



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2018; 6(6): 1192-1195

© 2018 JEZS

Received: 20-09-2018

Accepted: 26-10-2018

Mahavir Malik

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

Narendra Kumar

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

Ombir

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

Correspondence**Mahavir Malik**

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

Effects of larval rearing media and adult diets of rice moth, *Corcyra cephalonica* (Stainton) on longevity of moths and fecundity of female

Mahavir Malik, Narendra Kumar and Ombir

Abstract

Eight types of food media combinations of milled grains of sorghum (*Sorghum bicolor* L. Moench), maize (*Zea mays* L.), 'Bajra' (*Pennisetum typhoides* L.), alone and in different proportions were mixed to rear and maintain the rice moth, *Corcyra cephalonica*. Each food media was infested with 750 fresh eggs (0-24 h) of rice moth *C. cephalonica* and after moth emergence, paired moths were provided with different adult diets such as honey solution 10 and 5 percent, sugar solution 10 and 5 percent and water only. The maximum fecundity of 290.80 eggs/female was observed from moth emerged from sorghum while the lowest fecundity 134.16 eggs/female was observed from moth emerged from 'Bajra' which was found to be statistically lower than other grains. The longest longevity was followed by sorghum + maize (2:1), 'Bajra' + sorghum (2:1), maize + 'Bajra' (2:1) and maize + sorghum (2:1) where, it was 7.63, 7.56, 7.43 and 7.30 days, respectively. The shortest life of adult female was recorded on maize of 3 days with 5 percent sugar as adult diet and longest life on 'Bajra' + sorghum (2:1) of 13 days as 5 percent honey solution. No significant difference was observed for the female longevity when provided with different adult diets. The male longevity, longest 8.36 days was on sorghum + maize (2:1).

Keywords: *Corcyra cephalonica*, diet, fecundity, grains, longevity

Introduction

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) ^[1]. Rice meal moth *Corcyra cephalonica* Stainton can be mass multiplied throughout the year in all the various ecological zones of India by maintaining relative humidity. The rice meal moth preferred for mass culturing of entomophagous insects due to its amenability, adaptability to varied rearing conditions and its positive influence on the progeny of the natural enemies. It is distributed worldwide and a serious pest of stored husked and un-husked rice, other cereals and leguminous grains. It also attacks gingelly, oil-cakes, dry fruits, cocoa, chocolates, biscuits, flax seeds, cream of wheat, flour etc. in many countries of the world (Perveen, 2012) ^[2]. Due to the unavailability of egg masses of different borers throughout the year for mass production of *T. chilonis*, sufficient numbers of *C. cephalonica* eggs are essential. Rearing of these moths is generally done on wheat or chopped rice in the laboratory. It has been reported that *C. cephalonica* have a shorter development time on millet than on sorghum (Russell *et al.*, 1980 ^[3]). Both male and female reared on mixed diet with a combination of (rice+jowar+maize) had maximum body weight and body length (Bhardwaj *et al.*, 2017) ^[4]. It is very much necessary to select some cost effective food material(s) which can ensure proper development of *C. cephalonica* and production of its significant number of eggs for successful rearing of the egg parasitoid, *Trichogramma* spp. Keeping all these points in view, an experiment was conducted under laboratory condition to evaluate the effects of larval rearing media and adult diets of rice moth, *Corcyra cephalonica* (Stainton) on longevity of moths and fecundity of female were conducted.

Materials and methods

The present studies were carried out in the biological control laboratory of the Department of Entomology, Chaudhary Charan Singh Haryana Agricultural University, Hisar

