

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; 10(7): 912-916
www.biochemjournal.com
Received: 22-05-2026
Accepted: 27-06-2026

Kartik Rathi
Ph.D. Scholar, Department of
Entomology, Sardar
Vallabhbhai Patel University
of Agriculture and Technology,
Meerut, Uttar Pradesh, India

Prakhar Sahrawat
Ph.D. Scholar, Department of
Entomology, Sardar
Vallabhbhai Patel University
of Agriculture and Technology,
Meerut, Uttar Pradesh, India

Vishal Raghuvanshi
Master's Research Scholar,
Department of Plant
Protection, Ch. Charan Singh
University, Meerut, Uttar
Pradesh, India

Ankit Rai
Ph.D. Scholar, Department of
Entomology, Acharya
Narendra Deva University of
Agriculture and Technology,
Kumarganj, Ayodhya, Uttar
Pradesh, India

Corresponding Author:
Ankit Rai
Ph.D. Scholar, Department of
Entomology, Acharya
Narendra Deva University of
Agriculture and Technology,
Kumarganj, Ayodhya, Uttar
Pradesh, India

Mass multiplication of rice meal moth, *Corcyra cephalonica* (Stainton) on different diets under laboratory conditions

Kartik Rathi, Prakhar Sahrawat, Vishal Raghuvanshi and Ankit Rai

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i7l.9256>

Abstract

The rice meal moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) is one of the most widely used factitious hosts for mass rearing of egg parasitoids like *Trichogramma chilonis* (Ishii). The quality of the parasitoid largely depends on the nutritional quality of the host, which in turn is influenced by the rearing diet. The present study was conducted during 2020-21 at the Bio-control Laboratory, Department of Entomology, College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, to evaluate the suitability of eight different rearing media for mass multiplication of *C. cephalonica* under laboratory conditions. The treatments included: T₁ – Sorghum + Yeast powder; T₂ – Rice + Yeast powder; T₃ – Maize + Yeast powder; T₄ – Groundnut + Yeast powder; T₅ – Sorghum + Rice + Yeast powder; T₆ – Sorghum + Maize + Yeast powder; T₇ – Sorghum + Groundnut + Yeast powder; and T₈ – Sorghum + Rice + Maize + Groundnut + Yeast powder. Observations were recorded on total larval period, pupal period, per cent moth emergence, per cent female and male moth emergence, total egg production, and number of eggs production. Results revealed that treatment T₈ (Sorghum + Rice + Maize + Groundnut + Yeast powder) recorded the highest moth emergence (93.27%), female moth emergence (59.85%), male moth emergence (68.65%), total egg production (16.71 cc), and number of eggs (334,200/cc). However, T₈ also recorded the longest larval period (47.29 days) and pupal period (13.32 days). The shortest larval period (29.97 days) and pupal period (7.93 days) were recorded on T₃ (Maize + Yeast powder). Sorghum-based mixed diets, particularly T₇ (Sorghum + Groundnut) and T₄ (Groundnut), showed better results compared to sole cereal diets. The findings suggest that mixed diets with groundnut fortification significantly improve the reproductive performance of *C. cephalonica* and can serve as suitable rearing media for mass production of this important factitious host.

Keywords: *Corcyra cephalonica*, *Trichogramma chilonis*, mass rearing, factitious host, rearing media, biological control

