Tasar silkworm rearing on kusum: A new approach

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Abstract

This study showcases the viability of rearing tropical tasar silkworms (*Antheraea mylitta* D.) on Kusum (*Schleichera oleosa*) trees, traditionally used for lac cultivation. The rearing process, from coupling to harvesting, spanned approximately two months, yielding 31 cocoons per tree. In future integration tasar rearing with lac production on Kusum trees presents a lucrative opportunity for rural and tribal communities, with added benefits like silkworm excreta-based dye extraction. This eco-friendly approach fosters a circular economy, generating a new income stream for farmers.

Keywords: Tasar silkworm, Kusum, lac cultivation, sustainable agriculture, sericulture, rural development.

Tropical tasar silkworm, *Antheraea mylitta* D., is a key source of tasar silk. Traditional rearing relies on specific primary food plants, but the search for alternative host plants could increase production and sustainability.

Tasar Silkworm Food Plants

Tasar silkworms feed on a variety of plants, categorized into primary, secondary and tertiary. Primary food plants include *Terminalia arjuna* (Arjun), *Terminalia tomentosa* (Asan), *Lagerstroemia speciosa* (Jarul), and *Shorea robusta* (Sal), which silkworms prefer. Secondary and tertiary plants are those where silkworms can survive but are not typically the first choice.

Exploring Kusum for Tasar Silkworms

Kusum (*Schleichera oleosa*) is a versatile tree traditionally valued for lac cultivation, but its benefits extend far beyond this. It holds significant

Table 1: The lifecycle of tasar silkworm on kusum.

Stage	Date /Stadium
Date of Coupling	01.11.2023
Date of hatching	11.11.2023
Incubation	10 Days
I Instar	5 Days
I moult	16.11.2023
II Instar	5 days
II moult	21.11.2023
III Instar	7 days
III moult	28.11.2023
IV Instar	9 days
IV moult	07.12.2023
V Instar	12 days
Spinning	7 days
Harvesting	10.01.2024

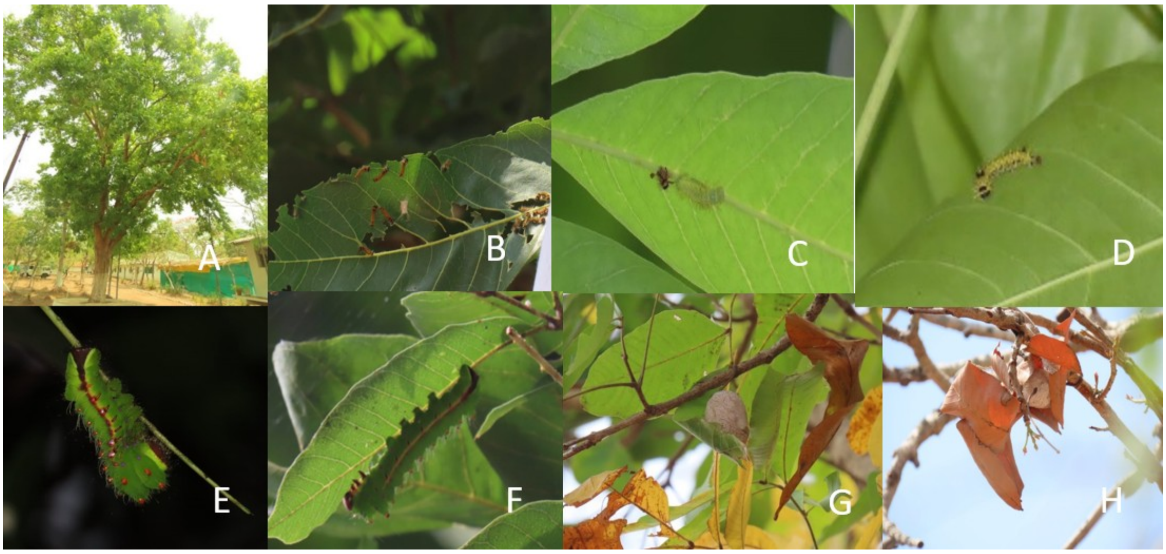

Figure 1: Tropical Tasar Silkworm rearing on Kusum Tree (A. Kusum tree, B. Brushed worms, C. Molting process of worms, D. Chawki worm E&F. Mature worms, G&H. Cocoons intact with kusum leaves.)

pharmacological potential, exhibiting anticancer, antioxidant, and antimicrobial properties, which could lead to new medical applications. In addition, Kusum offers promise for biodiesel production, with its biodiesel having a higher cetane number than petroleum diesel, positioning it as a viable alternative fuel. Moreover, its low tannin levels make it safe for use as livestock feed, further demonstrating its wide-ranging utility.

