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ECONOMIC TRAITS OF ERI SILKWORM (*Samia cynthia ricini*) IN MARATHWADA CONDITIONS

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ABSTRACT

The present investigation was conducted to study the economic performance of eri silkworm, *Samia cynthia ricini*, under the agro-climatic conditions of Marathwada. The study was carried out at the Sericulture Research Unit, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, during 2025–26. During the fifth larval instar, two distinct colour forms belonging to the Borduar eco-race, namely Greenish Blue Plain (GBP) and Yellow Plain (YP), were observed. The larvae were separated into respective groups and reared separately under similar conditions using castor leaves as the principal food source. Economic traits including mature larval weight, single cocoon weight, single shell weight, cocoon shell ratio, effective rate of rearing (ERR), incidence of deformed larvae and cocoon yield per 10,000 larvae were recorded. Green larvae showed comparatively better performance for most of the economic traits. The mean mature larval weight was 8.18 ± 0.57 g in Green larvae and 7.58 ± 0.07 g in Yellow larvae. Similarly, mean single cocoon weight was 3.97 ± 0.22 g and 3.48 ± 0.13 g, respectively, while mean single shell weight was 0.55 ± 0.11 g and 0.48 ± 0.02 g. The cocoon shell ratio was comparable between Green (13.79 ± 1.88%) and Yellow larvae (13.73 ± 0.95%). Green larvae recorded an ERR of 91.00 ± 1.00%, compared with 90.00 ± 1.00% in Yellow larvae. The incidence of deformed larvae was 1.50 ± 0.50% in Green and 2.00 ± 0.50% in Yellow larvae. Cocoon yield was 31.48 ± 1.84 kg per 10,000 larvae in Green larvae and 27.75 ± 0.79 kg in Yellow larvae. Overall, the Green form showed comparatively better economic performance under the prevailing Marathwada conditions.

Key words : Eri silkworm, *Samia cynthia ricini*, Economic traits, Cocoon yield, Marathwada.

Introduction

Eri silk production is an important component of sericulture, particularly because the eri silkworm can be reared under a range of agro-climatic conditions and its silk is valued for its soft texture and suitability for diversified silk products. The eri silkworm, *Samia cynthia ricini*, is mainly reared on castor and other suitable host plants. Its performance is influenced by the genetic constitution of the silkworm, host plant quality, temperature, relative humidity and rearing practices.

Economic traits are particularly important in eri silkworm production because they directly influence the productivity and profitability of rearing. Traits such as mature larval weight, cocoon weight, shell weight, shell ratio, effective rate of rearing and cocoon yield provide useful information about the rearing performance and silk-producing potential of the silkworm.

Although eri culture is traditionally concentrated in the North-Eastern region of India, its cultivation has potential in other parts of the country. Marathwada has different climatic conditions from the traditional eri-growing regions. Therefore, evaluating the performance of eri silkworm under local conditions is useful for understanding its adaptability and production potential.

During the present investigation, two distinct larval colour forms, Greenish Blue Plain (GBP) and Yellow Plain

(YP), were observed within the Borduar eco-race during the fifth instar. Since, the colour forms were clearly distinguishable, they were separated and reared independently under similar conditions. The present study was therefore undertaken to document and compare their economic traits under Marathwada conditions.

Materials and Methods

Experimental site

The investigation was conducted at the Sericulture Research Unit, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, during 2025–26. Eri silkworms were reared under the prevailing conditions of the region following standard rearing practices.

Silkworm material and host plant

Disease-free eri silkworm layings belonging to the Borduar eco-race were used for the study. Castor (*Ricinus communis*) was used as the principal host plant. Young larvae were supplied with tender castor leaves, while mature larvae were provided with fully expanded leaves. Hygienic conditions were maintained throughout the rearing period.

Separation of larval colour forms

Two distinct colour forms, Greenish Blue Plain (GBP) and Yellow Plain (YP), were observed during the fifth instar. The larvae were carefully separated according to their colour and maintained in separate rearing trays under similar prevailing conditions. Economic traits were subsequently recorded separately for the two colour forms.



Fig. 1 : Colour forms of eri silkworm (*Samia cynthia ricini*) during the fifth instar under Marathwada conditions. (A) Yellow Plain (YP) form; (B) Greenish Blue Plain (GBP) form.