Introduction

The rice moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae), has gained tremendous importance in biological control programmes. Although a serious pest of stored grains under natural conditions, it has been found to be an extremely useful insect as a factitious host for mass rearing of various biocontrol agents (Manjunath, 1993) [11]. One of the outstanding examples of mass-production of a biocontrol agent, using *C. cephalonica* as a laboratory host, is that of the egg parasitoid, *Trichogramma* spp. (Hymenoptera: Trichogrammatidae), which are extensively used in the control of sugarcane borers, cotton bollworms, and vegetable pests in several countries including India (Padhy *et al.*, 2020) [15]. The widespread acceptability of *C. cephalonica* as a laboratory host is unique and undoubtedly a boon to entomologists engaged in mass-production of biological control agents. Attempts to mass-produce *C. cephalonica* have been made in several laboratories using different natural food media like sorghum (*Sorghum vulgare*), pearl millet (*Pennisetum typhoides*), rice (*Oryza sativa*), maize (*Zea mays*), groundnut (*Arachis hypogaea*), and finger millet (*Eleusine coracana*), but the results have not been uniform with regard to production and economics (Kamel *et al.*, 1977; Medina and Cadapan, 1982) [7, 12]. Integrated Pest Management (IPM) is now well recognized globally, where all suitable pest control techniques are integrated to find ecologically sound and environmentally safe ways of pest control. Biological control should be regarded as the backbone of any IPM

programme, and about 90% of all potential pests are already under biological control (Shukla and Jadhav, 2014) ^[19]. The fundamental aim in mass production of natural enemies, viz., *Trichogramma chilonis*, is their quality production at a faster and cheaper rate. The quality of the natural enemies in the laboratory mostly depends on the quality of the host, which ultimately depends on the host nourishment. Therefore, the diet of the host is potentially of importance to the nutritional quality of host eggs and the survival of *Trichogramma chilonis* and other egg parasitoids released in the environment as biological control agents (Finney and Fisher, 1964) ^[6].

The indiscriminate and non-selective use of insecticides in pest management has created several problems including development of insecticide resistance in major crop pests, pest resurgence, destruction of natural enemies, and ill effects of toxic residues in food and environment (Armes *et al.*, 1992) ^[1]. Several insecticides that are widely used to suppress various pests can also disrupt the effectiveness of beneficial agents. Therefore, assessment on the safety of insecticides to natural enemies is essential, and it becomes necessary to manage pest populations through IPM programmes that integrate biological control agents like *Trichogramma* spp. (Renuka and Sawai, 2020).

The size of *Trichogramma* varies from 0.40-0.70 mm in length and 0.15-0.25 mm in width across the head. Their pigmentation ranges from light brown to dark colouration (Scholler *et al.*, 2005) ^[18]. *Trichogramma* adults are most active at 25±2°C. A female parasitizes from 1 to 10 eggs per day or 10-190 during its life span (Smith, 1996) ^[20]. The life cycle of *Trichogramma* ranges from 8-10 days in summer and 9-12 days in winter. The short life cycle allows the wasp population to increase rapidly (Scholler *et al.*, 2005) ^[18].

In light of the above-discussed points, the present investigation was undertaken to study the mass multiplication of rice meal moth, *Corcyra cephalonica* (Stainton), on different diets under laboratory conditions,

with the specific objective to evaluate the effect of different rearing media on biological parameters of *C. cephalonica*.

Materials and Methods

Experimental site: The present investigation was carried out during 2020-21 at the Bio-control Laboratory, Department of Entomology, College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P.), India. The district Meerut is topologically situated between 29°17' N latitude and 77°42' E longitude at an altitude of 237 meters above mean sea level in the sub-region of upper Gangetic plains. The region falls under the western plain zone of Uttar Pradesh with subtropical and semi-arid climate having very hot summers and severe cold winters. The maximum temperature is about 45°C during summer and a minimum temperature of 4-5°C during winter. The average rainfall in this area is about 863 mm, of which 75-80 per cent is received through south-west monsoon during July to September.

Source of culture: *Corcyra cephalonica*, the factitious host of *Trichogramma chilonis*, were obtained from Navin Mandi Sthal, Meerut. The culture was maintained on insecticide-free broken maize grains in *Corcyra* rearing cages at 27±2°C and 65±5% relative humidity.

