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Dispersing and Parasitizing Ability in *Trichogramma chilonis* Ishii in Early and Late Sown Niab-86 Cotton Variety

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Egg parasitoids *Trichogramma chilonis* were released in cotton by planting after early and late sown NIAB-86 to find out dispersing and parasitizing potential. Observations on percent parasitization were taken at distances of 1-5 meters from fixed releasing sites. It was recorded that the dispersal of *T. chilonis* was physically affected by crop growth and climatic conditions. The maximum dispersal and parasitization was recorded in late September and in early October. Intensity of parasitization was more after 24 h as compared to 48 h post release of parasitoids.

Key words**:** Dispersal, *Trichogramma chilonis*, Parasitization, Cotton.

Introduction

Egg parasitoids, *Trichogramma* spp. have been proved very beneficial as biological control agent in cotton crop (Ahmad *et al* 1998). Their releases in many crops are being made since the past 25 years. However, trials with these parasitoids prior to 1975 were aimed to control lepidopterous pests only in sugarcane and corn crops. Afterwards, from 1975 to 1985 these were applied for the control of cotton, cabbage, apple and tomatoe's pests etc. (King *et al* 1986). Currently, their inundative releases are being practiced in more than 50 countries and on an area of more than 32 million hectares to control lepidopterous pests every year around the world (Hassan 1993). Use of *Trichogramma* spp. is therefore, considered an effective and alternative mean of pest control, while comparing with other traditional approaches of pest control (Rehman *et al* 2003).

Dispersal ability of an insect is a fundamental element in its life history and ecology, is often judged by its range of flight. Dispersal can be hindered by individual itself and environmental factors that often interact together (Lidicker and Stenseth 1992). Parasitoids prove more effective with their dispersal and searching parasitizing ability is well adapted in the field. It was observed that the dispersal of *T. chilonis* is affected by the changes in the environmental conditions (Biever 1972; Lewis *et al* 1976).

The objective of the present studies was to find out the performance of *T. chilonis* in respect of its dispersal and parasitizing potential on a commercial cotton variety NIAB-86 sown on two different times.

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Materials and Methods

A commercial cotton variety NIAB-86 was planted on two different sowing times, i.e. early and late with fifteen days interval. Fertilizer application to crop; irrigation and all other agronomic practices were same as per crop requirement in both plots i.e. in early and late sown conditions. Three replications were made for each sowing time under Randomized Complete Block Design (RCBD). The *T. chilonis* strain used in the present experiment was collected from the parasitized eggs of *Helicoverpa armigera* (Lepidoptera; Noctuidae) on cotton crop in 2000 at entomological field area of NIAB, Faisalabad. Parasitoids have been reared in biological control laboratories of NIAB at $25 \pm 2^{\circ}$C, $75 \pm 5\%$ relative humidity for almost 70 generations on *S. cerealella* (Lepideptera; Gelechiidae) eggs. Five Tricho-cards, each having three thousands *T. chilonis* adults ready to emerge from host eggs and they were installed at five different locations in cotton field. Blank unparasitized *S. cerealella* host eggs, pasted on cards, were exposed to Tricho-cards at the distance of 1, 2, 3, 4 and 5 meters by using single parasitoid card to a single blank card for respective distances. Three repeats were made to each set of treatment covering all distances. The host cards were collected after every 24 and 48 h after post installation of Tricho-cards. The released parasitoid cards were checked under stereo binocular microscope to determine percent parasitization of eggs by the parasitoids that have traveled the distance in the field. Data was recorded in cotton field on weekly basis from July to October 2000 interpreted by using DMR-test to differentiate treatment means (Steel and Torrie 1984).

Table 1

Percent parasitization of host eggs by parasitoid *T. chilonis* in early sown NIAB-86, after 24 and 48 h releases at various distances