(Latitude 29° to 29-25' N, longitude 75-25'E, altitude 215 meter above sea level). The studies were conducted from September, 2003 to January, 2004 at 30±1 °C and 75±5 percent relative humidity in a BOD Incubator and relative humidity was maintained by making saturated sodium chloride solution (Winston and Bates, 1960). The fresh (0-24 h) eggs of rice moth of *Corcyra cephalonica* for infesting grains/media were taken from culture being maintained in the biological control laboratory. The milled grains (3-4 pieces) of sorghum (*Sorghum bicolor* L. Moench), maize (*Zea mays* L.), 'Bajra' (*Pennisetum typhoides* L.), alone and in different proportions were mixed for feeding. The milled/crushed grains were sterilized in hot air over at 110 °C for two hours. After cooling, the grains, were sprayed and properly mixed with 0.1 percent formalin, to prevent the growth of mould as well as to increase the grain moisture lost due to heat sterilization. Then it was mixed with 2.5 percent w/w yeast powder and streptomycin sulphate @ 0.5 g/3 kg of media grains. Then 225 g grains of each treatment was put in glass jars (16 x 10.5 cm) making a layer of rearing media 1.5 inch thick in glass jar which was most suitable for development as reported by Medina & Cadapan, 1982 [5]. Then each treatment was infested with 750 fresh eggs (0-24 h) of rice moth *C. cephalonica*. Each treatment was replicated four times.

The jars were covered with fine muslin cloth, guarded with rubber band. All the jars were set up in trays of the BOD Incubator maintained at 30±1 °C and relative humidity 75±5 percent maintained with saturated sodium chloride solution. The jars with charged media/grains placed in the incubator. The adult emerged were recorded daily and moths were collected in vials and placed in oviposition cages till the last emergence. For recording the fecundity and longevity of the adult moth, newly emerged males and females from each treatment were paired and placed in glass vials. At the bottom of each glass vial folded strips of white paper were placed to facilitate mating and egg lying. The open end of the glass vial was covered with a muslin cloth held in place by a rubber band to allow for aeration.

These paired moths were provided with different adult diets such as honey solution 10 and 5 percent, sugar solution 10 and 5 percent and water only. Cotton swab soaked in different food solution were hung in each glass vial using the pins through the muslin cloth. These swabs were recharged daily with food solution and changed after three days. The glass vials were kept in BOD Incubator maintained at temperature of 30±1 °C and relative humidity of 75±5 percent. The eggs laid by each female moth on paper strips and sometime the eggs were also laid on the muslin cloth were removed daily with the help of camel hair brush and were taken into account

for computing fecundity. The total number of eggs laid by each female fed on adult diets and in control were calculated. Time period from date of emergence of paired moth till death of these moths, males and females were noted and adult longevity was calculated.

Results and Discussions

Fecundity of *Corcyra cephalonica*

The data on the fecundity of adult female on different larval rearing media and adult diets are shown in Table 1. The maximum fecundity of 290.80 eggs/ female was observed from moth emerged from sorghum while the lowest fecundity 134.96 eggs/female was observed from moth emerged from 'Bajra' which was found to be statistically lower than other grains. The fecundity of adult female reared on sorghum + maize (2:1), sorghum + maize (1:1), maize + sorghum (2:1) and maize was found to be 274.63, 260.20, 243.93 and 223.20 eggs/female, respectively, but were statistically higher than the maize + Bajra (2:1) and maize + Bajra (1:1) where the fecundity was recorded to be 183.80 and 165.86 eggs/female, respectively. The fecundity of rice moth reared on Bajra + sorghum (2:1) and 'Bajra' + maize (2:1) was 151.16 and 147.83 eggs/female, respectively and statistically higher than the moth reared on 'Bajra' 134.16 egg/female and significantly lower than the sorghum + 'Bajra' (1:1) where the fecundity was 159.96 egg/female. The adult diet did not have any effect on the fecundity of rice moth where the mean fecundity was 206.83 and 202.55 with honey 5 and 10 percent, 203.15 and 204.40 eggs/female with sugar 5 and 10 percent, respectively. The fecundity was 203.85 and 192.91 eggs/female was observed with water and control, respectively. The present findings are in close proximity with Sreekumar and Paul (2000) where they recorded the fecundity 200.6 and 203.8 eggs/female on maize and sorghum, respectively. However, Xang *et al.* (1990) [7] reported the fecundity of 354 eggs/female on mixture of maize flower and wheat bran in ratio of 7:3 while Shazali and Smith (1986) [8] recorded the fecundity of 185.3 eggs/female on sorghum. In contrary, Murugesan *et al.* (1997) [9] reported the fecundity of rice moth, 415 eggs on 'Bajra' variety MH-179. Allotey (1991) [10] recorded the fecundity of 154 eggs/female on maize. Kumari *et al.* (2014) [11] found rice, wheat and groundnut mixture (5:5:1) to be the superior rearing medium among sex diet tested 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 with maximum fecundity of 175.60±0.13 and 157.65±2.64 in both the seasons.