Preparation of rearing media

The bold, clean grains of rice, wheat, sorghum, and groundnut were ground in a domestic grinder to make 2-3 pieces of each grain. These grains were heat-sterilized in a hot air oven at 100°C for 30 minutes to make them free from any secondary infestation. The material was also treated with streptomycin sulphate @ 50 mg per kg to prevent bacterial infection (Rao *et al.*, 1980). Five grams of dry powdered yeast was added to all treatment combinations to enhance the nutritional quality of the diets. Eight different treatments were prepared as follows:

Treatment	Diet Composition
T ₁	Sorghum + Yeast powder (250g + 5g)
T ₂	Rice + Yeast powder (250g + 5g)
T ₃	Maize + Yeast powder (250g + 5g)
T ₄	Groundnut + Yeast powder (250g + 5g)
T ₅	Sorghum + Rice + Yeast powder (50:50 + 5g)
T ₆	Sorghum + Maize + Yeast powder (50:50 + 5g)
T ₇	Sorghum + Groundnut + Yeast powder (50:50 + 5g)
T ₈	Sorghum + Rice + Maize + Groundnut + Yeast powder + 5g

Rearing procedure

Each treatment material of 250g capacity was placed in round, wooden *Corcyra* rearing boxes (diameter 15 cm and height 10 cm). The wooden box lid was cut open in the centre and closed with iron wire mesh to provide sufficient aeration and light. Freshly laid 1/4th cc eggs of *Corcyra* were added in each box and contents were mixed thoroughly for uniform distribution. The boxes were kept for development at 27±2°C and 65±5% relative humidity. Each treatment was replicated thrice.

Observations recorded

Total larval period: The larval period was recorded from the date of hatching to the date when 50 per cent larvae spun the cocoons. The average of 10 larvae for each treatment was worked out.

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

Percent moth emergence: The actual number of moths emerged from pupae were counted, and per cent adult emergence was calculated.

Per cent female and male moth emergence: The emerged moths were sexed, and the percentage of female and male moth emergence was recorded separately.

Total egg production (cc): The total number of eggs laid by females in each treatment was measured in cubic centimeters (cc).

Number of Eggs per cc

The number of eggs per cc was counted to determine the fecundity potential of females reared on different diets.

Statistical Analysis

The data obtained from the experiment were analyzed using suitable statistical methods. The standard error of mean (SEM $\pm$) and critical difference (CD)

at 5% level of significance were calculated to compare the treatment means.

Results and Discussion

The results on the effect of different rearing media on the biological parameters of *C. cephalonica* are presented in Table 1 and Figure 1 and 2. The data revealed significant differences among the treatments for all the parameters studied.

Table 1: Performance of *C. cephalonica* on different rearing media

Treatments	Total Larval Period (Days)	Pupal Period (Days)	% Moths Emergence	% Female Moths	% Male Moths	Total Egg Production (cc)	No. of Eggs/cc
T ₁ : Sorghum + Yeast	31.23	9.19	78.22	45.71	48.21	7.68	153600
T ₂ : Rice + Yeast	30.13	8.32	73.63	43.29	46.29	6.79	135800
T ₃ : Maize + Yeast	29.97	7.93	75.19	43.16	47.28	7.19	143600
T ₄ : Groundnut + Yeast	39.21	9.63	86.96	53.26	62.59	13.37	267400
T ₅ : Sorghum + Rice + Yeast	37.32	10.13	81.87	49.40	57.98	11.12	222400
T ₆ : Sorghum + Maize + Yeast	34.17	10.19	81.25	48.25	52.33	8.24	273600
T ₇ : Sorghum + Groundnut + Yeast	41.45	11.15	83.25	49.35	59.34	12.25	245000
T ₈ : Sorghum + Rice + Maize + Groundnut + Yeast	47.29	13.32	93.27	59.84	68.65	16.71	334200

