



## DISPERSAL AND PARASITIZING POTENTIAL OF TRICHOGRAMMA CHILONIS ISHII IN EARLY AND LATE SOWN COTTON VARIETY NIAB-KARISHMA

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Egg parasitoids, *Trichogramma chilonis* have enormous potential to control lepidopterous pests of many crops especially the bollworms of cotton. In the present studies dispersal ability of laboratory reared *T. chilonis* to varying distance ranging from one to five meters and its percent parasitization to its fictitious host (*S. cerealella*) eggs placed in early and late sown (fifteen days interval) cotton variety NIAB-Karishma was evaluated at the NIAB, field Faisalabad during 2000-2001 crop season. Results showed that percent parasitization to host eggs decreased with the increase in distance. More parasitization was recorded after 24 than that of 48 hrs at all distances from the site of parasitoid released. Efficiency of parasitoids in terms of percent parasitization increased during the months of July and September.

**Keywords:** Trichogramma, Searching, NIAB-Karishma.

### 1. Introduction

For biological control of lepidopterous pests, *Trichogramma* has been considered as one of the important parasitoids for more than 100 years. Flanders in 1930s found the activity of *Trichogramma* but quickly dissipated in the west with the rise of chemical insecticides as it was the rising era of chemicals for killing harmful insects [12]. In 1960s, Europeans and Americans restarted research on *Trichogramma* and in 1970s began its mass rearing and releases [2,9]. Parasitoid releases in China, Switzerland, Canada and former USSR showed a level of 60-80% parasitism with reduction in damage upto 77-92% on crops like sugarcane, corn and cotton [7]. *T. chilonis* showed an immediate effect not only on the target pests but possibly on other insect population as well [17]. It was concluded that it can be more effective when its parasitizing potential and searching ability is well adapted in the field. It was observed that the dispersal of *Trichogramma* in fields upto 400 ft within two days having 33-81% parasitism of *Heliothis* eggs [3,14]. Among the environmental factors, temperature, humidity and wind have long been known to influence the dispersal of insects [8]. Temperature thresholds have been identified for flight initiation and flight maintenance in many insect species [15].

Cotton, contributes about 59% share to total exports and also meet the domestic need of fiber, food and fuel [1]. It has been affected by 96 insects and mites causing 40-50 percent yield losses. Among these, bollworms of the order lepidoptera are the most harmful [8]. In the present studies, the performance of *T. chilonis* an egg parasitoid of bollworms in respect of its dispersal and parasitizing potential in cotton field of NIAB-Karishma sown at two different dates were evaluated for future IPM strategies.

### 2. Materials and Methods

The experiment was conducted at experimental farm of Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad. Commercial cotton variety NIAB-Karishma was grown as early and late season crop having fifteen days interval. The experiment was laid down in Randomized Complete Block Design (RCBD) with three replications. Data were recorded on weekly basis from July to October 2000. Egg parasitoid, *Trichogramma chilonis* cards having approximately three thousand eggs/card were taken from, Biological Control Lab. of NIAB, Faisalabad. These Trichocards were installed randomly at five different locations in two crop season respective treatments to record dispersal ability and parasitizing potential

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Table 1. Percent parasitization of host eggs by parasitoid, *T. chilonis* in early sown NIAB-Karishma after 24 and 48 hrs release of parasitoids at various distances.

