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Determination of Suitable and Economical Diet for Laboratory Rearing of Rice Moth, *Corcyra cephalonica* (Stainton)

K.M. Arun Kumar[1*], V.J. Tambe[2], Syed Khadeeru Rehaman[1], B.N. Choudhuri[2] and K.D. Thakur[2]

[1]Department of Entomology, SASF, RTU, Bengaluru, Karnataka, India
[2]Department of Entomology, College of Agriculture, Nagpur, Dr. P.D.K.V. Akola, Maharashtra, India

**Corresponding author*

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A B S T R A C T

Nine experimental dietary formulations (T1-T9) were prepared which composed of rice, wheat, sorghum, rice + groundnut, wheat + groundnut, sorghum + groundnut, rice + sesamum, wheat + sesamum and sorghum + sesamum as base diet to rear and maintain the rice moth, *Corcyra cephalonica* under laboratory conditions. All the diets were fortified with baker's yeast @ 5 g, wettable sulphur @ 5 g, and Streptomycin sulphate @ 50 mg. The parameters studied in the present work were total developmental period, percent adult moth emergence, percent male and female moth emergence, male and female longevity fecundity, total cost for preparing diet, total egg production, total income and net profit. The Diet T6 (sorghum 1000 g + groundnut 50 g) was found to outperform other dietary formulations as it resulted in lowest total development period (47.33 days), highest adult emergence (82 %), highest adult female emergence (52.11 days), highest male longevity (8.33 days), highest female longevity (9.67 days) and highest fecundity (312.33), highest egg production (21.73 cc), highest total income (Rs.426/-) and net profit (Rs.283/-). The obtained results provide suitable diets for mass rearing, thus contributing significantly for the large scale production of *C. cephalonica*.

Introduction

Global warming has cautioned us and the adverse consequences of insecticide use are always alarming and also inducing pest out break because of pest resistance. These entomological backlashes have compelled the scientists to be concerned with entomologically compatible pest management programme (Shukla and Jadhav, 2014). Now days, Integrated Pest Management (IPM) is well known to all of us where all the suitable pest control techniques are being used to find ecologically sound and environmentally safe ways of pest control. Biological control should be regarded as the backbone of any IPM programme and about 90% of all potential pests are already under biological control (Shukla and Jadhav, 2014). The biological control is one of the most effective means of achieving insect control. The fundamental aim in mass production of natural enemies viz.,

Trichogramma chilonis (Ishii) in is their quality production at faster and cheaper rate. The quality of the natural enemies in the laboratory mostly depends on the quality of the host, which ultimately depends on the host nourishment.

Therefore, the diet of the host is potentially of importance to the nutritional quality of host and the survival of *Trichogramma chilonis* Ishii and other egg parasitoids released in the environment as biological control agents (Finney and Fisher, 1964) and (Hunter, 2003)[3]. Several food materials viz., rice (*Oryza sativa* L.), sorghum [*Sorghum bicolor* (L.) Moench], groundnut (*Arachis hypogaea* L.), maize (*Zea mays* L.), castor (*Ricinus communis* L.), cashew nut (*Anacardium occidental* L.), wheat (*Triticum aestivum* L.), finger millet (*Eleusine coracana* Gaertn) and bajra (*Pennisetum typhoides* L.) 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; Solayappan, 1991; Singh and Jalali, 1991 and 1994; Kumar and Shenhmar, 2001).

The results of the experiments conducted by Nathen *et al.,* (2006) revealed that rearing *C. cephalonica* on a high quality nutrient source resulted in high quality eggs, which ultimately resulted in high quality production of *T. chilonis* reared on such host eggs.

The present investigation was therefore formulated with the aim of manipulation of *Corcyra* rearing medium for testing its suitability in getting good quality eggs through enhanced nourishment of *Corcyra* larvae. Thus, good quality egg parasitoid, *T. chilonis* could be utilized through inundative release for the management of many lepidopterous insect pest (Bhushan *et al.,* 2012; Fand *et al.,* 2013).