Effect on larval period

The larval period of *C. cephalonica* ranged significantly from 29.97 to 47.29 days across different treatments. The shortest larval period was recorded in T₃ (Maize + Yeast powder) at 29.97 days, followed by T₂ (Rice + Yeast powder) at 30.13 days. Among the sorghum-based diets, T₁ (Sorghum + Yeast) recorded 31.23 days. The mixed cereal diets T₆ (Sorghum + Maize) and T₅ (Sorghum + Rice) recorded 34.17 and 37.32 days, respectively. Notably, T₄ (Groundnut + Yeast), T₇ (Sorghum + Groundnut), and T₈ (mixed cereal + groundnut) recorded longer larval periods of 39.21, 41.45, and 47.29 days, respectively. The longer larval period in groundnut-fortified diets might be attributed to the higher protein and oil content which may require more time for digestion and assimilation. The longest larval period in T₈ indicates that the complex mixed diet with multiple ingredients requires extended time for complete larval development. Similar findings were reported by Kumar *et al.* (2018) [8], who recorded the shortest larval period on sorghum + groundnut diet.

Effect on pupal period

The pupal period ranged from 7.93 to 13.32 days. The shortest pupal period was recorded on T₃ (Maize + Yeast powder) at 7.93 days, closely followed by T₂ (Rice + Yeast powder) at 8.32 days. The pupal period gradually increased with the incorporation of groundnut and mixed ingredients. T₈ recorded the longest pupal period of 13.32 days. The shorter pupal period on sole cereal diets suggests rapid metamorphosis, possibly due to simpler nutritional composition. However, the longer pupal periods on mixed diets with groundnut fortification might indicate better nutritional accumulation during the pupal stage, which could contribute to better adult quality. Padamshali and Ganguli (2019) [14] reported similar trends where rice-based diets resulted in longer developmental periods in all stages compared to jowar + groundnut diets.

Effect on moth emergence

The per cent moth emergence varied significantly from 73.13% to 93.27%. The highest moth emergence was recorded in T₈ (Sorghum + Rice + Maize + Groundnut +

Yeast) at 93.27%, which was significantly superior to all other treatments. T₄ (Groundnut + Yeast powder) recorded 86.96%, followed by T₇ (Sorghum + Groundnut) at 83.25%. Among the sole cereal diets, T₁ (Sorghum + Yeast) showed 78.22%, while T₃ (Maize + Yeast) and T₂ (Rice + Yeast) recorded 75.19% and 73.63%, respectively. The high moth emergence in T₈ can be attributed to the balanced nutritional composition provided by the combination of multiple cereals and groundnut, ensuring adequate supply of carbohydrates, proteins, and lipids essential for complete development. These findings are in agreement with Bhandari *et al.* (2014) [2], who reported that corn + groundnut was superior for almost all biological parameters of *C. cephalonica*, followed by millet + groundnut.

Effect on female and male moth emergence

The female moth emergence ranged from 43.16% (T₃) to 59.84% (T₈). The highest female emergence was recorded on T₈ (59.84%), followed by T₄ (53.26%) and T₇ (49.35%). The higher proportion of female emergence is desirable for mass rearing programmes as females determine the reproductive potential of the population. Similarly, male moth emergence ranged from 46.29% (T₃) to 68.65% (T₈). The treatment T₈ again recorded the highest male emergence at 68.65%. The favourable sex ratio and higher emergence on mixed and groundnut-fortified diets indicate the importance of protein supplementation in the adult diet for better survival and reproductive fitness. Mehendale *et al.* (2014) [13] also reported maximum total females and fecundity in *Corcyra* females emerged from sorghum + groundnut + powdered yeast diets.

Effect on egg production

The total egg production is a critical parameter for determining the suitability of a rearing medium for mass multiplication of *C. cephalonica*. The total egg production ranged from 6.79 cc (T₂) to 16.71 cc (T₈). Treatment T₈ recorded the highest egg production of 16.71 cc, which was more than double the production of most sole cereal diets. T₄ (Groundnut + Yeast) recorded 13.37 cc, followed by T₇ (Sorghum + Groundnut) at 12.25 cc. Among the sole cereal

diets, T₁ (Sorghum + Yeast) produced 7.68 cc, while T₃ and T₂ produced 7.19 cc and 6.79 cc, respectively.