	July (weeks)			August (weeks)				September (weeks)				October (weeks)		Means
	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	
1 m														
24 hrs	21.0	23.0	14.0	13.3	15.0	14.6	10.0	10.6	20.0	19.0	20.0	20.3	21.0	17.06
48 hrs	22.3	20.6	13.6	12.0	13.0	14.0	10.3	10.0	18.0	18.0	18.6	19.3	22.3	16.30
	ab	a	c	c	c	c	d	d	b	b	b	ab	ab	
	a	ab	cd	cde	cde	c	de	e	b	b	b	ab	a	
2 m														
24 hrs	15.0	16.0	10.0	9.0	10.0	11.3	8.0	7.0	15.0	13.6	13.0	15.0	14.0	12.06
48 hrs	14.0	14.3	10.0	8.3	9.0	10.0	9.0	8.3	13.0	13.3	12.3	14.3	13.3	11.46
	ab	a	de	def	de	bc	ef	f	ab	abc	bc	ab	ab	
	a	a	bc	c	c	bc	c	c	a	a	ab	a	a	
3 m														
24 hrs	10.0	12.3	7.0	5.0	7.0	8.3	5.3	6.3	10.0	9.0	8.3	11.0	10.0	8.42
48 hrs	9.0	10.6	7.3	5.6	5.6	7.0	6.3	5.3	8.3	9.3	8.6	10.0	13.0	8.14
	ab	a	cd	d	cd	bc	d	cd	ab	bc	bc	ab	ab	
	bcde	ab	bcde	de	de	bcde	cde	e	bcde	Bcd	bcde	abc	a	
4 m														
24 hrs	8.3	7.6	5.0	4.0	5.0	5.6	5.3	5.0	7.0	7.3	6.0	7.0	7.3	6.18
48 hrs	9.0	8.0	5.3	3.3	5.6	6.6	4.3	3.3	6.0	6.0	5.6	5.6	9.0	5.96
	a	ab	bc	c	bc	abc	bc	bc	ab	ab	abc	ab	ab	
	a	ab	bcd	d	bcd	abc	cd	d	bcd	bcd	bcd	bcd	a	
5 m														
24 hrs	5.0	7.0	3.0	4.0	3.0	4.6	2.6	2.0	5.0	5.3	6.6	7.0	7.3	4.80
48 hrs	4.0	6.3	4.0	3.6	3.3	3.6	3.3	2.6	5.6	5.0	5.0	5.3	6.0	4.43
	ab	a	bc	bc	bc	ab	bc	c	ab	ab	a	a	a	
	abcd	a	abcd	bcd	cd	bcd	cd	d	abc	abcd	abcd	abc	ab	

Table 2. Percent parasitization of host eggs by parasitoid *T. chilonis* in late sown NIAB-Karishma after 24 and 48 hours release of parasitoids at various distances.

	July (weeks)			August (weeks)				September (weeks)				October (weeks)		Means
	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	
1 m														
24 hrs	17.0	19.0	8.0	5.3	7.0	8.0	6.0	6.0	15.3	12.6	12.6	17.0	18.0	11.67
48 hrs	16.3	18.0	7.6	4.3	8.0	7.0	5.3	5.3	15.0	13.6	14.3	16.3	19.0	11.53
	ab	a	d	e	de	d	de	de	b	c	c	ab	a	
	bc	ab	ef	h	e	efg	gh	gh	cd	d	cd	bc	a	
2 m														
24 hrs	12.6	14.3	6.0	4.3	5.3	6.0	6.0	4.3	13.6	10.0	11.0	12.6	12.6	9.12
48 hrs	13.0	12.6	6.3	3.3	6.0	5.0	4.3	5.3	13.3	10.3	9.6	8.6	14.0	8.58
	ab	a	d	d	d	d	d	d	a	c	bc	ab	ab	
	a	a	c	d	c	cd	cd	cd	a	b	b	b	a	
3 m														
24 hrs	8.0	10.0	11.3	3.3	5.0	5.0	4.0	3.3	9.3	7.0	7.0	8.0	8.6	6.36
48 hrs	7.3	9.0	5.3	2.0	4.3	4.3	2.6	3.0	8.0	6.0	7.3	7.3	10.0	5.87
	ab	a	d	d	cd	cd	d	d	ab	bc	bc	ab	ab	
	bcd	ab	de	g	ef	ef	fg	fg	abc	cde	bcd	bcd	a	
4 m														
24 hrs	6.0	7.0	3.3	2.0	2.6	3.0	4.0	2.0	7.0	6.0	6.0	5.0	6.0	4.60
48 hrs	5.3	6.0	3.0	2.0	3.3	2.3	2.3	2.3	6.0	4.3	6.0	6.0	7.0	4.03
	abc	ab	de	e	e	de	cde	e	a	abc	abc	bcd	abc	
	abc	ab	de	e	cde	de	de	de	ab	bcd	ab	ab	a	
5 m														
24 hrs	4.3	5.0	3.6	2.0	3.0	3.0	2.0	2.0	5.3	3.0	3.3	4.3	5.6	3.56
48 hrs	3.3	4.3	3.3	1.3	2.0	2.0	2.3	3.6	4.3	3.0	4.3	4.0	6.0	3.36
	ab	a	ab	b	ab	ab	b	b	a	ab	ab	ab	a	
	bc	ab	bc	c	bc	bc	bc	b	ab	bc	ab	ab	a	

