Study on different diets on the biological parameters of rice moth *Corcyra cephalonica* (Stainton)

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**ABSTRACT**  
The present investigations were undertaken in laboratory on “Study on factitious host *Corcyra cephalonica* (Stainton) against storage of egg parasitoid *Trichogramma chilonis* (Ishii) cards under laboratory conditions” during the year 2018 in the bio-control laboratory, Department of Agricultural Entomology, College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U. P.) India. The effects of different rearing media on some biological parameters of factitious host, *C. cephalonica* are based on results are most effective performance with T₃ (Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast), treatments i.e. larval, pupal, male and female moths emergence, and egg production in cc and followed by 17530, 16667, 15131, 14875, 13545 and 11830 i.e. T₃ (Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast), T₅ (Sorghum + Soyabean + Yeast powder, 50:50 + 5g Yeast), T₆ (Sorghum + Cowpea + Yeast powder, 50:50 + 5g Yeast), T₇ (Sorghum + Gram powder + Yeast powder, 50:50 + 5g Yeast), T₈ (Sorghum + Green Gram + Yeast powder, 50:50 + 5g Yeast) and T₉ (Sorghum alone (check) eggs per cc of Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast and wheal), respectively.

**KEYWORDS**  
Different Diets, Biological Parameters, Rice Moth, *Corcyra cephalonica*

**HOW TO CITE THIS ARTICLE**  

The indiscriminate and non selective use of insecticides in pest management has created several problems viz., development of insecticide resistance in major crop pests, pest resurgence, destruction of natural enemies besides ill effects of toxic residue in food and environment (Armes et al., 1992). In recent years, farmers are showing increased interest towards biological control of pests following the unsatisfactory control of insect pests with insecticides. Bio-agents occupy a premier position in the crop protection sector and constitute an important component of IPM on account of specificity, safety, economy with no resistance or residue problems. The elevated awareness of the impact of pesticide use on the environment and human health has resulted in efforts to reduce reliance on chemical control. A recent report by the US congress office of technology assessment indicated that biologically based technologies such as ‘Biological Control’ could be more widely used to solve pressing needs of pest management (Anon, 1995). Trichogrammatids are one of the important parasitoids amenable for mass production, which can be accomplished by mass culturing its factitious host, either *Corcyra cephalonica* (Stainton) or *Sitotroga cerealella* (Olivier).
The fundamental aim of mass production of parasitoid is the quality production of natural enemies at faster and cheaper rates. In *Trichogramma* rearing, the two basic components are mass production of factitious host and the parasitoid. The quality of the *Trichogrammatidae* in the laboratory mostly depends by and large on the quality of the host eggs, which ultimately depends on the host nourishment. Therefore, the diet of host is potentially of importance to the nutritional quality of host eggs and the survival of *Trichogramma* and other egg parasitoids released in the environment as biological control agents (Finney and Fisher, 1964). The parasitoids are mass-reared on the eggs of rice meal moth, *Corcyra cephalonica* storage pest which is being mass reared on sorghum/maize broken grains. *Corcyra cephalonica* (Stainton) a stored grain pest belonging to genus *Corcyra*, Tribe Tirathabini, sub-family Galleriinae, family Pyralididae and order Lepidoptera.

It was first observed to cause heavy losses to stored grains. Rice moth, *Corcyra cephalonica* is being utilized in various bio-control research, developmental and extension units for mass production of number of natural enemies (Jalali, S. K., Singh, S. P., 1992). *C. cephalonica* is industrialized for many of the natural enemies, mass bred in the laboratory mostly depends by and large on the quality of the host eggs, which ultimately depends on the host nourishment. Therefore, the diet of host is potentially of importance to the nutritional quality of host eggs and the survival of *Trichogramma* and other egg parasitoids released in the environment as biological control agents (Finney and Fisher, 1964). The parasitoids are mass-reared on the eggs of rice meal moth, *Corcyra cephalonica* storage pest which is being mass reared on sorghum/maize broken grains. *Corcyra cephalonica* (Stainton) a stored grain pest belonging to genus *Corcyra*, Tribe Tirathabini, sub-family Galleriinae, family Pyralididae and order Lepidoptera.

Materials and Methods

*Corcyra cephalonica*, the factitious host of *Trichogramma chilonis* were taken from Navin mandisthal Meerut. The *C. cephalonica* was reared on insecticide free broken maize grains in *Corcyra* rearing cage. The grains were sterilized for 30 minutes at 100°C in a hot air oven and were sprayed with 0.1% formalin to prevent the growth of moulds as well as to increase the grain moisture up to 15-16%. About 2.5 kg of sterilized maize grains were mixed with 100g groundnut powder and 5g powdered yeast and kept in a wooden box (45 cm ×30 cm × 10 cm size). A spray of streptomycin sulphate 0.05 percent was given @ 10-20 ml per box to prevent bacterial infection. Sulphur 80 WP was added @ 5g per box to prevent storage mite infection. Then *Corcyra* eggs @ 0.5 cc (approximate 10000 eggs) per box was mixed uniformly in grain medium of each box and kept for development at 27±2°C and 65±% R.H. Each box was having wire mesh on the top. The hatched larvae fed on the grain by webbing and completed their development in 30-35 days. Full grown larvae pupated inside the web grain mass for 5-7 days and adult moths emerged after 35-40 days from date of inoculation. After 40 days of charging, adult moths started emerging and could be collected up to 90 days. These moths were collected daily every morning and transferred to a specially designed ovipositional cage having a wire mesh below for egg laying.

