*Biological Forum – An International Journal* **9**(1): 01-06(2017)

**ISSN No. (Print): 0975-1130**
**ISSN No. (Online): 2249-3239**

# Studies on Different Cocooning Device in Muga Silkworm (*Antheraea assamensis*, Helfer)

***Rajesh Kumar, Girin Rajkhowa, Dulal Goswami and B.K. Singh***
*Central Muga Eri research and Training Institute,*
*Central Silk Board, Ministry of Textiles, Govt. of India, Lahdoigarh 785700, Jorhat, Assam, INDIA*

*(Corresponding author: Rajesh Kumar, rajesh.ento@gmail.com)*
*(Received 05 November, 2016, Accepted 18 December, 2016)*
*(Published by Research Trend, Website: www.researchtrend.net)*

**ABSTRACT: Study was undertaken to evaluate the performance of different types of cocooning device of muga silkworm *viz.*, Box type mountage, Plastic collapsible mountage, Bamboo Chandraki, Rotary mountage and the traditional *Jali* taking into consideration of the efficiency in cocooning, economic cocoon characters and convenient handling (easy to handle) as key parameters of the study. The comparative analysis of the performances of all the mountages revealed that Plastic collapsible mountage performed better results with regard to cocooning, the primary economic cocoon character which was recorded highest of 69 % as compared to Box type mountage (66 %) and the traditional *Jali* (63.75 %). Assessment of cocoon characters showed better performance in plastic mountage with regard to single cocoon weight (4.515 g in male & 5.514 g in female), single shell weight (0.382 g in male & 0.403 g in female) and silk ratio (8.465 % in male & 7.242% in female). Single cocoon analysis for reeling performance showed maximum filament length (316.25 m) and silk recovery (50%) in plastic mountage except the reelability which was recorded maximum (65.75 %) in Box type mountage as compared to 65.50 % in plastic mountage and 63.00 %) in *Jali*.**

**Keywords:** Muga silkworm, mountage, cocooning, plastic mountage and Jali.

## INTRODUCTION

Muga silkworm (*Antheraea assamensis*, Helfer) is a multiviltine insect endemic to the north eastern region of India and it belongs to the family Saturniidae (Lepidoptera). This silkworm is reared completely in outdoor condition on two primary host plants *viz.*, Som - *Perseabombycina* and Soalu - *Litseamonopetala* (Family: Lauraceae). It particularly suits rural-based farmers, entrepreneurs and artisans, as it requires low investment but, with potential relatively higher returns. Muga silk is predominantly produced in the North Eastern region of India particularly in Assam. Muga silk is well known for its golden luster colour and its durability. It is the costliest silk among all types of silk and has high demand in the global world.

Mountage is a device for providing the medium wherein mature silkworm is allowed to spin cocoon. Mountage plays a significant role in the success of a silkworm crop. After completion of larval growth and development, silkworms attain the matured or ripen stage. At this stage, silkworms stop feeding, body become translucent & shrink and ready for cocoon spinning. Mounting is the last and crucial stage of silkworm rearing operation. As cocoons are the ultimate commercial product of silkworm exploitation, it is necessary to take proper care of larval spinning for good cocoon harvest in terms of quality and quantity.

Being reared outdoor, collection of matured or ripen worms and mounting on suitable mountage for cocooning is an important task in muga silkworm rearing. It is the natural instinct of matured muga silkworm to crawl down the host plant in the evening hours of the day for searching a suitable place and medium for cocooning and pupation. So, timely picking up the maturedmuga worms and mounting on suitable mountage plays a significant role in the production of quality cocoons in terms of uniformity and compactness that considered as key parameters both for reeling cocoons as well as seed cocoons. Different types of mountages are used for muga cocoon spinning in different parts of North East Region of India. The common mountage widely used for muga silkworm spinning is traditional *Jali*, made of semi-dried tree leaves with twigs. However, *Jali* has several disadvantages as it is voluminous in size, need huge space for storing, loss of worms due to escape of worms, non-availability of suitable *Jali* leaves, unable to re-use etc.

Review of literature revealed thatstudieswere made on different types of mountages by different researchers (Karandikar *et al.*, 1992; Himantharaj *et al*., 1995, Singh, G.B. 1995) for improvement of the conventional type of mountages or development of new mountages suitable for mulberry silkworm.

