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## Effect of vitamin-enriched artificial diets on the biology of the rice moth, *Corcyra cephalonica* (Stainton)

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### Abstract

A laboratory study on effect of different artificial diet enriched with vitamins on the biological parameters of *Corcyra cephalonica* was carried out at the Biological Control Research Laboratory, ICAR Unit-9, AAU, Anand (Gujarat) during 2024-25. Seven different diets comprising a base diet of sorghum, crushed groundnut seeds, and powdered yeast supplemented with different vitamins viz., Vitamin A, Vitamin B complex, Ascorbic acid (Vitamin C), Vitamin E, Vitamin H and Multivitamin were used to rear the larvae of *C. cephalonica*. The different diets had no significant effect on the incubation period of the rice moth. The *C. cephalonica* exhibited shortest larval period (26.56 days), pupal period (7.04 days), maximum adult emergence percentage (98.48 %), highest female biased sex ratio (1.80), minimum female (47.56 days) and male (44.52 days) developmental period, the shortest total developmental period (46.04 days), preoviposition (1.00 day) and post oviposition (1.02 days) period, longest oviposition period (5.88 days), maximum fecundity (378.50 eggs), exceptionally elevated growth index and maximum food efficiency index (12.84), when reared on diet (Sorghum + Groundnut + Powdered yeast + Vit A). The longest female (9.84 days) and male (6.08 days) longevity was reported on diet (Sorghum + Groundnut + Powdered Yeast + Vitamin E). The treatment combination of Sorghum + Groundnut + Powdered Yeast exhibited the least favorable outcomes across the majority of parameters observed.

**Keywords:** *Corcyra cephalonica*, rice moth, vitamins, artificial diet

### Introduction

Globally, crop protection strategies are undergoing a paradigm shift away from conventional chemical-dependent pest control practices towards bio-intensive Integrated Pest Management (IPM) approaches. Biological control is an ecologically sustainable and economically viable approach within Integrated Pest Management, using parasites, predators, or pathogens for maintaining another organism's population density at a lower average than would occur in their absence. Approximately 90% of potential pests are already effectively managed through biological control (Shukla and Jadhav, 2014) <sup>[11]</sup>. Mass production of biological control agents is a fundamental requirement of biocontrol programs, necessitating a steady and sufficient supply of easily maintainable factitious hosts for mass culturing of bioagents. (Wadaskar *et al.*, 2015) <sup>[13]</sup>.

The rice moth, *Corcyra cephalonica* (Pyralidae: Lepidoptera) is a serious pest of stored commodities, such as rice, wheat, maize, sorghum, groundnut, cotton seeds, coffee, spices and cocoa beans, in India and other tropical and subtropical regions of the world (Devi *et al.*, 2013; Allotey & Azalekor, 2000) <sup>[5, 1]</sup>. The rice moth is employed in a variety of biological control research, development and extension units for the large-scale production of numerous natural enemies (Gauraha and Deole, 2016) <sup>[7]</sup>. The larvae of rice meal moth, *C. cephalonica*, is a top choice for mass cultured entomophagous insects including, egg parasitoids-*Trichogramma* spp., egg larval parasitoid-*Chelonus blackburnii*, larval parasitoids-*Bracon* spp., *Goniozus nephantidis* and *Apanteles angaleti* and insect predators which includes-*Chrysoperla carnea*, *Mallada boninensis*, *R. marginatus* and *Cyrtorhynus feltiae* (*Neoplectana carpocapsae*). For the mass production of *C. cephalonica*, a variety of food materials such as rice, sorghum, groundnuts, maize, wheat, ragi, sesame and bajra etc. have been utilized.

Rearing of *C. cephalonica* larvae on a high-quality nutritional source resulted in high quality eggs (Nathan *et al.*, 2006) [10]. Different diets affect various developmental parameters such as larval growth rate, pupation success, adult emergence, overall growth rates, survival rates and reproductive success of *C. cephalonica*, making the choice of food material critical for optimizing mass production of this species. Different investigations concluded that, growth and reproductive potential of *C. cephalonica* increased by providing optimum nutritional components in the diet (Gauraha and Deole, 2016) [7].

Vitamins are vital micronutrients that play a critical role in maintaining internal metabolism by acting as enzyme precursors and are indispensable for proper growth (Elsayeh *et al.*, 2022) [6]. Although several artificial diets have been developed for *C. cephalonica*, scientific information on the impact of vitamin enriched diets on its biological attributes and egg productivity remains limited. Accordingly, the present study was undertaken to study the effect of different artificial diets enriched with vitamins on the biology of rice moth *C. cephalonica* with the objective of developing a stable and nutritionally balanced rearing medium.

