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RESEARCH ARTICLE

TERMINALIA CATAPPA - A POTENTIAL NEW HOST OF *PHILOSAMIA RICINI* ERI SILKWORM UNDER WESTERN MAHARASHTRA CONDITION

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Abstract

An attempt was made to rear the eri silkworm, *Philosamia ricini* on the leaves of *Terminalia catappa* (Badam) for the first time in India and reared under laboratory condition. It was observed that the badam is a potential new host of eri silkworm. The growth parameters and cocoon characters of the eri silkworm reared on badam leaves were normal. The eri silkworm successfully lasted its life cycle ranged from 47 to 53 days. The effective rate of rearing, weight of pre-spinning larvae, cocoon, shell and pupae ranged from 90 to 95 per cent, 7 to 9 g, 3.02 to 3.10 g, 0.45 to 0.50 g, 2.60 to 2.90g, respectively. Parameters such as length of cocoon shell, width of shell, peduncle, shell thickness etc. The fecundity ranged from 400 to 425 eggs. The finding of badam as a potential new host for eri silkworm has opened new vistas in promoting vanya silk industry.

Introduction

The silk of the castor silkworm is produced by *Philosamia ricini*. Assam in India is the home of the eri silk industry (FAO, Manual, 1987). Sericulture being an important agro based industry provides employment at various levels i.e. host plant cultivation, silkworm rearing, reeling, spinning and weaving have much impact on the improvement of rural economy. Eri silkworm, *P.ricini* is a multivoltine sericigenous insect and largely reared by the farmers of North-eastern part of India, particularly in Assam (Sahu et al., 2006). The eri culture being carried out throughout the year in traditional areas because of the abundant availabity of castor plants in the rural areas (Rao et al., 2005; Siddique 2009). The ambient temperature during rearing affects larval growth, survival rate, cocoon parameters and silk quality (Gumma, 1972). The quality of feed plays a remarkable role for growth and development of the silkworm and ultimately on the economic traits of cocoons (Hazarika et al., 2005).the eri silkworm feeds on many food plants like primarily castor, secondary food plants like kessaree, tapioca, payam, jatropha, papaya etc. All the food plants are not equally good for eri silkworm rearing and eri silkworm show different behavior, when reared on different food plants (Rajesh Kumar and Gangwar, 2010). Based on the above cited literature and information the present study was conducted to suitable food for P.ricini under western Maharashtra condition. Therefore, an attempt has been made to rear the insect from 1st instar to 5th instar & allow for cocoon and adult formation.

MATERIALS AND METHODS

The eggs of *P.ricini* were brought from eri research station, CSB, Assam. The eggs were incubated at room temperature 28 ± 2°C, 80 ± 5% RH and 10 hrs photoperiod. For this study the rearing methodology developed for wild silkworm was followed (Kavane, 2010). Experiment was conducted from newly hatched larvae to adult formation. Sum of 1000 worms were maintained in plastic boxes and G.I. tray are specially prepared for new technique to wild silkworm rearing. The host plants tender and soft leaves were fed one time a day up to 2nd instar

and late age silkworms two times a day. Cloth boxes specially prepared montages by the ripening larva. Cocoon harvesting was carried out after fifth day of spinning. The data was recorded for the study of biology, which includes larval duration, adult longevity and fecundity, effective rate of rearing (ERR), cocoon characters, colour, shape, single cocoon weight, shell weight etc. the above species of silkworm sufficient number of silkworm (1000) were used for confirming results.

