EFFICACY OF TWO GRAVID FEMALE TRICHOGRAMMA CHILONIS AGAINST IMPORTANT LEPIDOPTERAN PESTS UNDER LABORATORY CONDITION

*Honnayya, R. W. Gawande
Entomology Section, College of Agriculture, Nagpur Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar Po, Akola (ms) 444104
*Corresponding authors email: honnu4946@gmail.com

ABSTRACT
The present study was conducted for efficient parasitization and efficacy of the two gravid female of Trichogramma chilonis (Ishii) against important lepidopteran pests viz., H. armigera, E. vitella, P. demoleus, A. janata and C. cephalonica, having 24, 48, and 72 hrs old age eggs were exposed to two gravid females of Trichogramma chilonis. Laboratory experiments were carried out at the college of Agriculture, Nagpur and CICR, Nagpur, Maharashtra during Kharif 2015. The results revealed that, the T. chilonis exhibited 70.00% parasitization on 24 hrs old eggs of Helicoverpa armigera, 28.25 average number of adult emergence of T. chilonis in 24 hrs old eggs of Papilio demoleus and 8.50 days required for adult emergence of T. chilonis in 72 hrs old eggs of Papilio demoleus. It is concluded that percent parasitization was more in H. armigera and average number of adult emergence and days required for adult emergence was more in Papilio demoleus as compare to all the 5 treatments. Hence, the H. armigera and Papilio demoleus eggs was more suitable for rearing of parasitoid to get good development of biological parameters of T. chilonis.

KEY WORDS: Gravid females, Lepidopteran pests, Trichogramma chilonis.
suppression of several lepidopteron pests all over India and widely distributed species of egg parasitoid in India and abroad. Over 200 insect species are parasitized by various strains of Trichogrammatids. Out of 26 Trichogramma species recorded in India, T. Chilnis, T. Japonicum, T. Acheae, are key mortality factors for many crop pests.

Ever since 1975, Trichogramma are being used to control lepidopterous pests of cotton, cabbage, apple and tomato etc. (Smith, 1996). The quality parasitoids can be produced by studying biological features of Trichogramma adult as longevity, emergence and parasitism abilities (Bigler, 1991). To get high rate of emergence in laboratory in hot summer, artificial manipulation in temperature is necessary for successful rearing (Rejendran, 1999). The 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 control 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. has the great potential to control bollworms in cotton IPM (Verma and Shenhmar, 1998). The Trichogramma are hymenopterous parasitoids of lepidopterous insect pests (Cadapan and Gonzales, 1986). They are minute (0.1 - 0.5 mm) endoparasitic insects which prey on other insects eggs. They complete their life cycle inside the eggs of other insects and kill the host before it is hatched. They belong to the chalcid group of hymenopterous insects in the family Trichogrammatidae (Cadapan, 1986).

MATERIALS & METHODS
Details of experiment:
1) Test parasitoid : Trichogramma chilonis
2) Experimental Designs : Completely Randomized Design (CRD)
3) No. of replications : 4
4) No. of treatments : 5

Treatments:
- T1 : Helicoverpa armigera
- T2 : Earias vitella
- T3 : Papilio demoleus
- T4 : Achoea janata
- T5 : Corcyra cephalonica

Procedure for test
Rearing of larvae of lepidopteran pests
Larvae of lepidopteran pests (H. armigera, E. vitella, P. demoleus, A. janata and C. cephalonica) were collected from different host plants and were reared in plastic containers by providing the natural diet till the pupal stage under laboratory condition. The pupae of lepidopteran pests were obtained and were kept in large size plastic jars and emerged adults were transferred into oviposition chamber for mating and oviposition. Adult of lepidopteran pests were released into oviposition chamber by providing 40% honey diet in hanging cotton swab, folded centuary paper for oviposition. Upper opening of oviposition chamber was closed with muslin cloth fixed with rubber band. All these materials were disinfected by using Sodium hypochloride 0.05% before the experiment.

Exposure of host eggs to gravid female of Trichogramma chilonis:
Eggs of all host viz., H. armigera, E. vitella, P. demoleus, A. janata and C. cephalonica having 24, 48, and 72 hrs old age were exposed to one gravid females of Trichogramma chilonis. Twenty eggs of each host were exposed to the parasitoid. The same set was replicated four times. The desired size empty cards were smeared with gum and required quantity of eggs i.e. twenty eggs on each cards were stuck on them. These cards were kept in test tubes. For identification of females of Trichogramma chilonis. Strip of untreated Corcyra eggs were placed in test tube in which a strip of parasitized tricho cards was inserted. The adults of Trichogramma chilonis which emerged out from the eggs were observed. The females after mating and lapse of waiting period were attracted towards the eggs of Corcyra for oviposition, such females were picked up with fine camel brush and one female were placed into each test tube containing the lepidopteran pest’s eggs. In this way lepidopteran eggs were exposed to one gravid female of Trichogramma chilonis under laboratory condition. The following observations were recorded.

