



IMPACT OF DIETS ON THE BIOLOGY OF *CORCYRA CEPHALONICA* (STANTON)

LOVEPREET KAUR^{1*}, DEEPIKA KALKAL¹ AND ANIL JAKHAR¹

¹Department of Entomology, Chaudhary Charan Singh Haryana Agricultural University,
Hisar 125004, Haryana, India

*Email: luvpreetkaur.7198@gmail.com (corresponding author); ORCID ID 0000-0003-1991-5836

ABSTRACT

The influence of various diets was evaluated on the biology of *Corcyra cephalonica* (Stainton) under laboratory conditions. Results revealed that the lowest egg hatching (60.33%) was found on wheat diet 100% and highest (87.50 %) was on bajra (32.33%) + maize (32.33%) + wheat (32.33%) + sugar (3%) diet. The shortest and longest incubation period (3.83 and 6.67 days), larval period (31.83 and 40.67 days) and total developmental period (50.50 and 65.00 days) were recorded on bajra (100%) and wheat (100%) diet, respectively. Meanwhile shortest and longest pupal period (14.83 and 19.33 days) were recorded on bajra (100%) and maize (100%) diet, respectively. The maximum and minimum adult emergence (88.33 and 53.75 %), sex ratio (1.72:1 and 0.42:1), adult male lifespan (12.50 and 7.17 days), fecundity (239.16 and 180.67 eggs/ female) and growth index (2.66 and 1.39) were recorded on maize (48.5%) + sorghum (48.5%) + Groundnut (3%) diet and Wheat (100%) diet, respectively. Life span of adult female was longest (8.67 days) and shortest (4.67 days) on diet maize (48.5%) + sorghum (48.5%) + groundnut (3%) and bajra (100%) diet, respectively. It may be concluded that among the seven diets, the most preferred diet for rearing of *C. cephalonica* was maize (48.5%) + sorghum (48.5%) + groundnut (3%) and the least preferred diet was wheat (100%).

Key words: *Corcyra cephalonica* developmental period, fecundity, growth index, longevity, mass rearing, sex ratio, incubation, larvae, pupal periods, emergence, lifespan, sorghum, bajra groundnut, wheat, maize

Corcyra cephalonica (Stainton) (Lepidoptera: Pyralidae) is popularly known as “rice moth” distributed worldwide and a serious pest of stored husked and unhusked rice, other cereals and leguminous grains. Additionally, it affects a variety of foods around the world, including gingelly, oil-cakes, dry fruits, cocoa, chocolates, biscuits, flax seeds, cream of wheat, and flour (Perveen, 2012). It is used in several bio-control researches, development and extension departments in India to mass produce a variety of natural enemies (Jalali et al., 2003; Kalyanakumar et al., 2013). It has wider adaptability to a variety of rearing conditions and beneficial impact on natural enemy progeny. Also the host's nutritional suitability is an important aspect of mass production programs. Thus, the secret to success is the economical and reliable production of easily culturable insect hosts on a large scale. As a result, in the current context of cost-intensive agriculture, knowledge of appropriate food substrates and methods of mass rearing of the laboratory host assumes a special significance. Since the larval stage of *C. cephalonica* is the active feeding stage, the nutritional value of the larval diet has a major effect on its use as a host. Rearing of *Corcyra* on efficient food media resulted in production of robust moths and robust eggs. The size of the egg was considered as one of the criteria for

assessing the health of the insect. For rearing of egg parasitoids utilization of robust host eggs is important (Pathak et al., 2010). Therefore, the present study evaluated the various diets on developmental and biological parameters of *C. cephalonica* as well as to access its suitability for producing good quality eggs through enhanced nutrition of larvae.

MATERIALS AND METHODS

The present study was conducted at the Biocontrol laboratory, Department of Entomology, Chaudhary Charan Singh Haryana Agricultural University, Hisar (29.15°N, 75.70° E) at 25°C and 75± 5% RH during October 2020 to April 2021. The nucleus culture was collected from the biocontrol laboratory, and (sterilized) wooden cages (41 x 22 x 12 cm³) were utilized. Then oven-exposed feeding material was added at 1.5 kg/ rearing enclosure, along with 5 g yeast powder/ cage and sprayed with 0.1% formalin, 0.05% streptomycin sulphate solution and 5 g sulphur powder/ cage was also dispersed to avoid storage mite infestation. Freshly laid 0.25 cc eggs/ cage were infested and thoroughly mixed to ensure uniform distribution. The representative sample of each treatment was extracted in petri plates with three replications to conduct the various

