A BEAN CONTAINING DIET FOR MASS REARING OF PECTINOPHORA GOSSYPIELLA (SAUNDERS) LEPIDOPTERA : GELICHIDAE

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Abstract Detailed description of medium apparatii and procedures are presented. Information on biology of artificial diet reared *Pectinophora gossypiella* (Saunders) upto three successive generations include average and range of incubation period, average larval period, and the range of it, average and range of full grown larval recovery, average and range of pupal period, normal and abnormal adult emergence percentage (physically deformed), percentage of pupal death, average and range of adult longevity, average and range of egg laying/female, temperature and humidity range,

Vanderzant and Adkisson[1] described an artificial diet for the rearing of *P. gossypiella* (Saunders). The major component of the diet is wheat germ which is not quite readily available in some parts of the world. The present study elaborates on a diet in which the wheat germ has been successfully replaced by *Vigna unguiculata* (L) Walp. (Asparagus bean) and an additional vitamin, vitamin 'E' has also been incorporated.

Contents and Preparation of the Medium

The ingredients and the quantities used in the preparation of two litre batch of diet are : Tap water (1600 ml), powdered agar (50 g), casein (84 g), sucrose (84 g), coarse bean powder (*Vigna unguiculata*) (72 g), Alphacel (12 g), Wesson's salt mixture (24 g), methyl *p*-hydroxybenzoate (3.6 g), vitamin E (powder) (0.015 g), choline chloride (10%) (24 ml), formaldehyde (10%) (10 ml), acetic acid (25%) (24 ml), potassium hydroxide (22%) (12 ml), and vitamin mixture (8 ml).

Agar was suspended to 1600 ml water and brought to boil. The boiling solution was allowed to stand for 5—10 min, then slowly poured into a blender which was already having all the dry ingredients except methyl *p*-hydroxybenzoate as well as vitamin E and mixed thoroughly for about 3-4 min. Then the diet was allowed to stand for 10-15 min. in order to cool the diet to approximately 65° —75°. Thereafter all the wet ingredients were added along with methyl *p*-hydroxybenzoate and vitamin E as well as the vitamin mixture and the whole mass was mashed thoroughly in the blender. The diet was then poured into vessels and allowed to solidify.

Vitamin Mixture Preparation in 200 ml Sterile Distilled Water

Calcium pantothenate 4.8 g, nicotine acidamide 2.4 g, riboflavin 1.2 g, folic acid 1.2 g, thiamine hydrochloride 0.6 g, pyridoxine hydrochloride 0.6 g, biotin 0.048 g, vitamins B_{12} 0.0024 g.

Ingredients were weighed and held in separate containers. All the white ingredients were poured into a flask to which 100 ml of water was added and mixed well. All yellow ingredients were then mixed with the addition of some water while maintaining constant stirring. Vitamin B_{12} was added in the end with remaining quantity of water.

Description of Rearing Apparatus and Procedure

Oviposition Cage. A medium size lampglass having 10.2 cm height, 7.9 cm lower end diameter and 6.6 cm upper end diameter was fashioned into an oviposition cage which held adults for mating and oviposition. Both open ends of the lampglass were closed with nylon net having smaller holes than the adult's size and attaching the net through scotch tape. A small hole in the nylon net centre was made at the upper side so that the hole bearing end of the lampglass became top of the cage while the end opposite to it was bottom. The bottom of the cage was placed on a petri dish of 9.5×1.5 cm size containing one inch thick absorbant cotton wool pad which came to lie in between the petri dish and the nylon net serving as oviposition site.

Required number of males and females were released in the cage from nylon net hole and closing it with a cotton wool plug for preventing escape of adults. Another oviposition pad-like that of the bottom was prepared and placed on top of the cage after removing the cotton wool plug. The top and bottom petri dishes were fixed tightly to the lampglass by rubber bands. Absorbant cotton wool oviposition pads were daily removed and checked.

Feeding of the adults was done by two absorbant cotton wool pads equal to the diameter of top and bottom of the lampglass soaked with 10% sucrose (ordinary cane sugar) solution. One pad was put in the petri dish on which the cage bottom was placed in a way that entire bottom nylon net came in contact with the soaked pad. Similarly other soaked pad was kept on the top net which not only provided the feeding surface, but also closed the releasing hole. Feeding was maintained for about an hour. After removing feeding pad the hole was closed by cotton wool plug and the cage left for about 20—30 min in order to get the nylon net surface dried. Thereafter the cage was again provided with new oviposition pads and wrapped with

black paper or kept in the dark.

Rearing Jars. Two types of rearing glass jars were used, big and small 9.5×20 and 7.8×15 cm respectively.

