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RESEARCH ARTICLE

Comparative evaluation of host plants for ericulture with special reference to Musiri, Tamil Nadu, India

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Abstract

The versatile eri silkworm, a fully domesticated species, can thrive on a variety of plants, including castor and tapioca, making it a year-round producer. However, its production is sensitive to both climate and the nutritional value of its host plants. This study aimed to determine the influence of castor and tapioca, two widely cultivated host plants, on the growth and development of eri silkworms in Musiri, Trichy District, Tamil Nadu, India. Biochemical analysis of selected cultivars was conducted using standard methods outlined by the Association of Official Analytical Chemists. Silkworm rearing and morphometric analysis were carried out following the standard protocol. The nutrient composition of pupae was analysed at Tamil Nadu Veterinary and Animal Science University (TANUVAS), Namakkal, Tamil Nadu, India, to assess their potential as a valuable resource for future research. The study found that castor leaves contained significantly higher levels of nutrients, including nitrogen, phosphorus, potassium, crude protein, total minerals and total carbohydrates, while exhibiting lower levels of anti-nutrients, particularly total tannins, compared to tapioca leaves. This superior nutritional profile led to significantly better performance of silkworms reared on castor, as evidenced by various economic parameters and morphometric analysis. The higher nutrient content of castor-reared pupae was also confirmed through proximate composition analysis. Based on the findings of this study, it is highly recommended that farmers integrate ericulture with castor or tapioca cultivation. By adopting optimal leaf removal practices, farmers can significantly increase their income from both silk production and crop yields. Additionally, this integrated approach can contribute to sustainable agricultural practices.

Keywords: castor and tapioca; eri silkworm rearing; morphometric analysis; nutrient compositions; pupae proximate composition

Introduction

The eri silkworm (*Samia ricini* Donovan) is a fully domesticated, multivoltine and polyphagous species reared year-round on various host plants. These host plants are categorized based on the silkworm's feeding preference: primary (castor and kesseru), secondary (tapioca, payam, borkesseru and barpat) and tertiary. Among the 19 Samia species identified in tropical Asia, three *S. ricini, S. canningi and S. fulva* are unique to India. Castor (*Ricinus communis*) and tapioca (*Manihot esculenta*) are extensively cultivated in Tamil Nadu, particularly in the districts of Salem, Dharmapuri, Namakkal, Erode and Coimbatore. These plants serve as primary and secondary host plants for eri silkworms, respectively. To enhance tuber yield, farmers traditionally prune weak tapioca branches six months after planting. The pruned leaves, often discarded, can be reused for ericulture, providing an additional income source (1). Similarly, studies have shown that defoliating up to 30 % of castor leaves does not significantly impact seed yield, making ericulture a sustainable practice for castor farmers in non-traditional sericulture states like Tamil Nadu (2).

The nutritional composition of host plants significantly influences the growth and development of eri silkworms. Previous research has shown that larvae reared on castor leaves display enhanced α-amylase and lipase activities, resulting in greater larval weight and better silk gland development than those fed on tapioca or papaya. The favourable biochemical profile of castor leaves, characterized by higher crude protein and lipid content, further supports improved cocoon quality and increased silk yield.

Considering the marked differences in the nutritional composition of castor and tapioca leaves, the present study was undertaken to assess their influence on the growth and development of eri silkworms (various economic parameters), focusing on the Musiri region of the Trichy District, Tamil Nadu. It was hypothesized that eri silkworms reared on these host plants would develop distinct nutrient profiles in the pupal stage, which could, in turn, affect silk production and quality. To test this hypothesis, a comparative biochemical analysis of pupae from castor and tapioca-fed silkworms was carried out.

Materials and Methods

Determination of the nutritive profile of host plants

Estimation of various biochemical parameters in selected tapioca and castor cultivars was carried out according to the following protocol (3).

Total carbohydrates

To estimate total carbohydrates, 100 mg of leaf sample from each cultivar was hydrolyzed with 2.5 N HCl, neutralized with sodium carbonate and diluted to 100 mL. A glucose standard was used to quantify carbohydrates using the anthrone reagent method, with absorbance measured at 630 nm.

Total tannin

To estimate total tannins, 0.5 g of powdered leaf sample was boiled in water, centrifuged and the supernatant was used as a sample extract. A portion of this extract was mixed with Folin-Denis's reagent and sodium carbonate solution. After 30 min, the absorbance of the mixture was measured at 700 nm to quantify tannins.

Total mineral

To estimate total mineral content, 5 g of the leaf sample was charred on a hot plate, then ashed in a muffle furnace at 600 °C until the ash was white or greyish-white. The ash was cooled and weighed to determine the mineral content.

Nitrogen content

To estimate nitrogen content, 1 g of dried plant sample was digested with a mixture of sulfuric and perchloric acids until a clear solution was obtained. The solution was filtered, diluted and a portion was transferred to a micro-Kjeldahl flask. After adding sodium hydroxide, the released ammonia was distilled into a boric acid solution.

Phosphorus

To estimate phosphorus content, 1 g of powdered plant sample was digested with a triple acid mixture (HNO_3:H_2SO_4:$HClO_3$) until a clear solution was obtained. The solution was filtered, diluted and a portion was mixed with Barton's reagent. After 10 min, the yellow-coloured solution was measured calorimetrically at 470 nm to determine phosphorus content.

