# EFFECTS OF PARASITOID AND HOST EGG AGE ON PARASITISM BY *TRICHOGRAMMA CHILONIS* (ISHII)

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## Abstract

**Parasitism of *Sitotroga cerealella* Oliv. (Lepidoptera: Gelechiidae) eggs by *Trichogramma chilonis* Ishii (Hymenoptera: Trichogrammatidae) as influenced by host egg age and age of the female parasitoid was evaluated under the laboratory conditions. An experiment conducted to see the effect of host egg age on parasitism by *T. chilonis* did not reveal an overall treatment effect (F = 0.95). This implies that *T. chilonis* does not discriminate between host ages of less than one day. The developmental period of *T. chilonis* inside the host eggs remains almost the same in both the experiments i.e. 11 days. A second experiment on investigating the effect of parasitoid age on parasitism showed that *T. chilonis* laid significantly the highest average numbers of eggs at 80.6 ± 1.5 and 69.4 ± 6.3% during the first 8 and 24 h of its age respectively. Later, the parasitization decreased to 35% by the end of day 4. Thus, for the highest yield of parasitoid production, it is important to use younger *Trichogramma* for parasitization.**

**Keywords:** ***Trichogramma chilonis*, *Sitotroga cerealella*, parasitism, parasitoid age, host age, developmental period**

## Introduction

*Trichogramma chilonis* (Ishii) is an important egg parasitoid used for the control of sugar cane borers (Ashraf and Fatima, 1993). *Sitotroga cerealella* (Oliv.) originally proposed by Flanders (1930), is one of the most commonly used as fictitious host for rearing *Trichogramma* sp. In a *Trichogramma* production facility, the host eggs are collected at specified time intervals. The age of host eggs involve in *Trichogramma* production in at least two ways. Firstly, the oviposition preference of the parasitoid females (Pak, 1986) and secondly, as an indicator of the resource quality available for the developing parasitoid larvae thus affecting the physiology of host parasitoid interaction (Vinson and Iwantsch, 1980). Similarly, the age of ovipositing *T. chilonis* is also important in attaining optimum parasitism of host eggs. The present studies have been conducted to see the effect of parasitoid age and the age of host eggs with a view to maximize the parasitization. Farid *et al.* (2001) found that *T. chilonis* preferred one-day-old eggs as compared to 2 - 3 days old' eggs. Both Guang *et al.* (1990) and Schmidt

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*et al*. (1999) found that *T. chilonis* significantly decreased its parasitization when the eggs were older than 48 h at the time of encounter. The host age at the time of parasitism appears to have implications on the fitness of progeny and parasitoids, which preferentially attack younger host eggs (Sequeira and Mackauer, 1988; 1992; 1994). Reznik *et al*. (1997) found that *Trichogramma* females offered old hosts require a higher motivation to oviposit and have a correspondingly higher egg load than females offered young (preferred) hosts.

## Materials and Methods

*Trichogramma chilonis* (Ishii) were reared on the eggs of the Angoumois grain moth, *Sitotroga cerealella* (Oliv.). Wheat grains were used as a rearing medium for *S. cerealella*. The moths were collected through an electrically operated suction apparatus and caged in oviposition chambers (2 liter of plastic jars with a wire mesh of 20 holes/sq.inch size at the bottom). Wheat starch was used as an oviposition substrate and eggs of *S. cerealella* were collected daily by sieving the wheat starch. Egg cards were prepared by gluing *S. cerealella* eggs to paper cards (9 × 4 cm) and were then exposed to *T. chilonis* in a 300 ml glass jar for 24 h. The parasitoids were fed with 50% honey solution provided as small drops on the walls of the glass jar. The cards were removed from the jar and kept in petridishes at controlled conditions (23 ± 2°C, 16L: 8D and 60% R.H.) for use in the experiments.