The Following observations were recorded
i) Per cent egg parasitisation
ii) Number of days required for adult emergence
iii) Number of parasitoids emerged

Statistical Analysis:
The data of all sets of experiment were collected scrupulously through observation (compiled, average tabulated). The tabulated data after appropriate transformations were subjected to statistical analysis as per Gomez and Gomez (1984).

RESULTS & DISCUSSION
Screening of Trichogrammatids:
Results obtained with regards to the per cent parasitization, average number of parasitoids emerged, average number of days required for adult emergence and percentage of unhatched eggs of Trichogramma chilonis, in the laboratory on important lepidopteran pests (Helicoverpa armigera, Earias vitella, Papilio demoleus, A. janata and Corcyra cephalonica) has been presented.

Effect of two gravid female Trichogramma chilonis on important lepidopteran pests:
A) Percent eggs parasitization by Trichogramma chilonis:
The data presented in the Table 1 revealed that, the age of the host eggs, significantly influenced the parasitization by Trichogramma chilonis. The data showed that, the maximum amount of parasitization was recorded in 24 hrs old eggs and followed by 48 hrs and 72 hrs old eggs, the lowest parasitization was observed in 72 hrs old eggs.
TABLE 1: Effect of two gravid female Trichogramma chilonis on per cent egg parasitization by Trichogramma chilonis

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Treatment</th>
<th>No. of host eggs exposed</th>
<th>Mean per cent egg parasitization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>24 hrs old eggs</td>
</tr>
<tr>
<td>1</td>
<td>T1- Helicoverpa armigera</td>
<td>20</td>
<td>70.00 (56.79)</td>
</tr>
<tr>
<td>2</td>
<td>T2- Earias vitella</td>
<td>20</td>
<td>61.25 (51.51)</td>
</tr>
<tr>
<td>3</td>
<td>T3- Papilio demoleus</td>
<td>20</td>
<td>65.00 (53.73)</td>
</tr>
<tr>
<td>4</td>
<td>T4- Achoea janata</td>
<td>20</td>
<td>55.00 (47.87)</td>
</tr>
<tr>
<td>5</td>
<td>T5- Corcyra cephalonica</td>
<td>20</td>
<td>68.75 (56.02)</td>
</tr>
</tbody>
</table>

*F* test | Sig | Sig | Sig
SE (m) ± | 0.48 | 0.67 | 0.71
CD at 5% | 1.39 | 1.97 | 2.10

(*Figures in the parentheses are corresponding values of arc sine transformation).

The maximum percent parasitization was recorded by Trichogramma chilonis on 24 hrs old eggs of Helicoverpa armigera (70.00%) and followed by Corcyra cephalonica (68.75%), Papilio demoleus (65.00%), Earias vitella (61.25%) and Achoea janata (55.00%) respectively. The highest percent parasitization was recorded on Helicoverpa armigera (70.00%), however, the treatment Corcyra cephalonica (68.75%), found statistically on par with Helicoverpa armigera (70.00%). The treatments Papilio demoleus (65.00%), found second best in egg parasitization. The host treatments Earias vitella (61.25%) and Achoea janata (55.00%) sharing parity with each other in percent egg parasitization.

After an exposure period of 48 hrs old eggs, the results showed similar trend like 24 hrs exposure with highest percent parasitization observed in Helicoverpa armigera eggs (68.75%) and followed by Corcyra cephalonica (66.25%), Papilio demoleus (65.00%), Earias vitella (63.75%) and Achoea janata (53.75%) respectively. However, the percent parasitization recorded in the treatment Corcyra cephalonica (66.25%), Papilio demoleus (65.00), and Earias vitella (63.75) were statistically on par with the Helicoverpa armigera (68.75%). The host treatment Achoea janata (51.25%) showed least preference in percent egg parasitization, amongst other hosts.

The parasitization by Trichogramma chilonis against important lepidopteran pests exhibited decreasing trend on 72 hrs old eggs, exposure period in percent parasitization as compared to 24 hrs in all treatments viz., Helicoverpa armigera (65.00%) and followed by Corcyra cephalonica (62.50%), Papilio demoleus (62.50%), Earias vitella (56.25%) and Achoea janata (51.25%) respectively. However, the parasitization recorded in the treatment Corcyra cephalonica (62.50%) and Papilio demoleus (62.50%) were found statistically on par with Helicoverpa armigera (65.00%). The host treatments Earias vitella (56.25%) and Achoea janata (51.25%) shown parity with each other in egg parasitization.

Present study indicated that, the maximum parasitization was noticed in 24 hrs old eggs of Helicoverpa armigera (70.00%) and followed by 48 hrs and 72 hrs old eggs and lowest parasitization was recorded in Achoea janata (51.25%) in 72 hrs old eggs. The reason being Trichogramma chilonis mainly preferred freshly laid eggs for parasitization.

