

Effect of different diets on the biological parameters of rice moth, *Corcyra cephalonica* Stainton

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ABSTRACT

The effect of different diets on the biological parameters of rice moth, *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae) was studied under laboratory condition during 2010 -2011 in the Department of Entomology, Assam Agricultural University, Jorhat, Assam. Among the six diets tested, rice, wheat and groundnut mixture (5:5:1) was found to be the superior rearing medium that enhanced quicker development period of *Corcyra cephalonica*, maximum fecundity and maximum fresh body weight of full grown larva for both summer and winter seasons. The quicker development period of *Corcyra cephalonica* were 36.30 ± 0.58 and 48.80 ± 0.33 in summer and winter, respectively whereas maximum fecundity were 175.60 ± 0.13 and 157.65 ± 2.64 in both the season. The maximum fresh body weight of full grown larva was 93.85 ± 0.56 in summer and 84.70 ± 1.05 in winter when *Corcyra cephalonica* reared in rice, wheat and groundnut mixture (5:5:1). Groundnut alone proved to be the least preferred by the *Corcyra cephalonica* so weak performance in all the parameters for this tested host of many natural enemies.

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INTRODUCTION

Biological control has come to have a significant role in integrated pest management (IPM) because of its many and varied advantages over chemical methods, pest resistance to conventional pesticides and compatibility with other IPM methods (Dent, 2000). Non-chemical control methods have gained importance in IPM, as a policy aiming to minimize the application of residual chemical insecticides such as methyl bromide (Fields and White, 2002) and greater restrictions on the use of dichlorvos (Scholler, 2010). The control of stored product pests requires the control of large numbers of pests hidden in large amounts of product or structurally complex building (Scholler, 2010). So, biological

control is especially vital with regard to stored product facilities (Scholler and Flinn, 2000). The success of biological control programme is highly dependent on the nature of the host-parasitoid interaction, which has led to many host-parasitoid systems being investigated in great detail by Salvador and Consoli (2008). Knowledge of the physiological and biochemical interactions in host-parasitoid systems is important for the efficient production of biological control agents (Nakamatsu and Tanaka, 2003).

In vitro rearing techniques have been used to determine the quantitative and qualitative needs, as well as the nutritional biochemistry of natural enemies. However, improvement of these techniques depends on knowledge and understanding of the physiology, nutrition, genetics, and

behaviour of parasitoids (Magro and Para, 2003). *Corcyra cephalonica* Stainton, a stored grain pest is widely used for rearing large number of natural enemies under laboratory condition as well as mass multiplication for field release. Nutrition received by the natural enemies from the host organism is vital for their normal growth, reproduction, longevity and parasitization. It is necessary to study the effect of various larval diets in the growth and development of *Corcyra cephalonica* Stainton, so that a suitable diet of the host may be recommended for the mass multiplication of natural enemies.

Keeping all these points in view, an experiment was conducted under laboratory condition in the Department of Entomology, Assam Agricultural University, Jorhat, to evaluate the diet dependent biological parameters of *Corcyra cephalonica* Stainton.

MATERIAL AND METHODS

In the present investigation, plastic containers (22 cm×12 cm diameters) were used as rearing unit of *Corcyra cephalonica*. The larvae of *Corcyra cephalonica* were reared by providing six different diets *i.e.* partially ground rice, wheat and groundnut alone and rice with groundnut (10:1) and wheat with groundnut (10:1) taking diet rice, wheat and groundnut mixture (5:5:1) as standard with ten replications. Each rearing unit contained 275 g of test diets. In case of rice mixed with groundnut diet was 250 g and 25 g, respectively and in case of wheat mixed with groundnut diet 250 g and 25 g, respectively. But for the standard medium, rice 125 g; wheat 125 g along with 25 g of groundnut. Before use, all the test diets were heated and sterilized in the oven at 45°C for 12 hrs. After preparation of the rearing units, 100 no. of eggs were placed in each diet so that the emerging larvae can develop in different rearing media since emergence. The rearing units were wrapped with black coloured paper to provide darkness to restrict the active movement of the growing larvae. The top of the container was covered with muslin cloth to provide sufficient aeration. In order to record the larval weight, another stock culture was also maintained for each of the diet.

Total development period :

To study the development period of *Corcyra cephalonica*, the freshly laid eggs obtained from stock culture were kept in a glass vial and allowed to remain there till they hatched. Soon after hatching, the newly emerged larvae were transferred by using a fine brush to glass tube (7.5×2.5 cm) containing 2 g of equilibrated rearing media. The different rearing media were investigated each with twenty replications. The tubes were examined daily for adult's emergence. The dates of adult emergence of the isolated larvae

were recorded. The number of days required from oviposition to adult emergence is the total development period.

Fecundity per female moth :

To study the fecundity, one pair of male and female moth, emerged on the same day from same rearing media was kept separately in oviposition cage. Glass chimneys fitted with net at the bottom and muslin cloth at the top was used as oviposition cage. Fifty per cent honey solution was provided as diet of the adult moths. Eggs laid by individual pair were collected and counted daily. Thus, the total number of eggs laid per female was calculated out. Data were recorded from twenty replications.

Body weight of full grown larva :

To determine the body weight of full grown larvae, last instars larvae (about to pupate) were taken from the stock culture and weighed in an electronic balance. Ten replications were kept for each rearing medium.