Materials and Methods

The present investigation was conducted at insectary area in biological control laboratory, Entomology Section, College of Agriculture, Nagpur (M.S.), during 2015 – 16 for determination of suitable and economical diet for laboratory rearing of rice moth, *Corcyra cephalonica* (Stainton). The material used and methods used to carry out these investigations are described below:

The bold, clean grains of rice, wheat, sorghum and other oilseeds were grinded in a domestic grinder by making 2 to 3pieces of each grain. These grains were then heat sterilized in hot air oven at 100ºC for 30 minutes to make them free from any secondary infestation. Similarly, material was treated with streptomycin sulphate @ 50mg per kg to prevent the bacterial infection (Rao *et al.,* 1980). Material of each treatment was mixed in the proportion of the ingredients in a *Corcyra* rearing boxes was round, transparent plastic box of about 2.5 kg capacities with plastic lid (Size: diameter-15 cm and height - 10 cm). The plastic box was cut open in the centre to make a round opening having 8 cm diameter. This opening of plastic lid was closed with iron wire mesh by heat soldering. This arrangement was made to provide sufficient aeration and light. Before adding of *Corcyra* eggs, 5 g dry powdered yeast was added in all combinations. Freshly laid 1/4th cc eggs of *Corcyra* were added in each tray and contents mixed thoroughly for uniform distribution. All the trays were daily checked for moth emergence. Emerged moths were collected separately as per respective treatment in the net house daily in the morning (Ingle *et al.,* 2000). Regarding the effects of different diets on some biological parameters of *C. cephalonica* following observations were recorded. Per cent adult emergence: The actual number of moths emerged from pupae were counted and per cent adult emergence was calculated. The per cent of male and

female adult moth emergence were also recorded. Adult longevity: The male and female moths on different diets were kept separately in plastic containers to record adult longevity. They were provided with 5 per cent honey solution. The total development period: The period from egg laying to death of adult was computed by combining the data obtained from the observation of incubation period to adult longevity and given as total life cycle of *C. cephalonica*. Fecundity: The total numbers of egg laid by each female in its lifetime was recorded. During this period, the pairs were supplied with 5 per cent honey solution. The average fecundity was worked out and total cost for preparing diet, total egg production, total income and net profit were also recorded.

Statistical analysis

The data collected on egg, larval and pupal duration, percentage of moth emergence, male and female emergence, male: female ratio, fecundity were subjected to the statistical analysis.

Results and Discussion

The effects of different rearing media on some biological parameters of factitious host, *C. cephalonica* are based on pooled results are presented Table 1. The per cent adult emergence of rice moth, *Corcyra cephalonica* (Stainton) ranged from 60.66 to 82 with a mean of 72.96. The maximum per cent adult emergence (i.e. 82 per cent) was observed on T6 (Sorghum 1000 g + ground nut 50 g) and the minimum per cent adult emergence was on T5 (Wheat 1000 g + ground nut 50g) i.e. 60.66 per cent. The observations made in this study are in agreement with the findings of Kamble *et al.,* (2006), who mentioned that mean per cent adult emergence was 43.92 per cent on different cereal grains. The percentage of male moth emergence of rice moth, *Corcyra cephalonica* (Stainton.) ranged from 47.89 to 55.92 with a mean of 52.54. The treatment T8 (Rice 1000 g + sesame 50 g) showed the maximum male moth emergence i.e. 55.92 per cent, which was significantly superior over the treatments and the lowest percentage of male moth emergence (i.e. 47.89 per cent) was observed on T6 (Sorghum 1000 g + ground nut 50 g). Similar observations were also recorded by Rizwana Begum and Ayesha Qamar (2015), who reported that the male emergence percentage of *Corcyra cephalonica* (Stainton) was ranged from 42.89 to 58.27 on different cereal grains and gave support to the data. The percentage of female moth emergence of rice moth, *Corcyra cephalonica* (Stainton) ranged from 44.06 to 52.11 with a mean of 47.47. The treatment T6 (Sorghum 1000 g + ground nut 50 g) showed the maximum female moth emergence i.e. 52.11 per cent, which was significantly superior over the treatments and the lowest percentage of female moth emergence (i.e. 44.06 per cent) was observed on T8 (Rice 1000 g + sesame 50 g).Similar observations were also recorded by Satpathy *et al.,* (2002) who noticed that the total female emergence percentage was low with high egg densities reared on fortification of diet with yeast. However, Kamble *et al.,* (2006) reported that the per cent female obtained from different cereal grains varied from 13.20 to 38.70 on different cereal grains. But this investigation was not exactly correlated with the present experiment. The longevity of adult male rice moth, *Corcyra cephalonica* (Stainton) on different diets was ranged from 5.33 to 8.33 days with a mean of 7.30 days. The longest male longevity (i.e. 8.33 days) was observed on T6 (Sorghum 1000 g + ground nut 50 g) and the shortest (5.33 days) was on T5 (Wheat 1000 g + ground nut 50g).The results obtained are in conformity with the findings of Pathak *et al.,* (2010), who reported that adult longevity was 8.36 days (male) and 91.3 days (female) on sorghum and gave support to the data. The longevity of adult female rice moth, *Corcyra*

