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RESEARCH ARTICLE

RELATIVE EFFECTS OF LARVAL DIETS FOR *CORCYRA CEPHALONICA* ON MOTH EMERGENCE AND EGG PRODUCTION IN MASS- REARING SYSTEMS

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ABSTRACT

Mass rearing of the rice moth, *Corcyra cephalonica* Stainton is a key component in mass production of several entomophagous biocontrol agents, for use as the factitious host/prey in commercial insectaries. Improvements in the larval diets for mass rearing of *C. cephalonica* constitute one of the strategies to enhance the efficiency and economics of large-scale rearing. The present study compared the relative efficiency of four larval diets (maize alone, sorghum alone, maize+ millet and maize +sorghum) in *C.cephalonica* mass production. The total moth production (over eight weeks duration) was found to be significantly higher (1657/tray) for sorghum + millet, followed by sorghum alone (1638), followed in rank by maize + millet (1268) while maize alone was the least productive (828). The peak moth emergence for all the diets was in the fifth week, while the two superior diets(sorghum+ millet and sorghum alone) showed enhanced moth production during the fourth to sixth weeks. Further, the overall egg production per tray followed a different trend from the overall moth production, the maximum egg production (11.9cc/tray) being in sorghum + millet, followed by sorghum alone (9.8cc), compared to third position by maize + millet (9.5cc), while the least eggs (4.8cc) were obtained with maize alone. It was evident that the larval diets not only differentially influenced the total moth production but also the fecundity (egg production efficiency) of the moths. The egg production efficiency of moths was observed to be maximum in millet + maize ,closely followed by millet+ sorghum Overall, millet+sorghum diet could be reckoned as the most productive diet, based on the greatest egg production, although more moths were produced in sorghum or maize-millet treatments. Since millet also tends to be cheaper than sorghum or maize, millet+ sorghum diet may be more economical for *Corcyra* egg production in commercial insectaries. Further research on the hatchability of eggs from moths reared on the more promising larval diets and their nutritional quality as prey/host in multiplication of insect biocontrol agents is recommended.

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INTRODUCTION

In South Asia, the rice moth, *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae), is mass-reared in commercial insectaries as a factitious host for several insect natural enemies such as the egg parasitoids of the genus *Trichogramma* (Trichogrammatidae: Hymenoptera) and the larval parasitoid, *Bracon hebetor* (Say) (Hymenoptera: Braconidae),besides as prey for predators like green lacewings *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) and *Rhynocoris marginatus* Fab. (Rhinocoridae: Hemiptera) (Bernardi *et.al*., 2000; George, 2000 Sahayaraj *et.al,* 2001;). For enhancing the efficiency of commercial mass rearing, the testing of alternative larval diets for *C. cephalonica* has been mainly by comparing among cereal grains (Russel *et.al.* 1980; Sahayaraj *et.al,* 2001; Sathpathy *et.al,* 2003; Senthilnathan *et.al,* 2006; Tauthong, 1989). This aspect is also a focal theme in the ongoing R&D on commercial mass production of *Trichogramma* at Sun Agro Biotech Research Centre, Chennai (Sithanantham and Ranjith 2010 a, b). The present study was taken up with sorghum and maize grains, both alone and in combination with millet grains, to identify the more efficient larval diet for *C. cephalonica*.

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MATERIALS AND METHODS

The nucleus culture of *C. cephalonica* was obtained from Sun Agro Biotech Research Centre, Chennai. The larval diets compared were as four treatments – sorghum and maize both alone and in mixture (1:1 ratio) with millet (cumbu), as broken

grains. There were ten replications and each replication was a circular plastic tray (35 cm dia; 10 cm depth) with 2.5 kg of the broken grains as larval diet and infested with 0.5 cc (approximate 6000) eggs of *C. cephalonica*. In each tray, 100 g of groundnut, 0.5 g of antibiotic (Ampicillin), 5 g of yeast and 1g of sulphur were added, in order to ensure healthy cultures in the trays (as per Sithanantham and Ranjith 2010 a). The emergence of moths was recorded daily and the numbers emerged were recorded for each tray during 7-14 weeks age of the host culture. In addition, the moths collected from these test trays in a chosen day per week were pooled and kept for egg laying in a wire mesh cage (10 cm dia; 14 cm depth). The amount of eggs laid during four day age of moths, (days 1-4) was recorded by measuring the quantity of eggs daily.

