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SUITABILITY OF DIFFERENT DIET AND THEIR COMBINATION FOR THE REARING OF *TRICHOGRAMMA* HOST *CORCYRA CEPHALONICA* STAINTON

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ABSTRACT – Seven types of food media combinations were evaluated for optimal rearing of *C. cephalonica* for its main host *Trichogramma.* Observations were taken on average developmental period, percentage of moth emergence and weight of eggs. To determine the best medium, a food efficiency index was computed. Food efficiency index (FEI) was calculated by dividing the product of percent emergence and egg weight by average development period. Results clearly established the superiority of sorghum over other media.

Key words : Rearing, *Trichogramma chilonis,* host, *Corcyra cephalonica,* diet.

INTRODUCTION

The rice meal moth, *Corcyra cephalonica* Stainton ranks 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.

Rice meal moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae) a stored grain pest has been proved to be one of the most efficient surrogate host for rearing a wide range of biological control agents. The important among them are egg parasitoids – *Trichogramma* spp., egg larval parasitoids – *Chelonus blackburni*, larval parasitoids – *Bracon* spp., *Goniozus nephantidis*, *Apaneteles angaleti*, insect predators – C*hrysoperla carnea, Mallanda boniensis.* C*yrtorhynus feltiae (Neoaplectana carpocapsea)* is reared on the larvae of *C. cephalonica.* Besides, some entomopathogenic nematodes such as *Steinernema feltiae* is also reared on the larvae of *Corcyra cephalonica* (Kumar and Murthy, 2000). Only an efficient and healthy insect mass rearing medium can result in mass production of effective biological control agents. Earlier studies showed that the combination of different diets can improve the ratio of female hosts amongst the insect mass.

In India, Rice meal moth is being utilized in various biocontrol research, developmental and extension units for mass production of number of natural enemies (Jalali and Singh, 1992). In an attempt to minimize cost of production by optimizing the grain utilization by *C. cephalonica,* experiment was conducted to find out suitable media and ideal temperature for storage of the eggs of Rice meal moth. Rice meal moth can be mass-multiplied throughout the year in all the ecological zones of India at 28°C ± 2°C and 65 ± 5% Relative Humidity considering the economics as well as quality of eggs produced. Mass rearing of *C. cephalonica* on broken maize or sorghum grains mixed with 2% dried yeast powder is recommended.

The rearing host diet is potentially of importance to the nutritional quality of host eggs and the survival of *Trichogramma* and other eggs parasitoids released into the environment as biological control agent (Hunter, 2003).It has been reported that *C. cephalonica* have a shorter development time on millet than on sorghum (Russell *et al*, 1980); and a shorter development time on maize than on cocoa (Mbata, 1989). In this report, we worked on the hypothesis that the quality of *T.chilonis* obtained from *C.cephalonica* eggs is affected by the type of cereal used to feed the host larvae. Such result would be an example of a "bottom-up cascade" of ecological effects (Hunter and Price, 1992). High quality plants may support development of herbivores with high nutritional quality that ultimately support high-quality parasitoids (Van Huis and de Roy, 1998) or predators (Shahayaraj and Sathiamoorthi, 2002). In the present study, the food efficiency index (FEI) has been worked out which has been used as a criterion for determining the suitability of different rearing medium for *C. cephalonica* .

MATERIALS AND METHODS

Source: *Corcyra cephalonica* larvae were obtained from naturally infested grain stored in a local warehouse - food store Hapur, Ghaziabad, Uttar Pradesh and reared

in the laboratory for further use in eggs farm.

Controlled Conditions: *C. cephalonica* were mass cultured at 28 ±1 ^{0}C, 80% RH; with a 14:10 light : dark cycle in wooden boxes (50 x 30 x 15 cm.) made of 12 mm plywood. The lids of the cages were provided with the beading, which kept it snugly fit inside the cage. The lids were also provided with two windows (10 cm x 10 cm) covered with fine copper wire mesh (400 sq. per inch^2). The wire mesh was nailed on each side of the windows so that they were kept apart by the thickness of the lid. The fitting of the mesh in the lid was perfect enough to prevent entry of *Bracon hebetor* inside the cage (Kumar and Kumar, 2001).