cephalonica (Stainton) on different diets was ranged from 6.33 to 9.67 days with a mean of 8.77 days. The longest female longevity (i.e. 9.67 days) was observed on treatment T6 (Sorghum 1000 g + ground nut 50 g) and the shortest (i.e. 6.33 days) was on T5 (Wheat 1000 g + ground nut 50g). The results obtained are in conformity with Urs and Morkharjee (1966), who reported that adult longevity was 7 (male) and 13 (female) on groundnut. Cox *et al.,* (1980) reported that rice moth adult male tended to emerge earlier and live longer than unmated females i.e. 5 days. Etman *et al.,* (2009) also observed that adult longevity was 9.1 and 7.0 days for mated and virgin females, respectively, on wheat flour medium. The fecundity of rice moth, *Corcyra cephalonica* (Stainton.) females are ranged from 177 to 312.33 with an average of 260.52. The treatment T6 (Sorghum 1000 g + ground nut 50 g) produced maximum and significantly superior eggs per female (i.e. 312.33) and the minimum fecundity was recorded on T8 (Wheat 1000 gm + sesame 50g).The observations of the present study are in agreement with those of Ayyar (1934), who mentioned that the fecundity of rice moth was varying from 89 to 191 with an average of 156. The total developmental period of *Corcyra cephalonica* i.e. from egg laying to death of adult moth ranged from 47.33 to 64.33 with a mean of 54.20 days. The longest developmental period of 64.33 days) was observed on treatment T5 (Wheat 1000 g + ground nut 50g) and the minimum developmental period of 47.33 days was on T6 (Sorghum 1000 g + ground nut 50 g). The treatment T6 was found to be best treatment by recording minimum development period, which was significantly superior over all other treatments. The observations made in the present study are in conformity with the findings of Urs and Mokharjee (1966). They reported that the development period of 61.42 and 89.00 days on groundnut and til. Kamble *et al.,* (2006) also recorded duration of life cycle from 67.6 to 88.6 days on broken grains of different food material. The cost for mass rearing of *C. cephalonica* under laboratory conditions is ranged from Rs. 35 to 47/- with a mean of Rs. 41.66/-. The cost was maximum in case of diet of the treatment T_7 (Rice 1000 g + sesame 50 g) and T_9 (Sorghum 1000 g + sesame 50 g) i.e. Rs. 47/- and the lowest cost was incurred for T_2 (Wheat 1000 g) i.e. Rs. 35/-. Pathak *et al.,* (2010) reported that the total cost incurred on each mass rearing diets varied from Rs. 188.90 to 255.25. But, it does not exactly correlate with the results of present experiment for comparison. The eggs production of *C. cephalonica* on different rearing media is varied from 11.75 to 21.73 cc with a mean of 14.48 cc. The maximum total egg production i.e. 21.73cc was observed from treatment T_6 (Sorghum 1000 g + ground nut 50 g) and found to be the best treatment and the treatment T_2 (Wheat 1000 g) recorded the least egg production of 11.75 cc. Kamble *et al.,* (2006) reported that the egg production in individual cereal grains varied from 1.50 to 6.01 cc. The maximum egg production (6.01) was observed on Bajra and minimum in nagali. But it does not compared due to difference of diet used in present experiment. The total income for mass rearing of *C. cephalonica* on different rearing media are ranged from Rs. 235 to 426 /- with an average of Rs. 288.88 /-.

The maximum income was gained from the treatment T_6 (Sorghum 1000 g + ground nut 50 g) i.e. Rs. 426 /- and the lowest income was from T_2 (Wheat 1000 g) i.e. Rs. 235 /-. The observations of the present study are in agreement with those of Tirthakar (2005)[25], who reported that the income of rice moth was varying from Rs. 623 to 829 with an average of Rs. 756 /-. Similarly, Rizwana Begum and Ayesha Qamar (2015) noticed the highest income of rice moth was Rs. 887.26 /- on cereals with ground nut.