observations. The representative samples were checked regularly under stereozoom microscope (Stemi 508) and the observations, viz., egg hatching (%), incubation period (days), larval period (days), pupal period (days), total developmental period (days), adult emergence (%), adult longevity (days), fecundity (no. of eggs/female) and sex ratio (F:M) were recorded. The females were generally larger than males and have elongate head and snout-like projection of labial palp which was blunted and inconspicuous in the case of males (Babu et al., 2020) and growth index was calculated with Howe's (1953) formula. The data were subjected to ANOVA (Fisher, 1958). Before statistical analysis, the % egg hatching and adult emergence were subjected to angular transformation ($\sin^{-1}\sqrt{X}$). The significant treatment effect was judged by using completely randomized design (CRD). The 'OPSTAT' software of CCS Haryana Agricultural University.

RESULTS AND DISCUSSION

Corcyra cephalonica reared on diets had shown varied response for completion of its life events and resulted as maximum 87.50 % egg hatching on maize (48.5%) + sorghum (48.5%) + groundnut (3%) diet which was significantly at par with bajra (32.33%) + maize (32.33%) + wheat (32.33%) + sugar (3%) diet whereas minimum (60.33 %) egg hatching was recorded on wheat (100%) diet. Similarly, Kumar et al. (2018) had also reported minimum 78.00% egg hatching on wheat. Longest and shortest incubation period 6.67 and 3.83 days was recorded on wheat and bajra (100%) diet, respectively (Table 1). Prakash and Senthil Kumar (2005) also observed the shortest incubation period on pearl millets. The shortest mean larval period (31.83 days) was recorded on bajra (100%) diet whereas longest (40.67 days) on wheat (100%) diet. These findings are similar to those of Kumar et al. (2018) and Jhala et al. (2019). The shortest larval period (28.20 days) was observed on pearl millet 100% diet as had been reported by Amadou et al. (2019). The longest pupal period (19.33 days) was recorded on diet maize (100%) meanwhile shortest pupal period (14.83 days) was recorded on bajra (100%) diet. These results are endorsed by Sharma (2011). Rasool et al. (2018) revealed that male and female pupae lived for longer duration on a mixture of wheat+ maize. Longest total development period (65.00 days) was recorded on wheat (100%) diet whereas significantly shortest (50.50 days) was recorded on bajra (100%). These findings agree with those of Pathak et al. (2010) on bajra. Jhala et al. (2019) found that the longest mean development period was on wheat diet.

Significantly maximum 88.33% adults of rice moth were emerged from maize (48.5%) + sorghum (48.5%)+ groundnut (3%) diet and minimum adult emergence 53.75% was observed from wheat (100%) diet. These observations are in agreement with the findings of Begum and Qamar (2015) and Kumar et al. (2018). The highest sex-ratio (1.72:1) was noted from the adults emerged out from maize (48.5%) + sorghum (48.5%)+ groundnut (3%) diet whereas lowest (0.42:1) was observed on wheat (100%) diet. These finding are supported by Runtu et al. (2023) on corn bran diet. Similar female biased sex ratio had been reported by Jagadish et al. (2010) and Patel (2011) when rice moth was reared on mixture of millets. Lifespan of adult female was longest (8.67 days) on maize (48.5%) + sorghum (48.5%) + groundnut (3%) diet and shortest life span (4.67 days) on bajra (100%) diet (Table 1). Malik (2018) revealed that adult female longevity was found maximum (8.03 days) on sorghum+ maize (2:1). Lo et al. (2020) found female longevity was more on millets. Longevity of adult male was longest (12.50 days) on maize (48.5%) + sorghum (48.5%) + groundnut (3%) diet and shortest (7.17 days) on wheat. These finding are in accordance with Lo et al. (2020) and Malik (2018) who reported that adult male survived longer on millets and on sorghum+ maize. Rasool et al. (2018) reported lowest male life span (6.79 days) on wheat flour. The maximum fecundity of 239.16 eggs/female was recorded on maize (48.5%)+ sorghum (48.5%)+ groundnut (3%) diet and minimum fecundity 180.67 eggs/ female was found on wheat (100%). The current findings are in close agreement with those of Jhala et al. (2019) and Bhandari and Regmi (2014) and Patel (2011). Lowest growth index (1.39) was recorded on wheat (100%) diet and significantly highest (2.66) on maize (48.5%) + sorghum (48.5%)+ groundnut (3%) diet (Table 1). These results are in agreement with those of Begum and Qamar (2015).

