

Value Added Products of Tasar Silkworm Cocoon by Utilization

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Abstract: *Realizing the scope of utilizing by-products of tasar silkworm cocoons by applying suitable methods is the immediate vital to optimize profits. The eye catching art of crafting silk waste is one of the interesting utility of silk, which develop human skills besides generating self-employment and additional revenue. The waste cocoons can be used in making art crafts like garlands, carpets, overcoats, decoratives and greeting cards. The in-depth research towards utility optimization and make aware this reality to sericulturists, reelers, weavers, traders, entrepreneurs, policy makers etc., is the upright want of the today's Sericulture industry. The innovative research towards utility to tasar cocoon on application of silk proteins as basic research material in biological and biomedical fields and make awareness and reality to sericulturists, reelers, weavers, traders, entrepreneurs, policy makers etc., is the upright want of the today's Sericulture industry.*

Keywords: Cocoon, By-products, Value addition, garlands, carpets, overcoats, decorative.

1. Introduction

Tropical Tasar growing area forms a distinct belt of humid and dense forest sprawling over the Central and Southern plateau, covering the traditional states of Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Orissa and touching the fringes of West Bengal, Andhra Pradesh, Uttar Pradesh and Maharashtra. Temperate tasar (oak tasar) extends from the sub-Himalayan region of Jammu and Kashmir in the West to Manipur in the East covering Himachal Pradesh, Uttarakhand, Assam, Mizoram, Arunachal Pradesh and Nagaland. Commercial sustenance of any enterprise in terms of returns and continuous employment depends on the optimal utilization of its resources. To utilize the resources as whole or as by-products require product diversification by realizing the potential, acquiring the skill and attaining the marketing avenues. Tropical tasar culture is a part time avocation of forest dwelling tribal families with tentative crop returns and seasonal employment, which needs optimal resource utilization to make it commercially viable with assured employment all through the year.

In spite of vast availability of tasar flora and fauna in the country, the tribal people living in and around with tasar culture as one of their prime livelihood still not ensure sustainable returns and assured employment throughout the year. Thus, the imperative need is to have effective ways and means to generate more income and employment through product diversification in tasar culture. In spite of worldwide remarkable augmentation of byproduct value to bump up the cost benefit ratio, India has not kept pace in sericultural fronts. The by-products presently felt as wastes, can put to better use in generating the value-based products and thereby catapult the industry to a more profitable and economically viable spot. The full utilization of tasar silkworm cocoons as different marketable products and such an integrated operation can certainly make the Sericulture more practical (Manohar Reddy, R., 2008; Aruga, 1994; Choudhury, 2003; Dandin and Nirmal Kumar, 2007; Han et

al., 2002; Kattiet al., 1996; Koundinya and Thangavelu, 2005; Majumder, 1997; Mani, 1997; Raju, 1996; Velayudhanet al., 2008). The cost of end product i.e. the silk can be proportionately brought down by the combination of regulating the processing methods and converting the tasar cocoon wastes like pierced cocoons, Uzi cocoons and unreelable cocoons as useful by-products. The optimal by-product utility concept can be highly useful to sericulture industry, which can help in elevating the socio economic status of the rural poor tasar growing farmers. Profitable conversion of wastes / by-products to high value utilities through phyto and post-harvest technologies (Majumdar, 1997), the collaboration of Seri scientists with related industries, to locate functional activities for potential applications (Koundinya and Thangavelu, 2005; Kumaresan et al., 2007) can reduce the production cost, pollution, recycles resources to cater the ever growing population and their demanding wants.

2. Present Status in Sericulture

Geographically, Asia is the main producer of silk in the world and produces over 95 % of the total global output. The rearing of silkworm is almost a prerogative for the Indian rural farmers and Sericulture is a subsidiary occupation in providing supplementary income to a large number of tribal populations of North East India. Majority of the host plants of all four types of silks i.e. mulberry, Tasar, Muga and Eri silkworms are available as cultivated or nature grown and the different agro climatic conditions have made the Sericulture as major commercial avocation.