Recording of economic traits

The following economic traits were recorded:

Mature larval weight (g): Mature fifth-instar larvae were weighed individually and expressed in grams.

Single cocoon weight (g): Individual cocoons were weighed and the weight was expressed in grams.

Single shell weight (g): The silk shell obtained after removal of the pupa was weighed individually.

Cocoon shell ratio (%): Shell ratio was calculated from shell weight and cocoon weight.

Effective Rate of Rearing (ERR): ERR was calculated based on the number of cocoons obtained in relation to the number of larvae brushed for rearing.

Deformed larvae (%): The proportion of deformed larvae was recorded during rearing.

Cocoon yield (kg/10,000 larvae): Cocoon yield was calculated on the basis of the cocoon production obtained from 10,000 larvae.

Statistical analysis

The observations recorded for the economic traits were summarized using mean and standard deviation (mean ± SD) based on three observations. Since the present investigation did not clearly establish independent replicated experimental treatments for statistical inference, comparisons between the Green and Yellow forms were presented descriptively rather than assigning statistical significance or P-values.

Results and Discussion

Mature larval weight

Mature larval weight is an important indicator of larval growth and is associated with subsequent cocoon production. In the present investigation, Green larvae recorded mature larval weights ranging from 7.65 to 8.78 g, with a mean of 8.18 ± 0.57 g. Yellow larvae ranged from 7.51 to 7.64 g, with a mean of 7.58 ± 0.07 g.

Thus, the Green form recorded a comparatively higher mature larval weight than the Yellow form. The greater larval weight may be associated with differences in growth performance and nutrient utilization. Kumar and Elangovan (2010) also reported variation in mature larval weight among eri eco-races and suggested that larval growth can be influenced by eco-race, host plant and environmental conditions.

Table 1 : Mature larval weight of eri silkworm.

Observation	Green larvae	Yellow larvae
R_1	8.78	7.64
R_2	7.65	7.51
R_3	8.11	7.59
Total	24.54	22.74
Mean ± SD	**8.18 ± 0.57**	**7.58 ± 0.07**

Single cocoon weight

Single cocoon weight is an important economic character because heavier cocoons generally provide greater raw material for silk processing. Green larvae produced cocoons weighing 3.83 to 4.22 g, with a mean single cocoon weight of 3.97 ± 0.22 g. Yellow larvae recorded a mean single cocoon weight of 3.48 ± 0.13 g.

Table 2 : Single cocoon weight of eri silkworm.

Observation	Green larvae (g)	Yellow larvae (g)
R_1	4.22	3.33
R_2	3.83	3.59
R_3	3.86	3.51
Total	11.91	10.43
Mean ± SD	**3.97 ± 0.22**	**3.48 ± 0.13**

The comparatively higher cocoon weight in Green larvae indicates better cocoon production under the conditions of the present investigation. Variation in cocoon weight among eri silkworm groups has also been reported by earlier workers and may be related to genetic constitution, host plant nutrition and rearing conditions.

Single shell weight

Shell weight directly reflects the amount of silk present in the cocoon and is therefore an important trait for evaluating silk-producing potential. Green larvae recorded a shell weight ranging from 0.47 to 0.67 g, with a mean of 0.55 ± 0.11 g. Yellow larvae recorded shell weights ranging from 0.46 to 0.49 g, with a mean of 0.48 ± 0.02 g.

Table 3 : Single shell weight of eri silkworm.

Observation	Green larvae	Yellow larvae
R_1	0.67	0.49
R_2	0.47	0.46
R_3	0.51	0.48
Total	1.65	1.43
Mean ± SD	**0.55 ± 0.11**	**0.48 ± 0.02**

The higher mean shell weight observed in Green larvae suggests comparatively greater silk shell production. The observed values are within the range reported for eri silkworm eco-races under different rearing conditions.

Cocoon shell ratio

Cocoon shell ratio is another important indicator of cocoon quality. Green larvae recorded a mean shell ratio of 13.79 ± 1.88%, whereas Yellow larvae recorded 13.73 ± 0.95%.The shell ratio was therefore very similar between the two colour forms, although the mean value was marginally higher in Green larvae. The relatively comparable shell ratios suggest that both forms possessed similar proportions of silk shell in relation to total cocoon weight under the conditions of the study.

Table 4 : Per cent Cocoon shell ratio of eri silkworm.