Table 1: Effect of larval rearing media and adult diets on fecundity of *Corcyra cephalonica*.

Larval rearing media	Mean number of eggs/female						
	Adult diets						
	Honey 5%	Hone 10%	Sugar 5%	Sugar 10%	Water	Control	Mean
Sorghum	285.20	292.20	296.00	285.20	301.20	285.00	290.80
Maize	229.40	221.40	220.80	230.00	217.20	220.40	223.20
Bajra	134.20	139.40	142.20	130.20	135.40	128.40	134.16
Sorghum + Maize (2:1)	277.40	276.20	279.60	285.80	272.60	256.20	274.63
Maize + Sorghum (2:1)	246.40	244.00	244.60	238.80	253.00	236.80	243.93
Maize + 'Bajra' (2:1)	180.40	186.60	197.20	188.20	179.60	170.80	183.80
'Bajra' + Maize (2:1)	174.20	148.40	134.20	153.20	142.40	134.60	147.83
Sorghum + 'Bajra' (2:1)	198.40	187.00	194.60	187.40	199.80	179.50	191.03
'Bajra' + Sorghum (2:1)	152.60	151.00	151.40	155.80	153.60	142.60	151.16
Sorghum + Maize (1:1)	272.00	242.40	253.00	264.60	165.20	252.00	260.20
Maize + 'Bajra' (1:1)	170.20	165.40	165.80	172.00	165.20	156.60	165.86

Sorghum + 'Bajra' (1:1)	161.60	164.60	158.40	161.60	161.00	152.60	159.96
Mean	206.83	202.55	203.15	204.40	203.85	192.91	

Figures in parentheses are average value

C.D. (P = 0.05) for larval media	7.28
C.D. (P = 0.05) for adult diets	5.95
C.D. (P = 0.05) for egg density x adult diets	N.S.

Longevity of *Corcyra cephalonica*

The data on longevity of adult female and male emerged from different grains is presented in Table 2 and 3, respectively. The longevity of adult female was longest (8.03 days) on sorghum + maize (1:1) and shortest (6.46 days) on 'Bajra'. The longest longevity was followed by sorghum + maize (2:1), 'Bajra' + sorghum (2:1), maize + 'Bajra' (2:1) and maize + sorghum (2:1) where, it was 7.63, 7.56, 7.43 and 7.30 days, respectively. The longevity on sorghum + 'Bajra' (2:1), maize, 'Bajra' + maize (2:1) and maize + 'Bajra' (1:1) was 7.20, 7.06, 6.90 and 6.80 days, respectively, while the longevity on 'Bajra' and sorghum + 'Bajra' (1:1) was 6.46 days. The shortest life of adult female was recorded on maize of 3 days with 5 percent sugar as adult diet and longest life on 'Bajra' + sorghum (2:1) of 13 days as 5 percent honey solution. No significant difference was observed for the female longevity when provided with different adult diets. The male longevity, longest 8.36 days was on sorghum + maize (2:1). The longest longevity was followed by 8.06, 7.93, 7.90, 7.76 and 7.70 days on 'Bajra' + sorghum (2:1), sorghum, maize + 'Bajra' (2:1), sorghum + maize (2:1) and sorghum + 'Bajra' (1:1), respectively, also the longevity on 'Bajra', maize and 'Bajra' + maize (2:1) was 7.56, 7.36 and 7.26 days, respectively. The shortest life of male adult was 4 days on sorghum + 'Bajra' (1:1), sorghum + 'Bajra' (1:1) and longest life span 13 days was on maize, sorghum + 'Bajra'

