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STUDYING THE LIFE CYCLE AND MORPHOLOGY OF PHILOSAMIA RICINI

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ABSTRACT

Natural silks such as Eri, Muga, Mulberry, and Tasar are produced in abundance in North East India. These remarkable silk insects thrive in the climate and environment of this location. Assam is home to one of the domesticated silkworm races, the Eri silkworm, which is being raised by its inhabitants. This research was conducted in 2016 and 2017 in Deosal, a hamlet in the Mayong Block of the Morigaon District of Assam, India.Its coordinates are 26°07'40.8" N, 092°15'08.6" E, and 62 m(MSL) in elevation.Primary data on participant profiles in host plant cultivation & management, rearing of silkworms, spinning of spun yarn, etc. were collected via personal contact method using a pre-structured interview schedule from 10 households randomly involved in erisilkworm rearing. Eggs, larvae, cocoons, and adult moths are collected as specimens for morphological analysis. We discovered that adult larvae fed on Ricinuscommunis Linn and Heteropanaxfragrans grow to a maximum length of 9 cm and a maximum weight of 8.940 gm. The heaviest pupae (3.2 g) are produced by larvae fed a mixture of HeteropanaxfragransRoxb and Alpiniaallughos. White and brick red make up the cocoon's two primary hues. Castor-fed larvae had the greatest shell ratio (%), at 21.05%. The households practicing ericulture in the Deosal region are economically and educationally disadvantaged. The use of castor (Ricinuscommunis) has been identified as a barrier to successful eri silkworm rearing.

Keywords: -Life Cycle, India, Silk Worm, Eri, Philosamia

I. INTRODUCTION

The production of silk and the practice of sericulture are deeply rooted in Indian culture. The current sericulture business in India generates over $25 billion (2013-14) and employs about 7.85 million people in rural and semi-urban regions (Central Silk Board, 2015). Increased breeding stock of silkworms is crucial to the success of the Sericulture industry. Hybridization is a method for increasing the productivity of silkworm and cocoon farms. High producing, disease-tolerant races with distinctive quantitative and qualitative features may be produced by crossing genetically diverse populations and gaining a knowledge of the silkworm's genetic process. Selecting appropriate breeding materials and then using them in various combinations to generate genetic variety for later selection is crucial to successful silkworm hybridization. Using multivoltine races as the female parent for commercial exploitation, it is estimated that nearly 80% of India's silk is produced by multivoltinebivoltine hybrids.

The most common explanation is that bivoltine, by virtue of its maternal transmission, may lead to consistent crop failure. A sustainable sericulture business relies on increased productivity and improved silk quality, both of which may be greatly aided by the use of suitable silkworm hybrids.

- Eri silkworm, Philosamiaricini is multivolitine and their cocoons are open mouthed.
- The Eri silkworm Philosamiaricini, is also known as Endi or Errandi and it belonging to family saturniidae.
- It is one of the commercially exploited silkworm species and can be reared indoors throughout the year to produce silk.
- The silk produced by Philosamiaricini is called Eri silk.
- The production of Eri silk is traditional in north-eastern states of India and particularly carried by the tribal people of Assam, Bihar, Orissa, U.P., West Bengal and some other states of India where ericulture is practiced on commercial basis.

