

Full Length Research Paper

Formulation of Artificial Diet using Flour of Dehusked Cereals and Pulses against Rice Armyworm *Mythimna separata* (Walker) (Lepidoptera ; Noctuidae)

Sucheta Shah Mehta

Department of Zoology, M.B. Post Graduate College, Haldwani, Uttarakhand, India.

Article history

Received: 27-04-2018

Revised: 01-05-2018

Accepted: 08-05-2018

Corresponding Author:

Sucheta Shah Mehta

Department of Zoology,
M.B. Post Graduate College,
Haldwani, Uttarakhand,
India.

Abstract

Formulation of a suitable diet for mass rearing of insects is necessary for the production of insects in large number in the laboratory. Insect Growth Regulator properties have been reported in the artificial diet developed for laboratory mass rearing of *Mythimna separata* using nine different kinds of cereals and pulses. Semi synthetic diet is a prerequisite for maintaining mass culture of insects as the required host plants are not available round the year. The above experiments were conducted in the department of Entomology, Pantnagar University, Nainital. Ragi, pea and gram based diet were found suitable up to some extent.

Key words: *Mythimna separata* , IGR, artificial diet, dehusked, cereals and pulses, flour.

Introduction

Mythimna separata commonly known as rice ear cutting caterpillar is reported to have assumed the status of major pest in Uttarakhand in the last few years. This pest has been found to be of regular occurrence to rice at maturity stage. To study its different aspects, a uniform culture of the pest is needed throughout the year, which is not possible in absence of host plants round the year. Keeping this in mind , a semi-synthetic diet was formulated using different commodities. Semi synthetic diets have been reported for *Spodoptera litura*, *Cretonotus gangis*, (Chenchiah K.C. 1987), *Spodoptera littoralis*, (Sorour *et.al.*2011) and other insects. A semi-synthetic diet has been developed for *M. separata* using French bean flour by Mehta and Sharma 1995, Mehta 2014. Further improvements have been tried using different dehusked form of cereals and pulses. Dehusked forms were used so that growth inhibitors if present in the seed coat may not affect the normal growth and development of the test insect.

Materials and methods

Nine different commodities (seeds) of black gram (*Phaseolus mungo*(L.) ,gram (*Cicer arietinum* (L.),lentil (*Lens esculentus*(L.),pea (*Pisum sativum*(L.),ragi (*Eleusine coracana*(L.), rice (*Oryza sativa*(L.),sorghum (*Sorghum vulgare*(L.),soybean (*Glycine max*(L.) and wheat (*Triticum aestivum* (L.) were dehusked .The various ingredients were used as adopted from Tiwari and Bhattacharya(1987).

The composition of the diet is as follows:

Commodity ---	17.67 gm
Yeast powder ---	3.07gm
Sodium ascorbate ---	0.31gm
Methyl –p- hydroxybenzoate (methyl paraben) ---	0.31gm
Sorbic acid ---	0.15gm
Agar ---	1.54gm
Formaldehyde (10%) ---	0.15 ml
Water (Distilled) ---	76.80 ml

The seeds were thoroughly washed and then placed over blotting papers to absorb excess water. Half the quantity of water was heated and agar added slowly to it while stirring continuously and then cooled at room temperature. Each base commodity was then transferred to the blender and mixed for two minutes with remaining half quantity of water. Yeast powder, methyl –p- hydroxyl benzoate, sorbic acid and formaldehyde were added to the above grinded commodity in the blender and mixed for two minutes. Agar and ascorbic acid were added to the blender and the entire diet was mixed for two minutes). The prepared diet was transferred immediately into plastic vials (15X5cm) and allowed to cool at room temperature and stored at 4 °C until used.