Production of raw silk in India was 26,480 MT in 2013-14 of which, mulberry raw silk output aggregated to 19,476 MT (74%). The remaining 7,004 MT (26%) was *Vanya* silks. Mulberry sericulture is mainly practiced in five states namely, Karnataka, Andhra Pradesh, West Bengal, Tamil Nadu and Jammu & Kashmir which jointly account for about 96% of the total mulberry silk production in the

country. As the consumption of raw silk (around 29,730 MT) exceeds the production, the additional requirement of around 3,500 MT of silk (particularly Bivoltine mulberry silk of international quality) is imported mainly from China.

The major portion of farmers belongs to economically poorer sections and unaware the full potential of by-products. The cocoons produced were sold for their immediate livelihood to reelers, who offer the rate assessing only the silk yield and the value addition through by-products was never thought of. The silk cocoons were mainly utilized for silk production, seed production and rarely for animal feed, oil extraction, fertilizer and art crafts. Incidentally, the nutritional values of the chrysalis made sericulture more important as delicacy than its silk. However, the trends on cost benefit ratio and comparison with other alternative cash crops made the farmers, reelers, weavers, traders and entrepreneurs to have a second thought on utilizing silk cocoons on all possible angles for revenue.

3. Methodology

Uses of tasar silk cocoon to make value added non-textile products is based on regenerated the secondary products by exploring various secondary data resources such as pierce tasar cocoons, inferior quality cocoons and their wastes and some of the intermediate items as following

- 1) Reeled Tasar / Tasar Raw Silk: It is reeled from Tasar cocoons using different appliance. Reeled Tasar is finer in nature.
- 2) TasarGicha: Yarn drawn by hand out of Tasar cocoons without any twist.
- 3) Tasar Katia: Yarn spun out of Tasar waste after opening and cleaning.
- 4) TasarJhuri: Yarn spun out of uncleaned Tasar waste without subjecting it to opening and cleaning process.
- 5) Balkal yarn: Yarn spun out of tasar cocoon peduncles, after boiling in alkaline solution and opened up.
- 6) Tasar Spun Silk: Yarn spun in the mill out of tasar silk waste.

4. Cocoon Art and handcraft

Handicraft sector occupies a prime objective in Indian economy the eye catching art of cocoon craft is one of the very interesting utility of by-products which will give scope to develop human skills in addition to generate self-employment and revenue. The value addition in post cocoon sectors is estimated to low investment and high income value added by products ranging from 10 to 25% in total returns. Different articles like garlands, flower vase, wreath, pen stand, dolls, jewellery, wall hangings, wall plates, clocks, bouquets and greeting cards are being prepared using the waste silk cocoons (Vathsala, 1997). In Japan some laboratories have produced silk paper in different colors for making craft articles like flowers and lamp stands. The silk leather, a paint containing silk powder is used to decorate plastics, steel, imitation jewellery and fabrics metal ware, hand printed textiles and scarves hand knotted carpets and embroidered goods. The hybrid silk, net raw silk, silk tow and silk wave were produced in Japan for making under garments, jackets, sweaters, carpets and furnishings (Singh et al., 2002). It one of the unique feature of the handicrafts is

that more often the same item of the handicraft produced in different regions are different from each other in terms of the craftsmanship, style color combination.

5. Other Uses of Silk

Scientists in Korea and Japan and also in India have made innovative research on application of silk proteins as basic research material in biological and biomedical fields. The silk pupae are the potential base for culturing highly valuable mushrooms fighting cancer with strengthening immune system and silk fibers can be used for making bioactive textiles due to their anti-bacterial activity (Koundinya and Thangavelu, 2005). The fibroin and sericin, the highly promising silk proteins with potential as biomaterial for tissue regeneration, (burn patches hounding), bio-adhesive and ultra violet resistant uses (Dandin and Kumar, 2007; Kumaresan et al., 2007).