RESULTS AND DISCUSSION

The results of overall statistical analysis (ANOVA) of the two major parameters- moth emergence and egg production are summarized in Table 1. There was significant differences between the four diet treatments and the weeks (8) for both the parameters, besides their interaction being significant for moth emergence alone.

Table 1. ANOVA summary for Corcyra moth emergence and egg production

Parameter	F value	CD (p=0.05)	Significance
Moth emergence			
Diet treatments (4)	470.59	6.38	**
Weeks (8)	1401.06	9.02	**
Diet treatments× Weeks	21.63	18.04	**
Egg production			
Diet treatments (4)	5.47	0.147	**
Weeks (8)	16.90	0.208	**
Diet treatments× Weeks	0.37	0.415	NS

CD=Critical Difference(p=0.05);**=Significant at 1%level;NS= Not significant

Moths production

The results showed that there were significant differences in total moth production over the eight week period (7^{th} to 14^{th} week) of adult emergence among the four diet treatments compared, besides the overall significance of per week emergence of moths. The total moth production per tray (over eight weeks) was found to be significantly higher (1657) for sorghum+ millet followed by sorghum alone (1638), next in rank being maize + millet (1268), while the least moth emergence (828) was observed with maize alone (Fig1).

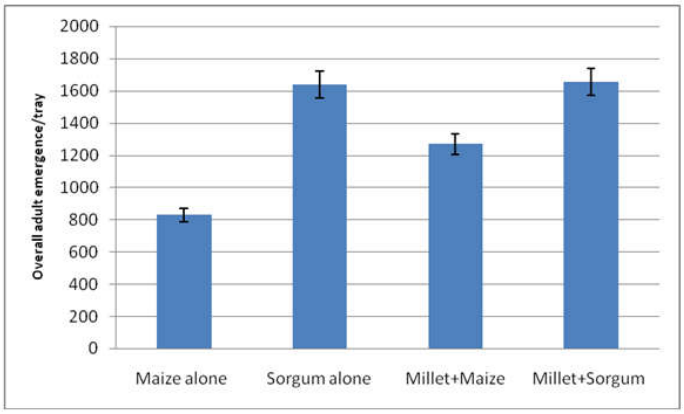

Fig. 1. Comparison of four larval diets on Corcyra adult emergence

Earlier studies of larval media on *Corcyra* moth production had also shown significant effects of different larval feed media (Russel *et.al*.1980; Tauthong, 1989; Sahayaraj *et.al.,* 2001). Further, irrespective of diets, the maximum overall weekly moth production occurred during the fifth week period (Fig2).

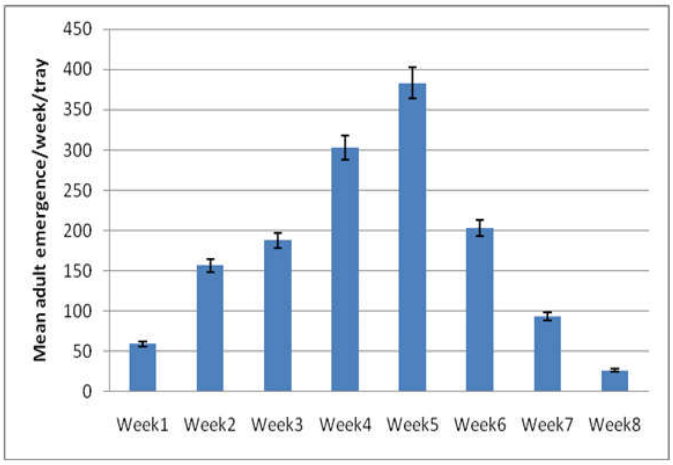

Fig. 2. Comparision of eight continuous weeks for *Corcyra* adult emergence

This trend was also in conformity with the results for millet-based larval diet observed by Sithanantham and Ranjith (2010 a). The trend in weekly moth emergence for the four larval diets followed a generalised pattern, with peak moth emergence in the fifth week for all the diets, while the two superior diets namely sorghum+ millet and sorghum alone showed distinctly greater moth production during the 4^{th} to 6^{th} weeks (Fig 3).

