J. Biol. Control, 15(2): 147-150, 2001

# Utilization of different cereal grains for the mass production of *Corcyra cephalonica* (Stainton)(Lepidoptera: Pyralidae)

S. ASHWANI KUMAR and M. SHENHMAR
Department of Entomology
Punjab Agricultural University
Ludhiana 141 004, Punjab, India
E-mail:darshan@pau.chd.nic.in

**ABSTRACT:** **Different cereal grains *viz*, maize, rice, sorghum and wheat were evaluated as food at various concentrations i. e., 500, 1000, 1500 and 2000 eggs per kg for the mass production of *Corcyra cephalonica* (Stainton). The aim was to find an alternative to sorghum, which is costly and to arrive at the optimum quantity of eggs per unit of food material. It was found that the life-cycle of *C. cephalonica* was shorter and fecundity and female progeny production were higher when reared on maize. Charging one kg of food material (maize) with of 1500 eggs of *C. cephalonica* was observed to be optimum for successful mass production.**

**KEY WORDS**: *Corcyra cephalonica*, cereals, mass production

*Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) is utilized as a laboratory host in several biological control /research, experimental and extension units, for the mass production of egg, egg-larval, larval and pupal parasitoids and predators like *Chrysoperla*. Several food materials namely cashewnut, fingermillet, groundnut, maize, rice, sorghum, soybean, wheat, etc. have been tried in India for the mass production of *C. cephalonica* and workers expressed different views regarding their suitability (Ambika *et al.*, 1981; Sharma *et al.*, 1982; Mbata, 1989; Solayappan, 1991; Jalali and Singh, 1992; Singh and Jalali, 1994). In Punjab it is reared on sorghum, grown only as a fodder crop in this region and hence besides being costly its availability cannot be ensured throughout the year. Therefore, the studies were planned with an objective to find out a suitable alternative to sorghum under Punjab conditions and also to arrive at the optimum number of *C. caphalonica* eggs per unit of food material for mass production of *C. cephalonica*.

## MATERIALS AND METHODS

Four types of cereal grains *viz.*, maize, rice, sorghum and wheat were procured from the local market. Bold grains of each were milled to small pieces in a domestic milling machine, and separately heat sterilized in a hot air oven at 100°C for 30 minutes to eliminate any secondary infestation. Healthy Ist/2nd instar larvae of *C. cephalonica* were allowed to feed on 100g samples of each food to test whether it was previously

*Part of M. Sc. thesis, submitted to the Punjab Agricultural University, Ludhiana, Punjab.

treated with any insecticide. The sterilized food materials were then treated with formalin (0.1 %) solution to prevent the growth of moulds. The air-dried food materials were then treated with streptomycin sulphate (0.2g/kg) against any bacterial infection at the later stage and transferred to specially designed *Corcyra* rearing rectangular wooden cages (43x23x12.5cm size covered by lids provided with 40 mesh nylon). The specified number of *Corcyra* eggs were inoculated into one kg of each food material in separate cages and covered. Food materials were the main treatments while the egg dosages of 500, 1000, 1500, 2000 were the sub-treatments. Each treatment was replicated three times. The mean temperature and relative humidity during the conduct of experiment were 30±2°C and 84±5per cent, respectively. All freshly emerged moths were collected daily and transferred to specially designed egg laying cage (plastic bucket, 19cm in length and 22cm diameter provided with a piece of nylon mesh on one side and a lid to cover). The eggs were collected daily with the help of a fine sable hairbrush and cleaned to eliminate dust and debris. The emergence pattern and the biological parameters of *C. cephalonica* from different food materials having different egg dosages were observed and the data were analyzed by Factorial Completely Randomized Design and presented in Tables 1 and 2.

## RESULTS AND DISCUSSION

The data on the emergence pattern and female characteristics of *C. cephalonica* on different food materials (Table 1) revealed that the moth emergence started after 36.08 days of inoculation from maize while it took 47.58, 49.08 and 63.5 days on rice, sorghum and wheat, respectively. Jalali and Singh (1992) reported that the first moth emerged from sorghum after 45 days at 30±2° C. The longest life-cycle of 116.83 and 114.66 days was observed on wheat and rice, respectively, while the lowest (89.24 days) was on