II. LIFE CYCLE OF PHILOSAMIA RICNI

The life cycle of Philosamiaricini, is completed through

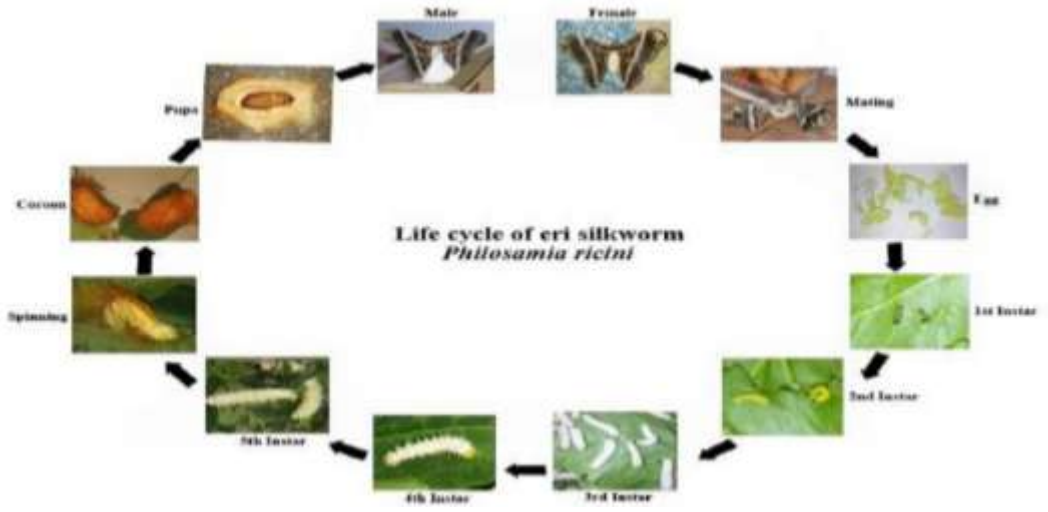
(a) Eggs

(b) Larva

(c) Pupa in cocoon

(d) Adult moth

Lifecycle: The life cycle of Philosamiaricini, Hutt. Is completed through (a) eggs, (b) Larva, (c) pupa in cocoon and (d) adult moth.



Life cycle- Eggs

- The eggs are oval shaped with medium size. It is covered by a hard chitinious white coloured shell. The shell colour may be creamy as in wild forms.
- The eggs are attached to the surface with one another by colourless glue.
- A female moth after copulation lays about 300-500 eggs in cluster. The laying may continue for 3 to 4 days but the eggs of first two days are only kept for rearing.
- Temperature and humidity play important role in hatching of the eggs
- The hatching of eggs takes place after about 10 days but it depends on the temperature of the environment. The hatching may be delayed upto 14-15 days in winter.

Life Cycle- Larva

- After hatching, the larvae tend to remain together. It is about one centimeter in length.
- It grows to a size of 8 centimeters, when mature.
- The newly hatched larvae possesses a black colored head and the body becomes yellow in colour but gradually changed to green yellow.
- The male and female larvae can be distinguished in later stage by the genital markings.
- The first moult occurs after three days.
- The larva matures in 17 to 45 days depends on the environmental temperature and humidity. During this period ,the larva moults four times.
- During the onset of moulting ,the larva becomes motionless and it does not feed.
- On moulting ,the integument of the head breaks on the sides and the larva comes out with a new integument.
- The larva possesses a long tubular silk glands. This gland is responsible for production of silk.
- The silk gland secrets the silky substance to form the cocoon. In the cocoon , the larva transform into a chrysalid.

Life cycle- Pupa

- The larva of last instar before moulting ceases feeding and transform into a chrysalid.
- The larva excretes silk substance after settling in a crevice and spin the cocoon.
- In 3-4 days, the cocoon formation is completed. Inside the cocoon the larva transforms itself into a brown colouredchrysalid.
- It is an intermediate form in between the larva and the moth.
- The essential organs of the moth are formed. The body is covered by hard integument. It can survive for long time inside the cocoon.
- The colour of the chrysalid turns black before the emergence of the moth.

Life cycle- Moth

- The moth emerges from the chrysalid forms after about 2 weeks.
- The moth comes out through the open end of the cocoon.
- It emerges normally in morning hours.
- As soon as the moth emerges, they secrete some brown liquid which is known as meconium.
- The newly hatched male and female moth abdomen has almost same size and their wings remain very soft but after sometime the male abdomen gradually become smaller and they fully stretch their wings which becomes harder.
- The colour of the wing varies from green to orange brown and the wing expanse varying from 10 cm to 15 cm.

III. MATERIALS AND METHODS

Collection of sample and selection of food plants

Healthy, disease free Samiaricini were collected at the cocoon stage from the local rearer of Kokrajhar district. Samiacanningi were collected at cocoon stage from different places of Assam. Identification of the sample moth was done by the experts of Central Silk Board, Guwahati. Castor (Ricinuscommunis, Family: Euphorbiaceae) and payam (Evodiafraxinifolia Hook, Fam: Rutaceae) were taken as the food plants for the experiment.

Preparation and isolation of pure line Parental seed cocoons of both the S. ricini and S. canningi were collected and laying of the races were done by adopting the method described by Tazima and Rao and Mariswamy. Briefly, Yellow Plain (YP) colored larvae with brick red cocoon (brc) of multivoltine S. ricini were selected and maintained up to eight generations. Similarly, bivoltine S. canningi with Greenish Blue Plain (GBP) larval color and dull brown cocoon (dbc) were selected for pure line maintenance.

Hybridization and rearing

After successful pure line maintenance of both the races, crossing was done by taking multivoltine female S. ricini and male bivoltine wild race S. canningi under controlled conditions of temperature and humidity following Doddaswamy et al. Rearing of silkworm was done following standard protocol of Grekov et al. with little modification. Eggs were disinfected with 2% formalin and washed with tap water. S. ricini was fed on castor leaves while S. canningi was fed on payam leaves at outdoor condition. The S. ricini x S. canningi cross-breeds (C-breed) were reared indoor and fed on both castor and payam leaves throughout the experimental period (2008-2011).