### Materials and Methods

The assessment of different artificial diet enriched with vitamins on the biological parameters of *C. cephalonica* was carried out at the Biological Control Research Laboratory, ICAR Unit-9, AAU, Anand, during 2024-25, using a sorghum-based diet. The experiment comprised seven treatments with twenty-five replications, laid out in a Completely Randomized Design (CRD) and the diets used for rearing *C. cephalonica* are detailed below in Table 1:

#### Maintenance of *C. cephalonica* culture

The fresh (0-24 hr) eggs of the rice moth infesting the media were taken from the culture maintained at the Biological Control Research Laboratory, ICAR Unit-9, AAU, Anand.

#### Preparation of rearing cage

The wooden cages (38.5 x 38.5 x 15 cm) used for *C. cephalonica* multiplication were thoroughly cleaned with a 0.5% detergent wash, rinsed in tap water, wiped with a dry, clean towel and shade-dried. The trays emptied after a cycle of rearing were cleaned with 2% formaldehyde.

#### Preparation of artificial diet formulations

The required quantities of sorghum grains needed for the experiment were thoroughly cleaned and coarsely milled, breaking them into 2-3 pieces in a flour mill. After that, the grains were sterilized at 100 °C for 30 minutes in a hot air oven to eliminate the residual population of stored product insects and fungal contaminants. Once sterilized, the grains were cooled under a fan in a clean area. Two kilograms of sterilized sorghum (Fig 1A) were weighed using a mechanical balance and placed into each wooden cage. The broken groundnut seeds (100 g), powdered yeast (5 g) and vitamins (10 g) were added (Fig 1B) to the respective treatments and the contents were mixed thoroughly. Furthermore, 5 g of wettable sulphur was mixed into each container. The prepared mediums were used for rearing *C. cephalonica* larvae in the study.



A. Sorghum grains, crushed groundnut and vitamins



B. Vitamin tablet powder

**Fig 1:** Mass rearing of *C. cephalonica*

**Rearing procedure:** The eggs of *C. cephalonica* (0.25 cc) were sprinkled in each wooden cage and carefully transferred to the iron racks (Fig 2A). The following observations were recorded starting from the third day to note egg hatching.

**a. Incubation period (days):** A total of twenty-five eggs from each treatment were kept under a microscope and observed for hatching. The incubation period was calculated from the date of egg laying to the date of hatching.

**b. Larval period (days):** A small representative sample consisting of 25 eggs from each treatment was kept separately in small Petri dishes (90 mm) to determine the number and duration of different larval instars and the total larval period (Fig 2B). Moulting was identified under a stereomicroscope by the presence of cast-off head capsules, as well as changes in larval size and color. The larval period was calculated by summing up the number of days from the date of egg hatching to the date of pupation, including the time required by larvae to undergo different instars.



A. Experimental setup showing wooden cages for rearing of *Corcyra* larvae



B. Representative samples

**Fig 2:** Experimental setup for *C. cephalonica* rearing

**c. Pupal period (days):** The pupal period was recorded by calculating the number of days between the date of pupa formation and adult emergence.

**d. Adult emergence (%):** Adult emergence per treatment was calculated by counting the number of adults that emerged per 25 eggs from each treatment on a daily basis, starting from the emergence of the first adult. The percentage of adult emergence was determined based on the total number of adults that emerged out of the total number of eggs used.

$$\text{Adult emergence (\%)} = \frac{\text{Number of adults emerged}}{\text{Total number of eggs}} \times 100$$

**e. Sex ratio (F:M):** To study the sex ratio, laboratory-reared adults were critically examined to determine their sex. The ratio was determined by distinguishing males and females based on their labial palps, which were smooth and forward in females and blunt and unnoticeable in males.

**f. Adult longevity (days):** The longevity of male and female moths was calculated from the date of their emergence to their death.

**g. Developmental period or total life cycle (days):** The period from eggs to adult emergence was considered the total developmental period, which was calculated by summing the incubation period, larval period, pupal period and adult longevity *i.e.* the periods from egg to adult stage.