Table 1. Moth emergence pattern and female characteristics of *C. cephalonica*

| Parameters | +Emergence when fed on one kg broken grains of | | | |
|---|---|---|---|---|
| | Rice | Sorghum | Maize | Wheat |
| *Duration of life-cycle (days) | 114.66 (10.72)[a] | 101.33 (10.08)[b] | 89.24 (9.46)[c] | 116.83 (10.84)[a] |
| Emergence of first moth after days of inoculation | 47.58 | 49.08 | 36.08 | 63.50 |
| *Total adult emergence period (days) | 68.33 (8.25)[a] | 52.20 (7.29)[b] | 53.99 (7.32)[b] | 54.33 (7.40)[b] |
| Peak adult emergence period (days) | 61-108 | 61-84 | 57-75 | 80-98 |
| *Total adult emerged | 745.58 (26.78)[c] | 1013.99 (31.23)[a] | 1036.83 (31.56)[a] | 956.24 (30.32)[b] |
| • Per cent adult emerged | 62.19 (52.07)[c] | 84.57 (67.74)[a] | 86.27 (69.08)[a] | 79.64 (63.59)[b] |
| • Per cent females | 40.31 (39.39)[d] | 46.72 (43.11)[b] | 50.11 (45.05)[a] | 44.6 (41.89) |
| **Total egg production (cc) | 4.20 (2.26)[d] | 9.40 (3.16)[b] | 10.90 (3.40)[a] | 7.60 (2.93)[c] |
| Weight of eggs/cc (mg) | 598.66[c] | 597.85[c] | 601.41[a] | 599.54[d] |
| *Number of eggs/cc | 16248 (127.47)[a] | 15812 (125.75)[b] | 15669 (125.18)[d] | 15747 (125.49)[c] |

\+ Mean of 4 egg dosages of 3 replications each

Figures in parentheses are the *$\sqrt{n}$ transformation and • Arcsine transformation

maize. The emergence was completed in 52.2, 53.99 and 54.33 days after the emergence of first moth on sorghum, maize and wheat, respectively, while it was prolonged to 68.33 days on rice. Peak adult emergence period was 61-108, 61-84, 57-75 and 80-98 days on rice, sorghum, maize and wheat, respectively. Maize and sorghum produced maximum number of moths 1036.83 and 1013.99 with 86.27 and 84.57 per cent emergence, respectively). The per cent adult emergence from rice was 62.1 whereas Ambika *et al.* (1981) reported 51.67 per cent adult emergence from rice. The per cent females emergence from maize was highest (50.11) with 10.90cc of egg production while the least emergence of females (40.31 %) with egg production of 4.20cc was observed on rice. The highest egg weight (601.41mg) per cc was observed from the moths reared on maize and least (597.85 mg) on sorghum-reared moths. One cc of eggs contained significantly more number of eggs (16248) when reared on rice while the corresponding figures were 15812, 15669 and 15747 eggs per cc of sorghum, maize and wheat, respectively.

The data on biological parameters of *C. cephalonica* presented in Table 2 revealed that the moth emergence started after 48 days of inoculation having 500, 1000, 1500, 2000 eggs/kg of each food. Jalali and Singh (1992) recorded 45 days for the first emergence of moth on sorghum with same egg dosages. As the egg density of food material increased the duration of life cycle and total adult emergence also increased considerably. Lowest duration of life cycle and adult emergence was 85.08 and 37.83 days, respectively, when 500 eggs/kg was the dosage. Highest duration of life cycle and adult emegence was observed when

Table 2. Influence of different egg dosages of *C. cephalonica* on moth emergence pattern and female characteristics

| Parameter | Moth emergence from different *Corcyra* egg dosages | | | |
|---|---|---|---|---|
| | 500 | 1000 | 1500 | 2000 |
| *Duration of life-cycle (days) | 85.08(9.26)$^{d}$ | 99.31 (9.99)$^{c}$ | 112.16(10.62)$^{b}$ | 125.48 (11.24)$^{a}$ |
| Emergence of first moth after days of inoculation | 48.24 | 49.25 | 49.49 | 49.25 |
| *Total adult emergence period (days) | 37.83(6.22)$^{d}$ | 51.08 (7.20)$^{c}$ | 63.24(7.99)$^{b}$ | 77.48 (8.85)$^{a}$ |
| Peak adult emergence period (days) | 57-86 | 60-93 | 63-98 | 69-108 |
| *Total adults emergence | 423.66(20.57)$^{c}$ | 825.75 (28.69)$^{c}$ | 1218.75(34.86)$^{a}$ | 1284.49 (35.77)$^{a}$ |
| ● Per cent adult emergence | 84.71(68.02)$^{a}$ | 82.55 (66.20)$^{b}$ | 81.20 (64.90)$^{b}$ | 64.22 (53.35)$^{c}$ |
| ● Per cent females | 46.70(43.11)$^{a}$ | 45.69 (42.48)$^{b}$ | 45.35(42.32)$^{b}$ | 44.03 (41.55)$^{c}$ |
| **Total egg production (cc) | 3.60(2.14)$^{c}$ | 7.10 (2.80)$^{b}$ | 10.70(3.39)$^{a}$ | 11.00 (3.42)$^{a}$ |
| Weight of eggs /cc (mg) | 599.42$^{abc}$ | 599.23$^{bc}$ | 599.85$^{a}$ | 598.95$^{c}$ |
| *Number of eggs/cc | 15872(125.99)$^{a}$ | 15846(125.80)$^{a}$ | 15900(126.10)$^{a}$ | 15857 (125.92)$^{a}$ |

