, parasitoid caused suppression in bollworm infestation up to 50% in 3rd week of July. Almost the same trend was observed on early sown NIAB-Karishma as the infestation of *H. armigera* was more in September and less

Table I. Relative percent infestation of American bollworm per plant on different observation weeks recorded before and after installation of parasitoids cards in two early sown cotton varieties

VARIETY		OBSERVATION WEEKS													
	Parasitoid Cards	July			August				September			October		Mean
		2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	
NIAB-86	Before	3.23	3.60	4.38	4.93	5.45	5.94	6.60	8.06	15.92	15.45	18.27	11.35	10.33	8.73
	Installation	i	hi	gh	fg	fg	ef	e	d	b	b	a	c	c	
	After	1.93	1.80	2.27	3.17	2.93	3.73	3.72	5.07	10.69	9.50	10.75	6.42	6.07	5.24
	Installation	d	d	d	cd	d	cd	cd	bc	a	a	a	b	b	
NIAB-	Before	3.18	3.73	4.28	4.86	5.44	5.95	6.46	8.07	14.45	15.65	16.23	11.26	10.27	8.45
Karishma	Installation	k	jk	ij	hi	gh	fg	f	e	b	a	a	c	d	
	After	2.00	2.11	2.67	2.58	3.19	3.75	3.44	5.75	8.98	8.70	8.95	7.34	7.24	5.13
	Installation	e	de	de	de	de	d	de	c	a	ab	a	ab	bc	

Table II. Relative percent infestation of American bollworm per plant on different observation weeks recorded before and after installation of parasitoids cards in two late sown cotton varieties

VARIETY		OBSERVATION WEEKS													
	Parasitoid Cards	July			August				September			October		Mean
		2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	
NIAB-86	Before	2.62	3.50	3.76	4.41	4.83	5.32	6.25	7.47	17.40	19.38	19.32	10.41	9.66	8.80
	Installation	k	j	j	i	h	g	f	e	b	a	a	c	d	
	After Installation	1.55	1.97	2.17	2.69	3.13	3.41	3.82	4.22	9.50	10.13	10.65	6.55	5.42	5.02
		j	ij	hij	ghi	fgh	efg	ef	e	b	ab	a	c	d	
NIAB-	Before	2.60	3.3	3.7	4.37	4.75	5.30	6.15	7.33	17.50	18.22	19.30	10.23	9.50	8.64
Karishma	Installation	i	1hi	1gh	fg	f	ef	e	d	b	b	a	c	c	
	After Installation	1.59	2.02	2.45	2.79	3.09	3.55	3.59	4.55	9.58	10.77	12.23	6.40	5.56	5.25
		h	gh	fgh	fgh	fg	ef	ef	de	b	b	a	c	cd	

Means sharing common letters do not differ significantly from each other at 5% probability.

in July i.e., 3.18 and 16.23%, respectively. The parasitoids effectively suppressed the bollworm incidence by parasitizing eggs, which declined cotton bollworm infestation. In late sown NIAB-86, infestation was also maximum in September while its intensity higher as compared to that of early sown having 19.38% infestation. In the mean time, *T. chilonis* is less effective having 47.73% suppression of bollworm incidence. When NIAB-Karishma in late sown was concerned here also more infestation as compared to early sown and was 19.30% in September and here parasitoids reduced the population of bollworm up to 45.26%. It is obvious that *H. armigera* infestation was more on late sown cultivars as compared to early ones. Stinner *et al*. (1974) reported similar results in parasitism with *T. chilonis* of *Heliothis* eggs averaging from 30-80%.

Temperature and humidity in field conditions also favoured the parasitoid efficacy. The present results revealed best performance of *T. chilonis* in the month of September where 32°C and 65% R.H. was prevailing. Biever (1972) reported increased parasitism of *T. chilonis,* when temperature increased from 20-35°C and decreased at 40°C. Gross (1988) concluded that *T. pretiosum* best survived at 27–32°C with 60-80% R.H. So, temperature and humidity was found to have a profound effect on parasitoids efficiency.

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