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# Development of a new indoor rearing polythene device and its performance in Early stages indoor Rearing of *Antheraea assamensis* (Lepidoptera: Saturniidae)

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**ABSTRACT**

A new indoor rearing device made up of polythene sheet with bamboo framework had been fabricated and, evaluated for maintenance of leaf freshness of detached twigs of Som plant (*Persea bombycina* Kost) and its indoor rearing performance of early stages of Muga silkworm (*Antheraea assamensis* Helfer). The device has a leaf bed platform and aeration system in one side of it. The device maintained high relative humidity while water soaked foam pads were used inside it. By keeping such foam pads inside for different periods the relative humidity inside the device could be raised conveniently. While water soaked foam pads were kept inside the device for 24 hours prior to twigs keeping and their continuous presence inside, raised the leaf moisture content dramatically to 63.094% over initial 56.233% at '0' hours. After 24 hours leaf moisture content gradually decreased that became stable around its initial state throughout the rest period. As a result of almost no loss of leaf moisture, the leaf of the detached twigs of Som plant remained fresh inside the device for continuous five days. Muga silkworm larvae were reared indoor on detached twigs of Som plant in this device and 85.37% larvae of third instars were successfully released on outdoor tree. Larvae exhibited normal growth as measured by their body weight. Prevailing market rate of fabrication is also low restricting at Rs.39.00 per device. Thus, the device is found as an ideal one for early instars indoor rearing of Muga silkworm.



## Introduction

Present system of rearing golden silk producing Muga silk worm Antheraea assamensis Helfer on outdoor tree has been facing many problems that includes not only birds, predators and diseases but also natural vagaries such as heavy rain, hailstorm, high temperature, very low temperature with fog, besides a significant extent agricultural chemicals, pollutants from the oilfield. Under such compulsions efforts have been made to develop codes of practice for indoor rearing of this precious golden silk producing silkworm that will save Muga silk industry from its gradual depletion and also makes it economically more viable. According to Das (2004), though certain reports (Kataky & Hazarika, 1995; Chatterjee, 1994 and Hazarika, 1995) are available on the attempt for indoor rearing of this particular silkworm, practice of such techniques on farmer's level is not known. He reared Muga silkworm indoor on freshly cut twigs of Machilus bombycina keeping emerged in a bucket containing plain water and harvested 5% cocoons. Growth, development and survival of the silkworm are influenced by the environment, leaf quality and rearing techniques (Yokoyama, 1962; Krishnaswami, 1994). Young age silkworms raised under ideal environment i.e. 27-28°C and 85-90% RH, disease free and hygienic conditions in addition to feeding on tender succulent mulberry leaves ensure improved quality and yield of cocoons (Omura, 1980; Benchamin & Nagaraj, 1987; Muniraju, 1995). To provide such optimum conditions for young age silkworm rearing, Sekharappa et al. 1995 and, Muniraju, 1995 developed an isolated chamber where withering of leaf on the rearing bed was observed to be slow in the chamber. The ideal conditions help the larvae grow robust and tolerate adverse conditions effectively during late age thus ensuring the success of the crops (Krishnaswami, 1994). This isolation chamber had been evaluated successfully at farmer's level for rearing of young stages mulberry silkworm (Muniraju et al. 1999). Hazarika, et al. (2004) carried indoor rearing of Muga silkworm in wooden boxes of 60 x 60 x 60 cm size with nylon net covering keeping water soaked cotton pads in four corners of the boxes so as to maintain humidity inside the chamber and to prevent leaf desiccation. They found lower weight of indoor reared larvae in different instars compared to the outdoor reared ones. The reasons behind as emphasized that leaf moisture is one of the factors of producing larvae with lower weight at indoor condition. Larval weight of Muga silkworm increases with the increase of leaf moisture content of Muga host plant (Kataky & Hazarika, 1994). The leaf moisture content of 'Som' plant regulates the rate of ingestion of silkworm, higher the moisture contents higher the feeding rate (Bordoloi & Hazarika, 1998). Mathur, et al. (1999) conducted indoor rearing of Tasar Silkworm A. mylitta D on detached twigs of Terminalia tomentosa and Terminalia arjuna in bottles, pitchers and pits with water under polythene cover. The polythene cover helps to keep the leaves fresh and succulent for longer duration. They also used box and sieve rearing devices to rear under indoor conditions. Bottom of the box was perforated. In both the cases

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polythene cover were given to keep leaves fresh. Mira et al. (1991) practiced polythene bags with aeration device at mouth and enameled trays lined with butter paper for rearing Tasar Silkworm. In order to maintain the humidity, wet foam pads were kept on the sides of the trays and these were covered with polythene sheets or butter paper. Prasad, et al. (2005) indoor reared Tasar silkworm in wooden tray with Tasar silkworm rearing frame (TSRF) under polythene cover.

