

EFFECT OF DIFFERENT DIETS ON BODY LENGTH, ADULT LIFE SPAN AND BIOMASS OF *Corcyra cephalonica* (STAINTON) UNDER LABORATORY CONDITION IN CHITWAN, NEPAL

G. Bhandari¹, R. Regmi²

¹Major author, Entomology Technician, National Maize Research Program Rampur, Chitwan, Nepal.

²Assistant professor, department of entomology, Agriculture and forestry university, Rampur, Chitwan, Nepal

ABSTRACT:

The experiments were conducted from 10 October 2013 to 10 January 2014 in Entomology Laboratory of NMRP/NARC, Chitwan at $26\pm 2^{\circ}\text{C}$ and $70\pm 5\%$ RH to study diet performance on body length, adult life span and biomass of *Corcyra cephalonica* (Stainton). Four cereals- corn, rice, millet and wheat tested solely and mixed with groundnut. The female moth has longer body length and wingspan as compared to male moth. Both male and female reared on mixed diet of corn and groundnut has maximum body length, wingspan and body weight. There is high positive correlation between fecundity and female body weight so the mixed diet of groundnut and corn is highly superior for mass production of *C. cephalonica*.

Key words:

Diet; Body length; Life span; Biomass

INTRODUCTION

Corcyra Cephalonia (Stainton), (Pyralidae: Lepidoptera) is a destructive storage pest (Neupane, 2000). It mainly

attacks on rice; so commonly named as 'rice moth' or 'rice meal moth'. But, *C. cephalonica* also attack in wheat, corn, sorghum, groundnut, cottonseeds, coffee, spices and cocoa beans (Allotey, 1986; Kumar and Kumar, 2001; Ayyar, 1934). Highly nutritious plant may support development of nutritionally quality herbivores that finally result production of high quality parasitoids (Van Huis and De Roy, 1998) or predator (Shahayaraj and Sathiamoorthi 2002). *Corcyra* rearing on efficient diet resulted in production of robust moths and robust eggs. The size of egg considered as important criteria for studying the health of insect. Rearing of egg parasitoids, such as *Trichogramma* spp., with utilization of robust host eggs is important (Pathak *et al.*, 2010). Cereal based media supplemented with groundnut (*Arachis hypogaea* L.) enhanced fecundity and other biological parameters compared to the yeast-fortified media (Sathpathy *et al.*, 2003).

C. cephalonica has proved one of the most efficient surrogate hosts for rearing a wide range of biological control agents. Parasitoids such as *Trichogramma* spp.,

Chelonus blackburni (Cameron), *Bracon* spp., *Goniozus nephantidis* (Muesebeck), *Apaneteles angaleti* (Muesebeck), insect predators such as *Chrysoperla carnea* (Stephens), *Mallanda boniensis* (Okamoto), *Cyrtorhinus fulvus* (Knight), and entomopathogenic nematodes such as *Steinernema feltiae* (Filipjev), *Neoaplectana carpocapsea* (Weiser) can be reared on larvae of *C. cephalonica*. Hence, *C. cephalonica* rank first in the mass culturing of entomophagous insects due to its amenability to mass production, adaptability to varied rearing conditions and its positive influence on the progeny of the natural enemies (Kumar and Murthy, 2000).

MATERIAL AND METHODS

Four different cereals, viz: corn (*Zea mays* L.), rice (*Oryza sativa* L), finger millet (*Eleusine coracana* L. Gaertn), and wheat (*Triticum aestivum* L), were milled separately and legume, i.e. groundnut (*Arachis hypogaea* L.) was grinded using home milling machine (grinder). Then, these materials were kept in muslin sack for oven sterilization at 100°C for about one hour separately. These materials were used solo (1.5 kg cereals only) or mixed (1375 gm cereal + 125 gm groundnut) forming total eight treatments. Each diet was fortified with 5 gm yeast extract and 0.5 gm streptomycin sulphate and kept in a small plastic trough (9cm depth and 25 cm diameter). 100 eggs of *C. cephalonica* obtained from the mass-rearing culture at 26±2° C, 70±5% RH, laboratory condition in corn flour fortified with yeast extract and streptomycin sulphate were inoculated in

each eight treatments and kept in room condition in the entomology laboratory of NMRP Rampur. The experiment was layout in completely randomized design with eight treatments and three replications. Observations recorded at 12 am daily and continued until all moth emergences. Male and female moths were identified with the help of labial palp and body size. A male moth has short and blunt labial palpi and small body size; whereas female moth has long, pointed labial palpi and comparatively larger body size. To study the effect of diet on adult body weight and wingspan, 20 males and 20 females from each experimental unit were taken and weighted on an electronic balance. Similarly wingspan and body length of moths were also measured. Data were analyzed using GenStat Discovery Edition 4. Mean comparison of were done by DMRT at 5% probability level.