Diet Options: In these cages, seven types of food media viz., Sorghum, Pearlmillet, Maize, Sorghum + Maize (9:1), Pearlmillet + Maize (9:1), Sorghum+ Pearlmillet (9:1), Sorghum + Maize (8:2) were chosen for studying the suitability of rearing medium for *C. cephalonica* at D.A.V. College Muzaffarnagar (U.P.). Two and half kilograms of rearing medium of each category + 20 gms. of Yeast + one gram of Streptomycin was kept in each wooden cages and mixed properly.

Rearing Methodology : Five thousand of *Corcyra* eggs (0-24 hrs. old) were added to each box and the contents were thoroughly mixed to have uniform distribution of eggs in food. Each treatment was replicated three times, thus there being a total of 21 boxes covered with tight fitting wooden lids. The boxes were stacked in racks in a dark room having controlled temperature (28 ±1 ^{0}C) , and relative humidity (80 ±5%).

Observations: After 30 days, they were observed daily for the emergence of moths. The moths were collected by opening these boxes inside the mosquito net to prevent escape of moths, Two separate units for the collection of moths and eggs have been used (Kumar and Jalali, 1993), the moths are removed from all the cages once in a day, using a domestic vacuum cleaner of the following specifications: Air flow, 27 litres/s; Vacuum, 1700 mm water column; suction power, 200 W; outer diameter of hose, 30 mm.

Oviposition cage: A large plastic container of approx. 40 ltr. was modified for the oviposition cage. A circular hole, diameter 24 cm, was cut in the base of the container and replaced by a steel wire mesh (12 wires/inch; wire diameter 0.4mm). Near the base of the cage, provision is made for the air to escape freely. The inner surface of the container and the lid is rubbed with fine emery paper to make the surface rough. Moths find it difficult to sit on the smooth plastic surface. A hole of 18 mm diameter is made in the centre of the lid. A cotton swab soaked in 50% honey solution is hung in the cage through this hole. This cage can hold around 4000 moths. The eggs are removed from the tray every day for 4-5 days during which time most of the eggs are laid. This oviposition cage was accommodated inside another large plastic container of approx. 60 ltrs. A hole, 18 mm diameter, is made in the centre of the lid. One end of a 2 m long PVC tube of 18 mm diameter is fitted in this hole, which further passes through the hole in the lid of the oviposition cage. Another hole is made in the wall near the base where the hose of vacuum cleaner is fitted. The oviposition cage taken out from the big cage, was kept on the tray for the egg laying. The total number of moths emerged were recorded separately for each cage. Emergence of moths was recorded for forty five days. Moth emergence was recorded regularly from 42nd day till it was over (Jalali and Singh, 1992). First day of moth emergence from each box was considered for developmental period. Percentage emergence of moths was calculated as (Total number of moth emerged x100) /5000 (total number of eggs used for charging each box).

Average developmental period was calculated by multiplying the development period with the number of moths emerged that day. The product of these two was

Table 1 : Effect of different rearing media on the biological parameters of *C. cephalonica*

S. No.	Media	Percent emergence of moths	Weight of 100 eggs (mg)	Average developmental period from egg to adult (days)	Food Efficiency Index (FEI)
1	Sorghum	37.02	4.26	50.82	3.10
2	Pearlmillet	31.89	3.91	47.62	2.62
3	Maize	25.12	4.55	52.01	2.20
4	Sorghum + Maize (9:1)	36.23	4.29	50.83	3.06
5	Pearlmillet + Maize (9:1)	30.29	3.99	47.89	2.52
6	Sorghum+ Pearlmillet (9:1)	35.53	4.16	49.23	3.00
7	Sorghum + Maize (8:2)	35.12	4.43	51.23	3.04

summed up for forty five days. The sum was then divided by the total number of moths emerged in forty days.

Average development period = x1 *z1+x2*z2+ ……..x45*z45/(x1+x2+…x45)

Where, x1=number of days after charging the boxes, when the first moth emerged.

Z1= number of moths emerged on the first day of emergence.

Four thousand moths from each treatment were kept in oviposition cage overnight. Eggs laid in each tray were collected next day. One hundred eggs from each tray were counted and weighed in a Precision balance and their weight recorded. Each treatment was replicated three times. Based on the above biological parameters the food efficiency index of different rearing media was calculated as:

Food efficiency index = percentage moth emerged x weight of 100 eggs/ Average development period.

