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BIOLOGY OF *CORCYRA CEPHALONICA* (STAINTON) ON DIFFERENT HOST

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ABSTRACT

The present investigation was carried out under laboratory condition in Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur during August, 2017 with the objective to assess the effect of five different hosts *viz.*, maize, rice, pearl millet, wheat and sorghum on the biology of *C. cephalonica*. The results revealed that the minimum larval period (32.40 days) was recorded on sorghum and maximum was on wheat (43.15 days). The maximum larval weight of 52.55 and 42.00 mg were recorded on sorghum and wheat, respectively. The minimum pupal period was recorded on sorghum (9.45 days) and maximum on wheat (10.20 days). The minimum hatching period (4.00 days) was observed on sorghum and maximum on wheat (5.50 days). The maximum adult emergence was recorded on sorghum (80.00%) and minimum on wheat (68.75%). The Growth Rate Index was maximum on sorghum (1.73) and minimum on wheat (1.18). The highest mean fecundity (301.75 eggs/female) was recorded on sorghum and minimum was on wheat (230.75 eggs/female). The maximum adult longevity period (10.50 days) was recorded on sorghum and minimum on wheat (8.25 days). The minimum developmental period was recorded on sorghum (46.20 days) and maximum was on wheat (57.80 days).

Key words: biology, rice moth, *Corcyra cephalonica*, host

INTRODUCTION

The rice moth, *Corcyra cephalonica (*Stainton) (Family: Pyralidae, Order: Lepidoptera) is one of the most destructive pests of stored cereals in Asia, Africa, North America and Europe causing severe economic losses (Atwal and Dhaliwal, 2008). It attacks rice, wheat, corn, sorghum, groundnut, cotton seeds, coffee, spices and cocoa beans under storage conditions. The adults are nocturnal and each female lays 90-300 eggs with an incubation period of 5 days, larval period of 23-25 days. 10 days of pupal period and adult life span of 1 week (Fenemone and Prakash, 2009). The larvae cause damage to broken grains by forming silken webs and feeding inside them. The present study was undertaken to find out suitability of different hosts for the mass multiplication of *C. cephalonica*.

MATERIALS AND METHODS

Experimental details: An experiment was conducted on the biology of rice moth on different hosts in the Department of Entomology, Rajasthan College of Agriculture, Udaipur during 2017, under laboratory conditions with the temperature of 31.3 ºC and 72-74 per cent humidity. The detailed methodology used for the investigation is described as under:

Maintenance of nucleus culture: The nucleus culture of the rice moth was maintained by collecting adult moths from the infested sorghum grains from Biocontol laboratory, Department of Entomology, RCA Udaipur. For carrying out the experiment, adults of rice moth were reared in the glass jars of 5 kg capacity, containing both broken as well as sound rice grains. These jars were covered with muslin cloth and sterilized in the oven at 100 ºC for about 1 hr, in order to kill the eggs and other hibernating macro as well as some microorganisms. The oven exposed broken rice was taken @ 3 kg in each of the glass jars. A cotton plug soaked in 5 per cent sucrose solution was provided in the jars for feeding the adults moths to increase the fecundity of moth (Pareek and Kushwaha, 1971). Each jar was then dusted with 5 gram yeast extract and 0.5 gm streptomycin sulphate. Most of the eggs were laid between the double layer of muslin cloth from where the eggs were collected daily with the help of a soft brush and kept in separate petri dishes. The egg laying chambers were kept in an incubator at 28±2º C and 75±5 per cent relative humidity. The culture so maintained was used for various investigations undertaken. The newly

hatched larvae when required were taken from dated culture for further experimentation.

Effect of different hosts on the biology of *C. cephalonica*:

Design : Completely Randomized Design

Replications : 4

Treatments : 5 (sorghum, rice, maize, bajra, wheat)

In order to study the biology of *C. cephalonica* on different hosts, 250 g grains of each host were taken in separate containers, one fourth part of grains were ground and disinfested by placing the grains in oven at 60°C for 2 hrs. The grains were treated with 0.1% formaldehyde @ 2.5 ml per 250 g grains and air dried. The varieties of each host used for the experiment included: wheat (Raj-4079), rice (P-1509), sorghum (PJ-1430), maize (Pratap makka), bajra (RHB-67). About 1000 (0-6 hr old) eggs were kept in petri dish covered with blotting paper for hatching. From these, twenty neonate larvae of *C. cephalonica* were released by wet brush into each container containing different hosts as food material. The mouth of each container was covered with muslin cloth and tightened with rubber band. The containers were regularly observed and following observations were recorded.