RESULTS AND DISCUSSIONS

Body length of females is longer than males. Maximum body length of female moth observed on corn + groundnut (12.10) and minimum 9.39 mm on rice (9.39). Similarly, maximum body length of male found on corn + groundnut (10.18 mm) and minimum on rice (8.88 mm). Paudyal, *et al.* (2007) reported maximum 14.67 mm and minimum 10 mm of female body length as well as maximum 13 mm and minimum 8.66 mm of male body length on more or less similar diets. Similar trends on male and female wingspan were found which was also agreed with the results drawn by Paudyal *et al.* (2007).

Table 3. Effect of different diets on male and female body length and wingspan of *C. cephalonica*, Rampur, Chitwan, 2014

Treatments (T)	Female body length (mm)	Female wingspan (mm)	Male body length (mm)	Male wingspan (mm)
Milled Corn	9.84 ^d	13.02 ^{bcd}	9.43 ^{bc}	10.87 ^b
Milled Corn+ Grinded Groundnut	12.10 ^a	14.89 ^a	10.18 ^a	12.88 ^a
Milled Rice	9.39 ^d	12.30 ^d	8.88 ^c	10.32 ^b
Milled Rice + Grinded Groundnut	9.96 ^{cd}	12.53 ^{cd}	9.20 ^c	11.11 ^b
Milled Millet	9.63 ^d	12.47 ^{cd}	9.05 ^c	10.69 ^b
Milled Millet+ Grinded Groundnut	11.21 ^{ab}	14.19 ^{ab}	9.44 ^{bc}	11.39 ^b
Milled Wheat	10.16 ^{cd}	13.08 ^{bcd}	8.92 ^c	10.45 ^b
Milled Wheat + Grinded Groundnut	10.91 ^{bc}	13.70 ^{abc}	9.78 ^{ab}	11.74 ^{ab}
SEM (±)	0.328	0.585	0.166	0.467
CV%	5.5	5.4	3.1	7.2
LSD (0.05)	0.99	1.25	0.50	1.42

Means followed by the same alphabets/letters on superscript are not significant by DMRT at 0.05 levels.

The fresh weight of male *C. cephalonica* was highest on corn + groundnut (19.56 mg) and lowest on rice (10.52 mg). Maximum male weight of 17.33 mg on mixed diet of rice bran + sugar + yeast (94:3:3) and minimum 12.22 mg on milled rice + sugar (97:3) was documented by Bernardi *et al.* (2000). Similarly, maximum 32.18 mg and minimum 15.24 mg weight of female *C. cephalonica* were found on corn + groundnut and rice. Supporting results by

Bernardi *et al.* (2000) revealed maximum 33.73 mg female weight on wheat germ + yeast (97:3) where minimum on ground rice + sugar (97:3). Regarding the male and female weight, Cox *et al.* (1981) documented mean value of 12.9 mg and 24.6 mg body weight for males and females, respectively. A body weight of 12.7 mg for males and 22.4 mg for female also reported by Mbata (1989).

Table 4. Effect of different diets on male and female longevity and weight of *C. cephalonica*, Rampur, Chitwan, 2014

Treatments (T)	Male body weight (mg)	Female body weight (mg)	Fecundity (Egg No.)	Male longevity (days)	Female longevity (days)
Milled Corn	16.49 ^b	24.89 ^{bc}	193.0 ^b	12.08 ^c	9.17 ^{bcd}
Milled Corn+ Grinded Groundnut	19.56 ^a	32.18 ^a	239.7 ^a	13.08 ^{abc}	7.9 ^d
Milled Rice	10.52 ^d	15.24 ^c	107.3 ^c	12.18 ^c	11.08 ^a
Milled Rice + Grinded Groundnut	15.69 ^{bc}	26.17 ^{bc}	192.0 ^b	13.92 ^a	10.58 ^{ab}
Milled Millet	13.57 ^c	21.54 ^c	192.7 ^b	12.17 ^c	9.08 ^{cd}
Milled Millet+ Grinded Groundnut	16.29 ^{bc}	27.54 ^{ab}	206.0 ^{ab}	13.42 ^{ab}	8.08 ^d
Milled Wheat	16.72 ^b	24.85 ^{bc}	192.0 ^b	12.58 ^{bc}	9.58 ^{cd}
Milled Wheat + Grinded Groundnut	17.04 ^{ab}	26.94 ^{abc}	195.3 ^b	14.08 ^a	9.17 ^{bcd}
SEM(±)	0.856	1.708	13.19	0.343	0.448
CV%	9.4	11.9	12	4.8	8.3
LSD (0.05)	2.59	5.18	40.02	1.04	1.36

Means followed by the same alphabets/letters on superscript are not significant by DMRT at 0.05 levels

In case of longevity, the males were longer living than females. Among males fed with different diets, moth provided with wheat + groundnut were found longest lifespan (14.08 days) and shortest lifespan on corn (12.08 days) while female longevity was highest on rice (11.08 days) and shortest on corn + groundnut (7.9 days). Ashwini Kumar *et al.* (2002) recorded male longevity 9.80 days on wheat, 9.70 days on rice, 9.45 days on sorghum and 7.25 days on maize while female longevity 7 days on sorghum, 7.10 days on maize, 7.35 days on rice and 7.55 days on wheat. Jagadish *et al.* (2009)

reported virgin male longevity 9.58 (9-12) days. Manjunath (2013) reported average 10 days of female longevity on bajra. The adult longevities in the present study were comparable to those observed by Karmel and Hassanein (1967), who recorded a female lifespan of 12.2 days and a male lifespan of 22.2 days. Allotey (1986) observed that the lifespan of males and females of *C. cephalonica* were 13.4 and 8.5 days, respectively on groundnut. Cox *et al.* (1981) reported that unmated males live on the average 5 days longer than females.