RESULTS AND DISCUSSION

Corcyra cephalonica developed on all the food media. Moth emergence started after 34 days of infesting the media with *Corcyra* eggs in all the treatments. The number of moth collected was recorded for forty days from the date of start of emergence from each cage. The emergence of moths continued even after forty days, but since the second generation moths were likely to emerge after forty days, the moth emerging after forty days was not included in the calculations.

Maximum of 37.02 percent moths emerged from sorghum followed by pearlmillet and maize in which it was 31.89 and 25.12 percent respectively. Statistically, moth emergence in sorghum and pearlmillet treatments was on par. Jalali and Singh (1992), used 5000 eggs per cages (2.5 kg. of sorghum in each cage), and obtained 12.8 percent recovery. It was observed that mixing of maize drastically reduced the moth emergence, in all the food media, but increased the weight of eggs. The most striking case was observed in pearlmillet, where the emergence was reduced from 31.89 to 25.12 percent when maize was mixed. When Sorghum was added to the mixture of Maize (9:1), Sorghum + Maize (8:2), and Pearlmillet + Maize (9:1) the percent emergence of moths significantly increased from 25.12 to 36.23, 35.12 and 30.29 respectively (Table-1).

Rearing *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 such as *Trichogramma* spp., utilization of robust host eggs is important. The weight of the egg, therefore, was considered as a measure of size of the egg. Maximum weight of 4.55 mg was recorded for 100 eggs laid by moths reared on maize, followed by 4.43, 4.29, 4.26 and 4.16 mg., from Sorghum + Maize (8:2), Sorghum + Maize (9:1), Sorghum+ Pearlmillet (9:1) respectively. The eggs from other diet media weighed lesser. Rao *et al* (1980) reared *C. cephalonica* both in sorghum flour and sorghum flour mixed with rice husk. They recorded more larval weight when reared in the latter.

Shorter development period is a desired trait in the mass production of any insect. The faster development of the insect indicates the efficiency of the rearing medium *Corcyra* could develop in a shortest period of 47.62 days in pearlmillet followed by 47.89, 49.23, 50.82, 50.83 and 51.23 days in Pearlmillet + Maize (9:1), Sorghum+ Pearlmillet (9:1), Sorghum + Maize (9:1), and Sorghum + Maize (8:2) respectively. The different rearing media were superior with respect to different biological parameters. Hence to determine the best medium, a food efficiency index was computed which clearly established the superiority of sorghum over other media, the next best food media being Sorghum + Maize (9:1) and Sorghum + Maize (8:2) [Table 1].

REFERENCES

Jalali S K and Singh S P (1992) Effect of infestation of sorghum grains by different dosage of *Corcyra cephalonica* on adult emergence pattern. *Entomon* **17,** 117-119.

Kumar P and Kumar S (2002) Evalution of different rearing media for *Corcyra cephalonica* (Stainton). *J. Biol. Control* **16,** 117-120.

Kumar P and Kumar S (2001) Fool proof cage for rearing *Corcyra cephalonica* (Stainton). *Indian J. Entomol.* **63,** 322-324.

Kumar P (1999) Mass production of biocontrol agents for commercial use. In: *Training Manual of First Training on Mass Production of Biocontrol Agents (Ed. Kumar, P.) held at National Centre for Integrated Pest Management,* New Delhi, India.

Kumar S and Murthy K S (2000) Mass production of *Corcyra*. pp. 10-20. In*: Training Manual of the second training on mass production of biological control agents. National Centre for Integrated Pest Management, New Delhi.*

Lingarajappa B V and Thontadarya (1983) A note on the effect of host egg size on the size of *Trichogramma* spp. *Current-Research,* University of Agricultural Sciences, Bangalore, 12: 10-12, 103-104.

Tauthong P (1989) Biological study and effects of some food media and temperature on the survival and development of *Corcyra cephalonica* (Stainton). PP. 143-150. *In proceedings, 9th Asian technology seminar on grain and post harvest technology.* Kuala Lumpur, Malaysia.

Tesfaye A and Gautam R D (2002) Effect of adult food supplements on reproductive attributes and longevity of *Chrysoperla carnea*. *Ann. Plant Prot. Sci.* **10,** 198-201.