Potassium

1 g of powdered plant sample was digested with a triple acid mixture (HNO_3: H_2SO_4: $HClO_3$) until a clear solution was obtained. The solution was filtered, diluted to 100 mL and analyzed for potassium content using a flame photometer. The results were expressed as a percentage of the dry weight of the sample. Biochemical analyses of castor and tapioca leaves were performed with three independent biological replicates per host plant, each comprising pooled leaves from at least five randomly selected plants.

Host plant cultivation

The castor cultivar YRCH-1, procured from the tapioca and castor Research Station, Yethapur, Tamil Nadu, was selected for eri silkworm rearing due to its moderate resistance to capsule borer and suitability for both irrigated and rainfed conditions, with a total crop duration of approximately 150-160 days and first picking at around 90 days after sowing (4, 5). Similarly, the tapioca cultivar YTP-1, known for its resistance to cassava mosaic virus, was sourced from the same institute (6). Both crops were planted on 2nd July 2024 in 40 × 20 m plots using the ridge-and-furrow method, a land preparation technique where alternating raised ridges and sunken furrows are formed to improve drainage, root aeration and irrigation efficiency. Castor was planted at a spacing of 120 × 90 cm and tapioca at 90 × 90 cm. Standard agronomic practices recommended for each crop were followed.

Eri silkworm rearing

Eri silkworm Disease Free Laying's (DFLs) (Fig. 1 & 2) were obtained from the Eri Silkworm Seed Production Centre, Central Sericulture Germplasm Resource Centre, Hosur, Tamil Nadu.

Rearing conditions and feeding protocol

Immediately after hatching, the eggs were transferred to plastic trays lined with newspapers to maintain optimal temperature and humidity. The larvae were reared on both tapioca and castor leaves (Fig. 3 & 4), fed three times daily and the bed was cleaned daily. For the first two instars, chopped tender leaves were provided, while whole leaves were used from the third instar onwards. Five different larval stages were shown in Fig. 5. During the rearing period, larvae were maintained through regular feeding, periodic cleaning of the rearing bed, provision of adequate spacing, careful handling during moulting and removal of weak or diseased individuals.

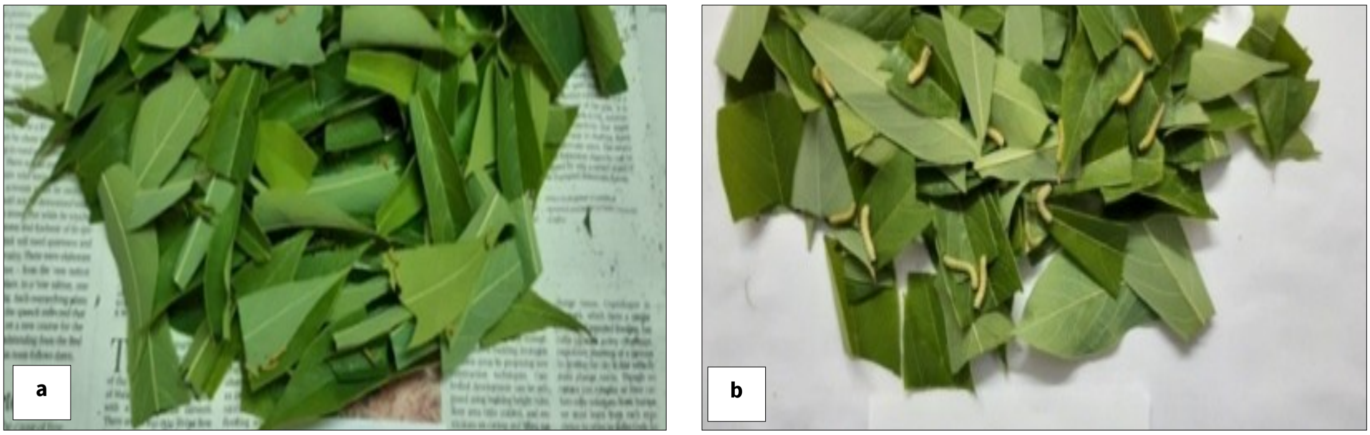
Mounting

In the mature fifth instar stage, larvae cease feeding after voiding their gut contents and actively search for suitable sites to spin cocoons. These ripened larvae were subsequently transferred to plastic collapsible mountages (Netrikas) for cocoon spinning (Fig. 6 & 7).

Fig. 1. Eggs of eri silkworm.

Fig. 2. Close view of eri silkworm egg.

Fig. 3. Rearing of eri silkworm in castor YRCH - 1: **a.** First instar larvae; **b.** Second instar larvae; **c.** Third instar larvae; **d.** Fourth instar larvae; **e.** Fifth instar larvae and **f.** Cocoons.



