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B.Sc. Part - III Paper - VI

Topic: Write an essay on Sericulture.

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Ans. Introduction : Silk has been under use by human beings for various purposes since ancient times. Pure silk is one of the finest and most beautiful natural fibres of the world and is said to be "The queen of fibres." Silk clothes have a look and feeling of affluence that no other cloth can equal. Due to its great value and usefulness, there have been any attempts in various parts of the world for the large scale production of silk. One of the methods was the rearing of silk worm on large scale with great care in natural and controlled conditions. Different rearing techniques are applied in different parts of the world for large scale productions of silk threads of fine quality. This is known as SERICULTURE.

Systematic Position :

Phylum-Arthropoda

Class-Insecta

Type-Silk worm

Sericulture of India : Although sericulture was under practice in ancient India, its scientific study was first of all made in India at Pussa in 1905-6 by Mr. Lefroy. A large silk house made up of straw was constructed and rearing of Eri and Mulberry silk-worm was started there. Till 1918 the silk house remained at 'Pussa' under supervision of various scientists like M.N.De; CM. Hutchinson etc., and after that it was transferred to Bhagalpur. One Mr. Ghose was very much interested in art of sericulture. He visited Japan and some silk producing countries of Europe just to have first hand information about the industry there. After his returns from abroad, he utilised some of the new techniques which gave excellent results and were instrumental in flourishing sericulture in India.

Silk industry is a very profitable business but at the same time it is quite troublesome as it consists of various aspects of different nature. One of such an aspect, perhaps the most important one, is Sericulture which consists of rearing of larvae. The rearing of larvae needs a healthy and an abundant growth of food plants. The formation of cocoon follows the reeling of threads which is the raw material for the Silk industry. Thus sericulture has three different aspects, one is of animal origin i. e; rearing of larvae (Entomological section); Second is of. plant origin i.e. cultivation of food plants. (Botanical sections) & third one of the technical side i.e; reeling of thread from cocoon (Technical section).

Sericulture (Mulberry Type) : This is multivoltine. Mulberry silk-worm were of domesticated type because they can be reared indoors; Large and healthy cocoons are selected during harvesting season for the next crop. These cocoons are kept in well ventilated cages. They emerge after few days. Males and Females are easily distinguishable (females larger in size and abdomen broader

than the males). The matured moth measure about $1\frac{1}{2}$ -2" in wing span and is

pale creamy in colour. These moths are kept in pairs (one male and one female) in coupling jars for about 24 hr. They copulate during this period and after that the females are transferred to egg laying boxes made up of card-board or earthen-ware. Each females lays about 200-400 eggs in the next 24 hours. These eggs are very small in size, white in colour, seed like in appearance and commercially they are known as "SEEDS". A great care is required in selection of these seeds because the whole industry is based on these seeds. They should be healthy and free from any sort of diseases. For this, tissue fluid of egg, laid moths are examined under microscope. If an evidence of any type of disease is found, the eggs laid by that particular moth are destroyed. These disease-free seeds are also supplied to villagers and tribal reares. These eggs are kept in incubators (at 75°F) in small boxes where they hatch between 7-10 days. These small larvae are known as caterpillars which are subjected to the processing of rearing.

Cultivation of Food Plants : The larvae of Bomboxmori feed on leaves of mulberry, so for undisrupted and regular rearing a continuous supply of healthy mulberry leaves is essential. For this a systematic and regular cultivation of food plants is maintained.

Rearing of Silk Worm : Tools and material necessary for rearing silk worms :

House : Any building or thatch which is well ventilated may be used for rearing the worms, but mud walled thatched houses are the best as they are cool in summer and warm in winter season. For proper growth and development of silk-worm the temperature inside the house should be maintained more or less between 70-75°F with similar percentage of humidity.

Feeding Trays : Freshly hatched worms are kept in flat trays along with small pieces of mulberry leaves. These trays are made up bamboo mattings with their edges turned up which afford a raised border made by stout stripes of bamboos. On the back of the tray two strong stripes are firmly fastened longitudinally.

Machan : Machans are needed to accomodate large number of trays in a limited space. Machans are easily and best made by fixing two pairs of bamboo or wooden poles in the ground and lying across bars of bamboo or wood horizontally.

Nets : Large amount of excreta, dirty products and remains of leaves may fall on the trays from the holes of the upper trays. If worms are not protected from these biproducts they may get diseased. To prevent this, trays are covered with the nets.