Among non-mulberry silks tasar silk fabrics in exotic designs are produced by handlooms. They are Gicha-noil, tasar plain, cotton-tasar blend, tasar-mulberry blend, peduncle fabric. Muga silk occupies sarees and dress material production. Eri spun silk is used for dress materials and the coarse variety for making chaddar, shawls and quilts. Trimoulters silk yarn is used as package material in pencil industry and for making talcum powder puffs. Silk is used as raw material for preparing sound-free gears for making precision machinery. In France 22-24 denier silk is used in tyre manufacturing to have a longer life span than rubber tyres. Parachutes are made from 13-15 denier silk fiber. These parachutes were used in World War-II. Cosy and soft sky jackets, comforters and sleeping bags are also made from silk. The silk gut used in surgery for internal suturing is made from silk glands. The silk glands are dissected out and put in warm water and pulled at two ends to yield a fibre of uniform thickness. This protein is auto absorbable and need not be removed after wound healing. Silk grafts have been used successfully to replace cut arteries. Silkworm can be reared in laboratory for genetic studies. This insect was proved as a good laboratory tool for any kind of experiment. Lot of research work is under progress on different lines of biotechnology, genetics using silkworms in Japan.

6. Review of Related Work

The radical shift of traditional sericulture to product diversification for better sustenance by South Korea during late 90's was revolutionary in the sericulture history (Sharma and Sinha, 2000). In spite of worldwide practical approach on optimizing the resource utilization for effective cost benefit ratio and better socio-economic advantage of rural people, India is yet to attain such pace, especially in sericultural fronts (Koundinya and Thangavelu, 2005; Dandin and Kumar, 2007; Reddy, 2008). The departments of forest, sericulture, tribal development and rural development, besides the NGOs like PRAVA and PRADAN have motivated many tribal self-help groups on product diversification in respect of food plant produce, cocoons, silk and other by-products of sericulture for value addition (Aruga, 1994; Vathsala, 1997; Singh et al., 2002; Ramesh et al., 2005; Kumaresan et al., 2007; Velayudhan et al., 2008:

Reddy, 2009). The collection of sal leaves for making cups and plates, sal seed for extracting oil, medicine and cake as non-timber forest produce and using the tasar pierced cocoons for making hand-crafts and decoratives is in existence at only certain tropical tasar practicing parts of the country (Chaitanya et al., 2000; Dash and Misra, 2001; Mukherjee, 2002; Sarkar and Das, 2004; Faysal, 2008; Reddy, 2010; Rout et al., 2010). Though, few groups realized the commercial feasibility of such venture, the major exploitation is yet to occur due to lack of information and awareness on the real potential, required innovative skill and marketing outlets.

7. Conclusion

Tasar silk industry by-product utilization hopefully should play a crucial role in the coming years to make the sericulture an economically viable proposition enabling it to withstand competition from other cash crops. The useful conversion of by-products through indigenously available processing techniques brings additional income lead to socio-economic advantage of rural people. The need for introduction of integrated processing complexes with redesigning of present practices deserves special mention to make the practice more attractive and people to participate enthusiastically. The practice of art craft, making garlands, flower vase, wreath, pen stand, dolls, jewelers, wall hangings, clocks, bouquets and greeting cards can be carved using silk wastes the silk based paper is used to craft flowers, buffet lamps and decorate plastics, steel and fabrics. The hybrid silk, net raw silk, silk tow and silk waves were converted as high valued fancy jackets, carpets and furnishings also used as tasar silkworm cocoon, nutritive value of pharmaceutical, bio-medical, cosmetic, animal feed, chemical industry, pupae, silk through methodical diversified dispensation certainly boosts up the Sericulture. The R & D institutions, Sericulture departments, policy makers should work towards popularize the concept of value addition with fitting trainings, multi discipline projects and global marketing outlets for effective by-product utilization in today's competitive competition. The realization of value addition span, application of suitable technology and optimization of utilizing by-products of tasar silkworm cocoons by all the stake holders is the integrated want of silk industry.

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