RES. BULL. PL. PROT. JAPAN No. 31 : 105~108 (1995)

Short Communication

Rearing of Mexican Fruit Fly, *Anastrepha ludens* (LOEW) (Diptera: Tephritidae) on Artificial Diet

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Abstract : The egging device for *A. ludens* could collect 24.4 eggs/day/female. When the eggs were seeded on artificial diet using corn flour, the percentage recovery of 3rd instar larvae and adults were 26% and 22%, respectively. The shortest developmental period from egg to adult emergence on the artificial diet was 34 days which was the same as that on mango fruit. There is no significant difference on the head width of adults between the artificial diet and mango fruit.
Key words : *Anastrepha ludens*, Tephritidae, rearing, artificial diet, larval diet

Introduction

The Mexican fruit fly, *Anastrepha ludens* is mainly distributed in Central America. This species has been known as the pest of citrus, mango and peach, there (WHITE and ELSON-HARRIS, 1992). Since genera *Anastrepha* contains serious pests of economic importance, many countries including Japan have prevented the pest from invading.

Artificial diets for larvae of fruit flies have been developed with mass production of fruit flies for the sterile insect technique or disinfestation technique. In these days, mill feed diet is used in Hawaii for *Ceratitis capitata, Bactrocera dorsalis* and *B. cucurbitae*, and in Central America sugarcane or sugarbeet bagasse diet for *C. capitata* (VARGAS, 1989). Also, NAKAMORI (1988) reported that wheat-bran was utilized for the mass rearing of *B. cucurbitae* in Japan.

As to artificial diets for Mexican fruit fly, SPISHAKOFF and DAVILA (1968) reported the improvement of the dehydrated carrot diet, and PINSON et al. (1993) tried to mass-rear the fruit fly reusing the medfly diet in Mexico. Meanwhile, OHTO et al. (1991) suggested that the developmental period of the fruit fly on the wheat bran diet became longer than that on fresh fruits of peach, grapefruit and mango. In this study, authors tried to rear the larvae of Mexican fruit fly on artificial diet using corn flour, and develop the simple and efficient method of collecting eggs.

Materials and Methods

Insects used has been reared in Yokohama Plant Protection Station obtaining the permit under special conditions from the Minister of the Agriculture, Forestry and Fisheries. They passed through about 45 generations after introduction.

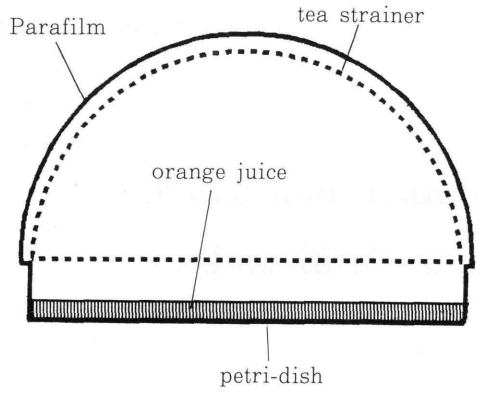

Fig. 1. Device for collecting eggs.

Table 1. Composition of artificial diet for *A. ludens*

Ingredients	Amount
Corn flour	60 g
Granulated sugar	13 g
Dried yeast	9 g
Dried wheat germ	7 g
Toilet paper	10 g
Methyl *p*-Hydroxy benzoate	0.2 g
Sodium benzoate	0.2 g
Water	170 ml

1) Experiment for collecting eggs of *A. ludens*

The device for collecting eggs was made of a petri-dish (6 cm in diameter), a tea strainer, Parafilm and orange juice. A tea strainer was put on a petri-dish containing a small amount of orange juice inside and covered with Parafilm (Fig. 1). The device was put for 5 hours daily in the cage in which 10 pairs of adults were reared. The experiment was started from 7 days after adult emergence. The number of eggs laid was counted everyday.

2) Development of *A. ludens* on the artificial diet

Table 1 shows the composition of artificial diet used. Twenty grams of the diet was put in a plastic container (3.5 cm in diameter and 4 cm in height). Fifty eggs, which were collected by the collecting device as above, were put on the artificial diet. Meanwhile, as the control, 200 eggs were put into a mango fruit. These eggs were transferred to the artificial diet or mango fruit after holding on a moistened filterpaper in a petri- dish for 3 days. These containers and fruit were kept at 25°C under the photoperiod of 16L:8D. Third instar larvae were taken out of the artificial diet or mango fruit on the 18th day after oviposition and put into ice-cream cups (7 cm in diameter and 4 cm in height) containing sand for pupation. The number of adults emerged was recorded daily and the head width of adults were measured. Tests were replicated 9 times on the artificial diet and 3 times on mango fruit.

3) Effects of egg-seeding density on development of *A. ludens*

Twenty-five, 50 and 100 eggs were put on the 20 g of artificial diet in plastic containers. These were kept at 26°C under the photoperiod of 16L:8D. Subsequent handling was the same as above.

