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IMPACT OF INDEPENDENT AND SEQUENTIAL FEEDING OF DIFFERENT HOST PLANTS ON ECONOMIC TRAITS OF ERI SILKWORM, *SAMIA CYNTHIA RICINI* BOISDUVAL

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Abstract: **The study was conducted to estimate the morpho-economic traits of eri silkworm, Samia cynthia ricini Boisduval by rearing on different host plants leaves under controlled conditions in laboratory at 25o C±2 and RH 70 to 75 percent. For this purpose healthy leaves of Castor (Ricinus communis L.), Papaya (Carica papaya), were used to perform rearing. While performing the experiment, independent trials of castor as well as interchanging of food plant with papaya during rearing were undertaken. It is observed that, despite the fact that the castor leaves serve as chief feed for rearing of eri silkworms, the combination of castor and papaya leaves could also be beneficial used for commercial rearing of eri silkworm. When the worms were fed with the leaves of castor up to 3rd instar and interchanging with papaya leaves during 4th and 5th instar resulted in successful eri silk regaining. Hence, the present study suggests the consecutive treatment specifically, castor leaves interchanging with papaya leaves for business raising of eri silk worm larvae. The present study was carried out to see the rearing performance of Eri silkworm on papaya leaves, it was observed that along with castor or in the scarcity of castor leaves papaya leaves can be utilized as food for the eri silkworn larvae. Different parameters studied during the experiment are shown in the table no. 1-3.**

Keywords: **Economic traits, Eri silkworm, Host plants.**

1. INTRODUCTION

Eri silkworm, Samia cynthia ricini is a multivoltine sericigenous insect and largely reared in the 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 availability of castor plants in the rural areas (Rao et al., 2005; Siddique 2009). Along with castor this polyphagous silkworm feeds on wide range of plants over 30 species. The host plants are sorted as primary, secondary and tertiary dependent on the tendency to acknowledge the leaves as nourishment, their development on the leaves of that plant improvement and cover yield (Bindroo et al., 2007). Castor (Ricinus communis) is considered to be the primary host while tapioca (Manihot esculenta) and payam (Evodia flaxinifolia) are secondary and these plants can be used for commercial production of eri silk (Sakthivel, 2012). Rest of the plant species like barkesseru (Ailanthus excelsa), papaya (Carica papaya), Jatropha (Jatropha curcas), barpat (A. grandis), gulancha (Plumeria acutifolia), gamari (Gmelina arborea) etc are tertiary on which the silkworm could complete its lifecycle. Eri silkworm could also survive on certain non-host plants species if meet with starvation due to non-availability of its food plants. Eri silkworm could likewise make due on certain non-have plants species if meet with starvation due to non-accessibility of its sustenance plants. 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). All the food plants are not equally good for eri silkworm rearing and eri silkworm show different behaviour, when reared on different food plants (Rajesh Kumar and Gangwar, 2010).

Therefore, the present study was carried out to find out the acceptance of commonly available tertiary food, papaya (Carica papaya L) (Caricaceae), by eri silkworm and feasibility if eri silk production compared to its primary food plant, castor (Ricinus communis L) (Euphorbiaceae).

2. MATERIAL AND METHODS

Disease free laying (eggs) of S. cynthia ricini were obtained from Central Muga and Eri Research and Training Institute, Jorhat, Assam. The eggs were kept in a petri plate. A small wet cotton swab was placed inside the Petri plate to maintain the optimum temperature (25 ± 1oC) and relative humidity (80–85 %).After hatching, a tender leaf of castor was placed over the neonate larvae and allowed for 15 minutes. The worms crawled on the leaf were then transferred into plastic troughs (16 x 7cm) and fed on castor leaves under laboratory condition (29±1oC temperature and 65 – 75 % RH).

Local castor and papaya variety was used for feeding trials. Tender leaves were fed twice a day up to third instar larvae and semi-tender and mature leaves were fed thrice a day to the fourth and fifth instars, respectively. A total of 300 first hatched larvae were randomly selected from the DFLs. Each group of 50 larvae was considered as replicate and maintained them till their pupation in a paper box. Rearing bed was checked daily and dead larvae and unfed food was removed at regular time interval. Egg, larval period and weight as well as pupal period and weight and also adult period, ERR were recorded. Survival rate of each set of larvae was also recorded. Ten cocoons were randomly selected and the mean cocoon weight was computed in grams using digital electronic balance up to two decimals accuracy. After removing the pupa and exuvial from the 10 randomly selected cocoons, the shell weight was recorded in grams using the digital electronic balance.

