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Sericulture, its type and Silkworm Rearing Technologies

A review

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Abstract : Sericulture also known as silk farming where the silkworms are reared to produce silk. There are varieties of silk produced all over the world. Different types of silk such as mulberry silk, non-mulberry silk, anaphe, fagara, coan, mussel, spider etc. silks. One of the rarest silk producer is- Assam that introduces three natural wild silks- golden muga, white pat and warm eri silk. This article throws an insight into the cultivation of silkworm and creation of the beautifully refined silk. It is not only considered as a tradition but also a living culture of Assam. Many cottage and small scale textile industries engages in such farm-based, labour intensive commercial economic activity providing employment to the rural farmers and attracts profit seeking entrepreneurs as it requires low investment with relatively higher returns.

Key words: Sericulture, silkworm, employment etc

Introduction

Sericulture , the production of raw silk by means of raising caterpillars (larvae), particularly those of the domesticated silkworm (*Bombyx mori*).

The production of silk generally involves two processes:

1. Care of the silkworm from the egg stage through completion of the cocoon.
2. Production of mulberry trees that provide leaves upon which the worms feed.

The silkworm caterpillar builds its cocoon by producing and surrounding itself with a long, continuous fibre, or filament. Liquid secretions from two large glands within the insect emerge from the spinneret, a single exit tube in the head, hardening upon exposure to air and forming twin filaments composed of fibroin, a protein material. A second pair of glands secretes sericin, a gummy substance that cements the two filaments together. Because an emerging moth would break the cocoon filament, the larva is killed in the cocoon by steam or hot air at the chrysalis stage.

Silk is a continuous filament within each cocoon, having a usable length of about 600 to 900 metres (2,000 to 3,000 feet). It is freed by softening the binding sericin and then locating the filament end and unwinding, or reeling, the filaments from several cocoons at the same time, sometimes with a slight twist, forming a single strand. Several silk strands, each too thin for most uses, are twisted together to make thicker, stronger yarn in the process called throwing, producing various yarns differing according to the amount and direction of the twist imparted.

Silk containing sericin is called raw silk. The gummy substance, affording protection during processing, is usually retained until the yarn or fabric stage and is removed by boiling the silk in soap and water, leaving it soft and lustrous, with weight reduced by as much as 30 percent. Spun silk is made from short lengths obtained from damaged cocoons or broken off during processing,

twisted together to make yarn. The thickness of silk filament yarn is expressed in terms of denier, the number of grams of weight per 9,000 metres (9,846 yards) of length. Silk is sometimes—in a process called weighting—treated with a finishing substance, such as metallic salts, to increase weight, add density, and improve draping quality.

The degumming process leaves silk lustrous and semitransparent; with a smooth surface that does not readily retain soil. Silk has good strength, resisting breakage when subjected to weights of about 4 grams (0.5 ounce) per denier. Wetting reduces strength by about 15–25 percent. A silk filament can be stretched about 20 percent beyond its original length before breaking but does not immediately resume its original length when stretched more than about 2 percent. Silk, lower in density than such fibres as cotton, wool, and rayon, is moisture-absorbent, retaining as much as a third of its weight in moisture without feeling damp, and has excellent dyeing properties. It is more heat-resistant than wool, decomposing at about 170° C (340° F). Silk loses strength over a long period of time without appropriate storage conditions and tends to decompose with extensive exposure to sunlight but is rarely attacked by mildew. It is not harmed by mild alkaline solutions and common dry-cleaning solvents. Friction imparts a static charge, especially in low humidity. The rustling sound, or scoop, associated with crisp silk fabrics is not a natural property of the fibre but is developed by processing treatments, and it does not indicate quality, as is sometimes believed.

There has long been interest in devising ways to produce silk that is stronger and more elastic than that produced by silkworms or traditional sericulture methods. One approach has involved the introduction of spider silk genes into the silkworm genome; spider silk is known for its remarkable strength and elasticity, but it cannot be mass produced by farming spiders. Genetically modified silkworms spin a strong composite silk that has many potential applications.