Results

1) Experiment for collecting eggs of *A. ludens*

The adults started to lay eggs on the 10th day after adult emergence. The mean number of eggs laid was 24.4 eggs/day(5 hours)/female during the 14th to 26th days after adult emergence.

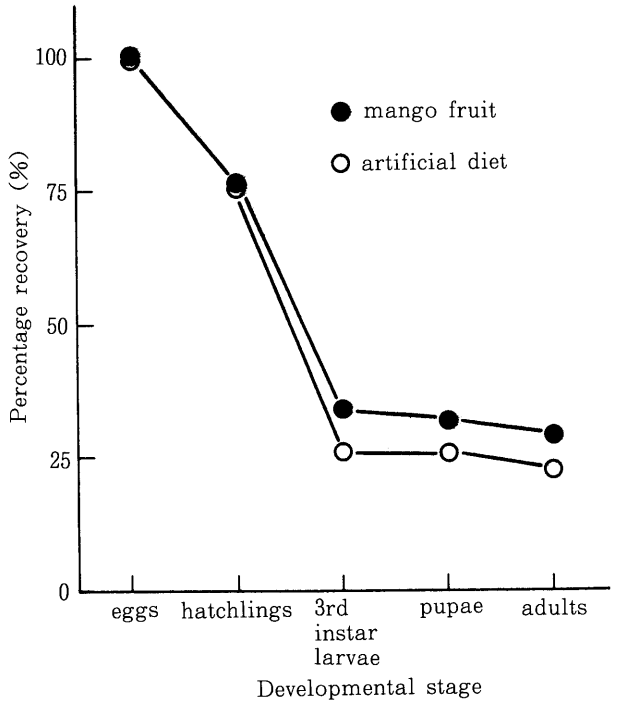

Fig. 2. Percentage recovery of *A. ludens* from egg to adult emergence.

2) Development of *A. ludens* on the artificial diet

Fig. 2 shows the percentage recovery of each developmental stage. The percentage recovery of 3rd instar larvae and adults were 26% and 22%, respectively, on the artificial diet. On mango fruit, 32% of seeded eggs developed into 3rd instar larvae and 28% into adults. The shortest developmental period from egg to adult emergence on the artificial diet was 34 days which was the same as that on mango fruit. There is not significant difference on the head width of adults between the artificial diet and mango fruit (Mann-Whiteny U-test at 5% level).

3) Effects of egg-seeding density on development of *A. ludens*

Table 2 shows the development of *A. ludens* in different egg-seeding densities. Percentage recovery decreased with higher density. Developmental period was 35 days and there is no significant difference on the head width of adults among all densities (Kruskal-Wallis's test at 5% level).

Table 2. Development of *A. ludens* on artificial diet in different egg-seeding densities

No.of eggs per 20 g of diet	Percentage recovery (%)			No. of replication	Developmental period[1] (day)	Head width (mm)	
	larvae	pupae	adults			female	male
25	32.0	32.0	20.0	4	35	2.24	2.18
50	28.6	28.6	18.6	3	35	2.24	2.14
100	19.3	19.3	15.5	4	35	2.33	2.19

[1] Values represent the shortest period from egg to adult emergence.

Discussion

The egging device used in this study could collect 7 times as many eggs as that used in OHTO et al. (1991). MCPHILL and GUIZA (1956) suggested that the dome-like shape of device was important for the oviposition of *A. ludens*.

On the artificial diet, eggs developed to mature larvae and they reached into adults though percentage recovery of each developmental stage was a little lower than that on mango fruit. Both on the artificial diet and mango fruit, larval mortality was high and largely affected on percentage recovery of adults. Especially, the mortality of 1st - 2nd instar larvae seemed to be higher on the artificial diet than on mango fruit since dead mature larvae were hardly observed in the artificial diet after living mature larvae removing. In further study, to reduce the mortality of 1st - 2nd instar larvae is required. Moreover, it is necessary to confirm the reproduction of the fruit fly reared on the artificial diet.

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和 文 摘 要

人工飼料を用いたメキシコミバエ *Anastrepha ludens* (LOEW) (Diptera: Tephritidae) の飼育

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メキシコミバエの卵を集めるために用いた採卵器は，雌1頭，1日あたり24.4個の卵を採取することが可能であった。これらの卵をトウモロコシの粉を成分とした人工飼料に接種した場合，3齢幼虫までの歩留まりは26%，成虫羽化までの歩留まりは22%であった。人工飼料を用いた場合の卵から成虫羽化までの発育期間は，最も短い個体で34日間であり，マンゴウ果実に接種した場合と同じであった。また，人工飼料から得られた成虫の頭幅と，マンゴウ果実から得られたものとの間に差は見られなかった。