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Silkworm: Strategy of silkworm survival and culture in Baroda dist. Gujarat, India

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Abstract
Sericulture means the production of silk from silkworm. The Eri silkworm, *Phylosamia ricini* highly fed upon castor as a host plant. In laboratory study we were used 5 plant species, viz., *Calotropis gigantea, Nerium odorum, Leucaena leucocephala, Parthenium hysterophororus, Annona squamosa, Pongamia pinnata* and *Terminalia catappa* for feeding the 5th instar larvae of Eri silk worm after pre-starvation period of 25 min. In case of *Calotropis gigantea*, the larvae started feeding initially than stopped in a short period and showed only 10% larval death within an hour. In *Terminalia catappa* and *Leucaena leucocephala*, the worms were not feeding. The moulting period for all the larval stages ranged from 4.5 to 5.5 days on different host plants. It was short in favourable plants. The result of the experiment showed 90% healthy Silkworm form cocoon. The quantity and quality of silk was better.

Keywords: Eri silkworm, rearing, season, host plant, larvae

Introduction
India is the only country which has all the four kinds of commercially exploitable silk namely, domesticated mulberry silk (*Bombyx mori*), semi domesticated eri silk (*Philosamia ricini*), wildtasar silk (*Antheraea mylitta*) and exclusive wild golden muga silk (*Antheraea assama*). India is the second largest producer of raw silk after China and the biggest consumer of raw silk and silk fabrics. Globally, sericulture has been phased out in many countries, notable in Japan, due to rapid industrialization and urbanization. European countries which had good production bases, have transformed completely as consuming countries with no production at all.

The progressive growth of eri silkworm was superior when fed on castor. Castor and tapioca are the two most important host plants for eri silkworm though there are certain perennial tree species like *kesseru* and *payam* in north east states may serve to provide supplementary food in the off season. Kumar *et al*. (1993) [5] reported that leaves of *kesseru* were next to the castor leaves in terms of cocoon harvest and other economic parameters in south India, the match wood tree species, *Ailanthus excelsa* is common in the plains and hills is also a alternative host for eri silkworm.

Further, the larvae receiving the castor leaves during fifth instar had better growth irrespective of the diet used earlier, i.e., whether tapioca/castor (Joshi, 1987) [4]. The eri silkworm culture adaptation is being practiced in a large scale on the leaves of castor. Castor and tapioca is grown on large scale in Baroda, Salem, Dharmapuri, Nammmakal, Erode and Coimbatore districts of Tamil Nadu where could be practiced successfully and adapted ericulture under these climatic conditions. Growing the castor and tapioca as commercial crop and ericulture would increase the net income to the farmers.

The ideal feeding is to administer nourishment to all the worms simultaneously and thereby to secure uniform growth and development of the worms. The feeding must be in harmony with the eating habit and appetite of larvae and must be done economically.

The Eri Silkworm Seed Organization (ESSO) is also headquartered at Guwahati. By and large eri silkworm rearers usually prepare their own layings in unhygienic conditions resulting in low productivity. In order to bring the eri seed production in an organised manner, the CSB had established one SSPC for Eri in Assam. This SSPC has been established as a demonstration unit to popularise the concept of disease freeness among farmers to improve the productivity. Subsequently, State Governments have also established grainages to meet the increased seed requirements from farmers. With the spread of ericulture in other areas, the demand for eri dfls is growing consistently. To meet this additional demand, CSB had

established 4 SSPCs in; Azara, Assam, Hosur (TN), Peddapuram (AP), Fatehpur (U.P) & Sujanpur (Punjab). The objective of this study was to culture of Erisilkworm and to aware its importance in commercial propaganda for rural and tribal inhabitants.

Material and Methods

The egg of Eri silkworm collected from Central Silk Board, Azara, Guwahati, Assam and India by Air. The eggs were preserved in a box covered with muslin cloth. The silkworms were released after 10 days of hatching from Eri Silkmoth. The minute silkworms were fed upon the tender leaves of Castor plant. When they reached upto fourth instar larvae, they fed upon mature leaf of castor plant.

After vigorous feeding, they produce silk from the mouth and convert them to Cocoon. Due to the voracious feeding habit of the fifth stage larvae; there is a need to identify alternative host plants for continuous rearing, in case there is a shortage of castor leaves. A study was conducted to test the suitability of the following plant species to fifth instar larvae of eri silkworm, after pre-starvation period of 30 min. For each treatment 30 larvae were used.

Further, the varieties of preferred host plant and method of rearing and their impact on rearing parameters was studied as per method given below. Same size of the platform (6 x 2 ft.) was used for all the treatments with a larval population of 50 per sq. ft. All the developmental parameters were observed on 50 larvae per replication in three places selected at random on each bed.

During the larval period worms were fed four times per day and bed cleaned according to the interval period. The ripened worms were collected from the rearing bed and allowed for spinning. Hundred worms were introduced in each treatment at the rate of 60 worms/sq. ft. and three replications were maintained through the entire span of experiment.

