

STUDIES ON THE LONG-TERM PRESERVATION METHOD OF MUGA COCOON (*ANTHERAEA ASSAMENSIS* HELFER) AT LOW TEMPERATURE

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[Rajkhowa, G., Kumar, R. & Rajan, R. K. 2011. Studies on the long-term preservation method of Muga Cocoon (*Antheraea assamensis* Helfer) at low temperature. Munis Entomology & Zoology, 6 (2): 815-818]

ABSTRACT: A study was made to develop a suitable long term seed cocoon preservation method for skipping unfavorable *Aherua* pre-seed crop of Muga silkworm by postponing moth emergence. Muga silkworm seed cocoons of 8 days old were subjected to the low temperatures at $7.5\pm 1^{\circ}\text{C}$ and $10\pm 1^{\circ}\text{C}$ in BOD incubator for long term preservation of 32 to 52 days following the double step preservation method. The results indicated that muga seed cocoons can effectively be preserved at $10\pm 1^{\circ}\text{C}$ for 42 days without affecting the grainage parameters measured for seed production.

KEY WORDS: Muga silkworm, *Antheraea assamensis*, seed cocoons, preservation.

The Vanya Muga silkworm, *Antheraea assamensis* Helfer is multivoltine with 6 overlapping crops, namely, *Jethua* (Apr–May), *Aherua* (Jun–July), *Bhadia* (Aug–Sept.), *Katia* (Oct–Nov), *Jarua* (Dec–Jan) and *Chatua* (Feb–Mar). Among these 6 crops, *Jethua* and *Katia* are the only commercial crops, reared during favourable climatic conditions, while the remaining 4 crops, which are reared as pre-seed and seed crops, viz., *Aherua* & *Jarua* pre-seed crops and *Bhadia* & *Chatua* seed crops are hazardous due to adverse inclement climatic conditions as well as other biotic factors.

In Assam, temperature prevailing during summer crop seasons, especially in *Aherua* pre-seed and *Bhadia* seed crop, ranges from $24\text{--}36^{\circ}\text{C}$ coupled with high humidity of 85–95%. Because of these hazardous inclement climatic conditions as well as other biotic factors viz., diseases and insect predators, the pre-seed and seed crops are low productive (14–40% crop loss) and sometimes highly uncertain leading to uneconomic crops (Chkravorty et al., 2007). However, these pre-seed and seed crops are mandatory to maintain the linkage for production of commercial seed for *Katia* crops.

Particularly, during summer pre-seed crop (*Aherua*), muga silkworms are exposed to the extremes of temperature & relative humidity detrimental to congenial development, which results in poor crop harvest in terms of quality and quantity. The rate of multiplication of seeds from pre-seed crop cocoons is also affected due to lack of quality seed cocoons obtained from the adverse *Aherua* pre-seed crop, which results in high ratio of cocoon : dfl and low hatching. As such, the rearing *vis-à-vis* seed production from summer pre-seed crop (*Aherua*) is identified as a major constraint and critical aspect In Muga culture, which is considered as bottleneck in augmenting Muga production.

In view of the above mentioned circumstances, this study is undertaken to tackle or to overcome the constraints of *Aherua* (May–June) pre-seed crop linked with the *Katia* (October–November) commercial seed production of Muga silkworm. An attempt is being made in this study to develop a suitable long term seed cocoon preservation method for skipping unfavourable *Aherua* pre-seed crop rearing of Muga silkworm by postponing moth emergence.

MATERIAL AND METHODS

Muga silkworm seed cocoons of 8 days old from commercial *Jethua* (April-May) crop were preserved in two lots at 7.5° & 10°C for 20 days initially followed by intermediate temperature treatment of 12.5°C for two days to allow pupae to develop to the next stage. Subsequently, treated pupae were further subjected to second step refrigeration for 10-30 days in BOD incubator and released at 10 days interval, i.e., released after 32, 42 and 52 days of preservation.. During the time of consigning and releasing, the cocoons were passed through an intermediate temperature exposure of 15°C for 12 hrs. After releasing from BOD incubator, the seed cocoons were kept in Air Condition Room at temperature 27±1°C and relative humidity 75-85% for grainage operation. The grainage performance of the preserved lots of seed cocoons in respect of total pupal period, the time taken for emergence after release, percentage of moth emergence, percentage of coupling, number of invalid of moths, percentage of fecundity and hatching were studied.

RESULTS AND DISCUSSION

The recorded data of the present observations are tabulated in Table 1. **Pupal period** was prolonged up to a maximum of 68 days (at 7.5°C) followed by 62 days (at 10°C) in 52 days preservation as compared to 18 days in the control (Fig. 1). **Moth emergence** ranged from 96.70 to 100.00% recorded and there was not much significant difference among the treatments in respect of moth emergence (Fig. 2). However, the emergence of the moth was found crippled and invalid while preserved for longer duration of 52 days at 7.5°C and 10°C (Fig. 3). **Coupling percentage** was recorded maximum of 72% at 10°C preserved for 32 days followed by 63% preserved for 42 days. However, 58% followed by 45% coupling was observed at 7.5°C preserved for 32 and 42 days, respectively (Fig. 4, 5). The crippled and invalid moths were recorded more in number, while the seed cocoons were preserved beyond 42 days. **Fecundity** was recorded maximum of 200 at 10°C followed by 196 at 7.5°C in 32 days preservation as compared to 190 in the control (Fig. 6, 7, 8). **Hatching** was recorded maximum of 79.80 % in 32 days preservation followed by 68.60 % in 42 days preservation at 10°C as compared to 80 % in the control. However, 25 to 30% eggs were found depressed while preserved beyond 42 to 52 days both at 7.5°C and 10°C.