Observation	Green larvae	Yellow larvae
R_1	15.88	14.71
R_2	12.27	12.81
R_3	13.21	13.67
Total	41.36	41.19
Mean ± SD	**13.79 ± 1.88**	**13.73 ± 0.95**

Effective Rate of Rearing

The Effective Rate of Rearing (ERR) indicates the proportion of larvae successfully completing rearing and forming cocoons. Green larvae recorded an ERR ranging from 90 to 92%, with a mean of 91.00 ± 1.00%. Yellow larvae recorded values ranging from 89 to 91%, with a mean of 90.00 ± 1.00%.

The slightly higher ERR recorded in Green larvae indicates comparatively better survival up to cocoon formation. Similar variations in ERR among eri silkworm strains and eco-races have been reported in earlier studies. Sharma and Kalita (2017) observed differences in ERR among eri strains under different seasonal conditions.

Table 5 : Effective Rate of Rearing (ERR) of eri silkworm.

Observation	Green larvae	Yellow larvae
R_1	90.00	89.00
R_2	91.00	90.00
R_3	92.00	91.00
Total	273.00	270.00
Mean ± SD	**91.00 ± 1.00**	**90.00 ± 1.00**

Deformed larvae

The incidence of deformed larvae was comparatively lower in Green larvae. Green larvae recorded 1.50 ± 0.50% deformed larvae, whereas Yellow larvae recorded 2.00 ± 0.50%.

The lower incidence observed in Green larvae indicates comparatively better larval development under the prevailing conditions. Deformation in silkworm larvae may be influenced by environmental fluctuations, nutrition, disease pressure and handling during rearing.

Cocoon yield per 10,000 larvae

Cocoon yield is one of the most important economic parameters in commercial eri silkworm production. Green larvae recorded cocoon yields of 33.03, 29.44 and 31.97 kg per 10,000 larvae, with a mean of 31.48 ± 1.84 kg. Yellow larvae recorded yields of 28.42, 26.87 and 27.95

Table 6 : Per cent Deformed larvae of eri silkworm.

Observation	Green larvae	Yellow larvae
R_1	2.00	2.50
R_2	1.00	2.00
R_3	1.50	1.50
Total	4.50	6.00
Mean ± SD	**1.50 ± 0.50**	**2.0±0.50**

Table 7 : Cocoon yield per 10,000 larvae of eri silkworm.

Rearing	Green larvae	Yellow larvae
R_1	33.03	28.42
R_2	29.44	26.87
R_3	31.97	27.95
Total	94.44	83.24
Mean±SD	**31.48±1.84**	**27.75±0.79**

kg per 10,000 larvae, with a mean of 27.75 ± 0.79 kg.The Green form therefore produced a comparatively higher cocoon yield than the Yellow form under the prevailing Marathwada conditions. The higher yield was consistent with the comparatively greater mature larval weight and cocoon weight observed in Green larvae. Wongsorn *et al*. (2015) also reported considerable variation in cocoon yield among eri silkworm eco-races, demonstrating the importance of genetic background in determining pro duction performance.

Overall comparison

The economic traits recorded during the investigation showed a consistent trend in favour of the Greenish Blue Plain (GBP) form for most parameters. Green larvae recorded higher mean mature larval weight, single cocoon weight, single shell weight, ERR and cocoon yield than Yellow larvae. The cocoon shell ratio was almost comparable between the two groups, while the incidence of deformed larvae was slightly lower in Green larvae.

The comparatively better performance of Green larvae may be related to differences in their growth and cocoon-forming ability. However, the present observations represent the prevailing conditions of a single experimental period and should therefore be interpreted as a comparative performance assessment rather than a definitive statistical superiority of one colour form over the other.

Conclusion

The present investigation demonstrated that both Greenish Blue Plain and Yellow Plain forms of the Borduar eco-race were capable of successful cocoon production under Marathwada conditions. However, the Green form showed comparatively better performance for mature larval weight, cocoon weight, shell weight, ERR and cocoon yield, while shell ratio remained nearly comparable between the two forms.

The results indicate that the Green form has promising economic performance under the conditions studied. Further evaluation over multiple seasons, generations and properly replicated experiments would be useful to confirm the consistency of these differences.

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Conflict of interest

The authors declare that there is no conflict of interest.

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