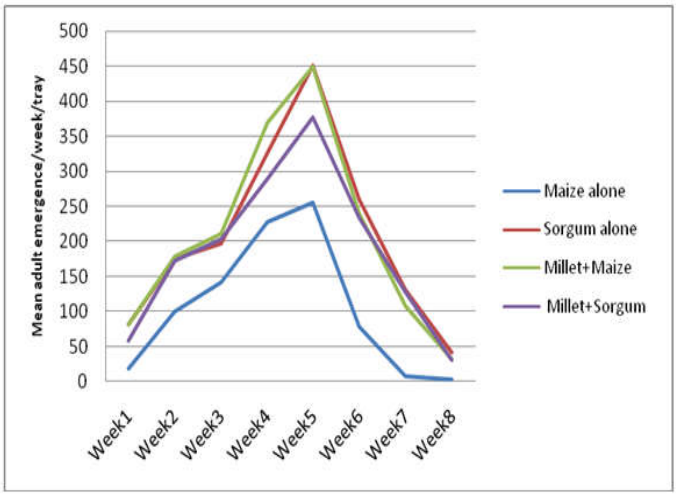

Fig. 3. *Corcyra* moth emergence in four larval diet treatments during eight weeks

This local information could be used in forecasting the weekly moth production enhancement in commercial units.

Egg production

There were significant differences between the larval diets for overall per tray egg production by moyhs, but it was different from the moth emergence trend (Fig 4). The maximum eggs (11.9 cc/tray) in sorghum + millet, followed by sorghum alone (9.8cc) while third in rank was maize + millet (9.5cc), the least (4.8cc) being with maize alone.

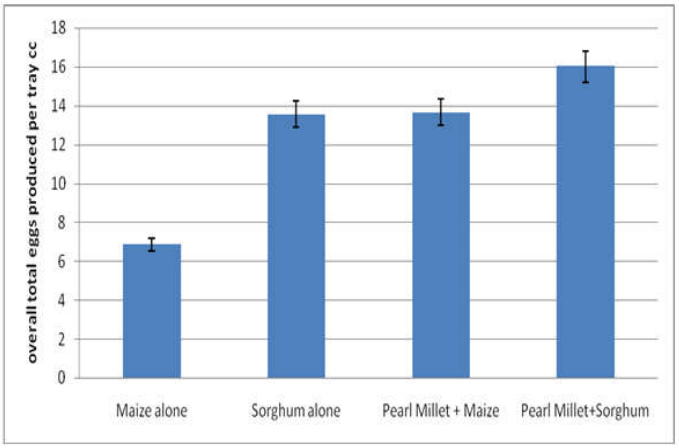

Fig. 4. Overall estimated total egg production among four larval diets

Such differential performance of cereals grains as components of the larval diets affecting egg production has also been reported earlier (Russel *et.al.*1980; Senthilnathan *et.al.* 2006). The weekly overall egg production also was similar in trend to the moth production (Fig 5).