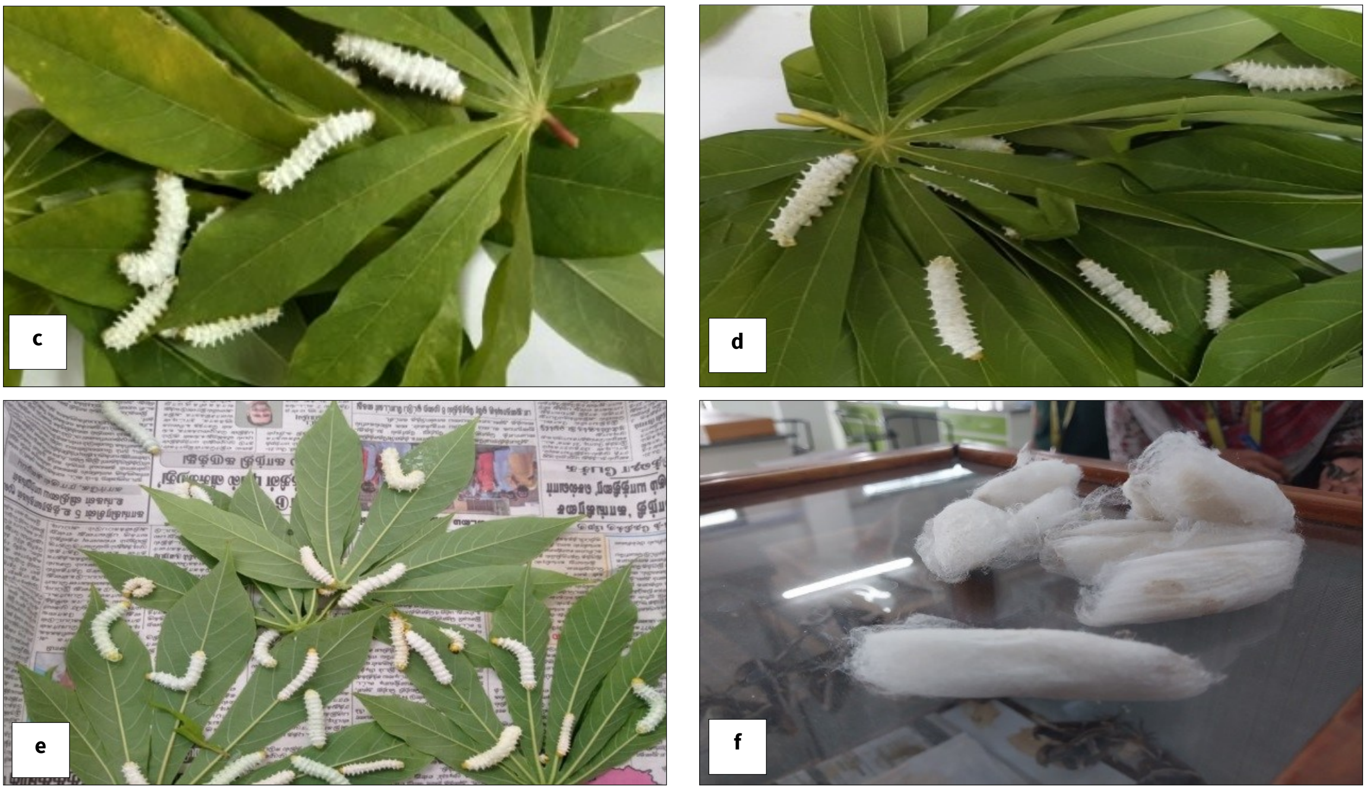


Fig. 4. Rearing of eri silkworm in tapioca YTP 1: **a.** First instar larvae; **b.** Second instar larvae; **c.** Third instar larvae; **d.** Fourth instar larvae; **e.** Fifth instar larvae and **f.** Cocoons.

