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Effect of different diets of *Corcyra cephalonica*on fecundity, longevity, and emergence percentage of *Trichogrammatoidea bactrae* Nagaraja (Hymenoptera :Trichogrammatoidea) under laboratory condition in Arunachal Pradesh

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ABSTRACT

Study was carried out to assess for fecundity, emergence percentage and longevity of TrichogrammatoideabactraeNagaraja on eggs of Corcyra cephalonica(Stainton)which was obtained by rearing the Corcyra larvae on different cereals as diets and its combination under State bio-control laboratory, Naharlagun, Arunachal Pradesh from 2012 to 2014. The maximum number of Corcyra egg wasparasitized when the parasitoid was reared on host egg produced fromjobstear+rice bran (61.30) and minimum parasitism was when the trichogramma was produced from host egg reared on rice bran (42.70). Maximum female longevity of 9.1 days was observed on host egg reared on rice + maize; while minimum was 4.8 days on host egg reared on maize. Highest number of trichogramma adult emergence was observed on Trichogrammatoideabactrae fed on host egg reared on maize+rice bran (77.17) and lowest emergence observed on rice bran (57.82).Combined diet with rice bran seems to have positive effect on development of the parasitoid.Therefore, it is suggested that mixing 50% rice bran with different cereal is more suitable as well as economical for mass production of T.bactrae.This also implies that the quality of hostdiethadconsiderable effect on quality and efficiency of the egg parasitoid,Trichogrammatoideabactrae.

Keywords:Trichogrammatoideabactrae, parasitism, longevity, emergence percentage .

I. INTRODUCTION

The Biological control is one of the major components of Integrated Pest Management (IPM). Biological control is defined as the reduction of pest populations by natural enemies and typically involves an active human role. Biological control is safe as bio- agents used host-specific or restricted to a few closely relatedspecies. As a result the non-target species like beneficial organisms are not affected. Apart from this, pest resistance and resurgence problem does not occur and it does not pose any human health and environmental treat. Therefore, use of bio-control agents in pest control programme helps in ensuring sustainability in agriculture production by maintaining ecological balance and by regulating the pest population in eco – friendly manner. Biological control is relatively permanent, safe, economical and environmental friendly.

The genus *Trichogramma*are the most studied and successful taxa used in biological control programs[1]. Species of the hymenopterous genus *Trichogramma*have been used more than any other natural enemy for inundative biological control [2]. Unlike larval and pupal parasitoids, Trichogramma kills the pest in the egg stage itself thus preventing the crop damage in advance which makes it most promising parasitoid in the biological control programmes. *Trichogramma*are used in more than 30 million ha worldwide to control lepidopteran pests in agriculture and forestry [3].

The quality of parasitoids is measured through life history parameters such as percentage parasitism, percentageemergence, developmental time, sexratio, adult longevity and size [4, 5].Environmental factors and host quality can effect developmental period, longevity, parasitism, Adult emergence from parasitized eggs and sex ratio [6]. The host quality depends on the diets on which it feeds. Thus,the nutritional status of the host is an important factor for its normal growth, development, longevity and fecundity, which in turn, affect the development of the parasitoid and thereby affecting the efficiency of the parasitoid in the field. It is important to maintain quality of Trichogramma in mass rearing programme for effective field release [7].A substantial knowledge of the parasitoid biology and host associations is necessary for efficient and quality production of parasitoids in respect of parasitizing ability, longevity and adult emergence. High quality bio-agents with high parasitization percentage and fecundity are required to be mass produced for a successful bio-control of the insect pest.

Therefore, the present study was conducted investigate the influence of various larval diets of *Corcyra cephalonica*on biological parameters of parasitoid *Trichogrammatoideabactrae*.The information, thus, generated through this investigation will help in selecting the optimum rearing media for host *Corcyra cephalonica* for mass multiplication of *Trichogrammatoideabactrae*.

II. MATERIALS AND METHOD

The present study was carried out in State Bio-control Laboratory under Directorate of Agriculture located at Naharlagun, Itanagar, Arunachal Pradesh, India. The study was conducted between 2012 and 2014. The culture of *Trichogrammatoideabactrae* was maintained on alternate host *Corcyra cephalonica* egg obtained from rearing the moth on ten different broken grains of cereals viz. rice, maize, millet, jobs tear, rice bran, rice +rice bran, rice +millet, rice + maize, maize + bran, and jobs tear + bran. The experiments were carried out at 27° C ± 3°C and 70 % R.H.