Table.1 Determination of suitable and economical diet for laboratory rearing of Rice moth, *Corcyra cephalonica* (Stainton)

Sr. No.	Treat ments	Per cent adult emerged	Per cent male emerged	Per cent female emerged	Male longevity	Female longevity	Fecundity No. of eggs/ female	Total developmental period	Total cost for preparing diet (In Rs.)	Total egg producti on (in cc)	Total income (In Rs.)	Net profit (in Rs.)
1	T_1	78.36	52.25	47.95	8.33	9.19	287.66	49.36	37	14.26	285.2	248.2
2	T_2	64.49	54.03	45.97	6.67	7.00	204.66	62.49	35	11.75	235	200
3	T_3	76.49	54.24	45.72	7.67	8.76	225.66	51.99	37	13.98	279.6	242.6
4	T_4	81.66	54.16	45.84	8.00	9.33	303	49.66	43	17.98	359.6	216.6
5	T_5	60.66	53.26	46.72	5.33	6.33	250.33	64.33	41	12.01	240.2	199.2
6	T_6	82	47.89	52.11	8.33	9.67	312.33	47.33	43	21.73	426	283
7	T_7	76	51.43	48.57	7.69	8.67	296.77	53.00	47	13.57	271.4	224.4
8	T_8	74	55.92	44.06	7.22	8.33	177	52.00	45	12.76	255.2	210.2
9	T_9	63	49.69	50.31	6.86	7.67	287.26	57.66	47	12.35	247	200
	Mean	72.96	52.54	47.47	7.30	8.77	260.52	54. 20	41.66	14.48	288.88	124.91
	‘F’test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.				
	SE(m)±	1.52	0.63	0.92	0.377	0.308	4.89	1.43				
	CD at 5%	4.56	1.89	2.76	1.13	0.924	14.67	4.27				

The net profit for mass rearing of *C. cephalonica* on different rearing media are ranged from Rs. 199.2 to 283 /-. The maximum net profit was gained from the treatment T_6 (Sorghum 1000 g + ground nut 50 g) i.e. Rs.283 /- and the lowest net profit was from T_5 (Wheat 1000 g + ground nut 50 g) i.e. Rs. 199.2 /-.The observations of the present study are in agreement with those of Tirthakar, (2005)[25], who reported that the income of rice moth was varying from Rs. 344 to 671 with an average of Rs.487 /- and the more net profit was from sorghum.

*C. cephalonica*is polyphagous storage and grocery pest. Among treatments, sorghum and groundnut were superior to all the other diets. In some parameters, T4 (Rice 1000 g + ground nut 50 g) or T_1 (Rice 1000 g) or T3 (Sorghum 1000 g) were found almost equally effective to standard media T6 (Sorghum 1000 g + ground nut 50 g) for the mass production of rice moth in the laboratory. The fecundity is considered as prime importance because of its utilization on egg parasitoid *T. chilonis*.

High quality and quantity of eggs of *C. cephalonica* was obtained on sorghum + groundnut and rice + groundnut hereby recommended for mass production purpose. Hence, from the study, it is evident that the sorghum +groundnut are economically and biologically proved better option in production of robust eggs of *C. cephalonica*.

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References

Ambika, B., C. C. Abraham, and D. Dale.1981. Food preference of the rice meal moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae). *Agric. Res. J.* Kerala.; 19(2): 117-118.

Ayyar K. A 1934. Very destructive pest of stored products in South India, *Corcyra cephalonica* (Stainton.) *Bull. Ent. Res*., 25(2): 155 -169.

Bhandari, G., R. Regmi and J. Shrestha2014. Effect of different diets on biology of Rice moth, *Corcyra cephalonica* (Stainton) under laboratory condition on Chitwan, Nepal International journal of of applied sciences and bio technology, Vol 2(4):585 – 588.

Bhushan, S., R. P. Singh, R. Shankar 2012. Biopesticidal management of yellow stem borer (*Scirpophagain certulas* Walker) in rice. *The Bioscan.* 7(2): 317-319.

Cox, P.D, L.A. Crawrord, Gjestrud, G Bell, C.H. and C.R. Bowley, 1980. The influence of temperature and humidity on the life cycle of *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae). Bull Ent. Res. 71; 171-81.

Etman, A.A.M., El-Sayed Ferial, M.A., Eesa, N.M. and L.E. Moursy.2009 Laboratory studies on development, survival, mating behaviour and reproductive capacity of the rice moth, *Corcyra cephalonica* (Stainton) (Lep., Galleriidae). *J. Appl. Ent.* 106 (1- 5), 232–240.