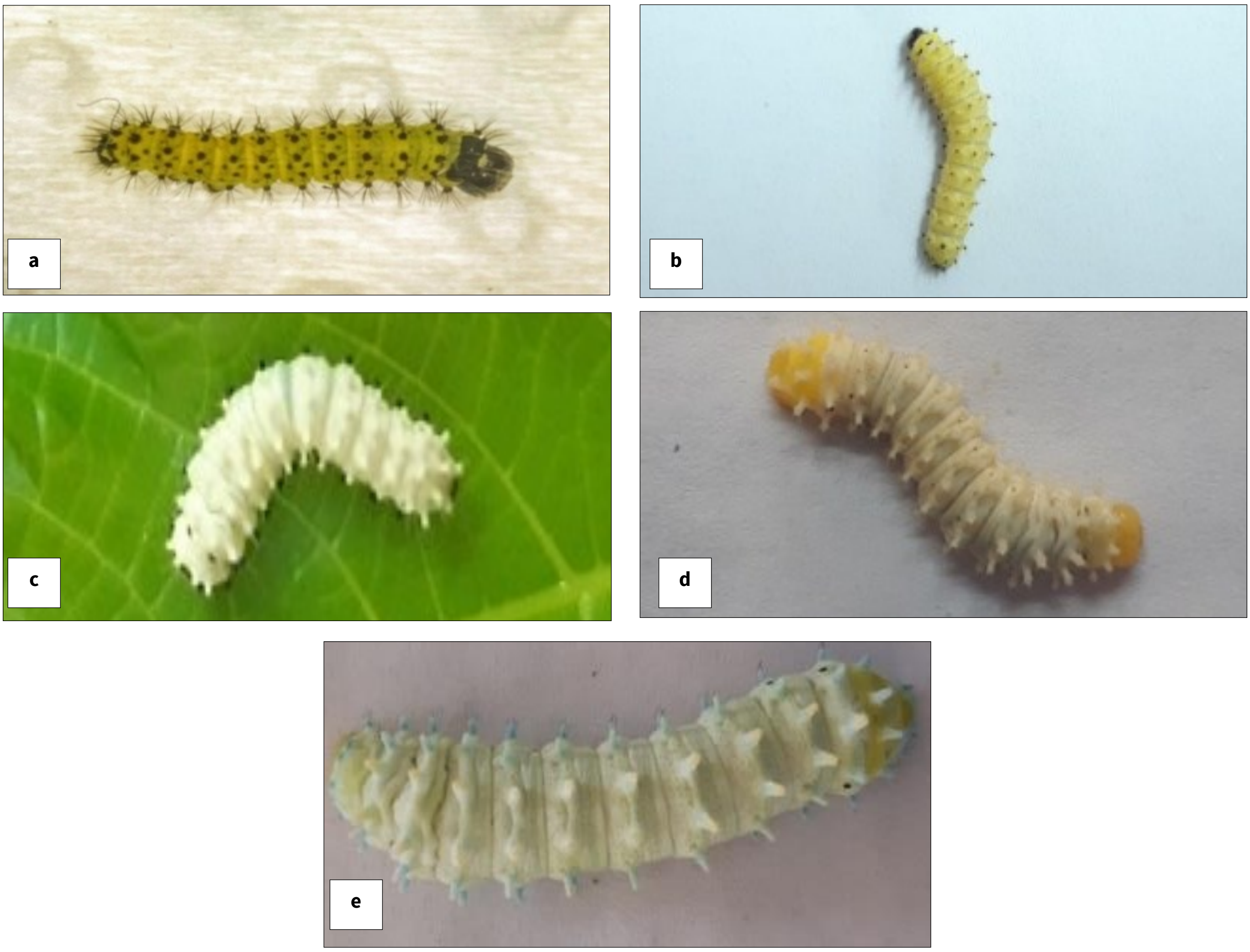


Fig. 5. Different instars of eri silkworm: **a.** First instar larvae; **b.** Second instar larvae; **c.** Third instar larvae; **d.** Fourth instar larvae; **e.** Fifth instar larvae and **f.** Cocoons.

Fig. 6. Mounting of worms.

Fig. 7. Cocoon.

Economic parameters measured

Economic parameters like larval duration, matured larval weight, cocoon weight, pupal weight, shell weight, shell ratio, percent pupation, percent adult emergence, sex ratio, fecundity rate, adult longevity and Effective Rate of Rearing (ERR %), were measured (Fig. 8-10) (7). Similarly, all these parameters were worked out for the castor cultivar (control) also.

Larval duration: Total time (in days) from hatching to completion of the fifth instar.

Matured larval weight: Average fresh weight (g) of fully grown fifth instar larvae before cocooning.

Cocoon weight: Fresh weight (g) of the whole cocoon, including the pupa.

Pupal weight: Fresh weight (g) of the pupa after removing the cocoon shell.

Shell weight: Dry weight (g) of the silk shell after removal of the pupa.

Shell ratio: Proportion (%) of shell weight to whole cocoon weight, indicating silk yield potential.

% pupation: Percentage of larvae that successfully pupated relative to the total number of larvae reared.

% adult emergence: Proportion (%) of pupae from which adults emerged successfully.

Sex ratio: Ratio of emerged females to males.

Fecundity rate: Average number of eggs laid per female moth during its reproductive lifespan.

Adult longevity: Mean lifespan (days) of male and female moths after emergence.

Effective rate of rearing (ERR): Percentage of healthy cocoons obtained from the total number of larvae brushed. All economic parameters were evaluated using three independent biological replicates, each comprising ten randomly selected individuals.

Morphometric analysis

Morphometric data were recorded for all developmental stages of the eri silkworm, including first to fifth instar larvae, cocoon, pupa and adult moths (wingspan, body length and body breadth). Measurements were taken using a transparent microscale (precision ± 0.1 mm). For each stage, three independent biological replicates were evaluated, with ten randomly selected individuals per replicate. All observations were conducted under uniform lighting and environmental conditions and larvae or adults were gently restrained to prevent

Fig. 8. Larval weight measurement.

Fig. 9. Pupal weight measurement.