Distance	July (weeks)			August (weeks)				September (weeks)				October (weeks)		Means
	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	
1 meter														
24 h	23.0 [a]	24.6 [a]	16.3 [b]	14.6 [b]	15.6 [s]	16.0 [b]	12.6 [b]	15.6 [b]	21.6 [a]	22.3 [a]	21.3 [a]	24.0 [a]	23.0 [a]	19.06
48 h	24.6 [ab]	25.6 [a]	16.0 [de]	13.0 [ef]	11.3 [f]	17.0 [d]	14.0 [def]	14.0 [def]	21.0 [c]	20.0 [c]	20.6 [c]	23.6 [abc]	21.6 [bc]	18.63
2 meters														
24 h	17.0 [ab]	19.0 [a]	13.0 [c]	11.6 [c]	13.0 [c]	13.3 [c]	11.6 [c]	12.0 [c]	18.3 [ab]	17.3 [ab]	17.0 [ab]	19.0 [a]	16.0 [b]	15.21
48 h	16.6 [a]	17.0 [a]	16.6 [b]	10.3 [b]	11.6 [b]	12.6 [b]	12.0 [b]	11.3 [b]	15.6 [a]	16.3 [a]	16.0 [a]	17.6 [a]	18.0 [a]	14.34
3 meters														
24 h	12.3 [b]	14.3 [a]	9.0 [cd]	8.0 [de]	7.0 [ef]	10.0 [c]	6.0 [f]	7.0 [ef]	12.0 [b]	13.0 [ab]	10.0 [e]	13.0 [ab]	11.6 [b]	10.24
48 h	12.6 [a]	12.3 [a]	7.3 [c]	6.3 [c]	7.3 [c]	9.0 [b]	7.0 [c]	6.3 [c]	11.6 [a]	11.0 [a]	11.0 [a]	11.0 [a]	12.6 [a]	9.63
4 meters														
24 h	10.0 [ab]	10.0 [b]	5.3 [e]	6.0 [de]	5.0 [e]	7.0 [cde]	6.0 [de]	5.0 [e]	8.0 [bcd]	9.6 [abc]	8.0 [bcd]	9.0 [abc]	10.6 [a]	7.63
48 h	10.3 [a]	9.6 [ab]	6.0 [cde]	6.0 [cde]	5.6 [de]	7.0 [bcd]	6.3 [cde]	4.6 [e]	7.3 [abcd]	8.6 [abc]	8.0 [abcd]	8.3 [abc]	9.3 [ab]	7.45
5 meters														
24 h	6.3 [abcd]	7.6 [bc]	4.0 [ef]	4.6 [def]	4.3 [def]	5.6 [cde]	4.0 [ef]	3.0 [f]	6.0 [bcde]	8.0 [ab]	8.3 [a]	8.3 [a]	7.3 [abc]	5.92
48 h	6.0 [abc]	6.6 [ab]	5.0 [abc]	5.3 [c]	5.0 [abc]	6.3 [ab]	4.0 [bc]	3.0 [c]	6.3 [ab]	6.3 [ab]	6.3 [ab]	7.3 [a]	7.6 [s]	5.59

N.B; Means sharing same alphabets in each column are statistically non-significant at 5% level of probability (P>0.05), h; Hours.

Table 2

Percent parasitization of host eggs by parasitoid *T. chilonis* in late sown NIAB-86, after 24 and 48 h releases at various distances