RESULTS AND DISCUSSION

The biology of saturniid, *P.ricini* was studied under laboratory condition. The descriptions were made from live specimens reared during 2011-2013. It was observed that there was less mortality of I st instar worms when fed with tender, soft badam leaves. The larvae of all the five instars fed upon tender, soft matured leaves and successfully complicated the life cycle. The result indicated that the rearing success of *P.ricini* on badam under indoor rearing conditions (28 ±2 ^{0}C and RH of 80 ± 5% and 10 hrs photoperiod) was 90%. The moths mated successfully, laid fertilized eggs in the mud pot and covered with nylon mesh in rearing house. On badam leaves, the incubation period, larval and pupal duration ranged from 8-9 days, 21 to 22 days, and 14 to 15 days respectively. The *P.ricini* silkworm molted four times and there were five instars each lasted 3 to 3.2, 2 to 2.1, 3.5 to 3.7, 5.4 to 5.6 and 6.5 to 7 days, respectively. The weight of matured tasar silkworm (v th instar) was 8.5 to 9 g and measured 7.40 to 7.60 cm in length, 1.26 to 1.27 cm in circum. The weight of cocoon including pupa 3.02 to 3.10 g, the shell weights of cocoon 0.45 to 0.50 g and the shell lengths were 3.85 to 3.87 cm, the shell width of cocoon in indoor method were 1.20 to 1.22 cm , silk ratio 14.90 to 15.00% (Table.1).

The effective rate of rearing (ERR), adult longevity and fecundity ranged from 90 to95 per cent, 3 to 5 days and 400 to 425 eggs, respectively. The eggs hatchability was 97 to 100 percent and it was maximum on first day between 8 to 10 am. Further the life cycle of insect ranged from 47 to 53 days. The results of the study like performance of *P.ricini* silkworms in (Table. 2) and the width of the different life stages are presented (Figs.1 to8).

Newly hatched larvae were released on the leaves of the host plants badam with the help of soft camel hairbrush. 4 - 5 such leaves with mounted larvae were placed in the plastic box size 27 cm x 6 cm x 7 cm in length, width, and height respectively. The maximum portion of edge of each leaf was available to the larvae for feeding; the box was perforated with numerous exits for aeration and with covered lid to prevent escape of the larvae. Next day, the larvae were transferred to new box containing fresh leaf diet. The molting larvae transferred along with their support leaves. The old leaves were removed from the boxes at 12 hrs interval. Rearing of 1st and 2nd instars for used boxes were then washed, disinfected and dried for re-use.

Rearing trays of size (3'x 2.5'x 6'in length x width x height respectively) were used for rearing of 3rd, 4th and 5th instar larvae. A twig having 12 to 15 leaves was used as leaf diet 8 – 9 leaf twigs were introduced in the tray at a time. Larvae were transferred to a new trey along with help of new food. Touching with hand to food plants and silkworms was avoided mostly. The trays were cleaned after 24 hr interval. Molting larvae were transferred along with the left over parts of the food plant.

The full grown 5th instar larvae wandering for cocoon construction were sorted out and transferred to a box (4'X 2.5'in height X width) made up of hard card sheet provided them opportunity to form the cocoons (Kavane,2010). The data was recorded for the study of biology, which includes larval duration, adult longevity and fecundity.

Eggs (Fig.1)

The eggs deposited in the mud pot were collected, washed with soap water and kept for incubation. The eggs are rounded; newly laid eggs look like brownish but become creamy white colour. An individual egg measured 0.16 to0.17 mm and breadth 0.12 to 0.13 mm, hatching percentage is 100 percent and incubation period of 8 to 9 days. The emergence of the larva from the egg commenced from morning and continued till 10 a.m.

Larva: **(Fig.2-8)**

First instar larva head black, body colour yellow with black lining and hairs, tubercles conical, legs black, black band present on the dorsal side. The length of first instar ranged from 0.74 mm. the duration of first instar ranged from 2.8 to3.2 days with a mean of 3 days.

The second instar, head black, body colour yellow without black lining and withes short black tubercles with whitish hair. Body bears pairs of black spot longitudinally. The length of 2nd instar ranged from 1.65 to 1.66 cm. the duration of second instar ranged from 1.9 to 2.3 days with a mean of 2.1 days.