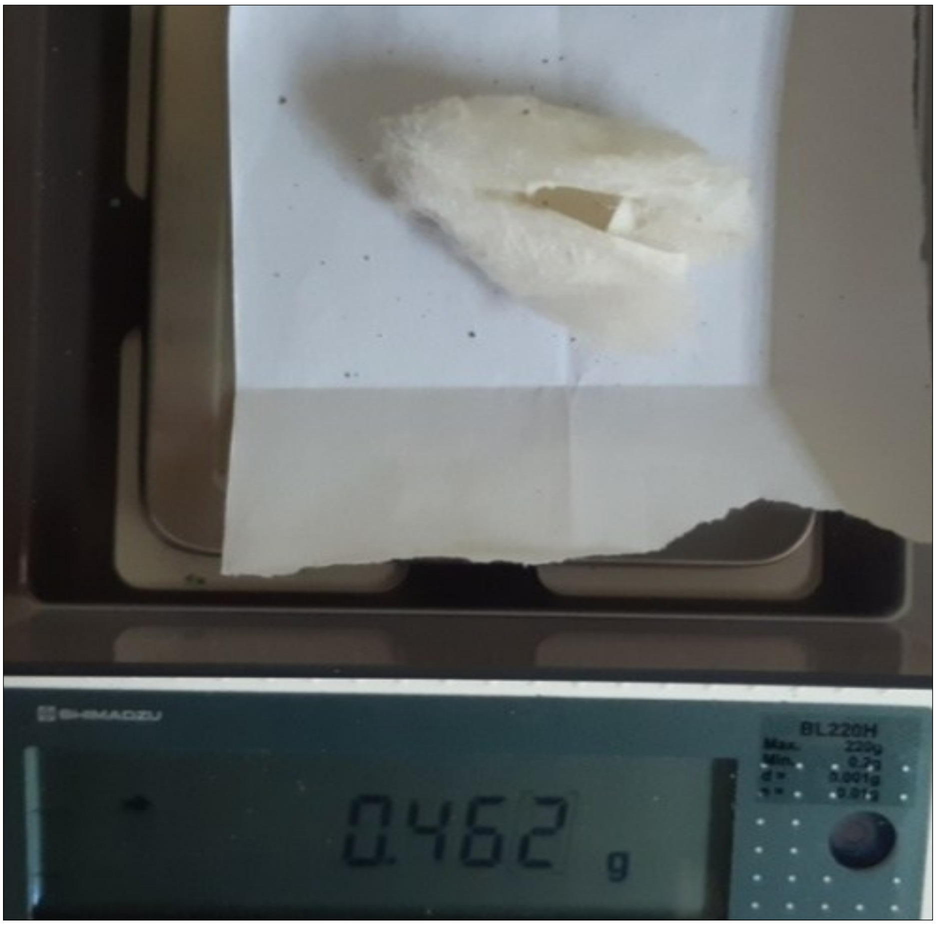


Fig. 10. Shell weight measurement.

movement during measurement, thereby ensuring accuracy and repeatability.

Nutrient analysis of pupae

Dried pupae from castor and tapioca-fed silkworms were ground into a fine powder after oven-drying at 60 °C. A 100 g subsample of each was submitted to TANUVAS, Namakkal, for proximate composition analysis. For each diet (castor and tapioca), a 100 g composite sample of oven-dried (60 °C) pupal powder was prepared by pooling material from 30 individuals collected from separate rearing trays. The composite sample for each diet was submitted to TANUVAS, Namakkal, for proximate composition analysis. All biochemical estimations were performed in technical triplicate.

Statistical analysis

All experiments were conducted with three independent biological replicates, each comprising pooled material from multiple randomly selected individuals or plants. Morphometric traits were measured (precision ± 0.1 mm) from ten individuals per replicate across all developmental stages. Economic parameters were expressed as mean ± SD, while results were reported as mean ± SE unless otherwise stated. Comparisons between castor and tapioca-fed groups were performed using independent two-sample t-tests and one-way ANOVA was applied where multiple developmental stages were compared. For pupal nutrient analysis, a single composite sample per diet was analysed; thus, comparisons reflect technical variation only. Statistical significance was set at $p < 0.05$. Analyses were performed using IBM SPSS Statistics v26.0 (IBM Corp., Armonk, NY, USA).

Results and Discussion

Evaluation of nutrient composition of castor and tapioca on eri silkworm growth and development

The comparative biochemical analysis revealed clear differences in nutrient and anti-nutrient composition between castor (*Ricinus communis*) and tapioca (*Manihot esculenta*) leaves, with important implications for insect growth and development. Castor leaves recorded significantly higher values across all nutritive parameters assessed: nitrogen (5.30 ± 0.76 vs. 3.90 ± 0.55 in tapioca), phosphorus (1.10 ± 0.04 vs. 0.60 ± 0.04), potassium (2.10 ± 0.11 vs. 1.40 ± 0.29), crude protein (28.19 ± 0.90 vs. 21.09 ± 0.72), total carbohydrate (570 ± 1.88 vs. 419 ± 0.99) and total mineral content (15.3 ± 1.07 vs. 12.1 ± 1.05). These results confirm the nutritional superiority of castor foliage, which provides a richer source of nitrogen and protein, key drivers of insect growth, than tapioca leaves (Table 1).

Table 1. Comparative nutritional analysis of castor and tapioca leaves

S.no	Composition	Castor leaf	Tapioca leaf
1	Nitrogen (%)	5.30 ± 0.76	3.90± 0.55
2	Phosphorus (%)	1.10 ± 0.04	0.60 ± 0.04
3	Potassium (%)	2.10 ± 0.11	1.40 ± 0.29
4	Crude protein (%)	28.19 ± 0.90	21.09 ± 0.72
5	Total carbohydrates (μg/ml)	570 ± 1.88	419 ± 0.99
6	Total mineral (%)	15.3 ± 1.07	12.1 ± 1.05
7	Total tannin (mg/g)	11.01 ± 1.33	27.8 ± 1.21

Data expressed as mean ± SE

In contrast, tapioca leaves exhibited markedly higher anti-nutrient levels, recording total tannin at 27.8 ± 1.21, compared to a much lower value in castor leaves. Additionally, tapioca foliage contains hydrogen cyanide (HCN) from cyanogenic glycosides such as linamarin and lotaustralin, known to exert toxic and growth-inhibitory effects on herbivorous insects (8). The elevated nitrogen and crude protein levels in castor leaves provide essential amino acids for tissue synthesis and enzymatic activity, thereby promoting higher larval biomass and faster developmental rates. Similar relationships have been observed in the eri silkworm (*Samia ricini*), where higher host-leaf protein and nitrogen were associated with improved larval performance and reproductive output. The present results, therefore, explain the superior growth of eri silkworm reared on castor foliage.

Tapioca's high tannin concentration can bind dietary proteins and digestive enzymes, reducing digestibility and nutrient absorption efficiency (9). The additional presence of HCN further suppresses feeding and impairs respiratory metabolism in the eri silkworm by inhibiting cytochrome oxidase. The superior performance of the eri silkworm fed on castor leaves is thus a product of two complementary factors: higher nutrient supply (particularly nitrogen and crude protein) and lower anti-nutrient burden. In contrast, tapioca's reduced nutrient density, coupled with high tannin and HCN levels, creates a biochemically challenging diet that limits the eri silkworm's growth and performance. From an applied perspective, castor remains a superior host for eri silkworm rearing due to its rich nutrient profile and lower anti-nutrient levels.