of the emerged adult parasitoids. For these parameters blank unparasitized *Sitotroga cerealella* eggs, pasted on cards were used at the distance of 1, 2, 3, 4 and 5 metres from pre-installed parasitoid cards by using single parasitoid card to a single blank card for respective distance. The *S. cerealella* cards were collected after 24 and 48 hours releases of parasitoids. *S. cerealella* cards for each distance were brought to laboratory and checked under stereomicroscope to determine percent parasitism by the parasitoids that travelled a test distance in the field. The data were interpreted by using DMR-test to differentiate treatment means [13].

### 3. Results and Discussion

Percent parasitization of host eggs by parasitoid *T. chilonis* in early sown NIAB-Karishma after 24 hrs release at one metre distance was maximum (23%) during 3rd week of July followed by 2nd week of July (21%) and then in the month of October (20 - 21%). In August and September parasitization was reduced from 10 to 20% due to rise in temperature and humidity. There was a gradual decrease in parasitism when distance was increased from one to five metres. However, the maximum parasitism was 16, 12.3, 8.3 and 7.3% at 2, 3, 4 and 5 metres distance respectively (Table 1). Results revealed that percent parasitization of host eggs decreased with more flight and remote presence of host eggs. When percent parasitization of host eggs was observed after 48 hrs release of parasitoids, somewhat less percent parasitization was recorded as compared to that of 24 hrs release. The reason might be poor/old age of the emerged parasitoids (Table 1). A cumulative parasitization of 44% on host eggs after 24 and 48 hrs released parasitoids was attained which is quite sufficient in suppression of bollworm complex in cotton fields.

In late sown NIAB-Karishma (Table 2) almost the same trend of percent parasitization of host eggs by *T. chilonis* from July to October but lesser in degree at all distances and after both 24 and 48 hrs release was recorded compared to that in early sown crop (Table 1). The reason might be the rise in temperature, reduced vigour in parasitoids on the difficulty in mobility of parasitoids in more grown-up crop of early season. Cumulative parasitization of 37% total both after 24 (19%) and 48 hrs (18%) release is less than that of 43.6% in early sown crop. It is concluded that parasitoids efficiency decrease by

the increase in distance. Therefore, to get high parasitization of hosts more number of parasitoids should be released in the field.

Our findings regarding parasitization upto 43.6% are in the line of studies made by Stinner *et al.* [14] who got 30-81% parasitism with *T. chilonis* on *Heliothis* eggs. According to Lewis *et al.* [6], *Heliothis zea* eggs were parasitized with *Trichogramma* spp., in the range of 30-75%. Verma and Shenhmar [16] reported that *T. chilonis* are the most common egg parasitoids of *Earias* spp. with 30 and 30-35% parasitization during September-October and October-November respectively. Rasool *et al.*, [11] reported 36.63% parasitization of *Trichogramma chilonis* on the eggs of *Helicoverpa armigera* in field conditions. Temperature and humidity also had a significant effect on the dispersal activity and parasitizing potential of the parasitoids. Gross [5] reported the effects of temperature and relative humidity (R.H.) during development of *T. pretiosum* and concluded that parasitoids best survived at 27-32°C with R.H. 60-80% while population of parasitoids decreased at 38-43°C with R.H. above 80%. In the present studies the mean temperature in the months of July, August, September and October was 36, 37.5, 36 & 35°C with R.H. 75.3, 70.6, 69.8 & 70% respectively which are quite suitable for dispersal and parasitization activity of *Trichogramma* in cotton fields.

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