

## REARING OF THE TEA BUNCH CATERPILLAR ON ARTIFICIAL MEDIUM (*ANDRACA BIPUNCTATA* WALKER: LASIOCAMPIDAE)

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### ABSTRACT

Y. I. Chu and I. H. Chen (1976). *Rearing of the tea bunch caterpillar on artificial medium* (*Andraca bipunctata* Walker: *Lasiocampidae*). Bull. Inst. Zool., Academia Sinica 15(1): 9-13. The larvae of tea bunch caterpillar (*Andraca bipunctata* Walker) were reared with artificial medium the main components of which consisted of tea leaves and soybean powder. Although the first and second instar larvae can not be raised with this medium, larvae older than the third instar stage are raised very successfully. The cause of the failure in raising the larvae of early stages is considered to be due to the large particle size (1 mm in diameter) of the main component of the medium; the particles are too big to be ingested by the young instars. The durations for the third instar larval stage and pupal stage are 18 and 17-20 days respectively. The longevity of male and female moths are 5.2 and 7.3 days respectively. Among the tested larvae, 78% of them pupated and 85% of the pupae emerged to adult. Twelve of the emerged adults seemed to be invalid because of their wrinkled wings or abnormal moultings. The sex ratio (female/male+female) of the emerged adults is 0.36. The female adult oviposites 55.3 eggs in average. The growth and survival rates of the adults are generally inferior to those of the individuals reared with tea leaves. Only 18 females and 685 eggs are obtained from the artificial medium reared group while 37 females and 3256 eggs are produced from the tea leaves reared group.

The mass rearing of phytophagous insects on the artificial diet, rather than on their host plants, is advantageous for various investigations. One of the advantages of artificial rearing is that many homogeneous insects will be obtained easily. The others are the uniformity of animals with regard to sex, age, etc. will be obtained for studies on the insect attractants or the insecticide screening test.

The tea bunch caterpillar (*Andraca bipunctata*

Walker) is one of the dangerous defoliators of the tea tree in Taiwan, and is sometimes listed as the most destructive one<sup>(1,2)</sup>. Although its life history and some control measures were studied by some workers<sup>(1,2,4)</sup>, no work has been done on its artificial diet.

The object of this experiment is to study an artificial diet on which the tea bunch caterpillar can be reared in a large numbers in the laboratory.

## MATERIALS AND METHODS

The strain of the tea bunch caterpillar employed in this study was collected from the tea garden at Lin-Kou (林口), Taipei and reared with tea leaves until reaching ovipositing stage. The newly hatched larvae were fed with the artificial test diet. All of the rearing experiments were carried out under the room temperature.

The artificial diet used in this experiment is modified from Tamaki's formula which has been used for the rearing of tea tortrix (*Homona magnanima* Diakonoff) and smaller tea tortrix (*Adoxophyes orana* Fisher von Roslerstamm<sup>(3)</sup>). The composition of the diet is given in Table 1.

TABLE 1  
The composition of the artificial medium  
for tea bunch caterpillar

|                          |       |    |
|--------------------------|-------|----|
| Soybean powder           | 10    | gm |
| Tea leaves powder        | 6     | gm |
| Yeast                    | 2     | gm |
| Sodium propionate        | 0.2   | gm |
| Anhydrous sodium acetate | 0.025 | gm |
| 4 N-Hydrochloric acid    | 1     | ml |
| Deionized water          | 47    | ml |

To prepare the diet, young tea leaves were first steamed for 20 seconds under 80 kg/cm<sup>2</sup>, desiccated under 80°C for 2 to 3 hours, and then ground thoroughly with a crusher and sieved to pass through 1 mm mesh screen. Dried soybean was also crushed and sieved to pass through the same mesh screen. Sodium propionate, anhydrous sodium acetate and hydrochloric acid were added into deionized water. After the chemicals were dissolved in the water, soybean powder, tea leaves powder, yeast and agar were added and the mixture heated in a boiling water bath for 30 minutes. The prepared diet were kept at room temperature for the rearings. The diet can be stored in a refrigerator (5°C) for a long time before use.

