

Techniques For Rearing of Silkworm

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ARTICLE ID: 41

Silk, the most civilized fabric known, is commercially reared through different species of silkworms. India is the second major producer of silkworms after China and produces all four types of silk: Mulberry - popular and domesticated, Muga - only found in India, Eri - semi-domesticated, and Tassar - wild type. The Mulberry silkworm (*Bombyx mori*) is preferred more over the others and forms almost 80% of the silk production in India. Muga silkworm is indigenous to India, particularly found in the Brahmaputra Valley of Assam, very popularly known as Assam silk.

Sericulture refers to the rearing of silkworms for the production of silk. Silk is obtained from cocoons produced by matured silkworms, retrieved after the cocoon formation process that takes about 7 to 10 days, through boiling. The classification of silkworms is determined by leaves used to feed them. Silkworms that eat mulberry leaves are categorized as mulberry silkworm. Along with raising silkworms, trees are also cultivated for their food at the same time. The cultivation of mulberry plants is referred to as moriculture. Harvesting of the leaves occurs during eating. Depending on the worms' age, the leaves are either provided whole or broken into tiny pieces for feeding. The elder worms are fed with old or young leaves without the necessity for chopping, but the younger worms require fresh, finely chopped leaves for ease of consumption. Silkworms, similar to all end pterygotes, progress through four completely differentiated life stages: egg, larva, pupa, and adult. The pupal stage, also known as the cocoon stage, is when silkworms are commercially exploited because that's when the silk is spun. Silk is extracted from the adult cocoon stage after the first three stages have been raised.

Procedure for rearing of silkworm:

Setting up the rearing room is the first stage of silkworm rearing and is critical in determining the survival rate of the worms. The room setup, maintenance, and facilities play a very vital role in creating the best conditions. Before the rearing process, fumigation of the room is undertaken to create a sterile environment that is very important in preventing disease

outbreaks. Farmers buy silkworm eggs from the government or some other genuine supplier and incubate them at 24 to 26°C until they hatch.

By the end of the incubation period, the eggs turn from bluish to black and are ready to hatch into larvae. The newly hatched larvae resemble small black ants. There are five stages or instars in the larval phase, and each stage has different requirements for rearing. The larvae that come out from the eggs are first instar larvae. The first three stages of larval development are collectively called chawki rearing, and the last two stages are known as late age rearing.

Young Age Rearing: Young age rearing, also known as Chawki rearing, requires proper care and monitoring of the process since the larvae are very sensitive at this stage. There are two methods of young age rearing:

- **Paraffin rearing:** Under and above the trays, paraffin sheets are placed, which are then stacked. These are removed 30 minutes before feeding to allow feeding.
- **Box method:** The silkworms are arranged in a box with a cover over them and are stacked over one another. This form of rearing is practiced as box rearing. The larvae, after hatching, from its egg shells, are transferred to a rearing tray by using a bird's feather. Finely chopped young and tender leaves of mulberry are provided to the insects as food in the rearing tray. The younger larvae feed on chopped leaves, while the older ones need whole leaves, shoots, or even branches.

As the silkworms feed, they also excrete waste. The accumulation of this in the bedding may make it unsanitary and unfit for the silkworms to survive. Thus, cleaning is necessary from time to time. Cleaning entails the removal of waste once during the first instar before molting, twice during the second instar (first when feeding is resumed and second before the second molt), and thrice during the third instar (first when fresh feed is resumed, second during the middle, and third before the third molt).

Over the existing bed with the larvae, a mesh screen is laid to keep it clean and disease-free; above this, a thin layer of fresh feed is distributed. The silkworms climb onto the new bed to feed, thereby making the environment clean and disease-free. A adjustment of bed size is required according to the growth phases of the larvae. Expansion in bed size provides adequate space for the silkworms to grow in and move about, thereby avoiding moisture and diseases due to it. In rearing young age, corresponding to different phases of larval growth, three different bed sizes are to be increased.

Late age rearing: In the case of late age rearing, 4th and 5th instar larvae are reared which corresponds to a young age with more feeds and frequency. There are mainly three types of rearing methods namely,

- **Shelf rearing:** The rearing of silkworms on stacked trays.
- **Floor rearing:** The silkworms are provided on fixed three tier arrangements on the floor.
- **Soot rearing:** In this method, the silkworms are directly reared on the branches of mulberry trees.

During late age rearing, the larvae significantly increase their feeding and gain considerable weight. The fourth instar larvae require 80 to 450 kilograms of leaf feed, while the fifth instar larvae consume even more. The weight gained is about ten times that of the first instar larvae. The leaves are fed in larger sizes without chopping, as the larvae are now of a size to consume entire leaves. In the fifth instar stage, full branches or plucked leaves are fed to reduce labor costs.

Bed sizes are adjusted according to need, and cleaning should be carried out daily to avoid any pest attack and for cleanliness. In this, chawki rearing is done on the same lines as nylon nets are provided with mulberry leaves on the top so that larvae crawl upwards and come out from there and leave excreta in the tray. Apart from this, lime powder is dusted on trays to absorb excess of water.

At this stage, the larvae start forming cocoons or the pupal stage. They extract silk through sideways movements of the head. Once some signs of transformation are noted, the matured larvae are transferred from the trays to a special setting material called Chandrika that offers the best environment for the formation of silk. When they completely transform into cocoons, they are allowed some days to mature before being transferred to the machines for extraction of silk. They are boiled in very hot water to extract the silk threads.

Challenges in Silkworm Rearing:

- **Availability of Eggs:** The problem in silkworm rearing is the availability of silkworm eggs. Again, at times the cause is due to the result of farmers' ignorance in obtaining healthy and disease-free eggs.
- **Financial Problems:** High cost of production discourages many potential farmers from entering into sericulture, as arranging sufficient finance remains a major problem.

- **Production Cost and Productivity:** This huge investment that is to be involved in the setting up and maintenance of the infrastructure serves as a deterrent for farmers to enter into sericulture farming and hence productivity.
- **Technology Adoptability:** There are inadequate integrations of innovative and modern technologies which could simplify this complex rearing process, which has been compounded by the problems associated with the transfer of laboratory findings to the field or farm.
- **Rural Industry Dynamics:** The rural nature of the sericulture industry makes it very tough to initiate and infuse technological progress and adoption due to infrastructural problems and traditional practices.
- **Skills Gap:** The inadequacy of farmers with the required skills to tackle the problems in sericulture, which is a present-day need, itself argues for skill development with the aim of reducing losses and improving productivity.
- **Disease and Pest Management:** This has a high-risk occurrence due to diseases and pests, for example, the uzi fly and pebrine disease, which result in losses—a drastic reduction of silkworm productivity and, if the condition is worse, significant losses or mortality.