



## Influence of wind direction on parasitization behaviour of *Trichogramma chilonis* Ishii (Hymenoptera: Trichogrammatidae) in brinjal ecosystem

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**ABSTRACT:** Investigations were carried out to assess the impact of wind direction on parasitization behaviour of *Trichogramma chilonis* Ishii on brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee indicated maximum number of parasitization in windward direction. Findings indicate importance of air stream in the parasitization behaviour of *T. chilonis* in field condition.

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**KEY WORDS:** Biocontrol, *Leucinodes orbonalis*, *Trichogramma* parasitoid, wind

Trichogrammatids are the most widely used egg parasitoids against lepidopterous pests on a wide range of agricultural and forest crops across the world for more than 70 years (Li, 1994) as inundative releases. More than 25 species reported in India, *Trichogramma chilonis* Ishii occurs widely all over the country throughout the year. Farmers in Tamil Nadu are known to use *Trichogramma* egg parasitoid for shoot and fruit borer *Leucinodes orbonalis* management. It is well known that movement activity of *Trichogramma* species may depend on environmental conditions, primarily temperature (Fournier and Boivin, 2000), host density, release rates (Singh and Jalali, 1992), host plant density, wing size (Kolliker- Ott *et al.*, 2004) and sex (Canto-Silva *et al.*, 2006). This study was

conducted to understand the orientation behaviour of *T. chilonis* influenced by wind direction to decide on parasitoid release points in an inundative release during wind influence situation for the management of brinjal shoot and fruit borer (BSFB) in brinjal ecosystem.

### Orientation behaviour of *T. chilonis* in brinjal field

#### 1. Sentinel Egg Card Technique

A field trial conducted *kharif* 2017 in Agricultural College and Research Institute, Killikulam in Thoothukudi district using brinjal variety KKM 1. The experiment was conducted in supervisory trial. The experiment was organized on brinjal crop in vegetative stage 25 DAT having shoot damage

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caused by *L. orbonalis* to the extent of more than 10 per cent. *T. chilonis* orientation behaviour study conducted adopting sentinel egg card technique (Niranjana, 2015). *Corcyra* egg card having approximately 0.0625 cc parasitized eggs fixed in centre surrounded by each 0.0125 cc unparasitized *Corcyra* egg placed in 60 cm and 120 cm distance in all four directions constituted an experimental unit. Five such units were arranged randomly in half acre of the cropped area. A minimum of more than five meter distance was maintained between the experimental units. After three days of parasitoid release, the baited cards were brought to the laboratory and the parasitized eggs (blackened eggs) were counted. Data was compared based on the number of parasitized eggs in each bait cards. Weather data *viz.*, wind direction and wind speed corresponding to the experimental period recorded in Meteorological unit of Agricultural College and Research Institute, Killikulam was used for further interpretation. Experiment was repeated eight times and the data were compared observation week wise with wind direction that prevailed.

## 2. On field host *L. orbonalis* egg in brinjal crop

To understand the parasitization behaviour of *T. chilonis* on the field host *L. orbonalis* eggs *insitu* in field condition, the parasitoid was released at the rate of 1cc per hectare in brinjal crop in the vegetative stage having a shoot damage caused by *L. orbonalis*. The extent of damage observed was more than 20 per cent. The *L. orbonalis* eggs (10 eggs) were located by using hand lens and tagged with bright colour tags before the parasitoid release for easy identification. *Corcyra* egg card having approximately 0.0625 cc parasitized eggs were placed in the prefixed parasitoid release spots. After three days of parasitoid release, the parasitized eggs were counted and brought to the laboratory for further observation. Data was compared based on the number of parasitized eggs in each direction and the parasitoid emergence, the species identity of *T. chilonis* was established based on the taxonomic features (Niranjana, 2015). Experiment was repeated six times. Weather data *viz.* wind direction and wind speed corresponding to the experimental period recorded in Meteorological unit

of Agricultural College and Research Institute, Killikulam was used for further interpretation. Experiment was replicated five and repeated seven times and data along with direction prevailed during the parasitoid release period was tabulated observation wise.

