

Sericulture

Silk is the finest and most beautiful natural fibers of the world & is said to be the “Queen of fibers”. They are very fine and light wt.& soft. They are very strong having high elastic property. Silk producing is an insect called silk moth. Altogether a no. of sp. Founded produces silk but only few species are used for sericulture.

Types of silk:

Mainly 4 species of silk have been recognized which are secreted only by different sp. of silk worm.

Mulberry silk -*Bombyx mori*- It belongs to the family – bomicidae which feeds on mulberry leaves. They are superior in quality to the other types due to its shining and creamy white colour.

Tasar silk- It is belonging to family saturnidae which feeds on the leaves of arjun, sal, oak and various secondary food plants. Tasar silk is secreted by the caterpillar of ***Antherea mylita, A.paphia, A.royelli and A.pernyi*** etc. This is copper colour.

Eri silk- it is produced by ***phylosomia ricini*** which feeds on castor and keseru leaves. It is creamy-white but less shining.

Muga silk- it is obtained from the caterpillar of ***Antheria assama*** which feeds on som, suwalo, champa, mejankari etc.

LIFE HISTORY OF SILK:

Out of 4 different types, mulberry and eri are manufactured from domesticated silkworms, whereas tasar and muga silk worms are wild in nature. The life cycle of these 4 types of silk moths are much common as they lay eggs from which caterpillar hatches. They eat and grow and produce cocoon for their protection, then pupate inside cocoon.

After some time, moth emerges from the cocoon, male and female mate, lay eggs, and repeat their life cycles.

Mulberry silk worm: The race of silkworm by which one crop is taken in one year is called univoltine, more than one is multivoltine and two crops are taken in one year is called bivoltine races. Different crosses are generally chosen for spring and autumn rearing.

Life history of mulberry silk worm: The adult *B. Mori* is about 2.5 cm. in length and pale creamy white in colour, flight is not possible in female because of its heavy body wt. the moth is unisexual in nature and does not feed during its very short period of 2-3 days.

Fertilization- Is internal preceded by copulation. Just after emergence, male moth copulates with female about 2-3 hrs. and if not separated they may be dying after few hrs. of copulating with female. One moth lays 400-500 eggs depending upon climatic condition and supply of food material to the caterpillar from which the female moth is obtained. They lay eggs on the upper part of the mulberry leaves and attached gelatinous secretion of female moth.

Eggs. Eggs are laid by the female, are rounded and white in colour. There are two types of eggs - diapause and non-diapause. Eggs are called seeds.

Hatching: The eggs after 10 days of incubation hatch into a larva called caterpillar. After hatching, caterpillar needs continuous food supply because they are voracious feeders and non-adequate food supply causes problems in growth in caterpillar.

Caterpillar: The newly hatched caterpillar is yellowish white in colour. The caterpillar is provided with well-developed mandibulate type of mouth parts adapted to feed easily on mulberry plant leaves. As they are voracious feeders, they grow rapidly which moult by moulting and 5th instar respectively. It takes 21-25 days after

hatching. A full-grown caterpillar develops salivary glands, stop feeding and undergo pupation. The time taken for the full growth of caterpillar from young to well grown stage varies with regards to temp., humidity and food supply and types of races.

Pupa: - The caterpillar stops feeding and moves towards corner among the leaves and secretes a sticky fluid through silk glands. The secreted fluids come out through the spinneret and takes the form of long fine threads of silk which hardens with the exposure to air and wrapped around the body of caterpillar in the form of covering called the cocoon.

Cocoon: - They are white coloured bed of pupa whose outer thread is irregular and inner threads are regular. The length of continuous threads secreted by a pupa for the formation of a cocoon is about 1000-12000m., which is required 6 days to complete. The pupal period last for 10-12 days and the pupa cuts the cocoon and emerge into the adult.

Emergence of Imago: - Due to active metamorphic changes during pupation period the abdominal pseudo legs disappear, and two pairs of wings develops. The silk worms within the cocoon secretes an alkaline fluid to moisten it's one of the ends and as a result moistened and become soft where the threads are cut open by the silkworm. Finally, a hole is formed through which a feeble adult moth squeezes out of the cocoon.

ECONOMIC IMPORTANCE OF SILK/USES OF SILK:

Bulk of silk fibers produced is utilized in preparing silk clothes, uses of pure silk decreased gradually due to its high-cost value and costly maintenance. Clothes in which silk fibers are combined with other natural and synthetic fibers are in great demand not only in India but also in foreign countries. Besides silk being used as garments, it is also used in other industries and for military purposes. It is used in the manufacture of fishing fibers, parachutes, cartridge bags, insulation coils for telephones and wireless receivers, tires of racing cars, filter cloths, for floor mills and in medical dressing and suture material, fabrics for garments in various weaves, plains, twill, stain, crepe, georgette and velvet, knitted goods such as vests, gloves, socks, stockings dyed and printed ornaments, fabrics for saris, jackets, shawls and wrappers are made out of these materials.

DISEASES OF SILKWORM:

This profitable industry is often threatened not only by various diseases resulting from the viral, fungal, bacterial and protozoan infections but by insect predators, birds and other higher animals.

