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Beyond Silk: Value Addition Opportunities in Sericulture

*G. Savitha[1], R. Moulidharshan[2] and R. Nandha Kumar[2]
[1]Ph.D. Research scholar, Department of Sericulture, University of Agricultural Sciences, GKVK, Bangalore-560065, India
[2]Department of Sericulture, Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam-641301
*Corresponding Author's email: savithasaran2001@gmail.com

Sericulture, traditionally known for silk production, also generates a wide range of by-products such as mulberry biomass, silkworm pupae, defective cocoons, sericin, and rearing waste, which hold significant potential for value addition. Converting these by-products into useful commodities such as nutraceuticals, cosmetics, pharmaceuticals, organic fertilizers, biofuels, and handicrafts can substantially enhance the economic viability and environmental sustainability of the silk industry. Value addition not only reduces waste disposal problems but also creates opportunities for income diversification, rural employment, and women entrepreneurship. Value addition helps reduce waste, diversify farmer income, generate rural employment, and promote women entrepreneurship. With growing research and technological advancements, sericulture is emerging as a diversified bio-resource industry. Strengthening value addition practices can therefore improve rural livelihoods and support sustainable development of the sericulture sector.

Introduction

Sericulture is an agro-based industry focused on rearing silkworms primarily for silk production, but it also generates various by-products such as mulberry leaves, pupae, defective cocoons and rearing waste. The silk industry is economically important, providing livelihoods to millions, especially in rural areas, yet the large volume of waste/by-products poses environmental and economic challenges if not properly managed. Value addition refers to processing these by-products into useful products with higher economic value, which enhances profitability and sustainability in sericulture by converting waste into resources for pharmaceuticals, cosmetics, organic fertilizers, biofuels, and handicrafts. This approach not only reduces environmental impact but also diversifies income sources for farmers and rural communities, making sericulture a more resilient and multifaceted enterprise. Income diversification through value addition is crucial for improving farmer livelihoods and empowering marginalized groups such as women by creating new entrepreneurial opportunities beyond raw silk production (Dash et al., 2025). Thus, integrating value-added utilization of sericulture by-products represents a strong strategy for sustainable development and enhanced rural income generation.

Sources of Value Addition in Sericulture

Mulberry-based products offer diverse opportunities for value addition in sericulture, utilizing fruits, leaves, roots, and bark for multiple industrial and health-related applications. Mulberry fruits are processed into syrups, jams, wines, teas, and other food products, enhancing their commercial value despite their high-water content and perishability. Leaves serve as the primary feed for silkworms but also have medicinal properties such as anti-microbial, anti-inflammatory, anti-cancer, and anti-diabetic effects, making them valuable in pharmaceuticals and cosmetics. (Jan et al., 2021). The roots and bark of mulberry plants are

used in traditional medicine and industries like paper making and biofuel production; the bark also finds applications in artificial leather and therapeutic uses. Additionally, mulberry biomass waste supports bioenergy generation and animal feed enhancement, contributing to environmental sustainability and rural income diversification (Jadhav et al., 2020). Overall, the comprehensive utilization of mulberry parts beyond silk production can significantly boost farmers' income while promoting sustainable sericulture practices

Mulberry-based products: Mulberry fruits are processed into jams, juices, wines, and teas; leaves have medicinal properties useful in pharmaceuticals and cosmetics; roots and bark serve therapeutic uses and industrial applications like paper making and biofuel production. (Dash et al., 2025)

Silkworm-based products: Pupae are used as animal feed or processed into powder and oil with nutritional and medicinal benefits

Silk industry by-products: Sericin and fibroin proteins extracted from cocoons have applications in cosmetics, wound healing, tissue engineering, while silk waste is used for spun yarns and handicrafts

Rearing waste: Bed refuse, leftover leaves, and larval litter are recycled into organic fertilizers like vermicompost or used as biomass for bioenergy (Rafiqu et al., 2025).

Economic benefits

Economic benefits of these practices include additional farmer income, rural employment generation, especially empowering women through handicraft production, entrepreneurship opportunities, and development of small-scale industries. Environmentally, value addition promotes waste recycling, supports organic farming practices, reduces pollution from sericulture residues, and contributes to sustainable agriculture (Rafiqu et al., 2025). Future prospects involve startup opportunities in bioproducts from sericulture wastes, biomedical applications of silk proteins, nutraceutical development from silkworm pupae, enhanced export potential of diversified products, alongside ongoing research to optimize utilization (Dash et al., 2025). Challenges remain in awareness creation among farmers, availability of processing facilities, market linkages for by-products, and training needs to fully realize the sector's potential (Rafiqu et al., 2025). Overall, value addition to sericulture by-products is key to income diversification that strengthens the economic viability and sustainability of the silk industry worldwide.

Future Scope

Sericulture value addition offers significant success opportunities and future scope through diverse startup ventures, research advancements, and product innovations. Startups can capitalize on the multipurpose applications of sericulture by-products such as silkworm pupae for nutrition and medicine, sericin and fibroin proteins for biomedical uses, and mulberry biomass for biofuels, creating new markets and employment, especially in rural areas (Jayaram et al., 2024). Research developments focus on biotechnological enhancements including genetic engineering, bio-nanotechnology, and advanced extraction methods to improve silk quality and develop regenerative medicine, tissue engineering scaffolds, drug delivery systems, and cosmeceuticals from silk proteins. Biomedical silk products are gaining prominence due to their biocompatibility and therapeutic properties, with applications in wound healing, anticancer treatments, and medical textiles (Altman and Farrell, 2022). Nutraceutical products derived from silkworm pupae and mulberry leaves show potential for metabolic regulation, anti-aging, and disease prevention, expanding sericulture's role beyond textiles into health sectors. The export potential of these diversified sericulture products is growing as global demand rises for sustainable biomaterials and functional foods, positioning sericulture as a promising sector for economic growth and innovation worldwide (Jayaram et al., 2024).

Conclusion

Value addition in sericulture plays an important role in improving income, promoting waste utilization, and ensuring environmental sustainability. The effective use of sericulture by-products can create employment opportunities and support rural enterprises. However, improving awareness, infrastructure, and market linkages is essential to fully utilize these opportunities. With proper support and innovation, value addition can transform sericulture into a more profitable and sustainable industry.

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