The number of eggs per cc also showed similar trend, ranging from 135,800 (T₂) to 334,200 (T₈). Treatment T₈ recorded the highest number of eggs (334,200/cc), followed by T₄ (267,400/cc), T₆ (273,600/cc), and T₇ (245,000/cc). Sole sorghum, rice, and maize diets yielded significantly lower egg numbers compared to mixed and groundnut-fortified diets. The superior egg production on groundnut-fortified and mixed diets can be attributed to higher nutritional value, particularly protein and lipid content, which are essential for ovarian development and fecundity in female moths. Laouali Amadou (2019) [9] observed that the addition of cowpea or peanut to cereal diets yielded higher *C. cephalonica* larval survival and female moths emerging from larvae fed on cereal and legume mixed diets produced higher numbers of eggs compared to those fed on sole cereals.

Comparative analysis of diets

Based on the overall performance, the eight treatments can be ranked as follows for mass multiplication of *C. cephalonica*. T₈ (Sorghum + Rice + Maize + Groundnut + Yeast powder) was the best treatment for maximum biomass production and egg yield, despite recording the longest developmental period. T₄ (Groundnut + Yeast powder) and T₇ (Sorghum + Groundnut + Yeast powder) emerged as the next best options. For rapid multiplication with shorter generation time, T₃ (Maize + Yeast powder) and T₂ (Rice + Yeast powder) could be preferred, although with lower overall productivity. The results clearly establish that groundnut fortification significantly enhances the reproductive performance of *C. cephalonica*. Rajasekhar *et al.* (2016) [16] also found that bajra-based medium was significantly superior for most parameters and could be used profitably in mass multiplication of *C. cephalonica*.

Conclusion

1. The present study clearly demonstrates that the rearing diet significantly influences the biological parameters of *Corcyra cephalonica*. The following conclusions can be drawn from the study:
2. Among the different diets tested, T₈ (Sorghum + Rice + Maize + Groundnut + Yeast powder) was the best treatment, recording the highest moth emergence (93.27%), female moth emergence (59.84%), male moth emergence (68.65%), total egg production (16.71 cc), and number of eggs (334,200/cc).
3. The shortest larval period (29.97 days) and pupal period (7.93 days) were recorded on T₃ (Maize + Yeast powder), indicating faster development on sole cereal-based diets.
4. Groundnut-fortified diets (T₄ and T₇) showed significantly better performance compared to sole cereal diets for parameters like moth emergence, egg production, and fecundity.
5. Mixed diets with multiple cereals and groundnut supplementation provide balanced nutrition and are most suitable for mass multiplication programmes where maximum egg production is the primary goal.
6. For mass rearing of *Trichogramma* and other egg parasitoids, diets promoting higher *C. cephalonica* fecundity are preferable, even with a longer

developmental period, as they ensure higher output of host eggs for parasitoid production.

The findings of this study contribute significantly to the optimization of mass rearing protocols for *C. cephalonica*, which serves as one of the most important factitious hosts in biological control programmes worldwide. The results provide valuable information for selecting appropriate rearing media based on the specific requirements of the mass production system, whether priority is given to rapid multiplication or maximum biomass and egg production.

