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Biology and morphometry of rice moth, *Corcyra cephalonica* (Stainton) on semi-synthetic diet under laboratory condition

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Abstract
Corcyra cephalonica (Stainton) (Lepidoptera Pyralidae) generally known as rice moth is an chief stored grain pest in India. Many of the predators and parasitoids are mass reared for their usage against agricultural pests are dependent on either egg or larval stages of *Corcyra* as it is the factitious host for almost 60 parasitoids and 15 predators having a limited that are host-specific in nature. It also acts as a laboratory host for many benificial mites and nematodes. The experiment was conducted in Insect biocontrol Laboratory, MSSSoA, CUTM, Odisha.to study the duration of different life stages and morphometry of corcyra at laboratory conditions. From the experimental results it was inferred that the egg, larval, pupal and adult duration were 5.96±0.92 days, 28.26±1.96 days, 8.26±0.72 days and 7.60±0.74 days respectively.

Keywords: *Corcyra*, Rice Moth, biology, life cycle, morphometry

Introduction
Corcyra cephalonica (Stainton) (Lepidoptera Pyralidae) generally known as rice moth is an chief stored grain pest in India (Atwal and Dhaliwal, 2008) [5]. It was first recorded by Ayyar (1919a) [6] and it was introduced to India via rice trade (Wadaskar et al., 2016) [28]. It is a key storage pest in rice but also feed on cereals, oilseeds, pulses, dried fruits, cotton, coffee, spices and cocoa beans, and millet (Alam, 1972 [2]; Cox et al., 1981 [10]; Allotey and Kumar, 1985 [4]; Allotey, 1991a [3]; Malek and Parveen, 1989[19]; Kumar and Kumar, 2001 [15]; Choudhury and Duit, 1989 [8]; Meenakanit et al., 1989 [21]; Chu-Yaui et al., 1994 [9]; Mukhukrishnan et al., 1996[25]; Cadapan, 1988 [7]; Nagarkati and Nagaraja, 1968 [26]). The larvae generally feeds by constructing the silken galleries among the seeds which will be visible under very serious infestation. The bulk grains will be converted into a webbed mass which generally emit a rotten smell and makes it unfit for consumption. (Alam, 1965) [1]. Moore et al., (1966) [24] reported that a single larva consumed an average of 32.9 mg resulting in 10.35% loss in weight. The eggs and larvae of *Corcyra cephalonica* serves as a laboratory host for mass rearing of almost 60 of parasitoids and 15 of predators together with a some species that are host-specific. Many benificial mites were also reared on *Corcyra* (Manjunath, 2013) [20]. Since the rearing of this insect is cheap and the suitability of the pest is very extensive they are highly preferred host. In India, *C. cephalonica* is widely mass multiplied as a laboratory host for egg parasitoids such as *Trichogramma chilonis*, *T. pretiosum*, the larval parasitoid, *Bracon brevicornis* (Say) (Hymenoptera: Braconidae), and also for the predator green lacewing, *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) (Kalyanakumar et al., 2013 [13]; Jalali and Singh, 1992 [11]; Kumar and Jalali, 1993 [14]; Li, 1994 [18]; Kumar and Murthy, 2000 [16]; Jalali et al., 2003 [12]). Since the application of the corcyra in biological control of crop pests are immense, the morphological and biological extensive studies need to conductted. With this view, the present studies have been conducted.