Spinning Trays : Before cocoon formation, mature worms are transferred to special type of trays known as spinning trays or chandhaki. Here they spin the cocoon without any disturbance.

Life Cycle : Tiny caterpillars which hatches from the egg measures 5-7 mm in length. They are transferred to feeding trays already supplied with chopped tender leaves of mulberry. These caterpillars move on the leaf in a characteristic looping manner. Their body is rough, wrinkled greyish in colour. They are made up of 12 segments which is distinct into three parts i.e. head, thorax and abdomen. The head bears mandibulate mouth parts with which they feed upon the leaves. The thorax in 3 segments and all the segments bears a pair of true jointed legs. The abdomen which has 10 segments is provided with five pairs of unjointed, stumpy prolegs or pseudolegs. (One pair each in segment 3rd, 4th, 5th, 6th and 10th) a short dorsal anal horn (on the 8th segment) and a series of spiracles on lateral sides. These larvae feed voraciously upon the mulberry leaves and grow very quickly. They stop feeding, become inactive after four to five days, and then 1st moulting takes place. The 2nd stage larvae

resembles the 1st stage larvae except that they are slightly bigger in size. They also eat voraciously for 7 days then 2nd moulting takes place and 3rd stage larvae are formed. The larvae repeats this process for 4 times, The maturity is achieved in about 45 days since the time of hatching and the matured caterpillar now measures 7-10 cms in length. By this time the formation of a pair of salivary glands is completed. Since these salivary glands secrete silk they are also called as silk-gland.

When the matured caterpillars stop feeding they are transferred to spinning trays. They excrete their last excreta and begins to secrete the sticky secretion from the silk-gland through a very narrow pore situated on the hypopharynx. This secretions is continuous and as it coming in contact with the air sticky secretion is converted into a fine long and solid thread of silk. The thread becomes wrapped around the body of larvae forming a pupal case or cocoon. This process continues for 3-4 days. At the end of which the caterpillar is enclosed within a thick somewhat hard, oval, whitish or yellowish cocoons, within 10 days the caterpillar is transformed into a brownish pupa or chrysalis. Active metamorphic changes takes place during pupation in which abdominal prolegs disappears while the thorax develops two pairs of wings, The pupa is finally metamorphosed young adult moth in about 12-15 days. This young-moth or imago secretes an alkaline fluid to soften one end of the cocoon and then escapes by forcing its way out of the softened silk. Soon after the emergence the silk moths mate, lay eggs and die. Just after the formation of cocoons healthy cocoons are selected and kept in cages for the next crop.

Reeling or Raw Silk from Cocoon : For the production of standard variety of raw silk latest technology is employed for the speedy and economical reeling or raw silk. This constitutes an important aspect of sericulture because cocoon production is directly related to reeling industries.

Before reeling the thread the cocoons are dipped in a container of hot water for more than 10 minutes. During this period they are continuously stirred with the rod. Due to this, their outer portion is loosened and removed in the form of long tapes and the end of the continuous filament is found, the filaments of several cocoons are picked up and passed through the glass eye on to the reel. The thread thus reeled forms the 'raw silk' of commerce. About 1 kg raw silk is obtained from nearly 55,000 cocoons.

Production of Silk : Silk is the result of secretion of silk glands. They are a pair of long tubular and coiled glands living one on each side of the alimentary canal of the caterpillar. Fibrous a soft of fibrous protein is secreted by each gland which at first is in the fluid condition. These glands are connected with very narrow, tube like structure known as spinneret which is a part of the hypopharynx. The liquid secretion of two glands passes through the spinneret

which transform them into a single thread. Sericin which causes the two fibres of fibrion to unite is secreted by a pair of accessory gland situated at the anterior region of silk gland situated at the anterior region of silk gland. Two streams of fibrion along with sericin are expelled through the spinneret due to contraction and expansion of the body of caterpillar. This sticky secretion after coming in contact with the air is converted into a fine long and solid thread of silk.

Use of Silk : Bulk of silk fibres produced is utilised in preparing silk clothes. Use of pure silk is decreasing gradually due to its high cost value and costly maintainance. Production of synthetic fibres has posed a serious threat to the silk industry clothes in which silk fibres are combined with other natural and synthetic fibres are in great demand not only in India but also in foreign countries. Secing this demand many textile industries are manufacturing clothes like Teri-silk, cot-silk etc. Besides silk being used as garments, it is used in the manufacture of fishing fibres, parachutes, cltridge bags, insulation coils for telephones and wireless receivers, types of racing cars, filter, clothes for flour mills and in medical dressings and suture materials.