The rearing performance of *Samia ricini* on castor (*Ricinus communis*) and tapioca (*Manihot esculenta*) leaves revealed a significantly superior performance of castor over tapioca in all recorded economic parameters. Larvae fed on castor completed their larval stage in 21 days 6 hr, whereas those reared on tapioca required 24 days 8 hr, indicating an extended developmental period of approximately 3 days 2 hr on tapioca. Prolonged larval duration is a common phenomenon when the host plant fails to meet the insect's nutritional requirements or contains antinutritional or toxic metabolites that interfere with metabolic processes (10, 11). In such cases, larvae may increase their food intake to compensate for nutrient deficiencies, but the overall growth rate remains slow (12). This pattern was evidenced in the present study, with castor-fed larvae completing development significantly faster than those fed on tapioca.

In terms of growth traits, castor-fed larvae achieved higher values for mature larval weight, cocoon weight, pupal weight, shell weight and shell ratio compared to those on tapioca. These parameters are directly influenced by the nutrient profile of the host plant, particularly protein and amino acid content, which are essential for silk gland development and cocoon formation (13, 14). The superior performance of castor in these traits suggests that its leaves provide a more balanced nutritional profile conducive to rapid biomass accumulation and higher silk yield.

Survivorship parameters also reflected the superiority of castor. Percent pupation and adult emergence were significantly higher for castor-fed larvae than for those reared on tapioca. The lower survival rates on tapioca may be attributable to unsuitable secondary metabolites, such as cyanogenic glycosides, which are known to occur in *M. esculenta* leaves and can negatively affect insect physiology (15). These compounds may impair metabolic efficiency, leading to reduced survival through metamorphosis.

Reproductive parameters followed the same trend. Fecundity, adult longevity and effective rate of rearing (ERR) were highest in the castor-fed group. High Effective Rate of Rearing (ERR) is a key determinant of economic success in eri silkworm culture, as it combines survival rate, cocoon quality and reproductive performance into a single index (16). The prolonged larval duration and reduced reproductive output observed on tapioca not only diminish productivity but also increase rearing costs due to longer crop cycles (Table 2).

The results of the present study agree with earlier findings that host plant species significantly influence growth, development and silk production in eri silkworms (17). Castor's superior nutrient composition, along with the absence of strong antinutritional factors, allows for faster growth, better silk yield, higher survival and improved reproductive potential. Conversely, tapioca leaves, while serving as an alternative host, may contain suboptimal nutrient ratios and secondary metabolites that limit their suitability for large-scale commercial rearing.

Morphometric analysis of eri silkworm reared on both castor and tapioca

The larvae in the first and second instars exhibited a yellow body with a black head capsule, with the second instar showing a reduction in setae compared to the first. In the third instar, the body colour changed to white with a light powdery coat while retaining the black head capsule. The fourth instar larvae displayed a white body with a yellow head capsule, along with the development of scoli. In the penultimate stage, the white body and yellow head capsule were like the fourth instar, but the scoli became more robust and prominent, a distinct black spiracle spot was present and the anal claspers were fully developed. These morphological transformations are consistent with instar-specific changes documented in earlier study and reflect adaptive structural changes such as enhanced defence (scoli development) and functional maturity (claspers, spiracles) (13).

Morphometric measurements, including the length and breadth of larvae across all five instars, cocoon size, pupal size and adult wingspan, were consistently higher in larvae fed on castor compared to tapioca (Table 3 & 4). These results align with previous findings that superior nutritional quality in host plants directly contributes to enhanced growth performance in

Table 2. Economic parameters of eri silkworm reared on castor and tapioca leaves

S.no	Indices	Reared on castor	Reared on tapioca
1	Larval duration (Days: Hours)	21:6	24:8
2	Matured larval weight (g)	8.86	6.49
3	Cocoon weight (g)	3.36	2.41
4	Shell weight (g)	0.67	0.42
5	Pupal weight (g)	2.68	1.99
6	Shell ratio (%)	19.94	17.42
7	Percent pupation	89.0	71.0
8	Percent adult emergence	85.0	60.0
9	Sex ratio (Male: Female)	1:3	1:2
10	Fecundity rate	295	240
11	Adult longevity (in days)	6.0	4.0
12	Effective Rate of Rearing (ERR %)	90.0	82.0

Table 3. Morphometric analysis of eri silkworm reared on castor leaves

S. No	Stages	Length (Cm) average ± SE	Breadth (Cm) average ± SE
1	1st Instar Larvae	0.61 ± 0.13	0.12 ± 0.02
2	2nd Instar Larvae	1.50 ± 0.20	0.33 ± 0.08
3	3rd Instar Larvae	3.89 ± 0.72	0.48 ± 0.04
4	4th Instar Larvae	5.23 ± 0.27	0.70 ± 0.09
5	5th Instar Larvae	7.90 ± 0.09	1.15 ± 0.12
6	Cocoon	5.29 ± 0.02	1.34 ± 0.28
7	Pupae	3.72 ± 0.11	0.95 ± 0.08
8	Adult Wingspan	11.92 ± 0.87	5.66 ± 0.05
9	Adult Size	4.87 ± 0.14	0.73 ± 0.05