Materials and Methodology
The experiment was conducted in Insect biocontrol Laboratory, MSSSoA, CUTM, Odisha. Eggs of Corcyra cephalonica were procured from Department of Entomology, OUAT, Bhubanshwar and was mass reared by distributing 1.5g eggs on 1.5kg broken maize grains in a wooden boxes made for corcyra rearing. The diet included maize grains (1.5 Kg), Biovet powder (1.5g), Ambystrin (0.5g) and protein X powder (1.5g). The larvae were reared on a wooden box of 45*45 cm and were kept on table. Frequent observation were made on the life cycle and morphological featured such as length and breadth every week till the emergence of moth from the pupa. The emerged moths were transferred to automatic egg collection apparatus (Manjunath, 2013) [20]. Further collected eggs were again used for the mass rearing untill sufficient population is obtained for further experiments. Biology studies were conduted in biocontrol laboratory on maize seeds January to April, 2022. The temperature and humidity were constant @ 28.5°C and 70% RH respectively. One male and one female Corcyra adults were reared and the collected eggs were reared in a small petri dishes. The period of egg development was

recorded during the time. After the hatching the larvaes were again transferred to small wooden box for rearing using smooth paint brush. The boxes were provided with mesh on top so the larva and adults might not escape. The duration of different larval instars, pupal period and adult duration were recorded. At every stage of the insect growth the morphometics were taken such as body length in case of larval stage and wing span in case of adult stage

Results and discussion

Egg stage

The eggs were creamy white and oval in shape as reported by Shailaja (2008) [27]. It was inferred that the egg period ranged from 5 to 6 days with an average of 5.96 ± 0.92 days on maize (Table 1). The morphometrics of egg of rice moth measured were 0.43mm length and 0.32 mm breadth respectively (Table 1). This was also inferred by Menge and Naik (2017) [22].

First instar larva

The newly hatched larva emerged by biting its way out of the egg shell and were creamy yellow in colour with a head capsule. The larval period observed were 4 to 5 days with an mean of 4.43 ± 0.52 days on maize (Table 1). The morphometrics of first instar larva were 1.92 mm length and 0.35mm breadth respectively (Table 1) as inferred by Sailaja (2008) [27].

Second instar larva

The second instar larva was also creamy white in colour developed a brown head capsule and a distinct prothoracic shield. The larval period was from 6 to 7 days with a mean of 6.26 ± 0.51 days on maize (Table 1). The morphometrics of second instar larva were 3.46 mm length with 0.92mm breadth (Table 1). The experimental results agreed with the findings of Sailaja (2008) [27].

Third instar larva

The third instar larvae were identified by the presence of dark head capsule with distinct thoracic and anal plates. The larval duration ranged from 5 to 6 days with an mean of 5.42 ± 0.43 days on maize (Table 1). The morphometrics of third instar larva was 6.03mm length and 1.20mm breadth respectively (Table 1). The experimental results agreed with the findings of Sailaja (2008) [27].

Fourth instar larva

The fourth instar larva were indistinguishable from their preceeding instars but were bigger in size. The larval period was 5 to 7 days with a mean of 5.23 ± 0.51 days on maize (Table 1). The morphometrics of fourth instar larva was 8.02mm and 1.67mm respectively (Table 1). This The experimental results agreed with the findings of Sailaja (2008) [27].

Fifth instar larva

The fifth instar larvae were bulky and cylindrical in shape with distinct head capsule, thoracic and anal plate. Observed larval period was 7 to 9 days with a mean of 7.92 ± 0.43 days on maize (Table 1). The morphometrics were 10.36mm length and 2.03mm breadth respectively (Table 1). The experimental results agreed with the findings of Sailaja (2008) [27].

Pupal stage

The brown ellipticaal pupa were enclosed in a cocoon mage up of webbings, frass, excreta and broken grains. The pupal period ranged from 7 to 10 days with a mean of 8.26 ± 0.72 days on maize (Table 1). The morphometrics were 9.24mm length and 2.10mm breadth respectively (Table 1). The experimental results agreed with the findings of Menge et al., (2018) [23].