Morphological study

Eggs: Morphological variations of the eggs of S. ricini, S. canningi and C-breed were studied on the basis of its size, shape, shell color, weight and average fecundity following standard protocol.

Larva: Morphological characters of the larvae were studied by observing its larval color, size (length and breadth) and body weight following standard protocol.

Cocoon: The cocoon characters such as shape, size length and breadth (LxB), cocoon weight, shell weight, peduncle length and silk ratio (silk weight/cocoon weight) were taken as the parameters for comparing the cocoons of S. ricini, S. canningi and the crossbreed.

Pupa: The pupal characters of all the three silkworms were studied on the basis of its size, shape and pupa weight following standard protocol.

Moth: The morphological differences in the adult moths of S. ricini, S. canningi and crossbreed were studied on the basis of LxB of antennae, wing span, pattern and its coloration; and pattern of tufts and tergum in abdomen.

IV. RESULTS AND DISCUSSION

During maintenance of the pure line, the selected wild bivoltine GBP S. canningi showed no segregation whereas YP multivoltine S. ricini showed segregation of spotted yellow larvae for two generations i.e. in F1 and F2-generation, but afterwards up to F8-generations it had not shown any further segregation. The crossing between the S. ricini and S. canningi, resulted in C-hybrid silkworm with GBP larval color with light reddish brown cocoon (rbc) were found in the F1- generation. No morphological changes were observed in the filial generations when the crossings were allowed between F1 hybrid worms. All the offspring of F1 x F1 cross showed GBP larval color with rbc color and all the offspring were maintained indoor to study the morphological characters (Figure 1).

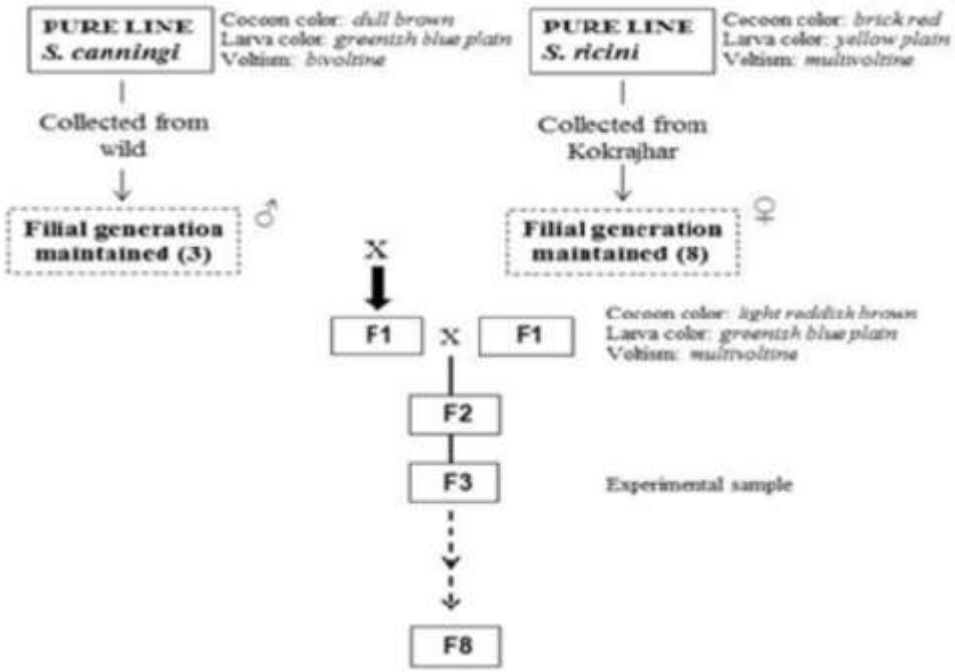


Fig 1: Maintenance of pure lines of S. ricini and S. canningi and hybrid.

V. CONCLUSION

Hybridization is an important technique in the realm of life sciences including sericulture industry. The hybridization experiment in the present study between local multivoltine variety S. ricini and wild bivoltine S. canningi showed better economic parameters almost all aspect of experimental parameters. Both the S. ricini and C-breed showed good cocoon productivity when reared on castor and payam leaves. Better survivability and resistance to diseases during the entire experimental period can also be seen as a good indication for silk industry. The results of the present study, therefore, throw considerable light on the potentiality of the S. ricini x S. canningi crossbreed in increasing the cocoon productivity and also suggest the possibility of introducing new host plant payam. However, detailed molecular level study need to be carried out to establish the relationship between the silkworm productivity and the food plants.

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