Test insect

Mated female *Mythimna separata* were released into glass jars covered with muslin cloth. Sucrose was provided on cotton swabs as food. Glass jars were lined with white paper inside to facilitate egg laying (Mehta, S, S-2014) Parts of paper containing eggs were cut and transferred to glass jars. Newly emerged first instar larvae were transferred to different formulated diets and control (maize leaves) 5-10 gm of each diet was placed per plastic vial (20x15cm) and ten newly emerged larvae were released in each vial and then closed with a cap having a brass mesh. An equal number of newly emerged larvae were introduced in control diet. The diet was changed at four days interval during early stages and after the eighth day larvae were reared individually for comparing the growth and development of insects. All the experiments were conducted at 27 C and 70_±5 % Relative Humidity. Comparison between different commodities was made on different parameters as larval period, pupal period, pupal weight, percent pupation, percent adult emergence and nature of adults. A hypothetical value of one was assigned to control and the formulated diets were categorized on the basis of survival index after comparison with control.

$$\text{Survival index} = \frac{\text{Percent adult emergence on test diet}}{\text{Percent adult emergence on control diet}}$$

Table 1: Developmental profile of *Mythimna Separata* on diets prepared with flour of different cereals and pulses.

Sr. No.	Different commodities	Larval period days	Pupal period days	Pupal weight (mg)	Percent pupation	Percent adult emergence	Nature of adults	Survival index
1	Black gram	-----	-----	-----	-----	-----	-----	-----
2	Gram	22.66	11.33	0.286	62.99 (52.4)	55.40 (48.1)	N, Ww	0.739(3)
3	Lentil	24.33	18.66	0.278	55.33 (48.0)	26.33 (33.8)	N, Wex	0.542(5)
4	Pea	13.00	11.00	0.180	54.50 (47.5)	29.66 (32.9)	Wex, N	0.798(2)
5	Ragi	13.00	10.00	0.103	63.33 (52.7)	26.66 (31.1)	Ww, N	0.805(1)
6	Rice	19.00	-----	-----	20.00 (26.5)	-----	D	0.305(8)
7	Sorghum	25.00	12.33	0.280	39.88 (39.1)	22.06 (27.9)	Abem	0.510(6)
8	Soybean	30.00	24.00	-----	20.00 (26.5)	-----	D	0.302(7)
9	Wheat	24.00	11.00	0.258	55.00 (47.8)	29.66 (32.9)	Wex, Abem	0.614(4)
10	Control (Maize leaves)	19.00	9.00	0.298	90.00 (71.5)	80.00 (63.4)	N,	1.000
	S.Em +	0.555	0.666	0.1899	1.317	3.601		
	-	1.650	2.021	0.5761	3.996	10.923		

Data in parentheses indicate ranking

--- All larvae died; N Normal Adults; Abem Adults failed to come out of pupal case; Deformed pupae; Wex ;Adults wings not expanded; Ww Adults with wavy wings

Results and discussion

On the basis of survival index Ragi, Pea, Gram, Wheat and Lentil were found suitable for rearing of *M. separata* after dehusking in flour form but in wheat, the adults were deformed having unexpanded wings or in some, the adults fail to come out of the pupal case. Thus, only gram, lentil, pea and ragi are considered suitable as artificial diets. Discussion on the basis of survival index the formulated diets can be arranged in the following order. Ragi>Pea>Gram>wheat>Lentil>Sorghum>Soybean>Rice. Black gram could not support the larvae in the initial stage and thus died. Thus the present experiments can be concluded that although some normal adults emerged but this diet is not at par with the earlier formulated French bean flour based diet. Some normal adults emerged in gram Lentil, Pea and Ragi but the percentage was very low.

Acknowledgement: The author is thankful to Dr. V.K. Sharma for his help in conducting the experiments.

References

Chenchiah, K.C., 1987 Formulation of semi synthetic diets for *Spodoptera Litura* and *Cretonotus gangis*. Ph. D. Thesis, 498, G.B.Pant University, Nainital.

Mehta S.S., Sharma, V.K.1995. Development of an artificial diet for rearing *Mythimna separata* using flour of different commodities. Entomon 20, 3 & 4:279-281.

Mehta S.S., 2014 Insect growth regulator properties in boiled edible plant products against rice Armyworm *Mythimna separata* (Walker) (Lepidoptera:Noctuidae). New Agriculturist,25(2):143-146,2014.

Sorour, M.A., O.Khamiss, A.S.Abd El Wahab, M. A. K.El Sheikh and S.Abul Ela 2011. An economically modified semi-synthetic diet for mass rearing of *Spodoptera litura*. Academic Journal of Entomology .4 (3):118-123.