A paper sheet was kept below to collect the eggs. The collected eggs were sieved through 15, 30 and 40 mesh sieves to make it free from insect scales and broken limbs and were run over a slope of paper to eliminate dust particles. The final output of *Corcyra* eggs from one cage has been assumed to be about 4-5 c.c. The adult moths were fed daily with honey solution prepared by mixing 50 ml honey with 50 ml water and 5 capsules of Vitamin E (Evion). The fed was stored in refrigerator and was used as when required. A piece of cotton wool tied with a thread was soaked in the solution and inserted into the ovipositional cage and was changed daily. Effect of different diets on the biology of rice moth, *Corcyra cephalonica* (Stainton.) (Pyralididae-Lepidoptera).

The materials and methods used to carry out these investigations are described in this investigation. The bold, clean grains of rice, wheat, sorghum and other oilseeds were grinded in a domestic grinder by making 2 to 3 pieces of each grain. These grains were then heat sterilized in hot air oven at 100 °C for 30 minutes to make them free from any secondary infestation. Similarly, material was treated with streptomycin sulphate @ 50 mg per kg to prevent the bacterial infection (Rao et al., 1980).
Materials of each treatment was mixed in the proportion of the ingredients in a Corcyra rearing boxes was round, wooden box of about 2.5 kg capacities with lid (size: diameter- 15 cm and height - 10 cm). The wooden box was cut open in the centre to make a round opening having 8x8 cm square. This opening of lid was closed with iron wire mesh fitted by the manufacturer. This arrangement was made to provide sufficient aeration and light. Before adding of Corcyra eggs, 5 g dry powdered yeast was added in all combinations. Freshly laid 1/4th cc eggs of Corcyra were added in each tray and contents mixed thoroughly for uniform distribution. All the trays were daily checked for moth emergence. Emerged moths were collected separately as per respective treatment in the net house daily in the morning (Ingle et al., 2000). Regarding the effects of different diets on some biological parameters of C. cephalonica following observations were recorded.

Eggs Hatching Percentage

Fifty eggs were kept in petridish to observe hatching. The number of eggs hatched out of fifty was counted to determine the hatching percentage.

Incubation Period

The egg laid by each of ten females were transferred to 10 petriplates (10 x 2 cm) separately, using moist camel hair brush and larva emerged was observed daily. One set of ten eggs was kept for observation.

Larval Period

The larvae hatched from each of the petri plates were transferred to ten petri plates with the help of moist camel hair brush having 100 g rearing media. The larval period was recorded from date of hatching to till the date up to 50 percent larva spin the cocoons. The average of 10 larvae for each treatment was worked out such three replications was maintained.

Pupation Percentage

The same ten larvae, which were about to pupate, were kept under observation for recording the pupation percentage.

Pupal Period

The same ten larvae, which were about to pupate, were kept under observation for recording the pupal period. Each larva was observed till adult emergence and then average pupal period was worked out.

Percent Adult Emergence

The actual number of moths emerged from pupae were counted and percent adult emergence was calculated. The percent of male and female adult moth emergence were also recorded.

Adult Longevity

The male and female moths on different diets were kept separately in plastic containers to record adult longevity. They were provided with 5 percent honey solution.

Total Development Period

The period from egg laying to death of adult was computed by combining the data obtained from the observation of incubation period to adult longevity and given as total life cycle of C. cephalonica.

Fecundity

The total numbers of egg laid by each female in its lifetime was recorded. During this period, the pairs were supplied with 5 percent honey solution. The average fecundity was worked out.

Equipments Used for Production of Trichogramma

1. UV radiated Corcyra eggs
2. Trichogramma chilonis
3. Magnifying lens
4. Acacia Gum
5. Card as per need
6. Glass vials of 15×7.5 cm
7. BOD incubator
8. Camel Hair Brush
9. Marker
10. Petri plate
Table 1. Materials for the experiment

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Total Larval period</th>
<th>Pupal period</th>
<th>Percent female moths emergence</th>
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<th>Total egg production (cc)</th>
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<tbody>
<tr>
<td>T₁ Sorghum + Black gram + Yeast powder (50:50 +5g Yeast)</td>
<td>32.25</td>
<td>5.31</td>
<td>78.48</td>
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Table 2. Performance of C. cephalonica on different rearing medium

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Statistical Analysis

The data recorded during the course of investigation were subjected to statistical analysis by using analysis of variance technique (ANOVA) for Completely Randomized Design (CRD).