Similarly, it was evident from the available literaturethat efforts were made for replacement of traditional mountages and to develop a suitable mountage for muga silkworm. Cartoon boxes fitted with alternate loops of gunny cloth were used as mountage of muga silkworm Paliwal *et al.,* (1988). Borah *et al*., ((1986-88) tried plastic collapsible mountage, counter boards, chandraki and collapsible wire mesh as mountages of muga silkworm and recorded better performance in these alternative devices as compared to Jali. Similar studies were made using bamboo chandraki and hanging loop made of bamboo (Kakoti *et al*., 1990) but no any recommendation had been made from these studies for suitable device for cocooning of muga silkworm. During 1997-1998, a series of experiments were conducted at Regional Muga Research Station, Boko, Assam using Box type mountage, Bamboo chandraki, Paddy straw and Jali made of jack fruit leaves and recommended Box type mountage based on its better performance (Sahu *et al.*, 1998). Lately, the Box type mountage had been released in the field for popularization as an improved mountage of muga silkworm and as a replacement of the traditional Jali. However, It has been observed that although Box type mountage is an improved device developed to overcome disadvantages of the traditional *Jali*,,it gets less popularization among the users due to its complexity in preparation and cumbersome handling. Keeping In view of the above, it is felt necessary to explore a suitable and user-friendly mountage of muga silkworm as an alternative of the improved Box type mountage.

## METHODOLOGY

Five different type of mountages *i.e.*, Box type mountage, Plastic collapsible mountage, Bamboo chandraki, Rotary mountage and traditional *Jali* were considered under the experiment. The experimental trials were conducted at the institute's farm in different crop seasons viz., winter, spring, summer and autumn seasons duringthe year 2012-2013. The rearing operations of muga silkworm were conducted as per the recommended Package of Practices.

**Box type mountage (Fig. 1-2):** The Box type mountages were prepared from bamboo web wooden framed boxes measuring 72 cm × 40 cm × 35 cm (Length × Breadth × Depth). Inside, the box is divided into 20 nos. of alternate channels or grooves with 1.5 cm width using a broad stripe of nylon net.In each Box type mountage, 300 matured worms can be mounted.


**Fig.** 1. Box type mountage, **2.** Cocoons of Box type mountage, **3.** Cocooning in Rotary mountage, **4.** Preview of Rotary mountage.

**Rotary mountage (Fig. 3-4):** Rotary mountage is an improved Japanese type of mountage made of thick paper boards. Each mounting frame has 13 rows and 12 columns containing a total 156 mounting slots and the dimension is 55 cm × 40 cm × 3 cm (Length × Breadth × Depth). In one set, 10 such mountages are arranged in a wooden frame with a distance of 8 cm from one another. Each frame is hung during spinning stage of worms.

**Bamboo chandrikas (Fig. 5):** Bamboo chandrikas are prepared from bamboo spirals placed on the bamboo mat. Bamboo Chandrika is the most commonly usedmountage for mulberry silkworm cocooning. This consist of a bamboo mat of size 1.6 m × 1.2 m supported by split bamboo reapers on all sides. On this bamboo mat, a bamboo tape of 4 -5 cm width is fitted in a spiral manner. Mounting space of the Bamboo chandraki is 9.00 sq.ft. About 300 worms can be mounted on this mountage.

**Traditional Jali (Fig. 6):** Jalis were prepared out of semi dried leaves of some plants, *Perseabombycina* and treated as control. The size of the *Jali* is about 1.5 m in diameter with the capacity of mounting 300 worms.

Each treatment was triplicates with 100 worms in each replication. Matured worms of the day of maximum maturation (6 -7$^{th}$ day of maturation)) were considered for mounting to maintain theuniformity and adequacy for all the treatments. The cocoons were harvested after 7 - 10 days of spinning depending upon the crop seasons.


**Fig. 5.** Bamboo chandrak, **6.** Traditional Jali, Figures: **7.** Plastic collapsible mountage, **8.** Back view of Cocooning in plastic mountage,

**Plastic collapsible mountage (Fig.7-12):** The Plastic collapsible mountages were especially prepared with wavy or corrugated plastic web of 2 cm mesh size placed in a plastic tray. The height of the corrugation is about 6 cm and each mountage is having 11 corrugations in number. The ideal size of plastic collapsible mountage is 80 cm × 90 cm × 7 cm (Length × Breadth × Depth). The mounting capacity of each Plastic collapsible mountage is about 300 worms.


**Fig. 9.** Cocoons with peduncle collected from plastic mountage, **10.** Different type of mountage in farmers field, **11.** Demonstration of Plastic mountage, Bamboochandraki, **12.** Harvesting of cocoon from plastic mountage.

**Parameters of study:** The economically important characters *viz.,* Cocooning, single cocoon weight, single shell weight, silk ratio, filament length, silk recovery and reelability were recorded. Data on single cocoon analysis were obtained out of 20 cocoons from each replication under different treatments and statistically analyzed.