In a plastic tray of the size 18.5 length and 10.2cm width, mature leaves of C. papaya, along with the primary food plant castor, R. communis (approximately one gram each) was placed. Equal distance (3 cm) was maintained between each plant leaves. Then three uniform sized newly moulted fourth instar larvae were introduced at the centre of the feeding arena and record the food acceptance of the larvae in minutes by visual method. Six replications were maintained. In another set of experiment, newly moulted larvae were starved for 24 hours and then the acceptance of tested plants was recorded as mentioned above. In the third set of experiment, newly moulted larvae were starved for 48 hours and then the experiment was carried out. Similar experiments were also conducted for fifth instar larvae (0 day, 1-day starved and 2-days starved).

It was observed that eri silkworm larvae accepted castor R. communis followed by Papaya C. papaya. Hence, secondary food plant papaya was provided to the larvae and allowed to feed continuously for 24 hours.

The experiment was conducted for both fourth and fifth instar larvae.

The larval period as per instar, cocoon weight (gm), shell weight (gm), shell ratio (%), ERR these economic parameters were noted and analyzed.

3. RESULTS AND DISCUSSION

In the present study it was observed that, feeding response of S. cynthia ricini to different varieties of castor available was good. The larvae started feeding immediately when fed. It is noticed that, the growth was faster in castor as compared to the papaya and mixed feeding with castor and papaya. Results are recorded in tables 1 to 3.

TABLE I. Effect of independent and mixed feeding of castor and papaya on growth and development of eri silkworm, Samia cynthia ricini

Type of Food plants	Instar I (days)	Instar II (days)	Instar III (days)	Instar IV (days)	Instar V (days)	Total larval Duration (days)	Matured larval Weight (gm)
Castor	2.8	3.45	4.01	4.35	6.5	21.11	6.94
Papaya	3.6	4.5	5.68	5.7	7.5	26.98	5.9
Mixed	3.27	4.12	4.6	4.81	6.54	23.34	6.71

The results recorded in above table show that, duration taken to complete first instar with castor variety was 2.8 days whereas the papaya fed Eri larvae took 3.6 days to complete their first instar stage while the larvae fed with mix feed of castor and papaya as a food, it took 3.27 days to complete their first instar stage. Second instar stage duration was

completed in 3.45 days in larvae fed with castor variety, where as in papaya fed worms it was noted for 4.5 days while with the mixed feeding of both castor and papaya, duration was 4.12 days. The third instar was completed in 4.01 days to complete the stage when fed on castor as a food, on the other hand when the larvae were fed on papaya leaves the duration was 5.68 days. However, when larvae fed with mixed feeding of both the food plants duration recorded was 4.6 days. Likewise, results were also recorded for fourth and fifth instars as well. The duration of fourth instar fed on castor variety recorded was 4.35 days, that with those fed on papaya, the duration of an instar was 5.7 days while the larvae fed with mixed food plants i.e. castor and papaya larvae took 4.81 days. In the fifth instar the larvae fed with castor took 6.5 days. The larvae fed with papaya leaves completed the fifth instar in 7.5 days whereas the larvae given mixed food completed the fifth instar in 6.54 days which was shorter as compared to only feeding on papaya. The average weight of the fifth instar larvae weight noticed was 6.94 gram, when fed on castor leaves. The average weight of the larvae fed with papaya leaves as alone was recorded at 5.9 gm. The data on silkworms fed with mixed leaves had shown better weight of 6.71 gm as average weight of matured larva.

TABLE II. Cocoon parameters of eri silkworm by feeding with castor and papaya as a feed during monsoon season

Type of food plant	Cocoon weight (gm)	Shell weight (gm)	Shell Ratio (%)	ERR (%)
Castor	2.64	0.4	15.1515152	93.75
Papaya	1.98	0.27	13.6363636	85.2273
Mixed (C+P) 50:50	2.22	0.35	15.7657658	89.2857

The results recorded in above table show that, the weight of the cocoon of which larvae was fed with the castor leaves was 2.64, the shell weight of the same was 0.4 gm and the shell ratio of the larvae fed with castor leaves was 15.15% and the Effective rate of rearing of the same was 93.75%. The larvae those were fed with papaya, the cocoon weight was found 1.98 gm, with shell weight was 0.27 gm. The shell ratio recorded of the larvae fed with papaya was 13.64% and the effective rate of rearing noticed was 85.23 %. When the larvae were fed with the mixed type of feeding i.e. castor and papaya the cocoon weight observed was 2.22 gm, and the shell weight was 0.35 gm. The average shell ratio in the same case was 15.77 % and the effective rate of rearing was 89.29 %. This shows that, with mixed feeding economical traits like single cocoon weight and shell weight were better than the sole feeding of papaya.