The third instar larva measured 2.34 to 2.36 cm with a mean of 2.35 cm. head black, body colour white with short white tubercles with powdery. The body bears longitudinal black spots, dorsally in pairs and dorsoventrally in irregular manner, legs, anal flap and claspers become yellow. The duration of third instar ranged from 3.5 days. The fourth instar ranged from 4.50 to 4.80 cm with a mean of 4.65 cm in length, head yellow, body

colour white with short white tubercles with powdery. The duration of fourth instar ranged from 5 to 6 days with a mean of 5.5 days. The fifth instar larvae measured from 6.5 to 7.5 cm with a mean of 7 cm in length, head yellow, body colour white with short white tubercles with powdery. The duration of fifth instar ranged from 6 to 8 days with a mean of 7 days. The fifth instar single larval weight varied between 6.60 to 7.30 g. with an average of 6.45 g. the total larval duration ranged from 21.5 days. The effective rate survival was as 95 percent.

At the end of the larval period the ripe larvae were released on the montages for cocoon construction on which cocoons were constructed. Matured larvae crawl down for cocooning in afternoon to till noon. Cocoons white, elongate, spindle shaped with a thin floss layer and it can be easily distinguished. It measures 3.02 to 3.10 g., 4.2 cm, 2.9 cm weight, length, width respectively. The open types of cocoons are compact and hard without peduncle. The pupa is dark brown or radish brown. Female pupa is bigger and heavier than male. The male moth has pointed wings while females has broad wing. The wing span of the male and female moth is 115 to 125 mm and 135 to 145mm. respectively. Wing colors dark brown. There have been no reports on the primary feeding habits of eri silk worm on badam, a potential alternate host plant. The present finding has firmly established that the eri silkworm P.ricini could be reared on badam leaves.

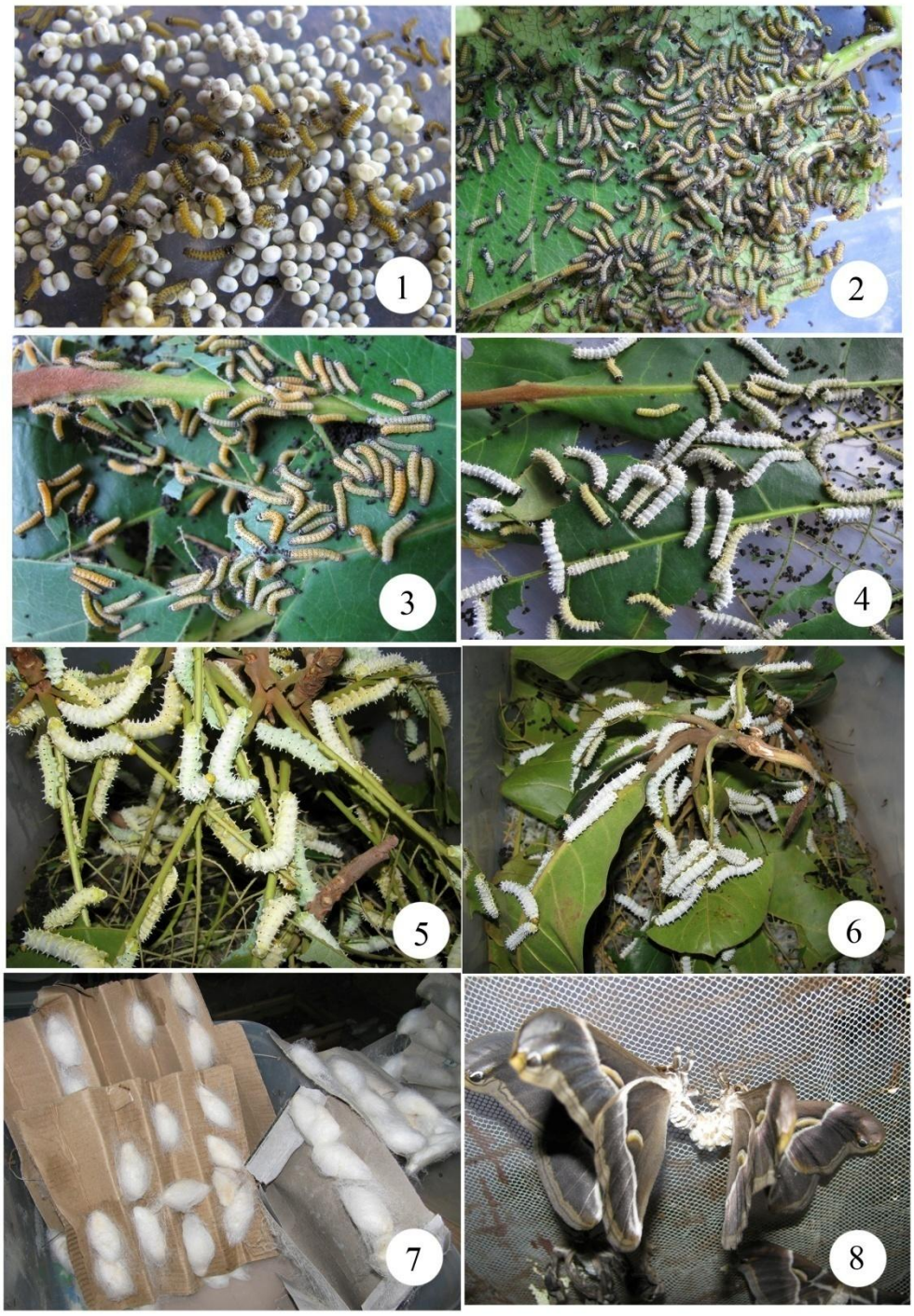
The effect of host plant species on the growth and development in the insects has been reported (Reddy et al., 1989). Impact of varietal feeding on *samia ricini* inspring and autumn season of Utter Pradesh studied (Rajesh Kumar and Gangwar, 2010).Hazarika et al. (2003) studies that castor was found best in terms of different parameters viz, larval wt, ERR, cocoon weight, shell weight etc. Performance of promising ecoraces of eri in agro climatic conditions of western Odisha region studied (Ray et al., 2010).Rearing technology of eri silkworm under varied seasonal and host plant conditions in Tamilnadu reported (Subramanianan et al., 2013). In the present study, some of the characters like hatching percentage, larval duration, larval weight, cocoon yield, single cocoon weight, shell weight, shell ratio, etc on *T.catappa* food plant is new investigations under western Maharashtra climatic condition.