These results are found in contrast to the findings of earlier workers. Attempts made by earlier workers to preserve seed cocoons at 5°C beyond 30 days led to detrimental effects on economic characters in muga silkworm (Sengupta and Singh, 1974 and Bharali, 1982; Anonymous, 1999-2000). It was also observed that tolerance of this temperature beyond 30 days was fully detrimental, but its tolerance beyond 120 days showed almost complete pupal mortality (Choudhury et al., 1987).

ACKNOWLEDGEMENT

The financial help provided by Central Silk Board (Ministry of Textiles, Govt. of India) is gratefully acknowledged.

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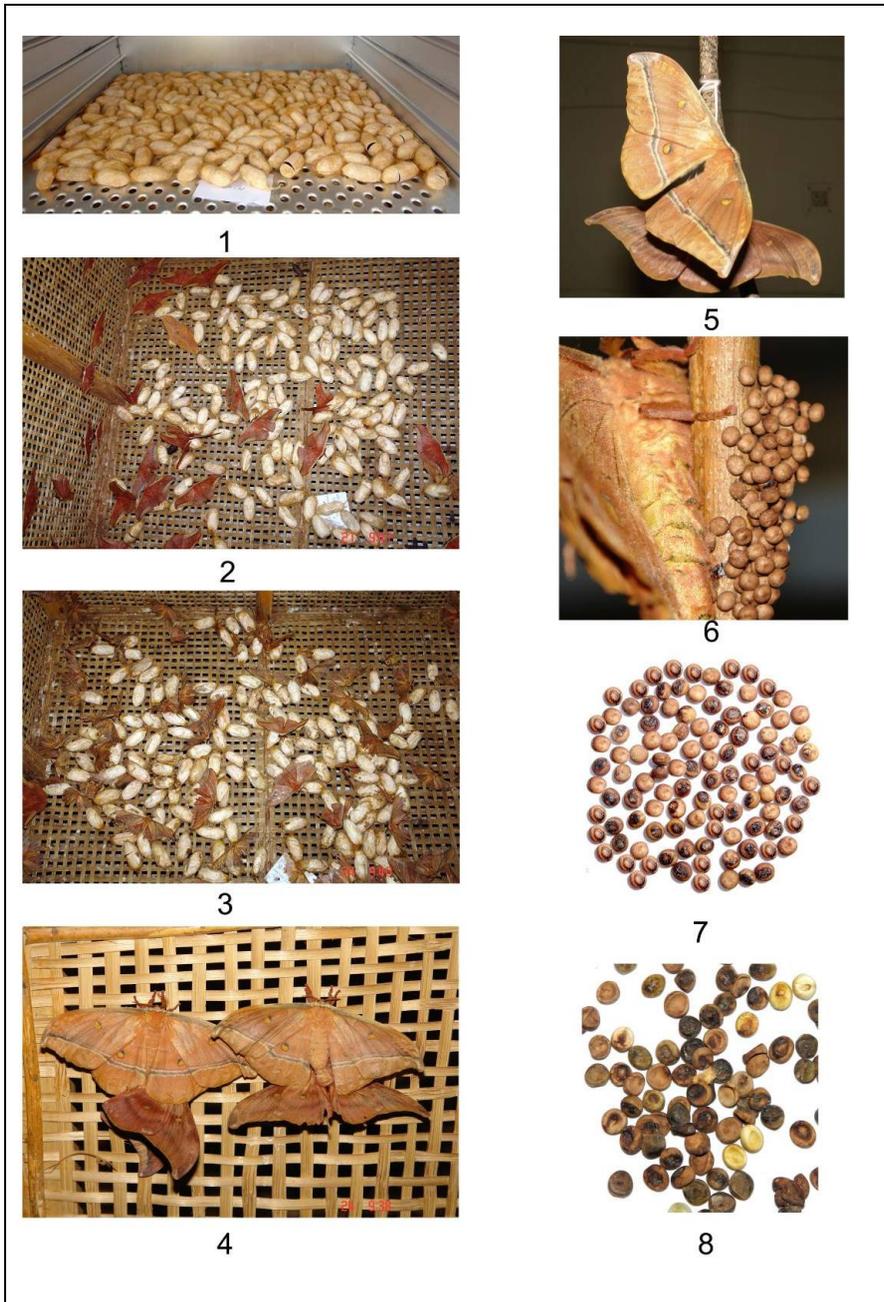
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Table 1. Grainage performance of Muga seed cocoons preserved for longer duration (32, 42 and 52 days) at low temperatures (7.5°C and 10°C).

SL No.	Parameters	Preservation Duration (Days)						Control
		LOT-I (7.5°C)			LOT-II (10°C)			
		32	42	52	32	42	52	Normal Room condition
1	Pupal period (days)	48	58	68	44	53	62	18
2	Emergence after release (Days)	7	7	7	3	2	1	-
3	Emergence (%)	100	98.00	96.67	100	100	98.0	98.50
4	Coupling (%):	58	45	28	72	63	39	65.00
	a) Natural –	18	15	07	19	17	08	54.8
	b) Manual –	06	06	09	04	05	09	45.2
5	Invalid Moth							
	a) Male –	-	-	43	-	-	21	4
	b) Female –	-	-	35	-	-	6	3
6	Fecundity (No)	196	162	153	200	192	185	190
7	Hatching (%)	64.00	55.40	50.80	79.80	68.60	45.80	80.00



Figures 1-8, Muga silkworm, *Antheraea assamensis* Helfer. 1. Seed cocoons preserved in BOD incubator, 2. Seed cocoons kept in moth cages for emergence, 3. Crippled and invalid moths, 4. Naturally coupled moths 5. Coupled moth tied on *Kharika*, the egg laying device, 6. Female moth laid eggs on *Kharika*, 7. Healthy eggs, 8. Depressed eggs.