Distance	July (weeks)			August (weeks)				September (weeks)				October (weeks)		Means
	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	
1 meter														
24 h	20.0 [b]	22.3 [a]	11.0 [e]	8.0 [f]	10.0 [ef]	13.6 [d]	10.0 [ef]	9.0 [ef]	18.0 [bc]	17.0 [c]	17.0 [c]	19.0 [bc]	19.0 [bc]	14.90
48 h	18.0 [b]	20.6 [a]	10.0 [de]	7.0 [f]	8.6 [ef]	11.0 [d]	9.0 [def]	7.0 [f]	16.3 [bc]	15.3 [c]	18.3 [b]	18.0 [b]	18.3 [b]	13.64
2 meters														
24 h	15.6 [b]	18.3 [a]	8.0 [de]	6.0 [e]	7.0 [de]	8.6 [d]	7.0 [de]	7.0 [de]	14.0 [ab]	12.6 [c]	12.6 [c]	14.0 [bc]	14.3 [bc]	11.15
48 h	14.3 [ab]	16.3 [a]	7.0 [de]	5.0 [e]	8.0 [d]	8.3 [d]	6.0 [de]	5.0 [e]	12.3 [bc]	11.0 [c]	14.3 [ab]	12.3 [bc]	14.0 [ab]	11.15
3 meters														
24 h	8.6 [b]	11.0 [a]	6.0 [c]	4.3 [c]	6.0 [c]	6.0 [c]	5.0 [c]	5.0 [c]	10.0 [ab]	9.0 [b]	9.0 [b]	10.0 [ab]	10.0 [ab]	7.68
48 h	10.0 [b]	12.3 [a]	5.0 [c]	3.6 [c]	5.0 [c]	5.0 [c]	4.6 [c]	4.3 [c]	9.0 [b]	8.0 [b]	10.0 [b]	9.0 [b]	9.0 [b]	7.29
4 meters														
24 h	7.0 [ab]	8.0 [a]	4.3 [cd]	3.0 [d]	3.0 [d]	4.3 [cd]	3.0 [bcd]	3.0 [d]	8.0 [a]	6.0 [abc]	7.0 [ab]	7.0 [ab]	7.0 [ab]	5.43
48 h	8.0 [a]	7.0 [ab]	3.3 [d]	3.3 [d]	3.3 [d]	4.0 [d]	4.3 [cd]	3.3 [d]	6.0 [bc]	5.0 [cd]	8.0 [a]	8.0 [a]	8.0 [a]	5.50
5 meters														
24 h	6.0 [a]	6.0 [a]	3.3 [bcd]	2.3 [d]	3.3 [bcd]	3.3 [bcd]	2.6 [cd]	3.3 [cd]	5.6 [ab]	5.0 [abc]	6.0 [a]	5.0 [abc]	5.0 [abc]	4.31
48 h	5.0 [ab]	5.6 [a]	3.0 [bc]	2.0 [c]	2.0 [c]	4.0 [abc]	2.3 [c]	2.3 [c]	4.3 [abc]	4.3 [abc]	5.0 [ab]	5.3 [ab]	5.3 [ab]	3.87

N.B; Means sharing same alphabets in each column are statistically non-significant at 5% level of probability (P>0.05), h; Hours.

Results and Discussion

The result (Table 1) showed that the rate of host eggs parasitization was reduced by the increase in the distance in between host eggs and sites of parasitoids released after both 24 to 48 h collections in early sown NIAB-86. However, parasitization was high at one meter distance (24.6%) during the 3rd week of July followed by 1st and 2nd week of October (24 and 23%, respectively). Similar trend of parasitization at 2,3,4 and 5 meters distance was recorded during weeks from July to October. Parasitization of host eggs by parasitoids after 48 h was comparatively less as compared to that of 24 h observation at all distances from July to October.

Similar parasitization trend in late sown crop was recorded as that of early sown with the exception of less percentage of parasitization Table 2. The reason might be differences in the physical grown up conditions of crop (early sown) which gave some environmental protection to the parasitization of host eggs. Percent parasitization of host eggs after 48 h was less than that of 24 h aged. The results, showed that with the passage of time i.e. post-release the parasitizing ability was decreased. Moreover, by increase in distance parasitization decreasd. To sum up parasitization both after 24 and 48 h during 3rd week of July, 42.2% parasitization was attained which was low as compared to that of 50.2% in early sown crop. This increase in percent parasitization might also be due to good crop vigour which provided more and better nectaries to parasitoids as a source of food.

Results regarding percent parasitization by *T. chilonis* up to 52.2% in the present studies are in line with that of 30-81% parasitization with *T. chilonis* on *Heliothis* eggs by Stinner *et al* (1974). According to Lewis *et al* (1976), eggs of *Heliothis zea* were parasitized with *Trichogramma* spp., in range of 30-75%. Verma and Shenhmar (1988) reported that *T. chilonis* parasitized eggs of *Earias* spp. in range of 30 and 30-35% in September-October and October-November, respectively. These investigations are in agreement with present findings. Temperature has a sound effect on the dispersal activity and parasitizing potential of parasitoids. High temperature, recorded during August and early September in the present studies, caused decrease in parasitization. However, Biever (1972) reported that rate of searching by female *T. chilonis*, *T. evanescens* and *T. semifimatum* increased as the temperature was increased from 20 to 35˚C and decreased at 40˚C. To avoid high temperature, parasitoids adults adopted themselves in micro habitat of cotton field to escape successfully from high temperature. Therefore, to reduce parasitoids mortality the time of application of parasitoids should be done when temperature of soil and plant surface beyond 37˚C (Lopez and Morrison 1980). High temperature is causing mortality while low temperature causing diapause in *Trichogramma* parasitoids (Garcia *et al* 2002).

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