Table 1: **Cocoon characters of *P.ricini* silkworm on Badam**

Fecundity no/worm	Hatch%	Larval wt(g)	ERR%	Cocoon wt(g)	Shell wt(g)	S.R%	Larval period
425	100	7to9	95%	3.06	0.45	14.90	21.5

Table: 2. Rearing performance *P.ricini* silkworm on Badam

Life stages	Duration (days)	Feeding time per day	Leaf number on food plant twig	Leaf size	No of boxes/ cages	No of trays	Box/tray cleaning time	Duration of sheding Cuticle(hrs)	Humidity %	Temp. 0c
Eggs	8-9	------	-------	-------	----------	----------	----------	----------	80 – 85	28-30
1st instar	3	one	Tender	Whole	2	----------	1	10	80 – 85	28-30
2nd instar	2.1	Two	Tender / June	Whole	4	-------	1	15	80 – 85	28-30
3rd instar	3.5	Two	June	Whole	------	2	2	15	80 – 85	28-30
4th instar	5.5	Two	June	Whole	------	3	3	20	80 – 85	28-30
5th instar	7	Two	June	Whole	----------	4	4	-------	80 – 85	28-30
pupal	15	----	------	------	-----	-----	------	------	80 – 85	28-30
Adult longevity	3-4	----	------	------	-----	-----	------	------	80 – 85	28-30



Figs.(1-8).Rearing of *Philiosamia ricini* on *Terminalia catapa*
Fig.1.Eggs with newly hatched larva, Fig.2. Ist instar,Fig.3.IInd instar ,Fig.4.IIIrd instar, Fig.5.IVth instar,Fig.6.Vth instar, Fig.7.Cocoon with pupa,Fig.8.Mating of moth.

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