Diseases are –

- Pebrine- Nosema
- Flacherie-Bacterial disease
- Grasserie- Viral
- Muscardine-fungal and
- Maggot disease- *Tricolyga sorbillans*, a fly.

FOOD PLANTS:

- **Mulberry:** mulberry
- **Muga:** Som, Suwalo (primary), Sal, Mayankuri, Champa, Gulanch (secondary)
- **Tasar:** Arjun, Asan, Sal, Oak, Bagari
- **Eri:** Castor (primary), Keseru.

REARING OF SILK WORM:

MULBERRY SILK

The word rearing does not mean only the feeding of caterpillars as often understand, but a continuous care from egg laying through aestivation, hibernation, incubation, early-stage larval care, late-stage larval care to the production of cocoon.

Grainage Management:

The establishment of grainage is to provide good quality of seed to rearers and maintenance of original quality of races. For this purpose, due care should be taken of the crop of silk worm for seed production from the very beginning i.e., the caterpillar stage, by providing them with proper nutrition and protection from the attack of disease, keeping these points of view initial selection is made on the base of percentage of dead pupae during normal development. First selection is made by separating out dead cocoons and nest selection in the grainage.

After first selection cocoons are subjected to sex separating by cutting one end of the cocoon either manually or cocoon opener.

For production of commercial eggs loose forms of cocoons are used and collective mother examination is done either through mass Pebrine detecting machine or general microscopic observation. They are then kept for mass emergence.

Emergence of moth and fertilization: - When kept for emergence at room temperature, mass emergence of adult takes place. As per their nature, just after emergence, male moth starts moving around the female. Males are very much active whereas the females which are loaded with eggs are incapable of flying. If not separated at once in cages males starts copulating with the females but the eggs obtained from this female fertilized from the male of the same stock is useless for the seed. So that, males and female just after emergence have to be separated into separate cages without their mating. Now one female of one lot is kept with the male of the other lot and at once they form pairing and compute for 3 hours.

After completion of mating males should be separated and may be used for the fertilization of other females. Now fertilized females are subjected to egg laying.

Egg laying:

After fertilization female starts egg laying and in the duration of 24 hours it completes egg laying process. The eggs laid by one female are about 400-500 depending upon their races. Female dies after egg laying. These eggs are called seeds. These eggs are kept in sterilized trays and stored at 4° C under laboratory condition or sometimes kept at hill stations in diapause condition.

The stages of egg production are of three types-

- i. Production and supply of parent's eggs,
- ii. Rearing of parent eggs and
- iii. Production of commercial F1 seed. The grand parent and parent's eggs are produced by recognized and reputed organization. This commercial seed is supplied to the rearers.

Hatching:

This is an important phase of sericulture industry because as soon as the larvae are hatched, they start feeding voraciously. So only those sericulturists who would be able to supply sufficient amount of fresh mulberry leaves to young hatched larvae, could perform successful sericulture problem otherwise young ones will die resulting great loss to sericulture Industry. This is why the hatching has to be controlled accelerated or postponed by artificial treatment under refrigerated condition. Proper hatching of seeds advanced techniques has been developed in which eggs are collected and kept with mulberry leaves working as stimulant for hatching in shady places on white sheet of paper in insect proof trays on a stool. For this purpose, the legs of stool must be kept in water so that insects may not crawl and damage the hatching eggs.

Post cocoons processing: - The method of obtaining silk thread from cocoon is known as post cocoon processing. This includes-

Stifling- The process of killing the cocoon is termed as stifling. Sericulturist should be very much careful that before the emergence of silk worm. Good sized cocoons of 8-10 days old for further process and dropped into hot water or subject to steam or dry heat, Sun exposure for 3 days or fumigation.

In this way pupae or cocoon are killed. The killing of cocoon in boiling water helps in softening the adhesion of silk thread among themselves and losing of outer thread to separate freely, facilitating the unbinding of silk thread.

Reeling and spinning – the process of removing then thread from the killed cocoon is called as reeling. 4 or 5 free ends of the threads of these cocoons are passed through the eyelet and guides to twist into one thread and wound round a large wheel from which it is transferred to spools. Thus, the silk obtained on the spool is known as raw silk or reeled silk. The waste outer layer or damaged cocoons' thread are separated, tested and then filaments are spun. The spunned silk is known as 'spun silk' the raw silk is further boiled stretch and purified by acid or by fermentation and then carefully washed over again and again to bring about the well-known lustre on the thread.

Silk:

Silk is a pasty secretion of silk worm produced by the silk gland. The silk glands are actually modified salivary glands which are long and sac like as this pasty secretion comes in contact with air it becomes hard and forms strong and pliable silk strands. This secretion forms 2 cores of fibroins and sericin protein.

i. A tough elastic insoluble protein consisting of 75% of fibers weight and cemented with **sericin** from the middle region of the silk gland and the time of secretion and

ii Sericin a gelatinous protein which is easily soluble in warm water. Some quantity of wax and carotenoid pigments are also detected.

Fibroin is made up **glycine, alanine, tyrosine.**

Sericin is easily soluble in water and composed of **sericin, alanine and leucine.**