Thus, the physical environment of indoor rearing device (inside environment of device) influences better growth and development of indoor reared A. assamensis. Present study depicted fabrication and performance of a new polythene device for indoor rearing of Muga silkworm on detached Som plant.

**Materials and Method**

A transparent polythene bag of 18 inches wide and 5 feet's long open on either sides was juxtaposed with one bamboo made frame works of three rings (18 inches radius) with a platform for twigs keeping. A piece of Poly Venial Concentrate (PVC) pipe of 5 inches radius and 3 inches long was fitted with one end of the polythene bag. The PVC pipe was further closed tightly by nylon net so that there can be gaseous exchange but worms cannot cripple out. The other end of the polythene bag was remained tightly wrapped when leaf twigs brushed with larvae were kept on the platform. To work out three different inter related criterions experiments were conducted separately.

(a) Maintenance of humidity inside the device: The RH and temperature of ambient conditions of laboratory was recorded. The moisture meter that also give reading of temperature, was placed inside the device and tightly wrapped. After 20 minutes the device was opened and recorded the temperature and humidity of inside environment of the device. Two pieces of 18 inches long water soaked foam pad were kept inside for 30 minutes in closed condition of the device. Again relative humidity and temperature of inside device had been measured keeping the moisture meter inside the device for 20 minutes.

(b) Twig's leaf freshness inside the closed device: Out of three devices, two empty devices were treated with water soaked foam pads before keeping leafs – one for 30 minutes and other for 24 hours. Twenty twigs each having 15 nos. leafs were cut from the mother Som plant. These twigs were separated into four bundles each with 5 nos. of twig and kept immediately inside three devices separately while one bundle was kept outside as control. Foam pads were removed from the device treated for 30 minutes after keeping twigs. Immediately following this 10 nos. leafs of different age groups from each of the four bundles and mother plant were taken in aluminum foil separately for determination of initial leaf moisture content by Hot Air Oven method at 70°C ± 1 for 4 hours. The leaf together with aluminum foil was weighted (W1) separately for each treatment in an electronic balance and kept open in hot air oven at 70° C ± 1 for 4 hours. After drying, each set of leaf was again reweighed (W2) in closed condition of same piece of aluminum foil. The weight of aluminum foil (W3) was recorded. The leaf moisture content of leafs was calculated by the formula:

$$\text{Leaf Moisture Content (LMC \%)} = \frac{(W1 - W3) - (W2 - W3)}{(W1 - W3)} \times 100$$

After every 24 hours interval the LMC of leaf kept inside devices and out side control in ambient conditions were determined separately by the same method.

(C) Early stages indoor Muga rearing performance of the device: The suitable one of above treatments that shows highest LMC for longer period had been considered for rearing performance test. Som plant twigs were selected with tender leafs and cut from the plant as feed. Newly hatched out Muga larvae were brushed on the feed and were placed inside the device. Every day the liters were removed from the device and the dead larvae were collected through out indoor rearing experiment period for mortality record. After first molt new twigs with middle aged leafs were collected and given as feed. The old ones were removed from the device after cleaning the larvae. During second instars new leafy twigs of Som plant with sufficient middle aged leafs were given as per requirement of larvae. After second molt, all larvae were sifted to outdoor Som plant for further rearing. A group of 5 nos. just molt out larvae was weighted at first as well as second molt to measure growth parameter.