These results are comparable with the findings of earlier studies made by Krishnamouorthy and Singh (2001) who reported the per cent parasitization of Trichogramma chilonis in the host eggs of Papilio demoleus (75.90%) in laboratory. Thus these findings gave supports to present investigation. Chandish and Singh (2003) they recorded per cent parasitization of Trichogramma chilonis in Helicoverpa armigera (66.7%) eggs. Thus these findings gave supports to present investigation.

B) Average number of parasitoids emergence:

The statistical data on average number of parasitoids emergence presented in Table 2 revealed that, the development (egg to adult emergence) of Trichogramma chilonis among the different age groups of host eggs was significantly found more in 24 hrs old eggs. The findings on adult emergence by feeding 24 hrs old eggs, revealed that, the treatment Papilio demoleus exhibited maximum adult emergence to the tune of 28.25 adult emerged. However, the treatments Helicoverpa armigera (24.25) and Corcyra cephalonica (23.50) were found on par with Papilio demoleus (28.25) in adult emergence. The treatment Earias vitella was found second best in which 22.25 adult emerged. The treatment Achoea janata (21.75) was found on par with treatment Earias vitella (22.50) in adult emergence.

The observations on exposure period of 48 hrs old eggs revealed that, the treatment Papilio demoleus exhibited maximum adult emergence to the tune of 25.25 number of adult emerged. However, the host treatment Helicoverpa armigera (24.00), Earias vitella (23.25), Achoea janata (22.75) and Corcyra cephalonica (22.00) were found on par with each other in adult emergence.

After an exposure period of 72 hrs of old eggs, the treatment Papilio demoleus exhibited maximum adult emergence to the tune of 23.75 number of adult emerged. The treatment Helicoverpa armigera was found second best in which 22.50 adult emerged. However, the treatments Earias vitella (21.50), Achoea janata (21.50) and Corcyra cephalonica (21.00) were found on par with each other in adult emergence.

The data recorded on parasitoids emergence at 24 hrs, 48 hrs and 72 hrs old eggs concluded that, the treatment Papilio demoleus was found superior in recording maximum parasitoid emergence ranging from 28.25, 25.25 and 23.75 adult emergences respectively. The lowest number of adult emergence 21.00 was observed in
Corcyra cephalonica, because the size of the host eggs was large, which was observed in Papilio demoleus and also age of the host egg increases the egg cell (chorion) becomes hard.

These results are comparable with the findings of earlier studies made by Budhwant et al. (2008) who recorded maximum numbers i.e. 10.59 adults of T. chilonis were emerged out from P. demoleus host eggs. Thus these findings gave supports to present investigation. Thus these findings gave support to present investigation. Kumar et al. (2004) they reported maximum per cent emergence of Trichogramma chilonis was noticed in Helicoverpa armigera (81.23%). Thus these findings gave support to present investigation.

**C) Average number of days (period) required for adult emergence:**

The observations recorded and presented in Table 3 on the time required for adult emergence at 24 hrs old eggs revealed that, the treatment Achoea janata (7.75 days) required maximum number of days and was found on par with Papilio demoleus (7.75 days) and Earias vitella (7.25 days). The treatment Corcyra cephalonica (6.75 days) took lowest period i.e. 6.75 days which was found on par with treatment Helicoverpa armigera (7.00 days).

<table>
<thead>
<tr>
<th>TABLE 2: Effect of two gravid female Trichogramma chilonis on average number of parasitoids Emergence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sr. No.</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 3: Effect of two gravid female Trichogramma chilonis on average number of days required for adult emergence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sr. No.</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

After on exposure period of 48 hrs old eggs, the observations recorded on the time required for adult emergence, the treatment Papilio demoleus (8.25 days) required maximum number of days and was found on par with treatment Achoea janata (8.00 days) and Helicoverpa armigera (7.75 days). The treatment Corcyra cephalonica took lowest period i.e. 7.00 days which was found on par with the treatment Earias vitella (7.25 days).

The observations recorded on the time required for adult emergence at 72 hrs old eggs revealed that, the treatment Achoea janata (8.25 days) required maximum number of days for adult emergence. However, the treatment Papilio demoleus (8.00 days) and Helicoverpa armigera (8.00 days) was found on par with Achoea janata (8.25 days). The treatment Earias vitella took lowest period i.e. 7.25 days which was found on par with Corcyra cephalonica (7.50 days) for adult emergence.

The study showed that, the maximum number of days (period) required for adult emergence of Trichogramma chilonis was observed in 72 hrs old eggs of Papilio demoleus (8.50 days) and lowest number of emergence was recorded in Corcyra cephalonica (6.75 days) in 24 hrs old eggs. These results are comparable with the findings of earlier studies made by Sajid Nadeem et al. (2009) who have reported that, the developmental period of Trichogramma chilonis on host eggs of Helicoverpa armigera was noticed in 7.3 days. Thus these findings gave supports to present investigation.

Krishnamoorthy and Singh (2001) who reported that, the Trichogramma chilonis readily parasitized 24 hrs and 48 hrs old eggs of Papilio spp, and emergence period was completed in 8.3 days. Thus these findings gave supports to present investigation.

**REFERENCES**