References

1. Armes NJ, Jadhav DR, Band GS, King ABS. Insecticide resistance in *Helicoverpa armigera* (Hub.) in South India. *Pesticide Science*. 1992;34:355-364.
2. Bhandari G, Regmi R, Shrestha J. Effect of different diets on biology of rice moth, *Corcyra cephalonica* (Stainton) under laboratory condition in Chitwan, Nepal. *International Journal of Applied Sciences and Biotechnology*. 2014;2(4):585-588.
3. Bhardwaj JR, Ganguli JL, Khan HH, Sahu R. Bionomics of the rice meal moth, *Corcyra cephalonica* (Stainton) reared under laboratory condition on different diets. *Journal of Entomology and Zoology Studies*. 2017;5(5):722-727.
4. Chandrawanshi P, Aherkar SK, Thakare VS, Shendage SA. Effect of magnetic field and different diets on the biological parameters of rice moth, *Corcyra cephalonica* (Stainton). *Journal of Entomology and Zoology Studies*. 2018;6(4):74-76.
5. Chaudhuri N, Senapati SK. Development and reproductive performance of rice moth *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae) in different rearing media. *Journal of the Saudi Society of Agricultural Sciences*. 2015.
6. Finney GL, Fisher TW. Culture of entomophagous insects and their hosts. In: DeBach P, editor. *Biological Control of Insect Pests and Weeds*. New York: Reinhold Publishing Corporation; 1964. p. 84.
7. Kamel AH, Ali MA, El-Bishlwy HM. Effect of flour constituents on certain biological aspects of the rice moth, *Corcyra cephalonica* Staint. (Galleridae, Lepidoptera) and parasitism by *Trichogramma australicum* Gir. PhD thesis. Coimbatore: Tamil Nadu Agricultural University; 1977.
8. Kumar A, Tambe VJ, Rehaman SK, Choudhuri BN, Thakur KD. Effect of different diets on the biology of rice moth, *Corcyra cephalonica* (Stainton). *Journal of Entomology and Zoology Studies*. 2018;6(3):251-254.
9. Laouali Amadou, Baoua I, Ba MN, Muniappan R. Development of an optimum diet for mass rearing of the rice moth, *Corcyra cephalonica* (Lepidoptera: Pyralidae), and production of the parasitoid, *Habrobracon hebetor*. *Journal of Insect Science*. 2019;19(2):1-5.
10. Malik M, Kumar N, Ombir. Effects of larval rearing media and adult diets of rice moth, *Corcyra cephalonica* (Stainton) on longevity of moths and fecundity of female. *Journal of Entomology and Zoology Studies*. 2018;6(6):1192-1195.
11. Manjunath TM. Qualitative and quantitative analysis of techniques leading to economic mass-production of *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae).

- PhD thesis. Bangalore: University of Agricultural Sciences; 1993. 130 p.
12. Medina CP, Cadapan EP. Mass rearing of *Corcyra cephalonica* and *Trichogramma* spp. Philippine Entomologist. 1982;5(2):181-198.
 13. Mehendale SK, Patel MB, Shinde CU. Evaluation of different rearing media for *Corcyra cephalonica* (Stainton) under laboratory condition. The Bioscan. 2014;9(1):259-264.
 14. Padamshali S, Ganguli JL. Tri-trophic interaction of different diet fed *Corcyra cephalonica* (Stainton) on feeding efficiency of reduviid predator, *Sycanus collaris* (Fab.) under laboratory condition. Journal of Biological Control. 2019;33(3):271-273.
 15. Padhy D, Ramlakshmi V, Dash L, Sahu AK. Recent advances in rearing of the laboratory host - rice moth, *Corcyra cephalonica* Stainton. Indian Journal of Pure and Applied Biosciences. 2020;8(6):501-510.
 16. Rajasekhar L, Lavanya N, Divya J. Estimation of production potential of host insect *Corcyra cephalonica* (Stainton, 1865) (Lep., Pyralidae) on different diet combinations to produce *Trichogramma chilonis*. International Journal of Agricultural Sciences. 2016;6(2):77-80.
 17. Rao PS, Perraia A, Rao KBH. Effect of fortification of natural rearing media with casein, cholesterol and glucose on *Corcyra cephalonica* (Stainton): I. Larval growth. Indian Journal of Entomology. 1980;42(2):218-222.
 18. Scholler M, Flinn PW, Grieshop MJ, Zd'arkova E. Biological control of stored product pests. In: Insect Management for Food Storage and Processing. 2nd ed. St. Paul (MN): American Association of Cereal Chemists; 2005.
 19. Shukla A, Jadhav DS. Biology of *Coccinella transversalis* (Fabricius) on different aphid species. The Bioscan. 2014;9(1):17-22.
 20. Smith SM. Biological control with *Trichogramma*: advances, successes and potential of their use. Annual Review of Entomology. 1996;41:375-406.