1. **Larval period (days):** To assess the larval period of *C. cephalonica*, the time period starting from the introduction of newly hatched larvae to the formation of silken web in each container was carefully observed and recorded.
2. **Larval weight (mg):** Weight of full grown larvae (20 in number) were taken with the help of electronic balance from each replication.
3. **Pupal period (days):** To assess the pupal period, the time period starting from formation of pupa or silken webs in grains to adult emergence in each container was recorded.
4. **Pupal weight (mg):** Weight of fully developed pupa (20 in number) was taken with the help of electronic balance from each replication.
5. **Adult emergence:** Adult emergence was calculated by counting the number of adults emerged in each replication and the per cent adult emergence was calculated using the following equation:

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

6. **Growth index:** The growth index was calculated by using the following equation (Singh and Pant, 1995)

$$\text{Growth index} = \frac{\text{Percent adult emergence}}{\text{Average developmental period (days)}} \times 100$$

7. **Fecundity:** Fecundity of adults was measured by collecting female from each host and placing them in separate jars for egg laying. Females were identified by observing the following characteristics viz., long, pointed labial palpi and comparatively larger body size. The total number of eggs laid by female was counted daily till its death.
8. **Adult longevity (days):** Adult longevity was recorded from the date of emergence of adult to death of adult in each replication of different host.
9. **Hatching period (days):** Eggs laid by female moths were used for recording the hatching period and were placed in the petri-dishes and allowed to hatch. 50 eggs of C. *cephalonica* reared on each replicated treatment were collected. The time period between egg laying to hatching was recorded for each replication.
10. **Developmental period (days):** The time period from hatching of the eggs to the emergence of adults in each replication from different host was recorded to estimate the developmental period of the insect.

Statistical Analysis: Statistical analysis was performed using MS-excel. Data was subjected to analysis of variance (ANOVA). Percentage data was converted into angular transformed value by using angular transformation.

RESULTS AND DISCUSSION

Effect of hosts on the biology of *C. cephalonica*:

The comparative study of five different hosts *viz*., maize, sorghum, rice, wheat and pearlmillet was studied on biological parameters of *C. cephalonica*. The ultimate purpose of this study was to find out the most preferred host by *C. cephalonica*. The preference of the host was assessed on the basis of their effects on the hatching period, larval period and weight, pupal period and weight, adult emergence, Growth Rate Index, fecundity, adult longevity and developmental period.

Larval period (days):

In case of larval period, minimum larval period was observed on sorghum (32.40 days) whereas, maximum was on wheat (43.15 days) and on remaining hosts *viz*., maize, rice, pearlmillet 42.45, 40.73, 41.46 days, respectively (Table 1). Similarly, Patel and Mehta (2011) recorded minimum larval period on sorghum (37.34 days), whereas Deulkar *et al.* (2012) reported that the least larval development period of 30.86 days was observed on Bajra based diet.

Larval weight (mg):

The mean larval weight ranged from 42.00 to 52.55 mg on different hosts (Table 1). The larval weights of *C. cephalonica* on sorghum, rice, pearl millet, wheat, maize were 52.55, 46.88, 46.31, 42.00 and 43.25, respectively.

Results were also found to be in accordance with the previous studies of Patel and Patel (2007) who reported that sorghum proved to be best host for the growth of the larvae.

Pupal period (days):

The pupal period varied from 9 to 11 days and the minimum mean pupal period (9.45 days) was recorded on sorghum; whereas, it was maximum on wheat(10.20 days) and on remaining hosts *viz*., maize, rice, pearlmillet being 9.75, 9.50, 9.70 days, respectively (Table 2). The results were found to be in line with the work of Patel and Mehta (2011) who also reported minimum pupal period of 8.14 days on sorghum. Similarly, Patel and Patel (2007) reported the minimum pupal period on sorghum.

Pupal weight (mg):

The mean pupal weight ranged from 33.95 to 38.50 mg on different hosts. The maximum pupal weight was recorded on sorghum (38.50 mg), while it was minimum on wheat and maize (33.95 mg) (Table 2).