Fig: a) Minute silkworm emerges out from the Eri silkworm egg. **b)** The 1st Instar larvae fed upon tender leaves of castor plant. **c)** The 2nd Instar Larvae fed upon castor leaves. **d)** The image of 3rd Instar larvae on the castor Larvae. **e)** The 5th Stage of Eri silkworm stop feeding. **f)** Cocoon formed by 5th Instar Larvae of Eri silkworm, **g)** Large amount of cocoon used by Farmers to sale. **h)** Reeling of silk thread in Industry.

Results and Discussion

Among the different host plants the castor showed better performance in respective with larval weight and cocoon weight. Apart from the above plants, diseased tapioca leaves infected with mosaic virus were also tried for feeding the fifth stage larvae of eri silkworm after a pre-starvation period of 30 min. The larvae fed normally on the mosaic-infected leaves and there was no adverse effect on the eri silkworm. Depending upon the host plant the larval duration was prolonged. The moulting period for all larval stages ranged from 1.5 to 2.5 days on different host plants and combinations. It was short in favourable plants. Feeding response of *Philosamia ricini* was best in the Kesseru and Barkesseru host plants (Huq *et al.*, 1991, Kumar 1993, Sachan *et al.*, 1973a) [3, 5, 8]. *Carica papaya* and *Terminalia catappa* recorded as alternative host plant for matured worms and worms were shown good feeding and no mortality was observed. The larvae started feeding immediately when fed but stopped within short period. In all other cases the larvae were not shown any growth and the larval stage exist for long time, Eri silkworm reared on Rosy castor variety recorded maximum mature larval weight, cocoon weight, pupal weight and shell weight (Dookia 1980) [2] (Fig 2). Some workers reported the effect of Food Plants on Certain Life Parameters of Eri Silkworm (*Philosamia ricini*)" (Sharma *et. al*, 1996) [9].

In the present study, the maximum larval weight (7.6 g) has been obtained in rearing on green castor, cocoon weight. Similarly, the higher survival rate, higher net reproductive rate (503.52) and shorter developmental period (46.49 days) when eri silkworms were reared on castor. Several workers reported castor is the best host plant affecting the larval weight, silk gland weight, cocoon weight and shell weight (Devaiah *et al.*, 1985, Neelu *et al*., 2000, Reddy *et al*., 1989b) [1, 6, 7].

Among the tapioca Kumkum Rose variety has been enhanced the growth of larvae in terms of weight, spinning potential, cocoon weight, shell weight and silk ratio compared to other varieties. In the present study, the larvae till 3rd stage becomes yellow in colour while, becomes white at 4th stage (Fig. a, b, c & d). The 5th Stage of larvae stops feeding and become green white yellowish colour (Fig. e). The study indicates that the number of feeding is not having much influence if sufficient food provided during three times feeding per day also lower. Sannappa *et al.* (1999) reported that the larval duration and mature larval weight were correlated with larval survival, effective rate of rearing, cocoon weight, papal weight, shell weight, shell ratio, adult emergence, fecundity and hatchability. He was concluded that increased larval duration and mature larval weigh have an influence on rearing performance and cocoon and grainage parameters. All the mountage materials selected in this study showed 100% spinning. After fifth day the cocoon was harvested from each mountage materials separately for studying the cocoon characters like cocoon weight, length and breadth; shell weight and silk ratio (Fig. f)

This study revealed that the worms allowed to spin on the green coconut material was recorded statistically significant highest cocoon weight (2.67 g) followed by rotary mountage, dried mango, coconut, sapota and banana leaves (2.53-2.46 g). The worms allowed to spinning on the plastic mountage, sugarcane leaf and sheath, palm leaf, guava leaves were recorded lowest cocoon weight (2.38-2.25 g) compared to other materials used. In the present study, we offered first and second instar eri silkworm larvae. Both of them are very tiny with minimum number of hairs. Mobility was not aggressive.

Neupane *et al.,* (1990) reported that *Samia cynthia ricini* had 6 generations annually on castor (*Ricinus communis*) in the laboratory. The life cycle took 38-50 days during March-September, 49-61 days during September-November and 114-126 days during November-April. The mean weights of mature larvae, cocoons, pupae and shells were 5.24, 3.75, 3.09 and 0.61g, respectively, during July-August. Similar results were obtained using cassava as the food plant, but the weights of larvae, cocoons, pupae and shells were slightly lower. The mean maximum temperature during the study period of April 2016 to May 2016 was in the range of 33.0 ºC to 39.0 ºC in the districts of Baroda, in Gujarat.

Conclusion

From the above experiment, we observed that the Ericulture practice could be implemented in Baroda Dist. of India. This experimental report is providing valuable guidelines and economical strategies to the castor cultivated farmers.

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