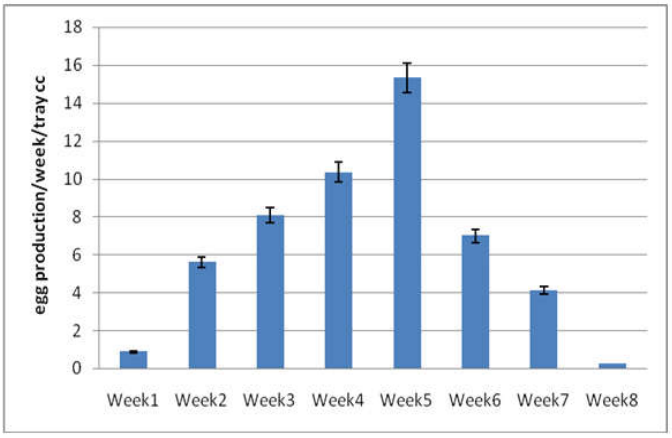

Fig. 5. Overall weekly egg production pattern

This trend is similar to the observations by Sithanantham and Ranjith (2010a) and Kalyanakumar *et.al*. (2014). The week-wise comparison of the four diets for egg production showed that the two superior diets (millet + maize, millet+ sorghum) were able to distinctly improve the egg production during 4th-6th weeks (Fig 6).

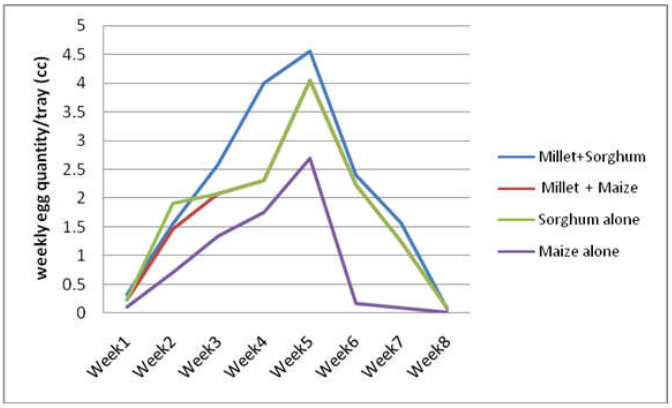

Fig. 6. Weekly egg production pattern for four diets

As already indicated, this information will also be useful to in forecasting the weekly moth/egg production in commercial units. Overall, our results also showed that the larval diets differentially influenced the egg production efficiency of the moths. The overall moths required to produce 1cc eggs was observed in millet + maize (with 136 moths producing 1 cc eggs), followed by millet+ sorghum (139 moths/cc) with sorghum alone (166) and maize alone (172) respectively (Fig.7).

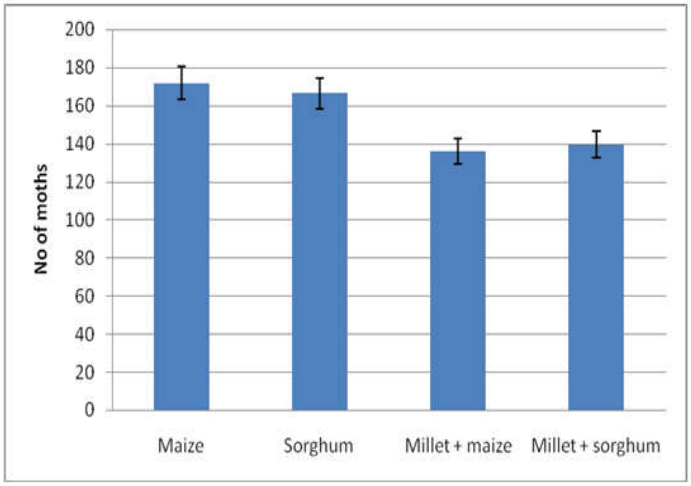

Fig. 7. Relative overall egg production efficacy of moths in four larval diets

Further, it was also evident that the superior larval diet can be judged on the basis of the number of moths emerged per tray, but more importantly based on their egg production ability (Kalyanakumar *et al*., 2014). In India, millet tends to be mostly cheaper than sorghum or maize grains and based on our present results, sorghum + millet diet could be chosen as more economical for *Corcyra* egg production in commercial insectaries. Further studies are required to clarify if the observed differences in larval diets between overall moth production and overall egg production could be attributed to differences in the sex ratio of the resulting adults and/or their mating/egg laying potential.