Nadaf et al. (2022) reported that lac cultivation could be integrated with tasar culture, given that *Ziziphus mauritiana* serves as a common host plant for both lac insects and tasar silkworms. However, Kusum (*S. oleosa*) had not been considered a food plant for the Daba ecorace of tropical tasar silkworms. This perception changed when the Basic Seed Multiplication and Training Centre (BSMTC) in Bastar, operating under the Basic Tasar Silkworm Seed Organization (BTSSO) of Central Silk Board, conducted rearing trials with tasar silkworms on Kusum for the first time.

Integrating Tasar Silk and Lac Production

Kusum has long been a host plant for lac insects. Its potential as a food plant for tasar silkworms has been studied by the Basic Seed Multiplication and Training Center (BSMTC) in Bastar where the 2 disease free layings (DFL) were bushed on 11.11.2023 on 20 year old tree.

Observations

It was observed that the first instar (larval stage) lasted for 5 days, from 11.11.2023 to 16.11.2023, followed by the first moult on 16.11.2023. The second instar also lasted 5 days, from 16.11.2023 to 21.11.2023, ending with the second moult on 21.11.2023. The third instar had a longer duration of 7 days, from 21.11.2023 to 28.11.2023, with the third moult occurring on 28.11.2023. The IV instar stage lasted 9 days, from 28.11.2023 to 07.12.2023, followed by the fourth moult on 07.12.2023. The fifth instar was the longest, lasted 12 days, from 07.12.2023 to 19.12.2023 and it was the final larval stage before the silkworms began spinning cocoons which lasted for 7 days, from 19.12.2023 to 26.12.2023. The fully formed cocoons were harvested on 10.01.2024 (Table).

The key observations were as follows:

- Incubation period was observed from 01.11.2023 to 11.11.2023 (10 days) while the larval development spanned approximately 38 days, culminating in the spinning stage.

- The longest instar was the fifth, lasting 12 days, while the first and second instars were the shortest, each lasting 5 days.
- After the spinning stage, harvested the cocoons when matured.
- Successful trials yielded 31 cocoons from a single tree.
- Cocoons were intact with kusum leaves.
- Further excreta of worms were used for the dye extraction studies. Need to draw a proper time schedule for the both the crops (Lac and Tasar).

Conclusion

The study demonstrated that Kusum trees (*S. oleosa*) are a suitable food source for rearing tropical tasar silkworms (Daba ecorace), with the entire rearing process, from coupling to cocoon harvesting, taking approximately four months. The larval development lasted about 38 days, with the longest instar (fifth) lasting 12 days and the shortest (first and second) each lasting 5 days. Successful trials yielded 31 cocoons from a single Kusum tree, confirming the feasibility of this approach. Typically, primary food plants produce a yield of 45-50 cocoons per DFL. While kusum's yield may be lower, it offers supplementary income without incremental input costs. Furthermore, when integrated with lac cultivation, kusum demonstrates significant profitability for rearers. These results suggest that integrating tasar rearing with Kusum-based lac production could provide a sustainable and profitable model for rural and tribal communities, with the added potential for innovative applications such as using silkworm excreta for dye extraction. Further research and larger-scale trials are needed to optimize conditions and assess the broader socio-economic impact of this method.

Future Scope

Given the success of this study, several future research directions can be considered like conducting larger-scale trials in different regions to validate the results and understand any geographical variations, exploring factors like tree density, climate conditions, and leaf quality to maximize cocoon yield and quality, investigating the potential to integrate tasar rearing with lac cultivation on the same Kusum trees, providing farmers with multiple revenue streams, further study into the potential uses of silk streams, further study into the potential uses of silkworm excreta for dye extraction and other applications, promoting a circular economy and assessing the socio-economic impact of introducing this cultivation method to rural and tribal communities, with a focus on sustainable income generation.

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