Results and Discussion

Performance of C. cephalonica on Different Rearing Medium

The effects of different rearing media on some biological parameters of factitious host, C. cephalonica are based on results are presented table 2 and fig 1. The larval period of rice moth, Corcyra cephalonica (Stainton) ranged from 28.03 to 37.68 days with an average of 33.33 days. The longest larval period was noticed when larvae reared on treatment T₃ (Sorghum + Groundnut + Yeast powder, 50:50 +5g Yeast) i.e. 37.68 days and the shortest period of 28.03 days was observed on T₇ (Sorghum alone, check). Quite similar type of observations was also recorded by (Kumar et al., 2018, Ashwani, S. and Shenhmar, M., 2001, Bhandari et al., 2014) stated that Corcyra cephalonica (Stainton) complete its larval period in the range of 29.58 to 41.08 days on different diets under laboratory condition in Chitwan, Nepal. The pupal period of Corcyra cephalonica ranged from 4.97 to 9.72 days with a mean of 6.79 days. The longest pupal period of 9.72 days was observed on T₃ (Sorghum + Groundnut + Yeast powder, 50:50 +5g Yeast) and the lowest (i.e. 4.97 days) were recorded on treatment T₇ (Sorghum alone, check).

The results obtained are in conformity with (Kumar, et al., 2018, Ashwani, S. and Shenhmar, M., 2001, Urs and Mookharjee, 1966) who reported that pupal period was 10.63 days on groundnut. The percent adult emergence of rice moth, Corcyra cephalonica (Stainton) ranged from 75.16 to 86.01 with a mean of 80.58.

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Average: 33.33

SEM= 0.191, 0.208, 0.216, 0.221, 0.265, 16.254

CD at 5%: 0.594, 0.647, 1.292, 0.510, 0.689, 0.827, 12.873

Figures in parentheses are angular transformed values
Fig 1. Performance of C. cephalonica on different rearing medium

The maximum percent adult emergence (i.e. 86.01 percent) was observed on T₃ (Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast) and the minimum percent adult emergence was on T₇ (Sorghum alone, check) i.e. 75.16 percent. The observations made in this study are in agreement with the findings of (Kumar, et al., 2018, Ashwani, S. and Shenhmar, M., 2001, Kamble et al., 2006) who mentioned that mean percent adult emergence was 43.92 percent on different cereal grains. The percentage of male moth emergence of rice moth, Corcyra cephalonica (Stainton) ranged from 45.12 to 56.12 with a mean of 47.49. The treatment T₃ (Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast) showed the maximum male moth emergence i.e. 56.12 percent, which was significantly superior over the treatments and the lowest percentage of female moth emergence (i.e. 45.17 percent) was observed on T₇ (Sorghum alone, check). Similar observations were also recorded by (Satpathy et al., 2002) who noticed that the total female emergence percentage was low with high egg densities reared on fortification of diet with yeast. However (Kamble et al., 2006) and one cc of eggs Corcyra cephalonica (Stainton) contained significantly more number of eggs produced in the treatment T₃ (Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast) showed the maximum 15393 ranged 11830 to 18515 when reared on rice while the corresponding figures followed by 17530, 16667, 15131, 14875, 13545 and 11830 i.e. T₅ (Sorghum + Soyabeen + Yeast powder, 50:50 + 5g Yeast), T₆ (Sorghum + Cowpea + Yeast powder, 50:50 + 5g Yeast), T₄ (Sorghum + Gram powder + Yeast powder (50:50 + 5g Yeast), T₂ (Sorghum + Green gram + Yeast powder, 50:50 + 5g Yeast), T₁ (Sorghum + Black gram + Yeast powder, 50:50 + 5g Yeast) and T₇ (Sorghum alone, check) eggs per c.c. of Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast and wheal respectively.

Conclusion

The effects of different rearing media on some biological parameters of factitious host, C. cephalonica are based on pooled results are presented.
The larval period of rice moth, *Corcyra cephalonica* (Stainton) ranged from 28.03 to 37.68 days with an average of 33.33 days. The longest larval period was noticed when larvae reared on treatment T3 (Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast) i.e. 37.68 days and the shortest period of 28.03 days was observed on T7 (Sorghum alone, check) followed by 17530, 16667, 15131, 14875, 13545 and 11830 i.e. T8 (Sorghum + Groundnut + Yeast powder, 50:50 + 5g Yeast), T6 (Sorghum + Cowpea + Yeast powder (50:50 + 5g Yeast), T4 (Sorghum + Gram powder + Yeast powder (50:50 + 5g Yeast), T2 (Sorghum + Green gram + Yeast powder, 50:50 + 5g Yeast), T1 (Sorghum + Black gram + Yeast powder, 50:50 + 5g Yeast) and T7 (Sorghum alone, check) eggs per c.c. of Sorghum + Groundnut + Yeast powder (50:50 + 5g Yeast) and wheal respectively.

References