**Results**

At the time of experiment the ambient condition was 19.3°C temperature and 69% relative humidity as measured by moisture meter. Inside the device also temperature and RH were recorded by the same moisture meter. Under this condition the inside environment of the device was 19.7°C and 69% RH. So, 0.4°C more temperature prevailed inside the device while RH remained same. Two wet foam pads were kept inside the device in closed condition for 30 minutes. Again the Quantity and Cost in Rupees investment in fabrication (1 no.):

| | | |
|---|---|---|
| 1. Polythene sheet (transparent) - 6 feets | - | 12.00 (INR) |
| 2. Bamboo - 1 piece | - | 4.00 (INR) |
| 3. Rope (for tightening) - 3 mtrs. | - | 1.00 (INR) |
| 4. PVC pipe (5 inches) - 3 inches | - | 6.50 (INR) |
| 5. Nylon net - 4x4 inches | - | 50 (INR) |
| 6. Man-day (labor) - 1 hrs. | - | 15.00 (INR) |
| TOTAL | = | Rs. 39.00 (INR) |

Temperature and RH inside the device were measured by the same moisture meter and recorded a temperature of 20.4°C and 85 % RH. Thus, with wet foam pad RH inside the device was raised to 85% and, temperature to 20.4°C. Under this condition detached leafy twigs of Som plant were kept inside the device for five days. Relative humidity inside the device was maintained by occasionally keeping the wet foam pad. Second day, after 24 hours the temperature and RH were found 20.9°C and 100% respectively. It had been observed; leaves remained green and fresh up to 5th day.

**Fig. 1: Photograph (A) is indoor rearing new polythene device and photograph (B) is action photograph showing rearing Muga Silkworm on Som plant leafs in the device**

The result of the experiment on detached twig's leaf freshness inside the closed device is given in Table 2. The experiment was conducted during the last week of February and first week of March, 2010. The prevailing average relative humidity and atmospheric temperature were around 79.45% and 20.12°C respectively. This period experienced highest RH of 90.3% and lowest of 67.8% whereas highest temperature was 22.25°C and lowest 17.68°C. The leaf moisture content while in the plant itself remains almost static at 56.56% under the prevailing ambient atmospheric conditions and soil water level. Similarly LMC of detached twigs remained almost same at '0' hour in all the treatments including control. However, slight higher LMC had been recorded inside the device treated with wet foam pad in comparison to control (T-4) and non-foam pad device (T-1). But at 24 hours and subsequent hours the LMC showed great differences in respect of treatments. Leaf lost moisture inside two devices (T-1 & T-2) and in control (T-4). The amount of moisture loss was nearly equal in leaves kept outside device (T-4) as control and inside device (T-1). Comparatively less amount of moisture had lost in device T-2 where wet foam pad was kept for 30 minutes prior to leaf keeping e.g. 52.33%. A reverse effect had been found in the device (T-3) where wet foam pads were placed 24 hours before keeping twigs and that also remained inside till 120 hours. Interestingly the leaf recorded higher LMC i.e. 63.094 % which was much higher than LMC at '0' hour and even LMC of leaves in plant. Thus it absorbed moisture from its surrounding. But again the same leaf recorded lower LMC e.g. 56.522% at 48 hours indicating loss of moisture from the leaf. In other treatments also recorded loss of moisture from the leaf, but at different values. The leaf in T-2 had L MC of 46.272% after 48 hours whereas it was 41.474 % in T-1. Leaves kept out side device as control (T-4) showed rapid loss of water from it. After 48 hours it retained only 27.039% moisture content. From the Table 2 it is clear that leaves of twigs in different treatments lost leaf moisture at different rates, the fastest one being in control. After 120 hours all treatments recorded different LMC i. e. 31.62% in T-1, 34.07% in T-2, 57.06% in T-3 and 8.67% in control. Thus the leaf remained fresh in the device (T-3) where wet foam pads were kept inside together with the twigs. The results of T-1 & T-2 also revealed the role of wet foam pads in maintaining leaf fresh of detached twigs of Som plant kept inside the device (Table 2).

For brushing Muga larvae the device was prepared 24 hours prior by keeping wet foam pads inside it in closed condition. This resulted high RH of inside air in the device and the same was maintained through out rearing period. Newly hatched out 827 nos. Muga larvae were brushed on detached more or less tender twigs of Som plant that were kept immediately inside the device. Under closed condition of the device larvae were reared up to second molt and then transferred to outdoor Som tree. In first instars 96.61% survivality was recorded while 88.36% larvae over first ones successfully passed into third instar. Finally 706 nos. larvae of third stage were released on outdoor tree. Thus 85.37% brushed larvae survived in indoor rearing condition in this polythene device.