Adult emergence :

The number of adults emerging from different rearing media were recorded and expressed in percentage (Bordoloi, 1994) :

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

Per cent female emergence :

The number of adults emerging from different rearing media were recorded and expressed in percentage :

$$\text{Female emergence} = \frac{\text{Number of adult female emerged}}{\text{Total number of eggs inoculated}} \times 100$$

Statistical analysis :

The data obtained from the experiments were used for statistical analysis. The data were analyzed statistically using Fisher's method of analysis of variance.

The standard error of difference of means (S.Ed) was calculated by the following expression :

$$\text{S.Ed}(\pm) = \sqrt{\frac{2 \times \text{error mean square}}{\text{total no. of replications}}}$$

The significances or otherwise differences between means were ascertained by comparing with appropriate critical difference (C.D).

RESULTS AND DISCUSSION

The quicker development period of *Corcyra cephalonica* (Table 1) was recorded 36.30±0.58 in summer than in winter (48.80±0.33) when the larvae were fed on rice, wheat and groundnut mixture (5:5:1). Jagdish *et al.* (2009) also reported that the total development period of *Corcyra cephalonica* was required 41 to 59 days on foxtail

Table 1 : Effect of different diets on the total development period and fecundity of <i>Corcyra cephalonica</i> Stainton				
Diets	Total development period		Fecundity per female	
	Summer(days) [Mean±S.Em.]	Winter (days) [Mean±S.Em.]	Summer(nos. of egg/female) [Mean±S.Em.]	Winter (nos. of egg/female) [Mean±S.Em.]
Rice	41.10±0.19	53.35±0.22	170.20±0.41	154.95±2.64
Wheat	44.50±0.41	56.20±0.10	161.40±0.62	152.10±1.93
Groundnut	46.95±0.25	58.15±0.30	158.30±0.76	151.70±2.44
Rice + Groundnut (10:1)	39.70±0.24	51.60±0.28	172.50±0.38	156.30±3.02
Wheat + Groundnut (10:1)	41.50±0.21	53.30±0.21	167.30±0.33	153.10±2.74
Rice + Wheat + Groundnut (5:5:1)	36.30±0.58	48.80±0.33	175.60±0.13	157.65±2.64
S.E. ±	0.40	0.7	1.01	0.69
CD (P=0.05)	0.77	1.3	1.95	1.33
CD (P=0.01)	1.0	1.7	2.53	1.72

Table 2 : Effect of different diets on the body weight of full grown larvae <i>Corcyra cephalonica</i> Stainton		
Diet	Body weight of full grown larva	
	Summer (mg) [Mean±S.Em.]	Winter (mg) [Mean±S.Em.]
Rice	90.80±1.18	82.60±1.53
Wheat	89.80±0.99	79.90±1.24
Groundnut	87.50±1.28	78.30±1.44
Rice+Groundnut (10:1)	91.45±0.98	83.55±1.28
Wheat+Groundnut (10:1)	90.40±0.57	82.50±1.24
Rice+Wheat+Groundnut (5:5:1)	93.85±0.56	84.70±1.05
S.E. ±	1.37	0.88
CD (P=0.05)	2.63	1.69
CD (P=0.01)	3.42	2.19

millet at a temperature of 24 to 28°C and 70 per cent relative humidity. The maximum fecundity of per female moth (Table 1) was found 175.60±0.13 and 157.65±2.64 summer and winter season, respectively. This findings agree with Zhange *et al.* (1991) who reported that among the media of 100 per cent rice bran, 100 per cent wheat bran, 90 per cent rice bran and 10 per cent maize flour, the rice bran reared *Corcyra cephalonica* produced the highest number of eggs. The maximum fresh body weight of full grown larva (Table 2) was 93.85±0.56 in summer and 84.70±1.05 in winter when *Corcyra cephalonica* reared in rice, wheat and groundnut mixture (5:5:1). The lowest fecundity and lowest body weight of full grown larvae in oth the seasons were recorded when larvae were fed on groundnut alone. This finding is in agreement with Allotey and Azalekor (2000) who mentioned that the mean development period of *Corcyra cephalonica* ranged from 33.3±0.20 days on powdered cowpea to 45.3±1.80 days on whole bambara groundnut.

During recent years, considerably greater emphasis has been laid on the possibility of increasing the usefulness of the biocontrol agent due to rightful concern over the conservation of natural enemies and also the environment. Having understood the ill effects of indiscriminate use of synthetic pesticides, inundative release of biotic agents as a

means of pest management has become very popular. In laboratory, culture of many parasitoid species is maintained on the larva of *Corcyra cephalonica* Stainton, a stored grain pest. Host insects play a major role in the developmental biology of the parasitoids. It is known that considerable amounts of carbohydrate, protein and lipid are needed by most parasitoids for survival and reproduction. Nutritional reserves for adult parasitoid may be either accumulated during larval development, or may be synthesized by intake of precursor substances via nutrition during the adult stage (Wheeler and Buck, 1992).

Selection of a suitable rearing medium is essential that would effectively support the development of *Corcyra cephalonica* Stainton and also the effect biology of natural enemies reared in such host diets. From the investigation, it can be concluded that rice, wheat and groundnut mixture (5:5:1) proved as the best and ideal diet for rearing *Corcyra cephalonica*.

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