**h. Pre-oviposition, oviposition, post-oviposition periods (days) and fecundity:** Five pairs of freshly emerged male and female adults were collected from the host commodity and released into plastic jars fitted with mesh. A 50 per cent honey solution (1:1 honey and water) was provided as food daily. The eggs laid by each female on the surface of the jar as well as on the inner surface of the mesh were counted daily using a moist camel hair brush under magnascope and the total number of eggs laid by each female was recorded. The period between the female's emergence and the commencement of egg laying was considered the pre-oviposition period. The period between the start and cessation of egg laying was referred to as the oviposition period. The period between the cessation of egg laying and the death of the female was considered the post-oviposition period.

**i. Growth index:** The growth index of *C. cephalonica* was calculated for different host commodities as per formula (Singh and Pant, 1995) [12],

$$\text{Growth index} = \frac{\text{Percentage of adult emergence}}{\text{Average developmental period(days)}}$$

**j. Food efficiency index:** The food efficiency index of *C. cephalonica* reared on different host diets under experiment on *C. cephalonica* was calculated by using following formula

$$\text{Food Efficiency Index} = \frac{\text{Adult emergence(\%)} \times \text{Wt. of 100 eggs}}{\text{Average developmental period(days)}}$$

The data obtained was subjected to statistical analysis.

## Results & Discussions

The effects of different artificial diets enriched with vitamins on the biological parameters of *Corcyra cephalonica* are presented in Table 2 & 3.

There was no significant variation in incubation period of *C. cephalonica* when reared on artificial diet enriched with different vitamins (Table 2). The treatment T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A) showed the shortest larval period of 26.56 days whereas, the longest larval period of 35.80 days was noticed in the treatment T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast) (Fig 3).

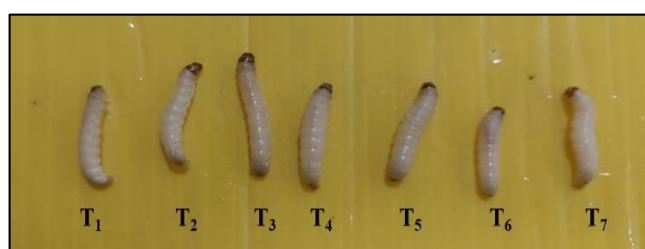


**Fig 3:** Seventh instar larvae of *C. cephalonica* from different diets

The lowest pupal period of 7.04 days was achieved in the treatment T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A) and the longest pupal period was observed in the treatment T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast) with 8.72 days (Fig 4). The maximum female longevity of 9.84 days was observed in the diet T<sub>5</sub> (Sorghum + Groundnut + Powdered yeast + Vit E), while the minimum female longevity of 7.88 days was recorded in T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast). The highest male longevity (6.92 days) was recorded when larvae reared on T<sub>5</sub> (Sorghum + Groundnut + Powdered yeast + Vit E) and the lowest longevity (4.88 days) was recorded when reared on T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast).



Slit on 8<sup>th</sup> female abdominal segment



No slit on 8<sup>th</sup> male abdominal segment

**Fig 4:** Female and male pupae of *C. cephalonica*

The shortest female development period of 47.56 days was observed in diet T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A), however, the longest female development period (57.56 days) was noticed in the treatment T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast). The treatment T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A) was found to be the superior diet for *C. cephalonica* with the lowest development period of 44.52 days (Table 2). It was reflected from the data that rearing of *C. cephalonica* on treatment T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast) recorded the longest male development period of 54.56 days. The total developmental period of *C. cephalonica* reared on different vitamin rich diets ranged from 46.04 days to 56.06 days (Table 2). The shortest developmental period of 46.04 days was recorded for *Corcyra* reared on the T<sub>2</sub> diet (Sorghum + Groundnut + Powdered yeast + Vit A) and the longest development period of 56.06 days was

noticed in T<sub>1</sub> diet (Sorghum + Groundnut + Powdered yeast).

A minimum preoviposition period of 1.00 day is recorded in the diet T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A), whereas the maximum preoviposition period of 1.86 days was recorded in T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast). The *Corcyra* reared on T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A) registered with maximum oviposition period of 5.88 days (Table 3). A significantly shorter oviposition period of 4.08 days was noticed in *Corcyra* reared on T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast) without any vitamin supplementation. A shorter postoviposition period of female was achieved from the *Corcyra* larvae reared on T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A) with 1.02 days. Significantly the longest post oviposition period of 1.98 days was noticed with T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast) treatment.

A significantly highest egg laying capacity of 378.50 eggs was recorded on the diet T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A) compared to other diets. A significantly lowest egg laying potential of 265.22 eggs was when *C. cephalonica* was reared on T<sub>1</sub> diet (Sorghum + Groundnut + Powdered yeast). The maximum adult emergence percentage of 98.48 was reported in T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A), which was significantly superior to all other treatments. The minimum adult emergence was observed in the treatment T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast) with an adult emergence of 68.40 per cent.