Type of sericulture:

Mulberry Culture
Tasar Culture
Muga Culture
Eri Culture

Mulberry Culture:

The insect producing mulberry silk is a domesticated variety of silkworms, which has been exploited for over 4000 years. All the strains reared at present belong to the species Bombyx mori that in believed to be derived from the original Mandarina silkworm, Bombyx mandarina Moore. China in the native place of this silk worm, but now it has been introduced in all the silk producing countries like Japan, India, Korea, Italy, France and Russia.

The races of mulberry silk worm may be identified on the basis of geographical distribution as Japanese, Chinese, European or Indian origin; or as Uni-, Bi- or Multi-voltine depending upon the number of generations produced in a year under natural conditions; or as Tri-, Tetra- and Penta-moulters according to the number of moults that occur during larval growth; or as pure strain and hybrid variety according to genetic recombination.

Tasar Culture:

Several species of Antiheroes are exploited for production of wild silk known as Tasar silk. These are Antiheroes militia, A. pernyi, A.yamamai, A.paphia and A.royeli. A. militia and A. paphia are reared in central and north eastern parts of India. Many regional strains known by different local

names are also found. Three types of voltinism, namely Unit-, Bi- and Multi-voltine are found in A. militia and A. paphia. These are reared on trees of Terminalia tormentors (Vern. As an), Terminalia arjuna (Vern. Arjuna), Shorea robusta (Vern. Saal) and Zizyphus jujuba (Vern. Ber). Rearing of A. pernyi and A. royal has been introduced recently in Manipur. These are reared on Quercus or Oak. A. pernyi and A.yamamai are the Tasar silk worms of China and Japan respectively. These species feed on Quercus or Oak trees and are normally bivoltine.

The Tasar moths are fairly large insects. Females are larger and yellowish brown in colour, while males are smaller and brick red in colour. Both have prominent and colourful eye spots on their wings. The antennae of males are bushy, and abdomen is narrower in comparison to female.

Muga Culture:

Muga is an Assamese word which indicates the golden brown (amber) colour of the cocoon. The Muga silk worm, Antiheroes assama is mainly confined to the Brahmaputra valley of Assam and foothills of East Garo hills of Meghalaya. Its distribution in the wild state, however, extends from western Himalaya to Nagaland, Cachar district of Assam and south Tripura. However, commercial exploitation is restricted only to north eastern India. The Muga silk worm is multivoltine and passes through four moults and five instars stages. Generally 4-5 crops are raised in a year. Muga silkworm is a polyphagous insect. It feeds on the leaves of several kinds of trees, but Machala's bombycine (Vern. some) and Latasha polyanthus (Vern. soil) are the two principal host food plants of muga silkworm. The host plants are cultivated through propagation by seeds or vegetative by air layering. The plants are trained and pruned regularly.

Like other Lepidopteron, muga silkworm is a holometabolous insect passing through a complete metamorphosis from egg (Koni) to adult (Chakari) stage through two intermediate stages of larva (Polo) and Pupa (Let). The entire life cycle lasts for about 50 days in summer and 120 days in winter. The wings and body of the male moth are copper brown to dark brown, while those of female, yellowish to brown. Both pair of wings bears eye spots. Besides colouration, the male moth can be distinguished from the female by its slightly smaller size, slender abdomen, bushy antennae and sharply curved forewing tips.

it is a semi-domesticated species in the sense that only the larval stage is spent in open, and the ripening worms are brought indoors for spinning the cocoons.

Eri Culture:

The silk produced by Philosamia ricini is called Eri silk. The distribution of Eri silk worm is confined to Assam and bordering districts of West Bengal. The Eri silkworm is multivoltine and reared indoors 5-6 times a year. Optimum conditions required are 24-28oC temperature and 85-90% humidity. Adult moths emerge from morning to mid day; males emerge earlier than the females. After an hour of emergence mating occurs and continues till evening. Males are then separated. Both male and female have brown (chocolate), black or green coloured wings with white crescent markings and woolly white abdomen. The male is smaller than female and bear bushy antennae and narrow abdomen.