For the rearing experiments, coagulated diet was cut into slices of 3×2×0.2 cm before affording it for the bunch caterpillars. For the culture of the larval stage, the diet was renewed

every day. Each test was conducted with at least 50 individuals and repeated 3 times.

## RESULTS AND DISCUSSION

Although the rearing tests on artificial diet was started from the newly hatched larvae, 80% of the tested larvae in their early stages, i. e. the 1st and 2nd instars, died within 5 days. However, when the newly hatched larvae were reared with tea leaves, 33 individuals of the 60 survived for 5 days when the larvae reached their late 2nd instar stage (Fig. 1). The survival rates of the 2nd instar larvae for 5 more days were 20% and 75% on the artificial diet and the tea leaf diet, respectively. When the 3rd instar larvae were used as the inoculum, a survival rate of over 80% was obtained for both groups (Fig. 1).

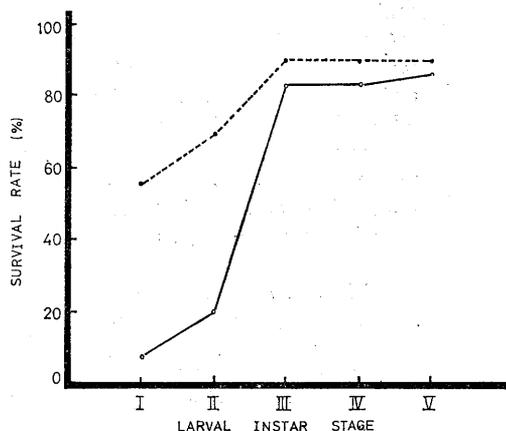


Fig. 1. The survival curves of the various instar stages of the tea bunch caterpillar reared on the artificial medium and tea leaves.  
 ••••• rearing with tea leaves.  
 ○—○ rearing with artificial medium.

The high mortality rate of the 1st and 2nd instar larvae on the artificial medium is possible due to the large particle size of the tea leaves and soybean powder; the particles were too large to be ingested by the young larvae.

Since the rearing of the 1st and 2nd instar larvae of the tea bunch caterpillar is impossible with the artificial formula, a feeding experiment was conducted with the 3rd instar larvae which

were fed on tea leaves during the 1st and 2nd instar stages. The results of rearing from the 3rd instar larvae with artificial medium are shown in Table 2. The table shows that the larval durations of the 3rd instar stage were  $6 \pm 1$  and  $5 \pm 1$  days, of the 4th instar  $7 \pm 1$  and  $6 \pm 1$  days and of the 5th instar  $7 \pm 1$  and  $6 \pm 1$  on the artificial diet and on the normal diet, respectively. Two days retardation is recognized on the artificial diet rearing individuals implying that the test group is inferior to the control group.

The percentage of pupation in artificial diet group decreased from 92% to 78% in comparison with the control group (Table 2). The cocoons formed in the artificial diet were apparently smaller and with thinner silken layer than those of the control group.

The pupal stage of the artificial diet group was prolonged for about 2-3 days than that of the control group. The percentage of emergence of artificial medium group was 85% while that of

control group was 98% (Table 3). Because of the entire or partial coalescence of the abdominal apex with the puparium, some adults failed to emerge from the pupae. Additionally, some emerged adults had wrinkled wings. These abnormal adults were more frequently observed in the artificial medium group. Accordingly, the average percentage of the appearance of abnormal adults were 12% and 3% in the artificial and normal diet groups, respectively.

The development at the adult stage is given in Table 4. The percentage of ovipositing females is 64.1% in the artificial medium group which is 14% lower than that of the control group. The number of oviposited eggs per female of the test group is 64.1 in average. It also indicates that the egg number in the test group decreased by two-thirds comparing with that of the control group.