(2:1). No significant difference was observed for the male longevity provided with different adult diets. The present studies are supported by Sreekumar and Paul (2000) [6] where they reported the male longevity of 8.66 days and female longevity of 6.88 days on sorghum. Shazali and Smith (1986) [8] reported the male longevity of 8.3 days on sorghum at 30 °C and 70 percent relative humidity. Chiung and Kang (1998) [12] found the mean longevity of 8.1 and 12.9 days for mated females and males and for unmated, it was 10.2 and 16.4 days, respectively. In contrary to present findings, Murugesan *et al.* (1997) [9] reported the adult female life of 4.0 days on 'Bajra' variety MH-179 and 3.85 days on variety Raj. The adult diet did not have any effect on male and female longevity of rice moth is also confirmed by Pajni *et al.* (1973) [13] who reported that the moth provided with sugar solution continued to live as long as those which were not given any food. Nasrin (2016) [14] showed that *C. cephalonica* revealed the highest number of eggs (115.6 female), higher hatchability (92.9%), extended larval duration (45.9 days), increased larval weight (0.058 gm), survival rate (88.3%), adult emergence rate (93.5%), and male and female longevity (7.7, 7.2 days respectively) when they were reared on chopped wheat as compared to wheat grain, paddy grain, rice grain, maize grain, chopped maize, rice bran, mixture of rice bran and chopped rice.

Table 2: Effect of larval rearing media and adult diets on female longevity of *Corcyra cephalonica*.

Larval rearing media	Female longevity (days)						
	Adult diets						
	Honey 5%	Hone 10%	Sugar 5%	Sugar 10%	Water	Control	Mean
Sorghum	4-8 (6.60)	5-8 (6.40)	4-9 (6.80)	5-10 (6.80)	4-8 (6.80)	5-9 (6.80)	6.70
Maize	4-8 (5.80)	7-10 (8.20)	3-10 (6.40)	4-9 (6.60)	4-9 (7.40)	5-4 (8.00)	7.06
'Bajra'	5-9 (7.00)	4-8 (6.20)	4-8(6.40)	7-8 (7.20)	5-8 (6.40)	4-7 (5.60)	6.46
Sorghum + Maize (2:1)	5-8 (6.40)	7-10 (8.40)	6-8 (7.20)	5-8 (6.80)	8-10 (8.80)	7-9 (8.20)	7.63
Maize + Sorghum (2:1)	5-11 (7.40)	7-9 (8.00)	6-9 (7.00)	4-9 (6.60)	6-8 (6.80)	7-9 (8.00)	7.30
Maize + 'Bajra' (2:1)	6-10 (8.40)	6-9 (7.40)	5-9 (6.80)	6-9 (7.80)	6-8 (7.00)	5-9 (7.20)	7.43
'Bajra' + Maize (2:1)	5-9 (7.20)	5-8 (6.60)	6-9 (7.60)	4-6 (5.20)	4-4 (6.80)	5-4 (8.00)	6.90
Sorghum + 'Bajra' (2:1)	4-4 (6.60)	5-6 (5.80)	6-10 (7.60)	6-8 (7.40)	6-12 (8.80)	4-10 (7.00)	7.20
'Bajra' + Sorghum (2:1)	6-13 (8.80)	6-9 (7.60)	5-8 (6.40)	6-9 (7.80)	4-11 (6.60)	7-9 (8.20)	7.56
Sorghum + Maize (1:1)	6-9 (7.80)	5-8 (6.00)	8-11 (8.80)	4-11 (7.80)	8-11 (9.40)	7-11(8.40)	8.03
Maize + 'Bajra' (1:1)	5-9 (6.60)	5-9 (6.80)	5-6 (5.80)	6-8 (7.00)	5-8 (6.20)	6-10 (8.40)	6.80
Sorghum + 'Bajra' (1:1)	5-8 (6.60)	5-9 (6.60)	4-8 (5.60)	5-8 (6.40)	6-8 (6.80)	5-9 (6.80)	6.46
Mean	7.10	7.00	6.86	6.95	7.31	7.55	

Figures in parentheses are average value

C.D. (P = 0.05) for larval media	N.S.
C.D. (P = 0.05) for adult diets	N.S.
C.D. (P = 0.05) for egg density x adult diets	N.S.

