Review Article

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Journal of Advanced Studies in Agricultural, Biological and Environmental Sciences (JABE)

A Peer Reviewed & Refereed, International Open Access Journal

www.jabe.in **Vol.1.Issue.2.2014, E-ISSN:2394-2606**

EFFECT OF ARTIFICIAL DIET COMPOSITION ON SOME BIOLOGICAL PARAMETERS OF GREATER WAX MOTH, Galleria mellonella L. UNDER LABORATORY CONDITIONS

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Article History

Received on:10-12-2014

Revised on:20-12-2014

Accepted on:27-12-2014

ABSTRACT

The study suitability of the four artificial diet compositions for mass rearing of greater wax moth, *Galleria mellonella* L. were compared to the natural food *i.e.* honey-bee wax. on the some biological parameters like number of eggs laid per female, number of developed larvae, larval weight (mg), larval length (mm), pupae wt.(mg), larval period(days), pupae period(days) and adult longevity (days) male and female adults. For five generations were also assessed in the FARMER Laboratory, Ghaziabad during 2013-14. The objective was to choose the best artificial diet composition for maximum mass production. The artificial diet comprised different ingredients (Wheat flour, wheat bran, corn flour, milk powder, yeast powder, honey, glycerine and Honey comb). The use of artificial diet **composition- I:** (Wheat flour240 gm, wheat bran 240gm, corn flour 240gm, milk powder 120gm, yeast 10gm ,Honey 100ml, Glycerine 200ml), **Composition-II:** (Wheat flour 350 gm, Corn flour 200gm, Milk powder 130gm, Yeast 70 gm, Honey 100ml, Glycerine 150ml) and **composition- III:** (Wheat flour120 gm, Wheat bran 120gm, Corn flour 120gm, Milk powder 100gm, yeast 5gm ,Honey 175ml, Glycerine 175ml, Honey comb 50 gm), **Composition – IV:** (Wheat flour100 gm, Wheat bran 100gm, Corn flour 100gm, Milk powder 100gm, Yeast 10gm ,Honey 40ml, Glycerine 50ml and Honey comb 500gm). The observed artificial diet composition –IV was better because total biological parameters in good growth. And other artificial composition diet in less biological parameters growth. Composition can be successfully used even for commercial rearing of the Galleria wax moth larvae use of in vivo mass multiplication of Entomopathogenic Nematodes (EPN).

Key Words: Galleria, Artificial Diet Composition, Natural diet and Laboratory Condition.

Cite this article: SUMIT PRATAP SINGH et al., *"**GREATER WAX MOTH, Galleria mellonella L. UNDER LABORATORY CONDITIONS**". Journal of Advanced Studies in Agricultural, Biological and Environmental Sciences, 1(2): 2014, 243-246*

INTRODUCTION

The Greater wax moth, *Galleria mellonella* L., is a major pest of beekeeping industry (Chandel *et al*., 2003) but valued mainly for its dominant role as a fictitious host owing to the susceptibility to various biological control agents (Knipling, 1979) for reproduction of many biocontrol agents (Knipling and Stadelbacher, 1983; Singh, 1994; Parthsarthy and Rabindra, 2003) including entomopathogenic nematodes, which are obligate parasites of a wide range of insect pests (Hussaini, 2003). Its economical importance the mass multiplication technology on artificial diet has been studied in the past, with greater necessity than any other host insect. The earliest artificial diet composition was described (Singh, 1977) which was later modified (PDBC, 2007; Birah *et al*., 2008) as per the suitability and cost-efficiency. The present investigation is also an effort to reduce the cost of

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www.jabe.in **Vol.1.Issue.2.2014, E-ISSN:2394-2606**

artificial diet for *G. mellonella* by experimenting modification in the existing popular technique (PDBC, 2007) for mass multiplication of Entomopathogenic nematodes. Besides the reduction in the cost of diet, it is also required to adjudge suitability of the modified artificial diet composition on the biological parameters like larval wt., duration, pupal wt. duration, fertility and overall survival and developmental period before the acceptance of the change (Birah *et al*., 2008). The present paper reports an economical modification in the artificial diet along with investigation on other parameters for five generations.

MATERIALS AND METHODS

The greater wax moth, *Galleria mellonella* L. (eggs, larva, pupae and adults), was collected from Division of Nematology, IARI, New Delhi, India. The adults were kept in Plastic jars size of 5cm x 30cm and cover with tissue paper for egg laying. Female adults were laying eggs on the tissue paper, every 24 hours eggs were collected and count under stereo microscope and divided in to 1000 Eggs per cluster. These clusters were placed in small jars size of 5cmx 15cm and incubated at (28±2^{o}C, RH 70±5% and 24 hours) after adding 5 gm freshly prepared diet with different composition (Table-1). Neonates were emerged after Eggs hatched in 3-4 days, these neonates were developed in to Ist Instar, IInd Instar, IIIrd Instar, IVth Instar and finally Vth Instars larvae, in these larval stage also added 20 to 35 gm freshly prepared diet after consumed previous diet. Fully developed Vth Instars Larvae were collected and kept in to other plastic jars for adult formation. All Vth Instars Larvae were made cocoon developed in to adult stage. After adult formation one pair of male & female adults were separated and kept into other plastic jar to examine number of eggs laying by single female. The whole study is given in Table no. 2 with different composition of artificial diet.