### Orientation behaviour of *T. chilonis* under field condition (Sentinel Egg Card Technique)

The result of the field experiment conducted using sentinel egg card technique is furnished in Table 1. During first observation conducted during 39<sup>th</sup> std. week, the mean level of parasitization ranged from 20 per card in South direction and 47 in North direction, during this period wind ward direction was in South. During 45<sup>th</sup> std. week (Observation II), a maximum parasitization was recorded in North direction (20.20 eggs/ card) and a minimum parasitization was observed in East direction (9.20 eggs/ card) and during this period wind ward direction was in South. During observation III (46<sup>th</sup> std. week) the mean level of parasitization ranged from 7.80 per card in South direction and 35.80 eggs per card in West direction and during this period the wind ward direction was in East. In the observation conducted during 48<sup>th</sup> std. week, the wind ward direction was remained same, a maximum level of parasitization was recorded in West direction (33.00 eggs/ card) and a minimum level of parasitization was observed in South direction (15.80 eggs/ card). During the subsequent observation V (6<sup>th</sup> std. week), the mean level of parasitization ranged from 6.80 eggs per card in North direction and 18.80 eggs per card in South direction. During this period the wind ward direction was in North. During 6<sup>th</sup> observation (8<sup>th</sup> std. week), a maximum parasitization was recorded in East direction (19.60 eggs/ card) and a minimum parasitization was observed in South direction (9.60 egg/ card) and during this period the wind ward direction was in West. During observation VII (10<sup>th</sup> std. week), the peak level of parasitization was recorded in East direction (15.40 eggs/ card) and minimum level of parasitization was observed in South direction (8.00 eggs/ card). In the final observation repeated during 13<sup>th</sup> std. week, a maximum level of parasitization was recorded in

North direction (10.80 eggs/ card) and a minimum level of parasitization was recorded in West direction (8.00 eggs/ card), during this period the wind ward direction was in South.

### Orientation behaviour of *T. chilonis* on *L. orbonalis* eggs in-suit under field condition

Based on the above result of the preliminary studies conducted on the orientation behaviour of *T. chilonis*, involving laboratory host egg (*Corcyra* egg) a subsequent experiment was conducted to

assess the orientation behaviour of *T. chilonis* on the *L. orbonalis* in field condition. Result is presented in Table 2.

During the first observation (18<sup>th</sup> std. week), the mean level of parasitization recorded ranged from 1.60 eggs in South direction and 3.60 eggs in East direction, during this period wind ward direction was West. During observation II made in 19<sup>th</sup> std. week, maximum level of parasitization was recorded in West direction (2.20 eggs) and a minimum level of parasitization was observed West direction (0.60

Table 1. Extend of parasitization of *T. chilonis* in brinjal field influence by wind direction (Sentinel Egg Card Technique)

Direction	Number of parasitized eggs/ card							
	Observation I	Observation II	Observation III	Observation IV	Observation V	Observation VI	Observation VII	Observation VIII
	(39 <sup>th</sup> std. week)	(45 <sup>th</sup> std. week)	(46 <sup>th</sup> std. week)	(48 <sup>th</sup> std. week)	(6 <sup>th</sup> std. week)	(8 <sup>th</sup> std. week)	(10 <sup>th</sup> std. week)	(13 <sup>th</sup> std. week)
East	22.00	09.20	15.40	19.80	12.20	19.60	15.40	07.80
West	23.00	16.60	35.80	33.00	10.20	17.20	10.60	08.00
North	47.00	20.20	16.00	20.00	06.80	15.60	10.00	10.80
South	20.00	10.40	07.80	15.80	18.80	09.60	08.00	08.40
Wind direction	North	North	West	West	South	East	East	North

Table 2. Extend of parasitization by *T. chilonis* on *L. orbonalis* egg in brinjal field influence by wind direction

Direction	Number of parasitized eggs					
	Observation I	Observation II	Observation III	Observation IV	Observation V	Observation VI
	(18 <sup>th</sup> std. week)	(19 <sup>th</sup> std. week)	(20 <sup>th</sup> std. week)	(21 <sup>th</sup> std. week)	(23 <sup>th</sup> std. week)	(24 <sup>th</sup> std. week)
East	3.60	2.20	1.40	2.60	1.80	0.40
West	2.00	0.60	3.20	3.00	0.80	1.40
North	3.00	1.80	5.40	4.20	5.60	2.20
South	1.60	2.00	4.00	3.00	4.60	2.20
Direction	East	East	North	North	North	North

egg). During this period wind ward direction was west. During 3<sup>rd</sup> observation period *i.e.* on 20<sup>th</sup> std. week ththth, the mean number of parasitization recorded ranged from 1.40 eggs in East direction and 5.40 eggs in North direction, during this period the wind ward direction was South. During the subsequent week (21<sup>th</sup> std. week), the wind direction remained same and maximum parasitization was recorded in North direction (5.60 eggs) and a minimum parasitization was observed in East direction (2.60 eggs). During subsequent observations the wind direction remained the same at North to South direction, a maximum level of parasitization (5.60 eggs) was observed in North direction in observation V and 2.20 eggs observed in observation VI. In East direction during this period of observation a minimum parasitized egg were recorded.

In the observation made on the orientation behaviour of *Trichogramma* under field condition, it is interesting to note that the wind direction has an influence on orientation behaviour of *T. chilonis*. The change in wind direction has resulted in shifting the parasitoid orientation on the host egg towards the wind stream. The consistency of observation indicates existence of positive correlation between parasitization and wind stream direction under field condition was recorded both in the sentinel egg card technique and *L. orbonalis* eggs. The kairomone fumes carried by the air current may attribute such variations in the orientation behaviour. This is the first such research report for the dispersal behaviour

of *T. chilonis* under field condition on both the *C. cephalonica* and *L. orbonalis* eggs under field condition.

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