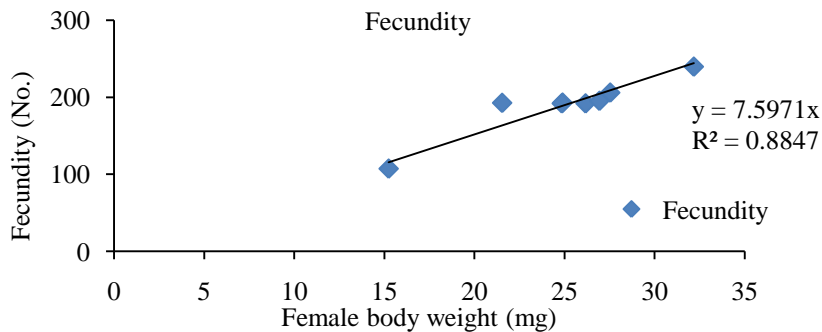


Figure 2. Correlation of fecundity to the female body weight of *C. cephalonica*.

Similarly, the female weight of *C. cephalonica* also correlated with the diets they fed. More over the weight is also further correlated with the mean fecundity of the female moths. Significantly higher weight gain was recorded 32.18 mg on corn + groundnut followed by 27.54 mg on millet + groundnut. An intermediate result 26.94 mg was found on wheat + groundnut. High positive correlation was recorded between fecundity vs. female body weight ($r=0.88$). The fecundity increased by 7.59 times with

per unit rise in body weight. Irrespective of other factors, 88% of the variation in fecundity depended on female body weight. Sathpathy *et al.* (2003) also documented positive correlation between fecundity vs. larval weight ($r = 0.86$) (Figure 2).

CONCLUSION

C. cephalonica is polyphagous storage and grocery pest. The female moth has longer body length and wingspan as compared to male moth. Both male and female reared on mixed diet of corn and

groundnut has maximum body length and wingspan, however body length and wingspan of moth reared on rice was minimum. Similarly, body weight of both female and male was highest on mixed diet of corn and groundnut and lowest on rice. There is high positive correlation between fecundity and female body weight. Since, the body weight of female moth was highest in mixed diet of groundnut and corn and there is positive correlation between fecundity and female body weight so the mixed diet of groundnut and corn is highly superior for mass production of *C. cephalonica*.

REFERENCES

- Allotey, J. 1986. Competition between the two moths *Corcyra cephalonica* (Stainton) and *Ephesia caulella* (Walker) on a laboratory diet. *Journal of Stored Product Research* 22(3): 105-107.
- Ashwani Kumar, S., S. Maninder and K. S. Brar. 2002. Development of *Corcyra Cephalonica* (Stainton) on different foods. M. Sc. Thesis. Punjab Agriculture University, India
- Ayyar, P. N. K. 1934. A very destructive pest of stored products in south India, *Corcyra cephalonica* (Stainton). *Bulletin on Entomological Research* 25(2): 155-160.
- Bernardi, E. B., M. L. Haddad and J. R. P. Parra. 2000. Comparison of artificial diets for *Trichogramma* mass production. *Brazilian Journal of Biology* 60(1):45-52.
- Cox, P. D., L. A. Crawford, G. Gjestrud, C. H. Bell and C. R. Bowley. 1981. The influence of temperature and humidity on the life-cycle of *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae). *Bulletin of Entomological Research London*, 7: 171-81.
- Jagadish, P. S., P. Nirmala, M. A. Rashmi, J. N. Hedge and N. Nangia. 2009. Biology of rice moth, *Corcyra cephalonica* (Stainton) on foxtail millet *Setaria italica* (L.). *Karnataka Journal of Agricultural Science* 22: 674-675.
- Karmel, A. H. and M. H. Hassanein. 1967. Biological studies on *Corcyra cephalonica* (Stainton) (Lepidoptera: Galleriidae). *Bulletin Societe Entomologie d'Egypte* 51, 1-8.
- Kumar, P. and S. Kumar. 2001. Fool proof cage for rearing *Corcyra cephalonica* (Stainton). *Indian Journal of Entomology* 63:322-324.
- Kumar, S. and K. S. Murthy. 2000. Mass production of *Corcyra*. In: *Training Manual of the Second Training on Mass Production of Biological Control Agents*. National Centre for Integrated Pest Management, New Delhi, India. pp.10-20.