The sex ratio demonstrated a dominance of females and it was varied from 1.80: 1 to 1.10: 1. A maximum sex ratio of 1.80 was noted in the treatment T<sub>2</sub> (Sorghum + Groundnut + Powdered yeast + Vit A), while the lowest sex ratio of 1.10 was noticed in the treatment T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast). In the present investigation, the growth index was determined using the adult emergence percentage and the average developmental period of rice moth. Seven different vitamin enriched artificial diets were evaluated using the growth index and the values are represented in Table 3. The T<sub>2</sub> diet (Sorghum + Groundnut + Powdered yeast + Vit A) showed a significantly highest growth index of 2.14 compared to the other diets. The lowest growth index of 1.22 was observed in T<sub>1</sub> diet (Sorghum + Groundnut + Powdered yeast). The highest food efficiency index (12.84) was recorded for insects reared on the T<sub>2</sub> diet (Sorghum + Groundnut + Powdered yeast + Vitamin A) and a significantly lowest food efficiency of 4.88 was recorded for the T<sub>1</sub> diet (Sorghum + Groundnut + Powdered yeast).

Examining the overall effects of different vitamin enriched diets on the biological characteristics of *C. cephalonica*, it was revealed that T<sub>2</sub> diet (Sorghum + Groundnut + Powdered yeast + Vit A) outperformed others in most of the parameters tested, reporting the shortest incubation period, larval period, pupal period, female and male developmental periods, total developmental period, preoviposition period, post oviposition period as well as the highest adult emergence, sex ratio, oviposition period, fecundity, growth index and food efficiency index. The next best performing diets, in order were T<sub>5</sub> (Sorghum + Groundnut + Powdered yeast + Vitamin E), T<sub>7</sub> (Sorghum + Groundnut + Powdered yeast + Multivitamin), T<sub>3</sub> diet (Sorghum + Groundnut + Powdered yeast + Vit B Complex), T<sub>6</sub> (Sorghum + Groundnut + Powdered yeast + Vit H) and T<sub>4</sub> (Sorghum +

Groundnut + Powdered yeast + Vit C). The highest male and female longevity is recorded in the diet T<sub>5</sub> (Sorghum + Groundnut + Powdered yeast + Vitamin E). The treatment T<sub>1</sub> (Sorghum + Groundnut + Powdered yeast) showed no excellence in any of the parameters tested.

In the present study, among the vitamin enriched diets used to rear *C. cephalonica*, Vitamin A outperformed all other vitamins (B, C, E, H, multivitamin) and base diet by improving the development and reproduction of rice moth. The result obtained in the present investigation are in close agreement with the findings of several workers. House (1965) [8] reported that dietary Vitamin A acetate significantly accelerated the growth rate of axenically reared *A. affinis* larvae on a chemically defined diet and enabled the resulting adults to reproduce. Similarly, House (1966) [9]

found that Vitamins A and E accelerated the growth and development of *A. affinis*, increased adult emergence, particularly improved male development, and corrected the previously abnormal sex ratio. In a similar study, Babu (2013) [3] reported that the fecundity of *H. armigera* increased with higher concentrations of Vitamin E in the artificial diet and gradually improved over generations when reared on multivitamin-enriched diets, additionally, adult emergence was higher (80.0%) in multivitamin-supplemented diets compared to the control (70.0%). According to Begum and Qamar (2015) [4], diet D<sub>5</sub> enriched with vitamin E exhibited superior performance in *C. cephalonica* compared to other dietary formulations containing Vitamin B and H, leading to the highest fecundity (399.2) and food efficiency index (8.45).

**Table 1:** Composition of different treatments used

| Sr. No. | Treatments                                                   | Quantity/Cage                |
|---------|--------------------------------------------------------------|------------------------------|
| 1       | Sorghum + Groundnut + Powdered Yeast                         | 2.00 kg + 100 g + 5 g        |
| 2       | Sorghum + Groundnut + Powdered Yeast + Vit A                 | 2.00 kg + 100 g + 5 g + 10 g |
| 3       | Sorghum + Groundnut + Powdered Yeast + Vit B Complex         | 2.00 kg + 100g + 5 g + 10 g  |
| 4       | Sorghum + Groundnut + Powdered yeast + Ascorbic acid (Vit C) | 2.00 kg + 100 g + 5 g + 10 g |
| 5       | Sorghum + Groundnut + Powdered Yeast + Vit E                 | 2.00 kg + 100 g + 5 g + 10 g |
| 6       | Sorghum + Groundnut+ Powdered Yeast + Vit H                  | 2.00 kg + 100 g + 5 g + 10 g |
| 7       | Sorghum + Groundnut + Powdered Yeast + Multivitamin          | 2.00 kg + 100 g + 5 g + 10 g |