Data expressed as mean ± SE

Table 4. Morphometric analysis of eri silkworm reared on tapioca leaves

S.no	Stages	Length (Cm) average ± SE	Breadth (Cm) average ± SE
1	1st Instar Larvae	0.39 ± 0.17	0.08 ± 0.01
2	2nd Instar Larvae	1.22 ± 0.18	0.19 ± 0.09
3	3rd Instar Larvae	2.65 ± 0.08	0.37 ± 0.06
4	4th Instar Larvae	4.50 ± 0.35	0.52 ± 0.08
5	5th Instar Larvae	5.96 ± 0.48	0.81 ± 0.06
6	Cocoon	3.63 ± 0.19	0.79 ± 0.07
7	Pupae	2.62 ± 0.16	0.65 ± 0.09
8	Adult Wingspan	8.76 ± 0.83	3.67 ± 0.02
9	Adult Size	3.58 ± 0.27	0.61 ± 0.07

Data expressed as mean ± SE

lepidopteran insects (18). Similar patterns have been reported in *Malacosoma disstria*, where larvae on nutrient-balanced diets achieved larger size and faster development and in *Argyrotaenia sphaleropa*, where nutrient-rich diets influenced head capsule width and shortened development periods (19, 20). The larger adult wingspan observed in castor-fed insects in the present study further indicates that diet influences not only larval and pupal size but also adult morphometric traits.

Evaluation of the nutrient profile of eri silkworm pupae reared on castor and tapioca

Nutrient composition analysis revealed that pupae reared on castor possessed higher protein, fat and mineral content than those reared on tapioca. Protein levels in castor-fed pupae in the present study were comparable to the 16 g/100 g reported, while fat content approached 8 g/100 g, along with notable mineral and amino acid profiles (Table 5). These values exceed or match the nutritional quality of other commonly reared insect pupae, such as black soldier fly (*Hermetia illucens*) or mealworm (*Tenebrio molitor*), which typically range from 14-20 g/100 g protein and have lower essential amino acid scores (21). Reports on *Spodoptera littoralis* demonstrate that protein-rich diets increase larval and pupal mass while shortening development time, further supporting the role of dietary protein in promoting efficient growth (12). Similarly, in *Lymantria dispar*, higher protein intake under suitable temperature conditions enhanced larval fitness traits (18).

Table 5. Comparative proximate composition of eri silkworm pupae fed castor and tapioca leaves

S.no	Composition	Pupae reared through castor	Pupae reared through tapioca
1	Protein (%)	59.43 ± 1.12	51.90 ± 0.92
2	Lipid (%)	22.19 ± 1.82	17.37 ± 1.52
3	Carbohydrate (%)	4.90 ± 0.49	3.78 ± 0.13
4	Moisture (%)	10.12 ± 1.18	9.06 ± 1.21
5	Ash (%)	1.10 ± 0.16	0.89 ± 0.02
6	Fibre (%)	1.38 ± 0.06	1.12 ± 0.08

Data expressed as mean ± SE

The nutrient richness of eri silkworm pupae has broad implications for utilisation. Silkworm pupae, both defatted and full-fat, can contain up to 75-80 % protein in defatted form, with high proportions of unsaturated fatty acids, including α-linolenic and linoleic acids, as well as micronutrients such as zinc, calcium and potassium (22). In addition to their value as human or animal food, pupae with such nutrient density are highly suitable for the mass multiplication of beneficial insects such as parasitoids and predators. Beyond *Samia ricini*, similar nutritional patterns are seen in *Gonimbrasia cocaulti* and *Samia ricini*, where pupae contain 50-62 % crude protein along with vitamins B_6, B_9 and B_{12}, α -tocopherol and high mineral concentrations. The potential of insect pupae for feed production is increasingly recognised globally, with applications in poultry and aquaculture diets due to their balanced amino acid profile, lipid quality and digestibility (23). The present results thus demonstrate that castor is a superior host plant compared to tapioca for rearing *S. ricini*, yielding better larval growth, larger morphometrics and a richer nutrient profile in pupae. The strong nutritional quality of pupae produced on both host plants, however, underscores their potential as a sustainable and high-quality feed ingredient and as a resource for biocontrol agent production. These findings, supported by prior research, highlight the dual role of host plant selection in optimising both silkworm productivity and the downstream value of their products in integrated farming and feed systems.

Conclusion

This study demonstrates that castor (*Ricinus communis*) is markedly superior to tapioca (*Manihot esculenta*) as a host plant for eri silkworm (*Samia ricini*), owing to its higher nitrogen, crude protein, carbohydrate and mineral content and lower anti-nutrient levels. Castor-fed larvae exhibited faster development, higher survival, greater biomass, improved cocoon and silk traits and superior reproductive performance compared to those reared on tapioca. The poorer performance on tapioca was attributable to lower nutrient density and elevated tannin and hydrogen cyanide levels, which impaired nutrient utilisation and metabolism. Nutritional profiling of pupae confirmed that castor supports the production of high-protein, lipid-rich and mineral-dense insect biomass, reinforcing their value as a sustainable feed ingredient and potential human food source. Overall, selecting nutrient-rich host plants such as castor can substantially enhance eri silkworm productivity and the economic returns of eri culture, while also contributing to sustainable protein production for diversified agricultural systems.

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Authors' contributions

ABB contributed to data collection and compilation. RBL participated in data collection and compilation. SCH assisted in collecting and compiling the data. DD contributed to data collection activities. MD was involved in data gathering and compilation. PJ assisted in compiling the dataset. RKG prepared the manuscript and carried out fine-tuning of the content. All authors planned and executed the research and approved the final version of the manuscript.

Compliance with ethical standards

Conflict of interest: The authors declare no conflict of interest.