**Effect of the Age of *S. Cerealella* Eggs on Oviposition Preference of the Female Parasitoid, *T. Chilonis* (Ishii)**

*S. cerealella* eggs of 8, 12, 16, and 24 h of age were exposed to parasitization by *T. chilonis* females in a no-choice experiment. A prepared egg card containing approximately 1,500 host eggs of each age was introduced in a parasitization 300 ml glass jar containing 50 pairs (male and female) of freshly emerged less than 1 day *T. chilonis* and removed after 24 h. The parasitized egg card was maintained at 23 ± 2°C, 16L : 8D until melanization of the parasitized eggs. The parasitized and unparasitized eggs were then counted and the percentage of parasitism of *S. cerealella* eggs was calculated. The experiment was designed as completely randomized with four replicates. LSD was used for mean separation after ANOVA.

**Parasitism of *S. Cerealella* Eggs as Influenced by the Age of the Female Parasitoid, *T. Chilonis* (Ishii)**

In this experiment, the effect of the age of *T. chilonis* female on the extent of parasitization of *S. cerealella* was investigated. *T. chilonis* females of different 5 age groups (treatments), 8, 24, 48, 72, and 96 h after emergence were used in the experiment. Fresh eggs (4 - 6 hours' old) of *S. cerealella* were glued on hard paper cards (9 × 4 cm) at 1,500 eggs per card. Fifty pairs (males and females) of each age group of *T. chilonis* were introduced into each of the 300 ml glass jar containing a prepared egg card and allowed to parasitize for 24 h. The egg card was then removed and the extent of parasitism was noted by counting the total number of the parasitized and unparasitized eggs. The experiment was designed as completely randomized and replicated four times. LSD was used for mean separation after ANOVA.

## Results and Discussion

The experiment on effect of host egg age on parasitism by *T. chilonis* did not show an overall treatment effect (F = 0.95). This experiment did not find a difference between the ages of the host eggs of 8 - 24 hours' age. This implies that *T. chilonis* does not discriminate between host ages of less than one day. In both experiments, the developmental period of *T. chilonis* inside the host eggs remains almost the same i.e., 11 days (Tables 1 and 2).

The second experiment showed that *T. chilonis* laid significantly the highest number of eggs 80.6 ± 1.5 and 69.4 ± 6.3 % during the first 8 and 24 h of its age respectively. Later, the parasitization decreased to 35% by the end of day 4. Thus, from the *Trichogramma*

**Table 1. Effect of the age of *S. cerealella* (Oliv.) eggs on oviposition preference of female parasitoid, *T. chilonis* (Ishii)**

| Age of *S. cerealella* eggs (h) | Developmental Period of *T. chilonis* (Ishii) (days) | Mean parasitism* (%) |
|---|---|---|
| 8 | 11 | 61.2 ± 8.6 |
| 12 | 11 | 48.4 ± 15.5 |
| 16 | 11 | 46.2 ± 2.5 |
| 24 | 11 | 39.0 ± 6.2 |

** All the treatments were non-significant at 5% level of probability.*

**Table 2. Parasitism of *S. cerealella* (Oliv.) eggs as influenced by the age of female Parasitoid, *T. chilonis* (Ishii)**

| Age of *S. cerealella* eggs (h) | Developmental Period of *T. chilonis* (Ishii) (days) | Mean parasitism* (%) |
|---|---|---|
| 8 | 11 | 80.6 ± 1.5 a |
| 24 | 11 | 69.4 ± 6.3 ab |
| 48 | 11 | 56.9 ± 8.9 b |
| 72 | 11 | 32.8 ± 6.1 c |
| 96 | 11 | 35.2 ± 7.0 c |

** Means within columns with the same letter (s) are not significantly different from each other at 5% level of probability.*

production point of view, it is important to use younger parasites for parasitization. Boivin and Lagace (1999) showed that under laboratory conditions, *T. evanescens* (Westwood) female deposited 56% of their eggs during the first 24 h and survival in the field did not exceed 24 - 48 h. The result suggested that the parasitoid age of 8 - 24 h is quite suitable to achieve the maximum parasitism of host eggs for large scale mass production of *T. chilonis* (Table 2).

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