Fand, B. B., S. S. Suroshe, and R. D. Gautam, 2013. For tuitous biological control of insect pests and weeds: a critical review. *The Bioscan;* 8(1): 1-10.

Finney, G. L. and T. W. Fisher.1964. Culture of entomophagous insects and their hosts. In: Biological control of Insect pests and weeds, Paul Deback (Ed).

Reinhold Publishing Corporation, New York. Pp. 84.

Gailad K.S. 1987. Studies on rice moth, *Corcyra cephalonica* Stainton in relation to different rice varieties. M.Sc. (Agri.). Thesis, submitted to Konkan Krishi Vidyapeeth, Dapoli.

Hunter, M. D.2003. Effect of plant quality on the population ecology of parasitoids. *Agric. Forest Entomol.,* 5: 1-8

Ingle, A. V., U. S. Satpute, S. A. Nimbalkar, D. N. Sarnaik, and A. K. 2000. Sadawarte. Performance of *Corcyra cephalonica* (Stainton) on different diets. *Pestology.,* 24(8): 51-54.

Kamble P.M. and V.S. Desai.2006. Use of different cereal grains for the mass production of *Corcyra cephalonica* (stainton) *Pestology*; 30 (12): 42-45.

Kumar, S. A. and Shenhmar, M.2001. Utilization of different cereal grains for the mass production of *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae). *J. Biol. Control.*; 15(2): 147-150.

Mehendale, S. K., M. B. Patel and C. U. Shinde.2014. Evaluation of different rearing media for *Corcyra cephalonica* (Stainton) under laboratory condition. ”*The Bio scan*; 9(1):259 – 264.

More, U.B. 1995.Relative susceptibility of some rice varieties to major stored grain pests. M.Sc. (Agri.). Thesis submitted K.K.V., Dapoli, M.S. (India).

Nathan, S. S., K. Kalaivani, R. W. Mankin, and K. Murugan.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). *Environ. Entomol.,* 35(3): 784-788.

Pathak, S. K., M. N. Dubey and P. R. Yadav. 2010. Suitability of different diet and their combination for the rearing of *Trichogramma* host *Corcyra cephalonica* (Stainton) *J. Exp. Zool. India Vol*.;13 (1): 29-31.

Rao, P. S., A. Perraju, and K. B. H. Rao, 1980. Effect of fortification of natural rearing media with Casein, Cholesterol and Glucose on *Corcyra cephalonica* (Stainton): I Larval growth. *Indian J. Ent*. 42(2): 218-222.

Rizwana Begum and Ayesha Qamar. Studies on the efficacy of various diet formulations on growth and development of Rice Moth, *Corcyra cephalonica* (Stainton), an important host of various parasitoids Journal of Entomology and Zoology Studies, 2015; 3(4): 400-403.

Sathpathy, S., De, N. and S. Rai.2003. Suitable rearing medium for rice moth (*Corcyra Cephalonica*) (Pyralidae: Lepidoptera). *Indian J. Agricultural Sciences*, 73(6): 331-333.

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

Shukla, A and D. S. Jadhav.2014. Biology of *Coccinella transversalis* (fabricius) on different aphid species. *The Bioscan*, 9(1): 17-22.

Singh, S. P. and S. K. Jalali, 1991. Trichogrammatids- Egg parasitoids, their production and use Extension Bulletin No.1. Project Directorate of Biological Control (ICAR), Bangalore, India; pp. 1-15.

Singh, S. P. and S. K. Jalali, 1994. Trichogrammatids. Technical Bulletin No. 7, Project Directorate of Biological Control (ICAR), Bangalore, p. 93.

Solayappan, A. R.1991. Techniques for mass culturing of *Corcyra cephalonica* (Stainton) In: David H. and Easwarnamoorthy S (Ed.) Bio-control Technology for sugarcane pest management. *Sugarcane Breeding*

Institute, Coimbatore, Tamil Nadu; pp. 141-144.

Urs, K.C.D. and P. B. Mookharjee. 1966. Effect of oil seed food on the biology of *Tribolium castaneum* (Hb). *Trogoderma granarium* (Everts) and *C. cephalonica* (St.) and their susceptibility to pyrethrins. *Indian Journal of Entomology*; 28(2): 234 - 240.

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