Ethical issues: None

References

1. Sakthivel N. Standardization of cassava leaf harvest in relation to ericulture cum tuber production. Int J Agric Innovations Res. 2018;6(5):190-5.
2. Narayanamma VL, Padmasri A. Rearing of eri silkworm and its economic viability to rainfed castor farmers. Indian J Entomol. 2022;84(4):814-8. https://doi.org/10.55446/IJE.2021.75
3. Association of Official Analytical Chemists. Official methods of analysis of the Association of Official Analytical Chemists. Vol. II. 15th ed. Arlington (VA): Association of Official Analytical Chemists; 1990.
4. Indian Council of Agricultural Research - Indian Institute of Oilseeds Research. YRCH-1: A promising castor hybrid for Tamil Nadu [Internet]. Hyderabad: ICAR-IIOR; 2024 (10 July 2010). Available from: https://icar-iior.org.in
5. Tamil Nadu Agricultural University. Crop improvement: Castor - YRCH-1 [Internet]. Coimbatore: TNAU; (11 Sept 2009). Available from: https://agritech.tnau.ac.in
6. Tamil Nadu Agricultural University, Agritech Portal. Crop improvement: Tapioca - YTP-1 [Internet]. 2020. Available from: https://agritech.tnau.ac.in
7. Chowdhury S, Das R, Deka M. Influence of host plants on the growth and development of eri silkworm (*Samia ricini Boisduval*). J Entomol Zool Stud. 2020;8(2):1405-10.
8. Nwosu MO, Onyeneke EN, Okwuosa EA. Cyanogenic potential of cassava and its effect on insect pests. Afr J Biotechnol. 2016;15 (24):1225-30.
9. Pinto-Zevallos DM, Querol MAP, Ambrogi B. Cassava wastewater as a natural pesticide: current knowledge and challenges for broader utilisation. Ann Appl Biol. 2018;173(3). https://doi.org/10.1111/aab.12464
10. Nair MR, Varghese J, Thomas G. Role of host plant nutrition on insect herbivore performance: a review. Curr Sci. 2017;112 (6):1173-82.
11. Kiran K, Reddy NA, Kumar VN. Nutritional and antinutritional factors in host plants and their influence on insect growth. Int J Trop Insect Sci. 2019;39(2):157-65. https://doi.org/10.1007/s42690-019-00045-5
12. de Paula C T, Paolucci R, Rizzi E. Macronutrient balance affects development, survival and metabolism in *Spodoptera littoralis*. J Insect Physiol. 2021;133:104263. https://doi.org/10.1016/j.jinsphys.2021.104263
13. Brahma D, Swargiary A, Dutta K. A comparative study on morphology and rearing performance of *Samia ricini* and *Samia canningi* crossbreed with reference to different food plants. J Entomol Zool Stud. 2015;3(5):12-9.
14. Naik CM, Patil GM, Murthy C, Awaknavar JS, Shekharappa, Alagundagi SC. Development and economic cocoon parameters of eri silkworm, *Samia cynthia ricini* Boisduval (Lepidoptera: Saturniidae) as influenced by new hosts. Karnataka J Agric Sci. 2010;23(5):716-21.
15. Mohidin SRNSP, Moshawih S, Hermansyah A, Asmuni MI, Shafqat N, Ming LC. Cassava (*Manihot esculenta* Crantz): a systematic review for the pharmacological activities, traditional uses, nutritional values and phytochemistry. J Evid Based Integr Med. 2023;28. https://doi.org/10.1177/2515690X231206227
16. Mohidin SRNSP, Moshawih S, Hermansyah A, Asmuni MI, Shafqat N, Ming LC. Cassava (*Manihot esculenta* Crantz): a systematic review for the pharmacological activities, traditional uses, nutritional values and phytochemistry. J Evid Based Integr Med. 2023;28. https://doi.org/10.1177/2515690X231206227
17. Yaligar M. Rearing performance of eri silkworm, *Samia cynthia ricini* Boisduval on different species of Terminalia and its impact on cocoon quality [master's thesis]. Bangalore: University of Agricultural Science; 2014. Available from: http://krishikosh.egranth.ac.in/handle/1/5810004207
18. Grusak MA, Keena MA, Elkinton JS. Effects of dietary protein and temperature on the development of *Lymantria dispar* (Lepidoptera: Erebidae). Insects. 2023;14(3):252. https://doi.org/10.3390/insects14030252
19. Parrish MD, Connor EF, Beck CW. Larval nutrition affects life-history traits in a moth (*Malacosoma disstria* Hubner). J Exp Biol. 2009;212(12):1794-800. https://doi.org/10.1242/jeb.027409
20. Castillo JA, Rubiolo ER, Greco NM. Growth and development of *Argyrotaenia sphaleropa* (Meyrick) (Lepidoptera: Tortricidae) on different diets. Neotrop Entomol. 2011;40(2):206-11. https://doi.org/10.1590/S1519-566X2011000200011
21. Muzzarelli RAA, Bhuvaneswari R, Ramesh V. Nutritional composition of selected edible insects and their potential as food and feed. Foods. 2023;12(3):456. https://doi.org/10.3390/foods12030456
22. Longvah T, Mangthya K, Ramulu P. Nutrient composition and protein quality evaluation of eri silkworm (*Samia ricini Boisdual*.) prepupae and pupae. Food Chem. 2011;128(2):400-3. https://doi.org/10.1016/j.foodchem.2011.03.041
23. Oonincx DGAB, van Itterbeeck J, Heetkamp MJW, van den Brand H, van Loon JJA. An exploration of greenhouse gas and ammonia production by insect species suitable for animal or human consumption. PLoS One. 2010;5(12):e14445. https://doi.org/10.1371/journal.pone.0014445

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