Adult stage

The adults moths were greyish-brown. Adult period of moth was ranged from 7 to 9 days with a mean of 7.60 ± 0.74 days on maize (Table 1). The morphometrics in adults were 13.89 mm in wing expansion whereas the average length was 12.32 mm (Table 1). The results agreed with the findings of the findings of Kumar et al., (2018) [17], Menge and Naik (2017) [22] and Sailaja (2008) [27], who reported similar period of adult longevity of *C. cephalonica.*

Table 1: Biology and morphometry studies of different stages of Corcyra cephalonica under laboratory conditions

Life Stages	Duration Range (days)	Duration Mean ± SD* (days)	Length (mm)	Breadth/wing span (mm)
Egg	5-6	5.96±0.92	0.43	0.32
Larval instars				
1st instar	4-5	4.43±0.52	1.92	0.35
2nd instar	6-7	6.26±0.51	3.46	0.92

3rd instar	5-6	5.42±0.43	6.03	1.20
4th instar	5-7	5.23±0.51	8.02	1.67
5th instar	7-9	7.92±0.43	10.36	2.03
Total larval period	26-33	28.26±1.96		
Pupal	7-10	8.26±0.72	9.24	2.10
Adult	7-9	7.60±0.74	12.32	13.89

* Mean of 10 replications

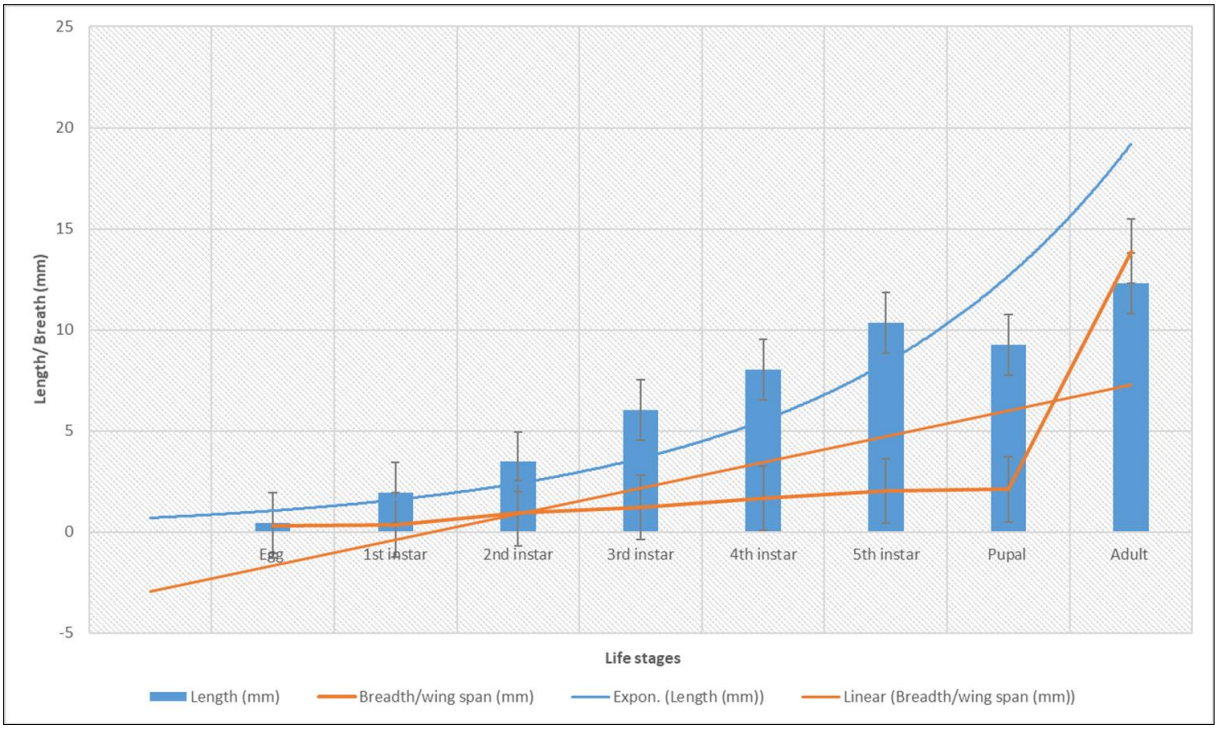

Fig 1: Morphometrics of various life stages of *Corcyra cephalonica*

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