Mortality was comparatively less in first instar than second instar. More mortality was recorded at second molting stage. During the rearing period up to second molt, mortality was recorded as 6th day 24 nos., 8th day 4 nos., 10th day 18 nos., 13th day 35 nos. and 16th day 40 nos. The reasons of death were observed multiples e.g. fall down from leaf to bottom of the device and failing to resume feeding, birth incompatibility (genetically), lecheries, handling injuries. Larval duration in each instar was eight days which was normal under the prevailing low temperature and humidity during rearing winter season. Other growth parameters as expressed in body weight were also recorded normal as generally found in winter Muga silkworm crop. Larval body weight just after 1st and 2nd molt out were 0.166 g / 5 nos. larvae and 0.453 g / 5 nos. larvae respectively. The rearing performances were summarized in Table- 3.

**Discussion & Conclusions**

The results of the experiments (Table- 1) reveals that the untreated device showed almost similar conditions of RH and temperature, the later being 0.4°C more in inside the device. Inside conditions of the device can be changed conveniently by using wet foam pads for different periods. It has been revealed from the results that keeping wet foam pads inside for 30 minutes dramatically increased RH from 69% to 85% and temperature from 19.7°C to 20.9°C. Again keeping wet foam pads for 24 hours further increased RH from 85% to 100% and, temperature to 20.9°C. Under such condition leaves of detached twigs of Som remained fresh up to 5 days (Table- 1). Thus the increased RH inside prevents leaf desiccation. Hazarika et al. (2004) also successfully used wet foam pad in preventing leaf desiccation while conducting indoor rearing of Muga silkworm in wooden boxes. Mathur et al. (1999) also reported polythene cover to help in keeping leaves fresh and succulent for long duration while conducted indoor rearing of Tasar Silkworm using detached twigs.

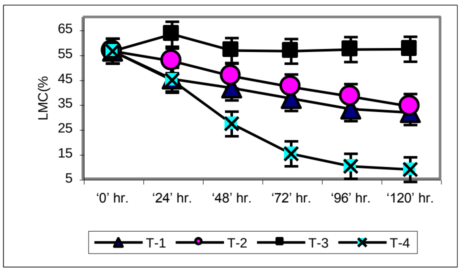


**Fig- 2: Graphical representation of LMC (%) of leafs in detached twigs of Som plant inside differently treated polythene devices with wet foam pads against control**

The results of the experiment with the new polythene device prominently exhibit that leaves in detached Som plant wilt rapidly in indoor room condition and the polythene device can prevent wilting to considerable duration (or keep leaves fresh). Graphical representation of result of LMC (%) of leaves in treated devices as depicted in fig- 2 clearly shows the influence of RH of inside air that was maintained by wet foam pads. The polythene cover prevents moisture to release from the device thus maintaining high RH inside it than outside environment. The wet foam pads release moisture from it, which cannot escape from the device resulting in increase of RH. In treatment T- 1 foam pads were not used to increase RH, only moisture released by leaves therein raised the inside RH. Therefore, the LMC measured at different time intervals were gradually low than T- 2 & T- 3, but higher than control i. e. T- 4. Again in T- 2 the device was treated initially for 30 minutes before keeping twigs to increase RH. In this case also leaves lost moisture gradually, but at slower rate than that of T-1 & T- 4 i. e. leaves remained fresher. The device of T- 3 was treated 24 hours prior to keeping twigs and through out the entire experiment period with wet foam pads. Thus the initial inside RH was very high which was maintained up to the end. Interestingly LMC after 24 hours was recorded higher than that of '0' hours and in subsequent periods also LMC were more or less similar with '0' hours. Since the initial RH inside the device was very high, moisture enter the leaves raising LMC according to vapor pressure gradient as leaves had lower vapor pressure exerted by 56.233% LMC at '0' hours. Gradually an equilibrium point was achieved where LMC became static. But this static point was further disturbed by the raised temperature inside the device due to respiratory activities of leaves. Vapor pressure is greatly influenced by temperature and turbulence. This increased temperature helped in raising the rate of moisture release from the device through aeration system. This ultimately lowered RH inside than its initial high RH of the device resulting alternation of vapor pressure gradient and moisture loss from leaves. Since respiration activities of leaves and moisture release from wet foam pads were continuous through out entire period ultimately again a more or less static equilibrium state of vapor pressure achieved. Therefore, in the subsequent periods the leaves maintained almost constant LMC (fig- 2).