**Statistical analysis:** For statistical analysis, ANOVA was done to obtain significant value using software developed by O.P. Sherone, Haryana Agriculture University, Hisar, Haryana, India.

## RESULTS AND DISCUSSION

The study was undertaken to evaluate the comparative performance of the Box type mountage, Plastic collapsible mountage, Bamboo Chandraki, Rotary mountage and the traditional *Jali* taking into consideration of the economic characters such as cocooning efficiency, economic cocoon characters and operational convenience (easy to handle) as key parameters of the study. The performance of different mountages is presented in Table 1.

*A. Cocooning*

Plastic collapsible mountage performed better results with 69 % cocooning (good cocoon) as compared to Box type mountage (66 %) and control *Jali* (63.75 %) without any significant difference. Larval spinning was found significantly low in Bamboo chandraki (50 %) and Rotary mountage (25.75 %).

*B. Cocoon assessment*

**Single cocoon weight:** Single male cocoon weight was recorded maximum in Plastic collapsible mountage (4.515 g) followed by Box type mountage (4.482 g) as compared to traditional Jali (4.302 g) and there was no significant difference among them.

**Table1: Performance of larval spinning and cocoon quality of muga silkworm in different types of mountages.**

| Type of Mountages | PARAMETERS OF STUDY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cocooning | | | Cocoon Assessment | | | | | | Reeling performance | | |
| | Good | Poor | Other | Male | | | Female | | | Filament Length (m) | Silk Recovery (%) | Reelability (%) |
| | | | | SCW (g) | SSW (g) | SR % | SCW (g) | SSW (g) | SR % | | | |
| **Box type** | 66.00 | 20.25 | 13.75 | 4.482 | 0.373 | 8.288 | 5.451 | 0.396 | 7.242 | 316.25 | 49.75 | 65.75 |
| **Plastic Collapsible** | 69.50 | 18.50 | 12.00 | 4.515 | 0.382 | 8.465 | 5.514 | 0.403 | 7.169 | 313.75 | 50.00 | 65.50 |
| **Bamboo Chandraki** | 50.00 | 29.25 | 20.75 | 3.759 | 0.282 | 7.514 | 4.667 | 0.309 | 6.591 | 196.75 | 45.50 | 62.25 |
| **Rotary Mountage** | 25.75 | 29.25 | 40.00 | 3.223 | 0.241 | 6.919 | 3.762 | 0.250 | 0.241 | 175.75 | 46.5 | 56.00 |
| **Traditional Jali** | 63.75 | 21.50 | 14.75 | 4.302 | 0.344 | 7.981 | 5.177 | 0.365 | 6.930 | 307.00 | 49.25 | 63.00 |
| **CD (P ≤ 0.05)** | **14.325** | **-** | **-** | **0.384** | **0.036** | **0.671** | **0.894** | **0.056** | **0.345** | **74.830** | **1.902** | **3.792** |

However, in Bamboo chandraki (3.759 g) and Rotary mountage (3.223 g) male cocoon weight was found significantly less as compared to the other treatments. Single female cocoon weight was found maximum of 5.514 g in Plastic collapsible mountage followed by 5.451 g in Box type mountage, 5.177 g in Jali and 4.667 g in Bamboo chandraki without any significant difference among them. It was recorded significantly lowest (3.762 g) in Rotary mountage among the treatments.

**Single shell weight:** Single male cocoon's shell weight was found maximum in Plastic collapsible mountage (0.382 g) followed by Box type mountage (0.373 g) without any significant difference. However, it was recorded significantly high as compared to Bamboo chandraki (0.282 g), traditional Jali (0.344 g) & the Rotary mountage (0.241 g). There was no significant difference between Box type mountage (0.373 g) and traditional Jali (0.344 g) with regard to single male cocoon shell weight. It was recorded significantly lowest in Rotary mountage (0.241 g) followed by Bamboo chandraki (0.282 g) among the treatments. Female cocoon's shell weight was recorded as 0.403 g in Plastic collapsible mountage followed by 0.396 g in Box type mountage and 0.365 g in the traditional Jali without any significant difference among these treatments. Among the treatments, shell weight of single cocoon was recorded significantly low in Bamboo chandraki (0.309 g) and Rotary mouintage (0.250 g). Cocoons of Plastic collapsible mountage were recorded with highest silk ratio (8.465 %) followed by Box type mountage (8.288 %) and Jali (7.981 %) without significant difference among the treatments. Silk ratio percentage recorded significantly low in Rotary mountage (6.919 %) as compared to Plastic collapsible mountage, Box type mountage and Jali followed by Bamboo chandraki (7.514 %) as compared to Plastic collapsible mountageand Box type mountage. Female cocoon silk ratio was recorded maximum (7.242 %) in Plastic collapsible mountage followed by Boxtypemountage (7.169 %) and traditional Jali (6.930 %) and there was no significant difference among them. Silk ratio was found significantly lowest (6.149 %) in Rotary mountage among the treatments.