Determining parasitizing ability of parasitoids

*Trichogrammatoideabactrae*cultures were maintained separately on host eggs obtained from moths, reared on different diets. Eggs were collected from moths reared on different diets. Twenty egg cards containing fifty numbers each was prepared from this fresh Corcyra eggs and put in a glass tube ((height: 15 cm; dm: 2 cm). Mated *Trichogrammatoideabactrae*adults were released into this glass tube containing Corcyra egg to allow parasitization. A solution of 50% honey was provided as diet for the adult parasitoid. After every 24 hrs the egg card was replaced with fresh egg card and this process continued till the death of the female parasitoid. *Trichogrammatoideabactrae*cultures were maintained separately on host eggs obtained from moths, reared on different diets.

Percentage of emergence of parasitoid

Freshly collected eggs from Corcyra reared on different test diets is used for preparing the egg cards. Single mated female parasitoid is provided with 50 (fifty) number of sterilized host eggs every day till its death. The total number of the *Trichogrammatoideabactrae* adult emerging out of total number of parasitized eggs is the emergence percentage of parasitoid.The emergence percentage was calculated as

$$\text{Percent emergence of Tr.B.} = \frac{\text{No. of } \textit{Tr. Bactrae emerged}}{\text{No. of parasitized egg}} \times 100$$

Longevity of adult parasitoid

*Trichogramma*culture was maintained from Corcyra egg reared on different diets. Newly emerged parasitoids were kept in the glass vials (1.5 cm diameter and 15cm high) till their death.Ten replicationswere maintained for each treatment.The time duration between the emergence of the adult parasitoid and its death is the longevity of the adult parasitoid.

Statistical analysis

Data were analyzed using ANOVA in SPSS 16 version. Means were separated using Tukey's HSD test.

III. RESULTS

Parasitizing ability

The study revealed that there was significant difference between the parasitizing ability of *Trichogrammatoideabactrae* reared on host egg of Corcyra developed from different diets ($F=14.848$;df = 9;$P<0.001$). Average parasitizing ability was highest on jobs tear (63.30) followed by jobs tear + bran (61.50), maize +bran (60.80) and rice +bran (59.20) (Table 1). Intermediate parasitizing ability was displayed by rice + maize (56.30), rice + millet (55.30), rice (54.90), maize (53.70). The lowest parasitizing ability was found on *Trichogrammatoideabactrae*developed from Corcyra egg reared on rice bran (42.70) and millet (49.20). There was no significant difference between rice + maize, rice +bran, Jobs tear + bran, maize + bran and jobstear.When bran was mixed with rice and maize, it increased the parasitizing ability of *T.bactrae*from 54.70 to 59.20 and 53.70 to 60.80.

Adult emergence

The adult emergence of *T.bactrae*produced from Corcyra egg reared on different dietsdiffered significantly ($F = 30.097$; df = 9; $P = < 0.001$). The highest number of emergence of adult of *T.bactrae*was from the diet maize + bran (77.17) followed by host reared on millet (76.08), rice (75.96) (Fig.1). The lowest number of adults emerged from bran (57.82) but when rice was added to the rice bran (72.25) the emergence percentage was at par with rice (75.96). However, addition ofmaize,jobs tear and rice in proportion of 50: 50 significantly increased the adult emergence percentage of the parasitoid from 57.82% to 77.17%, 70.85%, 72.25% respectively. Addition of rice to millet and maize reduced the emergence from 76.08% to 74.26% and 76.08% to 74.26% respectively.

Longevity

Adult longevity of *T.bactrae*differed significantly for diet maize + rice (4.7 days) and bran (4.8 days). However there was no significant difference in adult longevity in the following diets: maize (9.1days),jobs tear +bran (7.8days),maize + bran (7.8days),rice +bran (7.70days), millet (6.7days), jobs tear (6.60days),rice (5.90 days) rice + millet (5.8 days) (Table 1).

Table 1.Effect of different diets of host egg (*Corcyra cephalonica*) on Parasitizing ability, longevity and emergence percentage of *Trichogrammatoideabactrae*.

Treatments	Parasitizing ability (M±SD)	Longevity (days) (M±SD)	Emergence percentage (M±SD)
1. Rice	54.90 ±3.34 a	5.90±1.79 abc	75.96±3.42 abc
2. Millet	49.20±3.22 a	6.70±0.67 abc	76.08±4.35 abc
3. Maize	53.70 ±5.71 a	9.10±0.56 a	65.67±3.83 ac
4. Jobs tear	63.30 ±5.73 b	6.60±2.91 abc	72.25±5.10bd
5. Rice bran	42.70±5.71 c	4.80±1.75 bc	57.82±1.85 abcd
6. Rice +rice bran	59.20±6.89 a	7.70±4.66 abc	72.75±3.00 abcd
7. Rice +millet	55.30±4.24 b	5.80±2.85 abc	74.26±2.40 abcd
8. Rice +maize	56.30±3.59 b	4.70±3.23 bc	73.33±3.22 abcd
9. Maize +rice bran	60.80±5.65 b	7.80±2.65 abc	77.17±2.94 ac
10. Jobs tear + rice bran	61.50±5.35 b	7.80±4.28 abc	70.85±2.17 bd