Thus leaves in T- 3 were found to maintain constant LMC through out the period, hence remained equally fresh for 5 days. It is also inferred from above discussion, the level of surrounding RH of leaves ultimately determine LMC or freshness of leaves in detached twig. For Muga silkworm the device must be treated with wet foam pads 24 hours prior to brushing and during rearing period.

This device thus treated and used for early stage indoor rearing of Muga silkworm was found suitable. Indoor rearing in this device up to second molt out recorded an overall satisfactory survivability (85.37%) and normal growth pattern. Generally, in outdoor rearing of Muga silkworm on trees resulted 30-50% mortality, sometimes complete loss of population, during the early stages due to natural vagaries such as, wind, heavy rainfall, other ants and insect attack, birds etc. In contrary mortality in this device under indoor conditions were found due to diseases, handling, bed fall down which can be minimized by maintaining hygienic and careful handling practices except mortality due to birth incompatibility. Das (2004) carried indoor rearing of this silkworm on detached food plant twig keeping in plain water and recorded 5% cocoon harvest. Sekharappa et al. (1995); Muniraju (1995); and Muniraju et al. (1999) successfully reared mulberry silkworm in isolated chamber where they maintained ideal humidity and temperature for the worms.

In this device also ideal humidity required by Muga silkworm can be effectively maintained by using wet foam pads. Again according to Bordoloi & Hazarika (1998) leaf moisture content of 'Som' plant regulates the rate of ingestion of silkworm, higher the moisture contents higher the feeding rate. Kataky & Hazarika, (1994) reported that larval weight of A. assamensis increases with the increase of leaf moisture content of host plant. Since high leaf moisture content of leaves in detached twigs of Som plant can be maintained inside this device by using wet foam pads, this device may be an ideal indoor rearing device for early stages of Muga silkworm.

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**Reference**

1. Bardoloi S. and Hazarika L. K. 1998: Response of Muga silkworm, Antheraea assama to host quality. Entomon. . Vol. (23): 111-115.
2. Benchamin K. V. and Nagaraj C. S. 1987: Silkworm rearing techniques (Book). International Centre for Training and Research in Tropical Sericulture, Mysore, India. Pp. 69-80.
3. Chatterjee J. 1994: Formulation of artificial diet for Muga silkworm (Antheraea assama Westwood). M. Sc. (Agri) Thesis, Assam Agricultural University, Jorhat.
4. Das P. 2004: Indoor rearing of Antheraea assama on the leaves of its host plant Machilus bombycina – A biochemical approach. Muga Silkworm: Biochemistry and Biotechnology and Molecular Biology; Book- 1st edition, pp. 1-3.
5. Hazarika L. K., Kataky A. and Bhuyan M. 2004: A note on wild Muga silkworm and indoor rearing of its counterpart. Muga Silkworm- Biochemistry Biotechnology and Molecular Biology. Book- 1st edition. Pp. 75-78.
6. Hazarika Sanjay 1995: Effect of relative humidity on the survivability of Muga silkworm (Antheraea assama Westwood). M.Sc. (Agri) Thesis, Assam Agricultural University. Jorhat.
7. Kataky A and Hazarika L. K. 1995: Indoor rearing of Muga silkworm. National Seminar on Recent Researches in Science and Technology, Karimganj, Nov. 5-7.
8. Kataky A. and Hazarika L. K. 1994: Effect of host plants on certain biological and physiological variables of Antheraea assama (Lepidoptera: Saturniidae). Proceedings of the National Seminar on Recent Advances in Life Sciences (Seminar Publication). Vol.(1) : 19-24.
9. Krishnaswami S. 1994: A practical guide to Mulberry silk cocoon production in tropics (Book). Sri Ramula Sericulture Consultants, Bangalore, India. Pp. 1-101.
10. Mathur S. K., Singh B. M. K., Sinha A. K. and Sinha B. R. R. P. 1999: Techniques for rearing young age Tasar Silkworm A. mylitta D. Indian Silk, September issue; pp. 16-21.
11. Madan M, Neeru Saluja and Padma Vasudevan 1991: Polythene bag method – a new technique for rearing tasar silkworm till the third instar. Indian Silk, December issue; pp. 41-46.
12. Muniraju E. 1995: Studies on standardization of rearing methods of young age silkworm Bombyx mori L. Ph. D Thesis, Bangalore University, Bangalore, India. Pp.24-270.
13. Muniraju E.; Sekharappa B. M. and Raghuramana R. 1999: Field evaluation of isolation chamber for young age silkworm rearing. Indian J. Seric., Vol. (38), No. (1). pp. 12-16.
14. Omura S. 1980: Silkworm rearing techniques in Tropics (Book). Japanese International Co-operative Agency, Tokyo. Pp. 84-270.
15. Prasad B.C., Negi B. B. S., Singh G. and Sinha B. R. R. P. 2005: Indoor rearing of tasar silkworm: a break through. Bull. Ind. Acad. Seri. Vol. 9(1): pp. 44 – 50.
16. Sekharappa B. M.; Muniraju E. and Gururaj C. S. 1995: Use of an isolation chamber for young age (chawki) silkworm rearing in tropics. Sericologia, 35(3): pp. 525-534.
17. Yokoyama T. 1962: Synthesised Science of Sericulture. Central Silk Board, Bombay: pp. 1-306.