*C. Reeling performance*

**Filament length:** Filament length was recorded as 316.25 m in Plastic collapsible mountage followed by 313.75 in Box type mountage as compared to 307 m in the traditional Jali without any significant difference. It was recorded significantly lowest (175.75 m) in Rotary mountage followed by 196.75 m in Bamboo chandraki.

**Silk Recovery:** Silk recovery was found maximun of 50.00 % in the cocoons Plastic collapsible mountage, 49.75 % in Box type mountage and 49.25 % in the traditional Jali without any significant difference. However, in Bamboo chandraki it was recorded significantly lowest (45.50 %) followed by Rotary mountage (46.50 %).

*D. Reelability*

Reelability was recorded highest (65.75 %) in the cocoons spun in Box type mountage followed by Plastic collapsible mountage (65.50 %), Jali (63.00 %) and Bamboo chandraki (62.25 %) without any significant difference among the treatments. Reelability was found significantly lowest (56.00 %) in Rotary mountage cocoons.

The comparative analysis of the performances of all the mountages revealed that Plastic collapsible mountage performed better results with regard to larval spinning, the primary economic cocoon character which was recorded highest of 69 % as compared to Box type mountage (66 %) and the traditional Jali (63.75 %). Assessment of cocoon characters showed better performance in plastic mountage with regard to single cocoon weight (4.515 g in male & 5.514 g in female), single shell weight (0.382 g in male & 0.403 g in female) and silk ratio (8.465 % in male & 7.242 % in female). Single cocoon analysis for reeling performance showed maximum filament length (316.25 m) and silk recovery (50 %) in plastic mountage except the reelability which was recorded maximum (65.75 %) in Box type mountage as compared to 65.50 % in plastic mountage and 63.00 %) in Jali. Performance of Box type mountage was found to be the next of Plastic mountage followed by the traditional Jali with regard to all of the economic characters without any significant difference. It was observed that all the economically important characters were significantly lower in Rotary mountage followed by Bamboo chandraki as compared to Plastic mountage, Box type mountage and Jali.

## CONCLUSION

Analysis of data revealed that Plastic collapsible mountage performed comparatively better results with regard to all the economic cocoon characters followed by box type mountage as compared to the traditional Jali though there was no significant difference among these treatments. However, Rotary mountage and Bamboo chandraki performed significantly low among the mountages.

However, keeping in view of convenience of handling right from mounting of matured silkworms to harvesting of cocoons, durability, less space for keeping, easy disinfection, easy transportation and prevention of escaping worms, Plastic collapsible mountage can be recommended as a substitute of Box type mountage for cocooning of muga silkworm.

## REFERENCES

Barah, A., Goswami, M., and Samson, M.V. (1987). Evolution of suitable mountage for cocooning of muga silkworm. RMRS, Boko, Annual Report, p. 36.

Barah, A., Samson, M.V. and Goswami, M., (1986). Effect of different types of mountages for cocooning of muga silkworm. RMRS, Boko, Annual Report, p. 19.

Barah, A., Samson, M.V., Borah, B and Bhuyan, N. (1988). Effect of various mountages on cocooning of muga silkworm, *Antheraeaassamensis*, Helfer. Sericologia, **30**(3): 313-321.

Himantharaj, M.T., Meenal A., Rajan, R.K., Muroga, A. and Kamble, C.K. (1995). Rotary mountage for quality cocoons. Indian Silk, **34**(6): 25-27.

Kakoti, L.N., Singh, S.S. and Kakoti, J.B. (1990). Low cost mountage for spinning of muga cocoons. Indian Silk, **29**(7): 13-15.

Karandikar, A.V., Kamte I.A. and Sohani G.G. (1992). Study on alternate designs of mountages. In. Nat. Conf., Mulberry Seric. Res., CSR&TI, Mysore, p86.

Paliwal, D. and Das, P.K. (1988). Evolution of new cocoonage for muga. *Indian Silk*, **27**(5): 34-35.

Sahu, A.K., Singha, B.B., Rajkhowa, G. and Das, P.K. (1998). Improvement in muga silkworm seed technology: the box type mountage, a new model for cocooning of muga silkworm *Antheraeaassama* Westwood. *Sericologia*, **38**(2): 331-341.

Singh, G.B. (1995). Silworm mountages. *Indian Silk*, **34**(6): 13-16.