Table 3: Effect of larval rearing media and adult diets on male longevity of *Corcyra cephalonica*

Larval rearing media	Male longevity (days)						
	Adult diets						
	Honey 5%	Honey 10%	Sugar 5%	Sugar 10%	Water	Control	Mean
Sorghum	6-10 (8.20)	6-10 (7.80)	6-10 (7.40)	8-13 (9.80)	6-9 (7.60)	5-8 (6.80)	7.93
Maize	5-13 (7.40)	4-10 (7.40)	6-9 (7.40)	6-11 (8.00)	5-9 (7.00)	5-9 (7.00)	7.36
'Bajra'	5-8 (6.60)	5-8 (7.00)	6-12 (8.40)	6-10 (7.40)	6-10 (8.00)	6-10 (8.00)	7.56
Sorghum + Maize (2:1)	6-9 (7.20)	6-8 (7.80)	6-11 (8.60)	5-9 (7.00)	6-9 (8.00)	7-10 (8.00)	7.76
Maize + Sorghum (2:1)	5-11 (8.00)	6-9 (7.60)	6-8 (7.20)	6-9 (7.20)	6-8 (7.20)	6-8 (7.00)	7.36
Maize + 'Bajra' (2:1)	8-10 (8.80)	6-9 (7.60)	7-11 (8.20)	7-10 (8.20)	7-13 (9.00)	5-8 (6.00)	7.93

'Bajra' + Maize (2:1)	6-10 (7.80)	8-9 (6.40)	8-10 (8.40)	5-8 (6.40)	6-10 (7.80)	5-9 (6.80)	7.26
Sorghum + 'Bajra' (2:1)	5-13 (8.60)	5-7 (6.20)	6-4 (8.00)	6-10 (8.60)	7-11 (8.60)	4-11 (7.40)	7.90
'Bajra' + Sorghum (2:1)	8-12 (9.40)	6-10 (7.80)	6-9 (7.40)	6-13 (8.80)	4-10 (6.60)	8-9 (8.40)	8.06
Sorghum + Maize (1:1)	5-10 (8.00)	5-10 (8.20)	6-10 (8.00)	7-13 (9.20)	8-12 (9.20)	6-9 (7.60)	8.36
Maize + 'Bajra' (1:1)	5-9 (7.00)	5-10 (7.00)	6-9 (7.40)	6-11 (8.80)	7-10 (8.40)	6-10 (8.80)	7.90
Sorghum + 'Bajra' (1:1)	5-10 (7.60)	4-10 (6.80)	5-9 (6.60)	4-13 (8.80)	7-10 (8.40)	5-10 (8.00)	7.70
Mean	7.88	7.30	7.75	8.16	7.98	7.48	

Figures in parentheses are average value

C.D. (P = 0.05) for larval media

N.S.

C.D. (P = 0.05) for adult diets

N.S.

C.D. (P = 0.05) for egg density x adult diets

N.S.

Present study was supported by ¹Allotey and Azalekor (2000) who reported the adult longevity ranged from 1.5±0.5 to 11.9±1.3 days for males and 1.5±0.5 to 16.5±1.2 days for females in different pulses. Chaudhuri (2015) ^[14] reported the longevity of adults ranged from 4.50-6.50 days for male and 3.80-5.50 days for female in different cereals and millet, this difference in longevity is mainly due to the food used in rearing media. Bhardwaj *et al.*, (2017) ^[1] evaluated five cereals *viz.*, rice, wheat, pearl millet (jowar), sorghum (bajra) and maize solely along with their combinations. The mixed diet of rice+jowar+maize was highly superior, in comparison to others for mass production of *C. cephalonica*. The shortest life cycle was found in the combinations of bajra+jowar+maize up to 35 and 40 days respectively and longest life cycle was found in rice extending of 60 to 70 days.