ACKNOWLEDGEMENTS

Chaudhary Charan Singh Haryana Agricultural University, Hisar is sincerely acknowledged for providing the facilities.

FINANCIAL SUPPORT

The author acknowledges the financial support provided by the Department of Entomology.

AUTHORS CONTRIBUTION STATEMENT

LK: investigation, data collection, analysis and writing original research article, DK: Experiment

Table 1. Effect of diets on biological and reproductive parameters of *C. cephalonica* (pooled data)

S. No.	Treatments	Egg hatching (%)	Incubation period (days)	Larval period (days)	Pupal period (days)	Total developmental period (days)	Sex ratio (F:M)	Adult emergence %	Adult longevity (days)		Fecundity (No. of eggs/female)	Growth Index
									Female	Male		
T ₁	Bajra (100%)	73.83 (59.25)**	3.83 (2.19)*	31.83 (5.73)*	14.83 (3.97)*	50.50 (7.17)*	1.15:1	72.08 (58.08)**	4.67 (2.38)*	7.33 (2.88)*	216.00 (14.72)*	2.12 (1.76)*
T ₂	Maize (100%)	68.33 (55.73)	5.33 (2.51)	33.83 (5.90)	19.33 (4.50)	58.50 (7.71)	0.53:1	63.33 (52.76)	5.50 (2.55)	9.00 (3.21)	219.00 (14.83)	2.22 (1.79)
T ₃	Wheat (100%)	60.33 (50.95)	6.67 (2.76)	40.67 (6.54)	17.66 (4.31)	65.00 (8.12)	0.42:1	53.75 (47.14)	5.83 (2.61)	7.17 (3.15)	180.67 (13.45)	1.39 (1.54)
T ₄	Bajra (48.5%) + sorghum (48.5%) + Groundnut (3%)	80.83 (64.08)	4.50 (2.34)	33.83 (5.89)	16.67 (4.20)	55.00 (7.48)	1.68:1	80.42 (63.80)	5.67 (2.58)	9.33 (2.85)	229.16 (15.17)	2.32 (1.82)
T ₅	Maize (48.5%) + sorghum (48.5%) + groundnut (3%)	87.50 (69.33)	4.50 (2.34)	33.33 (5.85)	15.17 (4.01)	53.00 (7.34)	1.72:1	88.33 (70.28)	8.67 (3.11)	12.50 (3.66)	239.16 (15.49)	2.66 (1.91)
T ₆	Wheat (48.5%) + sorghum (48.5%) + groundnut (3%)	71.67 (58.05)	5.50 (2.54)	39.67 (6.37)	16.33 (4.16)	61.50 (7.90)	1.37:1	63.75 (52.99)	7.00 (2.83)	11.83 (3.57)	192.67 (13.91)	1.55 (1.59)
T ₇	Bajra (32.33%) + maize (32.33%) + wheat (32.33%) + sugar (3%)	87.50 (69.27)	4.33 (2.30)	36.00 (6.08)	17.67 (4.31)	58.00 (7.68)	1.60:1	84.17 (66.73)	7.67 (2.94)	12.00 (3.60)	229.83 (15.18)	2.51 (1.87)
CD (p=0.05)		(5.22)	(0.14)	(0.34)	(0.29)	(0.37)	(0.79)	(6.04)	(0.16)	(0.34)	(0.80)	(0.06)
SE m(±)		1.70	0.04	0.11	0.09	0.12	0.25	1.97	0.05	0.11	0.26	0.02

*Values in parentheses square root transformed; **Values in parentheses angular transformed

plotting, methodology, supervision, reviewing and editing, and AJ: supervision, reviewing and editing.

CONFLICT OF INTEREST

No conflict of interests.