Pupation Jars and Adult Emergence Petri Dishes. Rearing glass jars were also used for pupation purpose. Full grown larvae placed between layers of moist muslin cloth, covering the jar mouth with the same stuff. The muslin cloth layers were daily checked. The pupae were taken out and put on a thin layer of cotton wool in a petri dish, covering it with its lid. Adults after emergence were removed through glass test tube and released in mating oviposition cage.

Rearing Procedure. The rearing technique of alternate cotton wool and diet layers was carried out. At the bottom of the sterile jar were placed 1/6 in. thick pieces of 24-48 hr air dried diet side by side so that it constituted a layer of diet and over which a layer of 1/3 in. thick sterile absorbant cotton wool was spread. A number of such alternate diet and cotton wool layers were made upto the mouth of the glass jar.

The eggs laid on the oviposition pads were separated by removing a layer of cotton wool fibres bearing the eggs from the rest of the pad. The thin layer of cotton wool bearing the eggs was placed in a beaker with 10% formaldehyde and soaked for 20 min for the purpose of disinfection. After soaking, eggs were transferred to another beaker or jar and washed with sterile water leaving no trace of formaldehyde in it. Then the eggs bearing thin cotton wool layers were placed in between the sheets of blotting paper where these got dried and placed in a polythene bag for incubation. Hatching larvae or eggs about to hatch on the cotton wool layers were kept between alternate diet and cotton wool layers in the rearing jar. The jar mouth was then closed with the help of a thin polythene sheet held in place tightly by rubber bands. These jars were kept in the darkness for first four or five days due to the reason that first stage larvae were photopositive, and in being so it might not take the food properly. After about sixteen days, rearing jars were checked, all full grown larvae were transferred in pupation jars leaving the developing larvae in the diet jar. Pupation jars were also checked daily transferring pupae to emergence petri dishes. Adults after emergence from pupal shell were held in glass test tubes for about 24 hr and then released in the cage in different numbers with respect to male and female.

Results and Discussion

The data on the development of pink boll worm for three successive generations (although work carried out beyond third generation) given in the Table 1 indicate that average and range of incubation period decreased with the increase in temperature. The average larval period of first generation was more by 1—2 days at 23—31° as compared to the period of second and third generation which were approximately the same as the temperature difference was not significant. The range of larval

TABLE 1.

Generation	Incubation period (days)		Larval period (days)		Larval recovery (%)		Pupation period (days)		Adult emergence (%)			Adult longevity (days)		Egg production female		Temp. range (°F)	Humidity (%)
	Average	Range	Average	Range	Average	Range	Average	Range	Normal	Abnormal	Pupal death	Average	Range	Average	Range		
1st	7	6-7	17.7	13-21	26.4	12.5-44	11.5	6-16	79.6	6.8	13.6	17.8	12-25	46.7	22-88	74-87	40-90
2nd	5.7	5-8	16.5	13-21	28.1	14-55	10.0	5-18	79.3	6.4	14.3	16.4	10-29	38,8	8-83	74-96	40-90
3rd	5	4-6	16.3	13-23	23.6	10.4-70.5	8.1	5-15	79.8	5.3	14.4	14.5	10-22	33.7	7-77	77-96	40-90

period, in all the generations, was the same except that the maximum range in third generation was two days more comparatively. The average larval recovery in all generations was found to be affected partly due to high cannibalistic characteristic of the larvae and partly by fungus development in the rearing jar. During the rearing of individual insects in glass vials using the same diet, the full grown larval recovery on an average was found to be 65%. Range of larval recovery varied greatly in all generations from container to container. Average and range of pupal period decreased with the rise of temperature accordingly. Normal adult emergence percentage was about the same in all the generations, but abnormal adult emergence percentage (wing deformity and the failure of moth to emerge from the pupal exuviae) showed slight decrease in second generation and further decrease in third egneration (Table 1). Pupal death percentage increased in second generation and in the third it was approximately the same as in second generation. Average adults longevity decreased from first to third generation, but the range of longevity was comparatively less in third generation. Average egg per female also decreased from 1st to 3rd generation. Range of eggs per female showed decline from 1st to 3rd generation.

Temperature and humidity range for 1st generation was 23—31° and 40—90%, for second generation 23—36° and 40—90% and for 3rd generation 25—31° and 40—90 % respectively.

Patana[2] describes a rearing procedure in which he has essentially used the alternate cotton pad and diet layer as supporting medium for developing larvae and the entire rearing period from first instar to full grown was spent by the larvae in 1-gallon cartons.

In the present study the rearing was conducted in sterile glass jars providing an opportunity for visual detection of any fungal contamination. Furthermore, the close examination of the jars every day would reveal the instar position of larvae. When they were noted to be full grown they were manually removed from the diet and kept in the pupation jars.

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