**Table 2:** Effect of different artificial diets enriched with vitamins on the development of rice moth, *C. cephalonica*

| Sr. No.                                                                                                                                                                           | Treatments                                                   | Incubation period (days) | Larval period (days) | Pupal Period (days) | Adult longevity (days) |                   | Total developmental period (days) |                    | Total developmental period (days) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------|----------------------|---------------------|------------------------|-------------------|-----------------------------------|--------------------|-----------------------------------|
|                                                                                                                                                                                   |                                                              |                          |                      |                     | Female                 | Male              | Female                            | Male               |                                   |
| T <sub>1</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast                         | 5.16                     | 35.80 <sup>f</sup>   | 8.72 <sup>d</sup>   | 7.88 <sup>e</sup>      | 4.88 <sup>e</sup> | 57.56 <sup>f</sup>                | 54.56 <sup>f</sup> | 56.06 <sup>f</sup>                |
| T <sub>2</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit A                 | 4.84                     | 26.56 <sup>a</sup>   | 7.04 <sup>a</sup>   | 9.12 <sup>b</sup>      | 6.08 <sup>b</sup> | 47.56 <sup>a</sup>                | 44.52 <sup>a</sup> | 46.04 <sup>a</sup>                |
| T <sub>3</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit B Complex         | 4.96                     | 31.76 <sup>c</sup>   | 7.44 <sup>b</sup>   | 8.76 <sup>c</sup>      | 5.60 <sup>d</sup> | 52.92 <sup>c</sup>                | 49.76 <sup>c</sup> | 51.34 <sup>c</sup>                |
| T <sub>4</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Ascorbic acid (Vit C) | 5.00                     | 34.80 <sup>e</sup>   | 8.20 <sup>c</sup>   | 7.92 <sup>e</sup>      | 4.92 <sup>e</sup> | 55.92 <sup>e</sup>                | 52.92 <sup>e</sup> | 54.42 <sup>e</sup>                |
| T <sub>5</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit E                 | 4.92                     | 29.20 <sup>b</sup>   | 7.12 <sup>a</sup>   | 9.84 <sup>a</sup>      | 6.92 <sup>a</sup> | 51.08 <sup>b</sup>                | 48.16 <sup>b</sup> | 49.62 <sup>b</sup>                |
| T <sub>6</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit H                 | 4.96                     | 34.44 <sup>c</sup>   | 7.68 <sup>b</sup>   | 8.36 <sup>d</sup>      | 4.96 <sup>e</sup> | 55.44 <sup>de</sup>               | 52.04 <sup>d</sup> | 53.74 <sup>de</sup>               |
| T <sub>7</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Multivitamin          | 4.92                     | 33.56 <sup>d</sup>   | 7.52 <sup>b</sup>   | 8.80 <sup>c</sup>      | 5.80 <sup>c</sup> | 54.80 <sup>d</sup>                | 51.08 <sup>d</sup> | 53.30 <sup>d</sup>                |
| F                                                                                                                                                                                 | S.Em. ±                                                      | 0.08                     | 0.28                 | 0.10                | 0.08                   | 0.07              | 0.33                              | 0.31               | 0.32                              |
|                                                                                                                                                                                   | F test (T)                                                   | NS                       | Sig.                 | Sig.                | Sig.                   | Sig.              | Sig.                              | Sig.               | Sig.                              |
|                                                                                                                                                                                   | CV (%)                                                       | 7.66                     | 4.38                 | 6.40                | 4.78                   | 6.03              | 3.10                              | 3.08               | 3.05                              |
| <b>Note:</b> (1) Treatment means followed by the same letter are not significantly differed by DNMRT at a 5% level of significance<br>(2) NS= Non-Significant, Sig. = Significant |                                                              |                          |                      |                     |                        |                   |                                   |                    |                                   |