REFERENCES

- Amadou L, Baoua, I, Ba M N, Muniappan R. 2019. Development of an optimum diet for mass rearing of the rice moth, *Corcyra cephalonica* (Lepidoptera: Pyralidae) and production of the parasitoid, *Habrobracon hebetor* (Hymenoptera: Braconidae), for the control of pearl millet head miner. *Journal of Insect Science* 19(2): 1-5.
- Babu B S, Samal T, Mishra M K, Mohanty S, Jubuli S. 2020. Biology and morphometry of *Corcyra cephalonica* (Stainton) in sesamum seeds during storage. *International Journal of Current Microbiology and Applied Sciences* 9(7): 2766-2775.
- Begum R, Qamar A. 2015. Studies on the efficacy of various diet formulations on growth and development of rice moth, *Corcyra cephalonica* (Stainton), an important host of various parasitoids. *Journal of Entomology and Zoology Studies* 3(4): 400-403.
- Bhandari G, Regmi R. 2014. Effect of different diets on body length, adult life span and biomass of *Corcyra cephalonica* (Stainton) under laboratory condition in Chitwan, Nepal. *International Journal of Research* 1(10): 2348-6848.
- Fisher W D. 1958. On grouping for maximum homogeneity. *Journal of the American Statistical Association*, 53(284): 789-798.
- Howe R W. 1953. The rapid determination of the intrinsic rate of increase of an insect population. *Annals of Applied Biology* 40(1): 134-151.
- Jagadish P S, Nirmala P, Rashmi M A, Narayan H J, Nangia N. 2010. Biology of rice moth, *Corcyra cephalonica* (Stainton) on foxtail millet. *Karnataka Journal of Agricultural Sciences* 22(3): 674-675.
- Jalali S K, Rabindra R J, Rao N S, Dasan C B, 2003. Mass production of trichogrammatids and chrysopids. Project Directorate of Biological Control, Bangalore, India. 16 pp.
- Jhala J, Vyas A K, Rajput V S, Sharma S. 2019. Biology of *Corcyra cephalonica* (Stainton) on different host. *Journal of Pharmacognosy and Phytochemistry* 8(5): 476-479.
- Kalyanakumar R, Ranjith C, Venkatachalam A, Sithanatham S. 2013. Mass production of *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) in a commercial mass rearing unit: moth emergence and egg production studies. 13th workshop of the IOBC global working group on MRQA, 6–8 November 2012, Bengaluru, India. pp. 27-28.
- Kumar K M A, Tambe V J, Rehaman S K, Choudhuri B N, Thakur K D. 2018. Effect of different diets on the biology of rice moth, *Corcyra cephalonica* (Stainton). *Journal of Entomology and Zoology Studies* 6(3): 251-254.
- Lo M, Diome T, Thiaw C, Sembene M. 2020. Study of the reproductive parameters of *Corcyra cephalonica* (Stainton) according to the type of food substrate. *International Journal of Entomology Research* 5(5): 05-09
- Malik M. 2018. 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* 6(6): 1192-1195.
- Patel R. 2011. Comparative biology and mass production of *Corcyra cephalonica* (Stainton) (Pyralidae: Lepidoptera) on different food materials. PhD Thesis, Anand Agricultural University, Gujarat, India.
- Pathak S K, Dubey M N, Yadav P R. 2010. Suitability of different diet and their combination for the rearing of *Trichogramma* host *Corcyra cephalonica* (Stainton). *Journal of Experimental Zoology India* 13(1): 29-31.
- Perveen F, Sultan R, Ul-Haque E. 2012. Role of temperature and hosts (*Sitotroga cerealella* and *Corcyra cephalonica*) egg age on the quality production of *Trichogramma chilonis*. *Arthropods* 1(4):144.
- Prakash R A, Senthilkumar P. 2005. Biology of *Corcyra cephalonica* (Stainton) in important cereals and millets. *Insect Environment* 11(2): 86.
- Rasool A, Zubair R, Rasheed R, Gull S, Ahmed A. 2018. Mass production of rice meal moth (*Corcyra cephalonica*) on different food media under laboratory conditions. *Journal of Research and Development* 18: 0972-5407.
- Runtu Y, Watung J F, Tairas R W. 2023. Biology of *Corcyra Cephalonica* Stainton (Lepidoptera: Pyralidae) on several types of feed media. *Jurnal Agroekoteknologi Terapan* 4(1): 18-28.
- Sharma A. 2011. Host preference of rice moth *Corcyra cephalonica* Stainton with special reference to food utilization studies: MSc Thesis Swami Keshwanand Rajasthan Agricultural University, Bikaner, India.

(Manuscript Received: February, 2023; Revised: June, 2023;

Accepted: June, 2023; Online Published: July, 2023)

Online First in www.entosocindia.org and indianentomology.org Ref. No. e23129