Moth age as a factor in egg production

The age of moths (day 1 to day 4) as a factor in overall egg production was also compared among the four larval diets (Fig 8). It was found that the two superior diets (sorghum+millet, maize+millet) produced most of the eggs in the first two days, whereas in maize, the third day old moths also contributed to some extent to the total egg production. The utility of this information could be to forecast/limit the egg collection period for the different/productive ages of the moths, if so required, for mass rearing efficiency improvement.

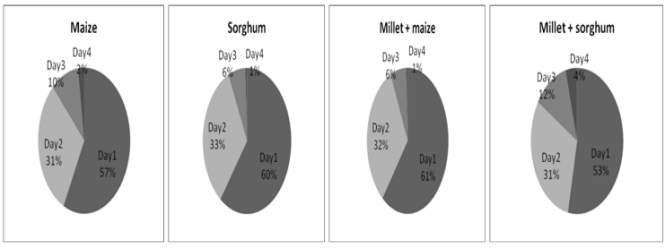

Fig. 8. Relative share of moth age in total egg production. (4 days)

Conclusion

The conclusion from our study is that sorghum + millet could be chosen as the most productive larval diet, based on maximum overall egg production, whereas more moths alone were produced in sorghum or maize-millet treatments. It is recommended that follow-up research should focus on the relative suitability of the eggs produced from moths reared from the promising diet for hatchability and also for their quality as prey/host for supporting the multiplication of the concerned predator/parasitoids.

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REFERENCES

Bernardi, E. B., M. L. Haddad, and J.R.P. Parra. 2000**.** Comparison of artificial diets for rearing *Corcyra cephalonica* (Stainton, 1865) (Lep.: Pyralidae) for *Trichogramma* mass production. Rev. *Brasil Biol.* 60: 45-52.

George, P. J. E. 2000. Life tables and intrinsic rate of natural increase of the three morphs of *Rhynocoris marginatus* (Fab.) on *Corcyra cephalonica* Stainton. *Journal of Experimental Zoology* 3(1): 59 – 63.

Russell, V. M., G.G.M. Schulten, and F. A. Roorda. 1980. Laboratory observations on the development of the rice moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Galleriinae) on millet and sorghum at 28^0C and different relative humidities. *Z. Ang. Entomol*. 89: 488 – 498.

Sahayaraj, K., Sathyamoorthy, P. and Rajamanickam, K. 2001. Effect of rearing media on *Corcyra cephalonica* Stainton biology and life table. *Shashpa* 8(2): 125 – 130.

Sathpathy, S., Nirmal. D.E. and Samarjit, R.A.I. 2003. Suitable rearing medium for rice moth *Corcyra cephalonica* (Pyralidae: Lepidoptera). *Indian Journal of Agricultural Science*s, 73(6):331-333.

Senthilnathan, S, Kalaivani, K., Mankin R.W. and Murugan, K. 2006. Effects of millet, wheat, rice, and sorghum diets on development of *Corcyra cephalonica* (Stainton) (Lepidoptera: Galleriidae) and its suitability as a host for *Trichogramma chilonis* Ishii (Hymenoptera: Trichogrammatidae). *Environmental Entomology*, 35(3): 784-788.

Sithanantham, S. and Carlton Ranjith, W.A. 2010 (a). Trichogramma mass production system improvement. 1. Study of moth emergence and egg production pattern in host (*Corcyra*) culture. *Hexapoda,* 17(1)37-40.

Sithanantham, S. and Carlton Ranjith, W.A. 2010 (b). Trichogramma mass production system improvement. 2. Study of storability of host (*Corcyra*) eggs. *Hexapoda* 17(1) 41-42.

Tauthong, P. 1989**.** Biological study and effects of some food media and temperature on the survival and development of *Corcyra cephalonica* (Sta.), pp. 143-150. *In* Proceedings of, 9th Asian Technology Seminar on Grain and Post Harvest Technology. Kuala Lumpur, Malaysia.

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