+Mean of 4 food materials (rice, sorghum, wheat and maize) with 3 replications of each

Figures in parentheses are the * $\sqrt{n}$ transformation , ● Arcsine transformation and ** $\sqrt{n+1}$ transformation

(125.48 and 77.48 days, respectively) when 2000 eggs/kg was the dosage. Jalali and Singh (1992) recorded life-cycle of 150 days duration and 105 days of moth emergence on sorghum having the above- mentioned dosages. Peak moth emergence periods were 57-86, 60-93, 63-98 and 69-108 days at dosages of 500, 1000, 1500 and 2000 eggs/kg food, respectively. Total adult emergence and per cent moth recovery was 423.66 (84.71), 825.75 (82.55), 1218.75 (81.20) and 1284.49 (64.22) at 500, 1000, 1500 and 2000 egg dosages, respectively. The moth emergence in the higher dosages (1500 & 2000) was significantly higher than the lower dosages. Jalali and Singh (1992) observed 63.6, 43.0, 45 and 12.9 per cent emergence having 500, 1000, 1500 and 2000 eggs/kg of food material, respectively. More number of females emerged from 1500 egg per kg of food material with an egg production of 10.70cc, while the lowest egg production was noted at 500 eggs/kg of food material. Weight per cc of eggs varied from 598.95 to 599.85mg at different egg dosages. There was no significant difference in the number of eggs per cc when reared at different egg densities/kg of food material. The number of eggs/cc varied from 15669 to 16248 which almost confirmed the results (15000-18000 eggs/cc) of Manjunath (1991). So it can be concluded that 1500 egg/kg of maize may be the optimum egg density for mass production of *C. cephalonica.*

## ACKNOWLEDGEMENTS

The authors express their deep gratitude to Dr. Darshan Singh, Professor & Head, Department of Entomology, Punjab Agricultural University, Ludhiana for providing necessary facilities. The senior author is also thankful to Indian Council of Agricultural Research for the award of Junior Research Fellowship for this work.

## REFERENCES

Ambika, B., Abraham, C. C. and Dale, D. 1981. Food preference of the rice meal moth *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae). *Agriculture Research Journal Kerela,* **19**: 117-18.

Jalali, S. K. and Singh, S. P. 1992. Effect of infestation of sorghum grains by different dosages of *Corcyra cephalonica* eggs on adult emergence pattern. *Entomon,* **7**: 117-19.

Manjunath, T. M. 1991. Practical aspects related to mass production, storage, packing and field release of *Trichogramma.* In: David, H. and Easwaramoorthy, S. (Eds) *Biocontrol Technology for Sugarcane Pest Management.* pp.127-32. Sugarcane Breeding Institute, Coimbatore, Tamil Nadu.

Mbata, G. N. 1989. Studies on some aspects of the biology of *Corcyra cephalonica* (Stainton) (Lepidoptera: Galleriidae). *Journal Stored Product Research,* **25**: 181-86.

Sharma, G. K., Jain, K. L. and Pareek, B. L. 1982. Food utilization studies of *Corcyra cephalonica* and *Ephestia cautella. Entomon,* **7**: 71-74.

Singh, S. P. and Jalali, S. K. 1994. *Trichogrammatids.* PDBC Technical Bulletin, 7, 95 pp. Indian Council of Agricultural Research, New Delhi.

Solayappan, A. R. 1991. Economic mass production of *Corcyra.* In: David, H. and Easwaramoorthy, S. (Eds.) *Biocontrol Technology for Sugarcane Pest Management.* pp. 133-140. Sugarcane Breeding Institute Coimbatore, Tamil Nadu.