**Table 1: Relative humidity and temperature of inside environment of the Polythene Device before and after wet foam pad treatment**

| Sl. No. | Environment | Temperature | Relative humidity |
|---|---|---|---|
| 1. | Ambient room condition | 19.3°C | 69% |
| 2. | Inside condition of device | | |
| | a) Ambient inside condition of device | 19.7°C | 69% |
| | b) After keeping wet foam pad for 30 minutes | 20.4°C | 85% |
| 3. | After keeping leafy twigs and foam pad for 24 hrs | 20.9°C | 100% |

**Table 2: Different treatments given for the polythene device against an outside control for leaf moisture content (LMC) change in detached twigs of Som plant at different time periods**

| Sl. No. | Treatments | LMC of leaves in plant (%) | LMC of leaves of detached twigs at different time (%) | | | | | | Average ambient environment during the period | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | '0' hr. | '24' hr. | '48' hr. | '72' hr. | '96' hr. | '120' hr. | RH (%) | Temp. (°C) |
| T-1 | Without wet foam pad | 56.56 | 56.22 | 45.13 | 41.47 | 37.29 | 33.06 | 31.62 | 79.46 | 20.12 |
| T-2 | Keeping wet foam pad for 30 minutes prior twigs keeping | 56.56 | 56.23 | 52.33 | 46.27 | 41.90 | 38.000 | 34.07 | | |
| T-3 | Keeping wet foam pad throughout the observe period and prior 24 hrs. of twigs keeping | 56.56 | 56.23 | 63.09 | 56.522 | 56.20 | 56.91 | 57.06 | | |
| T-4 | Out side the device as control | 56.56 | 56.22 | 44.60 | 27.04 | 15.07 | 10.01 | 8.67 | | |
| CD at 5% | | | | | | | | | | |
| | T | NS | 1.79 | 2.56 | 3.53 | 3.78 | 3.88 | | | |
| | H | NS | 2.23 | 3.76 | 4.34 | 4.99 | 5.42 | | | |
| | TXH | NS | 3.67 | 4.33 | 5.11 | 5.11 | 6.01 | | | |

**Table 3: Rearing performance of 1st and 2nd instars Muga silkworm in polythene device under indoor condition.**

| SL. NO. | PERFORMANCE PARAMETERS | PERFORMANCE |
|---|---|---|
| 1. | Nos. of larvae brushed | 827 nos. |
| 2. | Nos. of larvae passed into 2nd instars | 799 nos. (96.61%) |
| 3. | Nos. of larvae died in 1st instars | 28 nos. (3.39%) |
| 4. | Weight of 5 nos. 1st molt out larvae | 0.166 g |
| 5. | Nos. of larvae passed into 3rd instars | 706 nos. (85.37%) |
| 6. | Nos. of larvae died in 2nd instars | 93 nos. (11.64%) |
| 7. | Weight of 5 nos. 2nd molt out larvae | 0.453 g |
| 8. | Nos. of 3rd instars larvae released on outdoor tree | 706 nos. (85.37%) |