Eri worms are polyphagous having primary as well as secondary food plants (hosts). Primary food plants are Ricinus communis (Vern. Castor) and Heteropenax fragrans (Vern. Kasseru). Castor plants are of two varieties; the green leaved and violet leaved. Both are equally suitable for feeding the Eri silkworms. These plants are grown by seed sowing. Kasseru grows wild but may be

cultivated as regular plantations on embankments around homestead land. It is grown by seed sowing and also vegetative by stem cuttings. The secondary food plants are Mani hot utilissima (Vern. Tapioca), Evodia flaxinifola (Vern. Pay am), Plumier acutifolia (Vern. Plum) and Carioca papaya (Vern. Papaya).

Silkworm Rearing Technologies

Sheet Egg Transportation Bag :

The silkworms eggs should be transported very carefully from egg production/cold store to rearing house. It should not be exposed to heat and jerks. An egg transportation bag designed and developed by CSRTI, Mysore is very effective and safe.

Loose Egg Transportation and Incubation Bag:

To facilitate safe transportation and incubation of loose eggs of silkworms, a simple bag is designed and developed by CSRTI, Mysore. By using this bag, the jerks to silkworms eggs are avoided.

Earthen Pot for Incubation of silkworm Eggs:

To facilitate individual farmers for incubation of the eggs, a specially designed earthen pots have been developed by CSRTI, Mysore. One can incubate 250 – 300 dfls in a pot. Inside the pot 25–26 °C temperature and 80–85 % relative humidity can be maintained leading to high hatching of egg

Hydrodynamic incubator :

It consists of a metal frame fixed with gunny cloth. The gunny cloth covered box is placed in a tray containing water. The water rises by capillary action and evaporates from the gunny cloth cooling the air inside. It can be used for preservation and incubation of eggs.

Loose Egg Incubation Frame :

To provide optimal environmental conditions during incubation of loose eggs, low cost incubation frames have been developed by CSRTI, Mysore. The frames are very useful for incubation, black boxing and brushing. More than 90 % hatching can be achieved by using incubation frames.

Environator:

It consists of a metal frame covered with gunny cloth. An arrangement is made for dropping water from top. Water from wet gunny cloth evaporates thus cooling air inside. The plastic trays of 2’ x 3’ size can be placed inside the Environator. This can be used for Chawki rearing and late age rearing in hot regions.

Conclusion:

Silk is a highly valued textile fiber of animal origin. It is used almost entirely for the production of high quality textiles. The sericulture industry is unique for more than one reason. It is based on agricultural output viz., cocoons and cottage based labor intensive in nature. The industry comprises of reeling, silk preparatory and weaving, silk knitting, silk wet and processing consisting of degumming, dyeing, printing and finishing besides garment manufacturing. These activities in turn support the ancillary enterprises of marketing, manufacture and by-product utilization comprising of spun silk yarn manufacture and pupae oil extraction. Thus, a lot of value is added to the product at each stage of the industry.

References:

Down and Silk: Birds and Insects Exploited for Fabric PETA. Retri*eved 6 January2007*

History of Sericulture (PDF). Governmentof Andhra Pradesh (India) - Department of Sericulture. Archived from the original (PDF) on 21 July 2011. Retrieved 7 November2010.

Silk Making: How to Make Silk . TexereSilk.com. Retrieved 25 May 2014.

Bezzina, Neville. Silk Production Process . Sense of Nature Research. Archived from the original on 29 June 2012.

Muthesius, "Silk in the Medieval World", p. 331.

Parekh, Dhimant (11 September 2008). "Ahimsa Silk: Silk Saree without killing a single silkworm". The Better India. Vikara Services Pvt Ltd. Retrieved 19 April 2013.

Radhakrishnan, S., ed. (1968). Mahatma Gandhi: 100 years. New Delhi: Gandhi Peace Foundation. p. 349. Retrieved 19 April 2013.