TABLE III. Grainage parameters of eri silkworms fed with castor and papaya during monsoon season

Type of food plant	Pupal period (days)	Pupal weight (gm)	Average fecundity	Hatchability	Percent of moth emergence
Castor	13.73	2.16	365.39	99.14	96.9
Papaya	15.61	1.83	349.56	98.5	95.5
Mixed	14.41	1.91	350.73	98.8	96.7

The data recorded in table no. 3 shows that the average pupal period of castor fed larvae was 13.73 days where as larvae fed with papaya took 15.61 days to complete their pupal period while the larvae fed with mixed type of food took 14.41 days. The data on pupa shows that performance of eri was better with castor over the papaya and mixed feed of both the food plants. The average pupal weight of the larvae fed on castor leaves was noted as 2.16 gm, that of the eri silkworms fed on papaya was noted as 1.83 gm. The silkworms fed with thw mixed food were resulted into 1.91 gm of average pupal weight. As far as pupal weight is concerned papaya shows better weight (1.83gm) over mixed (1.91 gm) and castor (2.16).

The average fecundity of the castor fed moth was 365.39 whereas the average fecundity of silkworms fed with papaya recorded was 349.56 and that mixed food was observed 350.73. Hence fecundity was better with castor over the papaya and mixed food. The hatchability noted was 99.14% in the case of silkworm fed with castor leaves. In case of papaya fed eri worms hatching percentage was 98.5% and that with mixed feeding the hatchability was 98.8%. Thus the present study shows that hatching percentage was better in castor than mixed fed and papaya fed. The moth emergence percentage observed in present study was 96.9 % in the larvae fed on the castor. It was 95.5% in papaya whereas it was 96.7% in the larvae fed on mixed food. As far as percent moth emergence is concerned castor food performs better over the mixed and papaya alone.

The above study clearly showed that though the castor is primary food plant for S. c. ricini, papaya can also be used as a secondary food plant when there is scarcity of castor leaves. The mixed food of castor and papaya also showed better performance in some of the traits over the papaya as a sole food.

4. CONCLUSION

The present study confirmed that, along with the castor, papaya can also be used for rearing of eri silkworm as a secondary food plant. Therefore, if in any case castor leaves non availability to feed the progeny one can use papaya leaves for the rearing and sustaining the batch. The present experiment concludes that the ericulture practice could be implemented in the Western region of Maharashtra. This experiment would be helpful in providing guidelines to the castor growers as well as papaya growers, that they can use eri culture as secondary source of income with available extra leaves upto 40 % without affecting yield of castor seed and papaya fruit.

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List of figures:

Fig. 1 Eggs of Eri silkworm *Samia cynthia ricini*

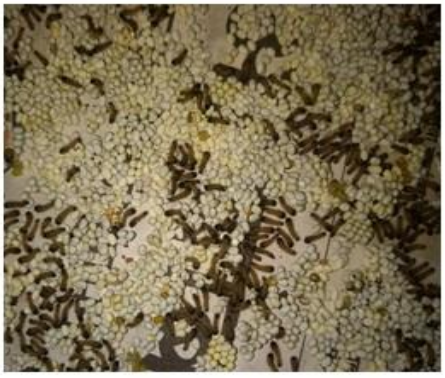

Fig. 2 Newly hatched larva of Eri silkworm S. c. ricini

Fig. 3 Second instar fed on Castor

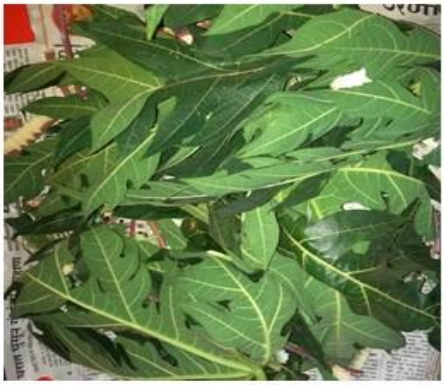

Fig. 4 4th instar fed on Papaya

Fig. 5 Cocoons of S. c. ricini

Fig. 6 Adult of S. c. ricini