Table- 1. Ingredients of different artificial diets, used for rearing of greater wax moth, *Galleria mellonella* (L), in the laboratory.

Ingredients (gm)	**Natural Diets**	**Artificial Diet Composition**			
	Control	**Composition I**	**Composition II**	**Composition III**	**Composition IV**
Wheat flour	-	240 gm	350 gm	120 gm	100 gm
Corn flour	-	240 gm	200 gm	120 gm	100 gm
Wheat bran	-	240 gm	-	120 gm	100 gm
Milk Powder	-	120 gm	130 gm	100 gm	100 gm
Yeast	-	10 gm	70 gm	5 gm	10 gm
Honey	-	100 ml	100 ml	175 ml	40 gm
Glycerin	-	200 ml	150 ml	175 ml	50 gm
Honey Comb (bee wax)	1000 gm	-	-	50 gm	500 gm
Total weight (gm)	1000 gm	1150 gm	1000 gm	865 gm	1000 gm

The experimental rearing of wax moth larvae was done in fours artificial diet compositions using the artificial diet composition recommended (PDBC, 2007)

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Table2. Effect of artificial diet compositions on the growth parameters of Greater wax moth, *Galleria mellonella*.

Diet composition	Hatching Period (days)	No. of developed larvae	Larvae wt. (mg)	Larval length (cm)	Pupal wt. (mg)	Larval period (days)	Pupal period (days)	Adults longevity (days)		No. of eggs laid /female
								M	F	
Composition -I (Range)	3-4	300-400	0.45-0.57	20-28	0.18-0.26	21-26	10-18	15-18	24-30	800-915
Average		350	0.50	25.80	0.21	24	12	16	26	866
Composition-II (Range)	2-3	200-250	0.35-0.51	18-28	0.123-0.185	20-25	10-15	10-14	17-24	667-840
Average		226	0.43	24.80	0.15	22	12.00	11	20	739
Composition-III (Range)	2-3	150-250	0.30-0.48	15-26	0.110-0.154	20-23	12-18	07-12	15-20	500-800
Average		204	0.37	21.40	0.12	21	11	9	17	637
Composition – IV (Range)	2-3	400-450	0.48-0.60	25-28	0.25-0.28	22-28	10-14	10-15	24-30	800-1000
Average		426	0.56	26.80	0.26	25	12	13	26	888
Control (Range)	2-3	400-500	0.60-0.65	22-30	0.25-0.30	22-28	6-12	15-20	24-30	800-1000
Average		450	0.62	27.00	0.27	25	10	17	26	888

Means in a column not sharing letter are statistically different (P<0.05).

RESULT AND DISCUSSION

The data (Table 2) indicate the Eggs hatching (Artificial diet composition- II, III and IV) are similar to control diet the hatching period 2-3 days. But observed artificial diet composition -I in eggs hatching period 3-4 days. The average number of eggs 888 laid per female in artificial diet Composition- IV Similar to average number of eggs 888 (Natural food Control). The result showed no statistical difference between number of eggs laid by the female developed on natural food number of eggs 888 and those reared on composition- I (866 eggs) composition- II (739 eggs) And Composition- III (637 eggs). The observed number of V^{th} Instar larvae developed average 426 larvae development in artificial diet composition- IV. Compare to natural diet in 450 V^{th} Instars larvae developed so significant difference between artificial diet composition –IV and natural diet. Also similar result of other artificial diet composition- I have 350 larvae developed and composition- II 226 or composition- III 204 larvae developed. The observed of V^{th} instars larvae length 26.80 cm in developed in artificial diet composition –IV approximately larvae length average 27.00 cm. Weight of pupa developed on the diet 0.26 mg in diet composition IV and weight of pupa 0.27 mg in Control diet. Also observed of pupal periods average in artificial diet composition-IV is 12 days and 10 days in control diet. The study of larval periods average 25 days in artificial diet composition- IV compare to 25 days control diet. The result also observed the number of female and male adult's longevity on artificial diet compassion -IV 13 days for male adults and female adults for 26 days compare to control diet female and male adults longevity were 26 days and 13 days respectively. While the longevity of these adults. The data further showed that this diet composition IV had the same specification of natural diet for maximum mass production of *G.mellonella* L. under laboratory conditions. The main reason was that this diet was so soft in comparison with other diet composition I, II and III). Which become solid only few days after preparation Due to this the larvae could easily move through the diet, which was reflected positively on its feeding and ultimately increased the weight of pupa Also this diet include 50% of natural diet (dark bee wax), which improved its specifications for the growth of larvae.

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