**Table 3:** Effect of different artificial diets enriched with vitamins on the reproduction of rice moth, *C. cephalonica*

| Sr. No.                                                                                                                                                                           | Treatments                                                   | Pre-oviposition Period (days) | Oviposition Period (days) | Post-oviposition Period (days) | Fecundity (No. of eggs/female) | Adult emergence (%) | Sex ratio (F: M)  | Growth Index       | Food Efficiency Index |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------|---------------------------|--------------------------------|--------------------------------|---------------------|-------------------|--------------------|-----------------------|
| T <sub>1</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast                         | 1.86 <sup>e</sup>             | 4.08 <sup>e</sup>         | 1.98 <sup>f</sup>              | 265.22 <sup>g</sup>            | 68.40 <sup>d</sup>  | 1.10 <sup>f</sup> | 1.22 <sup>e</sup>  | 4.88 <sup>e</sup>     |
| T <sub>2</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit A                 | 1.00 <sup>a</sup>             | 5.88 <sup>a</sup>         | 1.02 <sup>a</sup>              | 378.50 <sup>a</sup>            | 98.48 <sup>a</sup>  | 1.80 <sup>a</sup> | 2.14 <sup>a</sup>  | 12.84 <sup>a</sup>    |
| T <sub>3</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit B Complex         | 1.14 <sup>bc</sup>            | 4.96 <sup>b</sup>         | 1.06 <sup>bc</sup>             | 325.07 <sup>d</sup>            | 69.12 <sup>cd</sup> | 1.20 <sup>d</sup> | 1.35 <sup>cd</sup> | 5.39 <sup>e</sup>     |
| T <sub>4</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Ascorbic acid (Vit C) | 1.74 <sup>e</sup>             | 4.36 <sup>d</sup>         | 1.80 <sup>e</sup>              | 285.99 <sup>f</sup>            | 69.08 <sup>cd</sup> | 1.15 <sup>e</sup> | 1.27 <sup>de</sup> | 6.35 <sup>d</sup>     |
| T <sub>5</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit E                 | 1.12 <sup>ab</sup>            | 5.84 <sup>a</sup>         | 1.04 <sup>ab</sup>             | 340.94 <sup>b</sup>            | 83.57 <sup>b</sup>  | 1.61 <sup>b</sup> | 1.68 <sup>b</sup>  | 8.42 <sup>c</sup>     |
| T <sub>6</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Vit H                 | 1.26 <sup>d</sup>             | 4.76 <sup>c</sup>         | 1.22 <sup>d</sup>              | 317.45 <sup>e</sup>            | 73.92 <sup>c</sup>  | 1.38 <sup>c</sup> | 1.38 <sup>c</sup>  | 6.88 <sup>d</sup>     |
| T <sub>7</sub>                                                                                                                                                                    | Sorghum + Groundnut + Powdered yeast + Multivitamin          | 1.24 <sup>cd</sup>            | 4.80 <sup>bc</sup>        | 1.10 <sup>cd</sup>             | 330.18 <sup>c</sup>            | 84.24 <sup>b</sup>  | 1.15 <sup>e</sup> | 1.58 <sup>b</sup>  | 9.53 <sup>b</sup>     |
|                                                                                                                                                                                   | S.Em. ±                                                      | 0.05                          | 0.07                      | 0.05                           | 1.59                           | 1.67                | 0.01              | 0.03               | 0.20                  |
|                                                                                                                                                                                   | F test (T)                                                   | Sig.                          | Sig.                      | Sig.                           | Sig.                           | Sig.                | Sig.              | Sig.               | Sig.                  |
|                                                                                                                                                                                   | CV (%)                                                       | 16.66                         | 7.49                      | 17.22                          | 2.48                           | 10.66               | 4.81              | 11.07              | 12.59                 |
| <b>Note:</b> (1) Treatment means followed by the same letter are not significantly differed by DNMRT at a 5% level of significance<br>(2) NS= Non-Significant, Sig. = Significant |                                                              |                               |                           |                                |                                |                     |                   |                    |                       |

## Conclusion

Biological control involves the effective utilisation of natural enemies such as parasitoids, predators and microbial agents, which necessitates the mass rearing of bioagents. The rice moth, continues to rank as the most widely used factitious host for mass culturing entomophagous insects due to its ease of mass production, adaptability to varied rearing conditions and its favorable influence on the quality of natural enemy progeny. The present investigation highlighted the influence of vitamin fortified artificial diets on the biological attributes of *Corcyra*. Among the vitamin enriched diets used to rear *C. cephalonica*, Vitamin A outperformed all other vitamins (B, C, E, H, multivitamin) and base diet by improving the development and reproduction of rice moth. The results suggest that inclusion of a vitamin A-enriched diet for the mass rearing of *Corcyra* can reduce rearing time and improve host quality for the production of other entomophagous insects.

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