The sex ratio female/total of 0.36 and 0.47 obtained in the artificial diet and control groups

TABLE 2  
The larval development of the tea bunch caterpillar

|                      | Duration of larval stage (days) |           |           |          | Percent of Pupation |
|----------------------|---------------------------------|-----------|-----------|----------|---------------------|
|                      | 3rd                             | 4th       | 5th       | Total    |                     |
| Artificial diet      | $6 \pm 1$                       | $7 \pm 1$ | $7 \pm 1$ | 17-18-20 | 78.3                |
| Tea leaves (control) | $5 \pm 1$                       | $6 \pm 1$ | $6 \pm 1$ | 15-16-18 | 95.2                |

TABLE 3  
The pupal development of the tea bunch caterpillar

|                      |      | Pupal stage (days) | Percent emergence | Percent abnormal pupae |
|----------------------|------|--------------------|-------------------|------------------------|
| Artificial media     | I    | 18-20              | 87.4              | 13.4                   |
|                      | II   | 17-20              | 82.6              | 11.3                   |
|                      | III  | 17-19              | 85.9              | 12.2                   |
|                      | ave. | —                  | 85.3              | 12.3                   |
| Tea leaves (control) | I    | 15-17              | 98.0              | 2.6                    |
|                      | II   | 16-17              | 100.0             | 1.3                    |
|                      | III  | 16-18              | 96.6              | 4.5                    |
|                      | ave. | —                  | 98.2              | 2.8                    |

TABLE 4  
The development of the adult of tea bunch caterpillar

|                      |      | Percent of oviposited female | No. of eggs oviposited per female | Longevity (days) |        | Sex ratio |
|----------------------|------|------------------------------|-----------------------------------|------------------|--------|-----------|
|                      |      |                              |                                   | male             | female |           |
| Artificial media     | I    | 72.3                         | 61.8                              | 4.8              | 7.6    | 0.32      |
|                      | II   | 58.5                         | 52.2                              | 5.5              | 6.9    | 0.44      |
|                      | III  | 61.5                         | 52.5                              | 5.3              | 7.4    | 0.38      |
|                      | ave. | 64.1                         | 55.3                              | 5.2              | 7.3    | 0.36      |
| Tea leaves (control) | I    | 85.1                         | 92.6                              | 9.8              | 10.2   | 0.43      |
|                      | II   | 73.5                         | 81.3                              | 11.3             | 8.8    | 0.38      |
|                      | III  | 75.7                         | 91.9                              | 9.2              | 9.8    | 0.60      |
|                      | ave. | 78.1                         | 88.6                              | 10.1             | 9.6    | 0.47      |

showed obviously that the female is more susceptible to the artificial nutrient condition (Table 4). It is noteworthy that the longevity of the male adults is more greatly influenced by the artificial diet (Table 4).

In the other experiment started with 100 individuals each of the 3rd instar larvae fed on the artificial formula and tea leaves respectively, 18 ovipositing female adults and 685 eggs were obtained for the former while the latter produced 37 female adults and 3256 eggs. It indicated that only one half of the adult females and one fifth of the laid eggs could develop by subsisting on the artificial medium compared with the control ones.

From the above result, it is apparent that, the rearing efficiency of the artificial medium is inferior to that of tea leaves. The deficiency could be overcome by the improvement of the medium component. For the rearing of the

newly hatched larvae with the artificial medium, better results could be expected by the improvement of the physical property of the medium, especially by using more finely ground tea leaves and soybean powder.

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## 茶 蠶 之 人 工 飼 料

朱 耀 沂 陳 一 弘

以大豆和茶葉粉末爲主的人工飼料飼養茶蠶時，所得結果如下：

第一齡、第二齡幼蟲無法利用供試之人工飼料，探其原因，可能爲粉末顆粒過粗（直徑約 1 mm）。第三齡幼蟲以後的飼養結果，雖較對照組差，但尙稱成功。試驗組蟲隻自第三齡至蛹化期日數爲 18 日，蛹期 17~20 日。成蟲壽命，雌雄各爲 7.3 日（♀）和 5.2 日（♂）。蛹化率 78%。羽化率 85.3%。雌蟲平均產卵數爲 55.3。性比（♀/♂ + ♀）爲 0.36。

若以 100 隻三齡幼蟲各用人工飼料和茶葉飼養時，最後所獲得能產卵的雌蟲分別爲 18 隻和 37 隻。所得卵數分別爲 685 與 3256 粒。