Means ± SD followed by same alphabets /letters within the same column are not significantly different (P <0.05 ; Tukey Test)

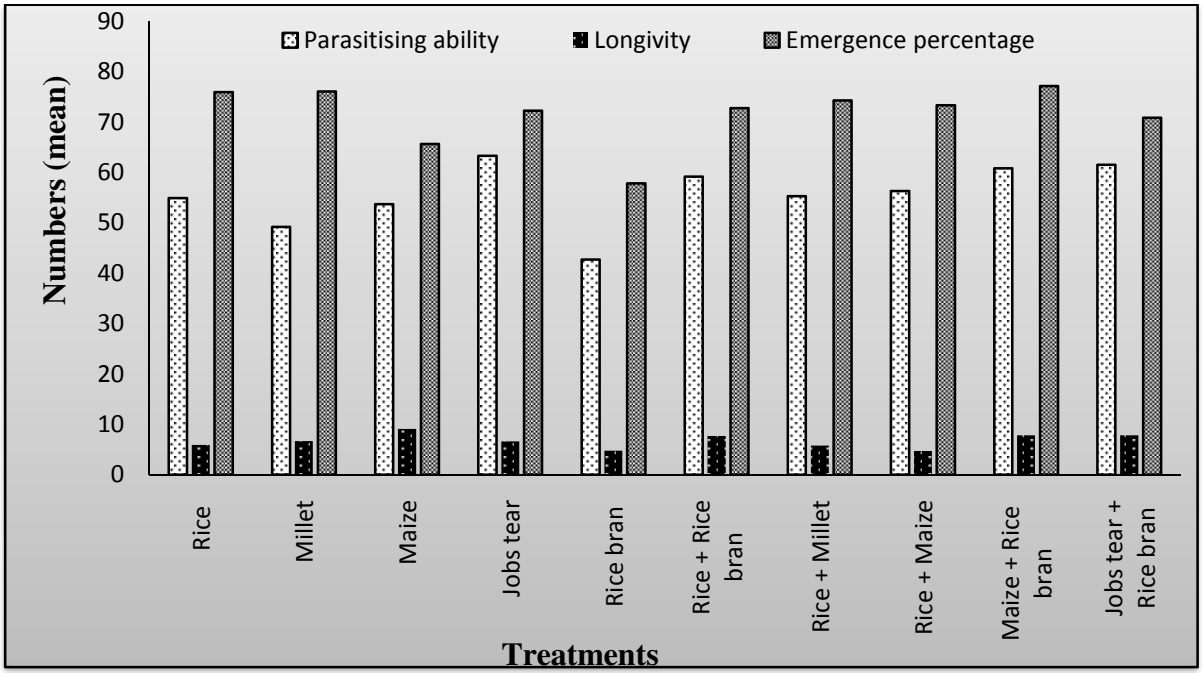

Figure 1. Comparison of different cereals diets on parasitising ability, longevity and emergence percentage of *C. cephalonica*

IV. DISCUSSION

The result of the present study revealed that the food source of host *Corcyra cephalonica* had affected different biological parameters of *Trichogrammatoideabactrae i.e.,* parasitizing ability, emergence percentage and longevity. Highest parasitizing ability of *T.bactrae*was observed in jobs tear with mean no. of parasitized egg 63.30, which was at par with jobs tear + bran (61.50), maize + rice bran (60.80), rice + rice bran (59.20) and rice + maize (56.30). Average fecundity of *T.bactrae*was similar toPerera*et al.* [8]who reported fecundity of 55.7 eggs per female at 27°C [9] with mean of 55 eggs per female at 25°C.However,Malik [10] reported a fecundity of 24 eggs per female at 28°C. Nathan et al., [11] also observed that the different cereals used as feed for rearing Corcyra moth affected the quality of egg parasitoid *T.chilonis.* Parasitoid produced from single cereal feed like rice, millet, maize and rice bran parasitized lesser number of Corcyra egg. Emergence and longevity of parasitoid was also lower in single cereal diet. Therefore, combination of rice bran with different cereals except rice + millet was found to be superior. These diets proved to be more superior and economical for mass production of *T.bactrae.* The main aim of mass rearing programme is "to produce the maximum quantity of quality-assured individuals by predetermined dates at a lowest cost" [12]. In this study it is observed that addition of bran to the cereals appears to be suitable diet for rearing of host of the parasitoid *T.bactrae*, since the bran is easily available at cheaper rates in the markets, so this diet combination will help in reducing the production cost and at the same time it will enhance the efficiency of the parasitoid.

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