Conclusion

The sorghum was found better diet for female rice moth with maximum fecundity while the lowest fecundity was observed from moth emerged from 'Bajra' which was found to be statistically lower than other grains. The longest longevity was followed by sorghum + maize (2:1), 'Bajra' + sorghum (2:1), maize + 'Bajra' (2:1) and maize + sorghum (2:1) where, it was 7.63, 7.56, 7.43 and 7.30 days, respectively. The shortest life of adult female was recorded on maize of 3 days with 5 percent sugar as adult diet and longest life on 'Bajra' + sorghum (2:1) of 13 days as 5 percent honey solution. The male longevity was longest on sorghum + maize (2:1). No significant difference was observed for the female longevity when provided with different adult diets.

References

- Nakamatsu Y, Tanaka T. Development of a gregarious ectoparasitoid, *Euplectrus seperatae* (Hym: Eulophidae), that parasitises *Pseudaletia seperata* (Lep: Noctuidae). *Arthropod. Struct. Dev.* 2003; 32:329-336.
- Perveen F. *Sitotroga cerealella* and *Corcyra cephalonica*. www.iaees.org/publications/journals/role-of-temperature-and-hosts-sit, 2012.
- Russell, VM, GGM Schulten, Roorda FA. Laboratory observations on the development of the rice moth *Corcyra cephalonica* (Stainton) (Lepidoptera: Galleriinae) on millet and sorghum at 28 °C and different relative humidities. *Z. Ang. Entomol.* 1980; 89:488-498
- Bhardwaj JR, Ganguli JL, Khan HH, Sahu RK. Bionomics of the rice meal moth, *Corcyra cephalonica* (Stainton) reared under laboratory condition on different diets. *Journal of Entomology and Zoology Studies.* 2017; 5(5):722-727
- Medina CP, Cadapan EP. Mass rearing of *Corcyra cephalonica* (Stainton) and *Trichogramma* species. *Philippine Entomologist.* 1982; 5(2):181-198.
- Sreekumar KM, Paul AVN. Labour efficient technology for the mass production of rice meal moth *Corcyra cephalonica* (Stainton). *Indian J Ent.* 2000; 62(3):304-311.
- Xang CC, Wang JL, Zhang J. A breeding experiment with rice moth at different densities. *J. Shehuyang Agri. Univ.* 1990; 21(2):137-140.
- Shazali MEH, Smith RH. Life history studies of externally feeding pests of stored sorghum: *Corcyra cephalonica* (Stainton) and *Tribolium castaneum* (HBST), *J Stored Prod. Res.* 1986; 22(2):55-61.
- Murugesan S, Sundraraj R, Mishra RN. Varieties of pearl millet for the maintenance of *Corcyra cephalonica* (Stainton) culture towards the detrimental effect of the predatory habit of *Tribolium castaneum* (Herbst). *Indian Forester.* 1997; 123(2):175-179.
- Allotey J, Azalekor W. Some aspects of the biology and control using botanicals of the rice moth, *Corcyra cephalonica* (Stainton), on some pulses. *J Stored Prod. Res.* 2000; 36:235-243
- Kumari R, Basit A, Sharmah D. Effect of different diets on the biological parameters of rice moth, *Corcyra cephalonica* Stainton. *International journal of plant protection.* 2014; 7(2):397-400
- Pajni HR, Rose HS, Gill KM. Some observations on the biology of *Corcyra cephalonica* (Staint.) (Lepidoptera: Galleriidae). *Research Bulletin (Sci.), Punjab University.* 1973; 27(3, 4):223-224.
- Chaudhuri N, Ghosh A, Ghosh J. Variation in biological parameters of *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae) with quality of rearing media. *Int. J. Curr. Res. Aca. Rev.* 2015; 3(4):373-380.
- Nasrin M, Alam MZ, Alam SN; Miah MRU, Hossain MM. Effect of various cereals on the development of *Corcyra cephalonica* (Stainton) and its egg parasitoid *Trichogramma chilonis* (Ishii). *Bangladesh J Agril. Res.* 2016; 41(1):183-194.