Table 1. Influence of different host on larval period and larval weight of *C. cephalonica*

Hosts	Larval period (days)	Larval weight (mg)
Rice	40.73	46.88
Pearl millet	41.46	46.31
Sorghum	32.40	52.55
Wheat	43.15	42.00
Maize	42.45	43.25
S. Em±	0.204	0.789
CD 5%	0.615	2.379

Table 2. Influence of different host on pupal period and pupal weight of *C. cephalonica*

Hosts	Pupal period (days)	Pupal weight (mg)
Rice	9.50	37.50
Pearl millet	9.70	37.00
Sorghum	9.45	38.50
Wheat	10.20	33.95
Maize	9.75	33.95
S. Em±	0.068	0.199
CD 5%	0.204	0.601

Hatching period (days):

The results are presented in Table (3) which show that the minimum hatching period was observed on sorghum (4.00 days), rice (4.25 days) and pearlmillet (4.50 days), which was at par with wheat (5.25 days) and maize (5.50 days). The maximum hatching period was recorded maize. Similarly, Patel and Mehta (2011) recorded minimum hatching period on sorghum (3.43 days). While Prakash and Senthil Kumar (2005) reported that the shortest incubation period of 4.21 days was on pearl millet. The slight difference in the present study may be due to controlled rearing environment.

Adult emergence:

The adult emergence on different host grains ranged from 68.00 to 80.00 per cent (Table 3). The maximum adult emergence was recorded on sorghum (80.00%), followed by rice (78.75%). However, minimum adult emergence was recorded on wheat (68.75%) and on remaining host *viz.,* maize and pearlmillet it was 70.00% and 75.00%, respectively. Similarly Pathak *et al.* (2010) reported the maximum adult emergence in sorghum.

Growth rate index:

The growth rate index ranged from 1.18 to 1.73 on different hosts being minimum on wheat (1.18) followed by maize (1.21) and pearlmillet (1.35) (Table 3). The maximum growth rate index was recorded on sorghum (1.73) followed by that on rice (1.42). This finding is also in support of Patel and Patel (2007) who also reported higher growth index (1.62). Similarly Patel and Mehta (2011) reported the higher growth index (1.60) on sorghum.

Fecundity:

The average number of eggs from single female on different host ranged from 230.75-301.75. The maximum mean fecundity recorded per female was observed as 301.75 on sorghum whereas minimum mean fecundity per female was 230.75 on wheat and on remaining host, *viz.,* maize, pearlmillet and rice it was 268.25, 291.25 and 292.50, respectively. These findings are also in line with Patel and Patel (2007) who reported higher growth index (1.62). Similarly, Patel and Mehta (2011) reported higher growth index (1.60) on sorghum.

Adult longevity:

The mean value of adult longevity recorded on five hosts; sorghum, rice, pearlmillet, wheat, maize were 10.50, 10.00, 9.50, 8.25, 8.75 days, respectively (table 3). The maximum adult longevity was recorded in sorghum while minimum in wheat.

Developmental Period:

The average developmental period of *C. cephalonica* varied significantly on different host grains. The minimum developmental period was recorded on sorghum (46.20 days) followed by rice (55.20 days). The maximum developmental period was recorded on wheat (57.80 days) followed by maize (57.55 days) and in pearl millet (55.20 days) (Table 3). Similarly Patel and Mehta (2011) reported minimum developmental period in sorghum (50.59 days).

Table 3. Influence of different host on biology of *Corcyra cephalonica*

Hosts	Fecundity (No. of eggs/ female)	Hatching Period (days)	Adult longevity (days)	Adult emergence (%)	Developmental period (days)
Rice	292.50 (17.12)	4.25	10.00	78.75 (62.58)	55.20
Pearl millet	291.25 (17.08)	4.50	9.50	75.00 (60.06)	55.40
Sorghum	301.75 (17.39)	4.00	10.50	80 (63.52)	46.20
Wheat	230.75 (15.21)	5.50	8.25	68.75 (56.06)	57.80
Maize	268.25 (16.39)	5.25	8.75	70 (56.79)	57.55
SEm±	0.024	0.242	0.438	1.183	0.497
CD 5%	0.074	0.728	1.320	3.565	1.499

Data in parentheses are angular retransformed values of adult emergence; Data in parentheses are square root transformed values of fecundity

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