Abstract:
The history of silkworm and its trades date back to fifteenth century in Indian history. India is unique due to its climatic condition, which made India the only country producing all the five known commercial silks Sericulture has turned into eco-friendly agro-based small enterprise that has turned into long chain industry from mulberry cultivation to fabric making. This commercially attractive economic activity has frequently provided returns in the tropical states of the country through year. Silkworm rearing is sensitive to the climatic and environmental components. Differences in these components may show considerable affects in the form phenotypic output of silkworm crop. In the view of the importance of silkworm rearing, this paper tries to provide necessary steps and important stages with proper handling techniques for proper management and rearing of silkworm corp.

Keywords: Sericulture, cocoons, mulberry, rearing.

I. INTRODUCTION

India produces 23,060 MT of raw silk accounting for more than 17% of total world silk production. India is the second largest producer of silk. Our country is the only country blessed with all the four types of silkworm i.e. Mulberry, Tasari, Eri and Munga.

Muga silk is the commonly domesticated silk of India. Currently, production of mulberry is confined to states of Tamil Nadu, Karnataka, Andhra Pradesh, West Bengal and JammuKashmir.

It is important to realize the production potential of sericulture to meet the gap in demand and supply of mulberry plantation for rearing good silkworm. Three categories of Mulberry silkworm are reared in India viz, Bivoltine, Cross Breed or Multivoltine and Improved Cross Breed.

Biovoltine produces high 3A grade import quality silk, Cross breed/Multivoltine are much easier to handle and rear as they are hard and can easily adopt to the environmental conditions while Improved Cross Breed are used in powerlooms as they are capable of producing 2A to 3A grade silk. Mulberry silkworm is domesticated insect is sensitive to various parameter such as temperature and humidity that cannot survive with required and sufficient care.

Like another typical Butterfly (Lepidoptera) insect, the silkworm passes through 4 distinct stages i.e. egg, larva, pupa and adult during its life cycle. The duration may last for 6-8 weeks depending on the prevailing climatic conditions. The silkworm passes 5 instar larval stages during its development. Late age worm that begins from third instar to fifth instar. The instar larvae are voracious feeder.

The worms consume about 90 to 95% of the total feed at these stages. The rearing techniques are different in young/chawki rearing or late age rearing. Not only nutritional but also ecological requirements of the worms are different at different stages. Therefore, to support a strong and sturdy silkworm it is necessary to follow good management practices depending upon the stage of the instar.

II. MULBERRY CULTIVATION

1. Land Preparation:

Poor initial establishment, inadequate cultural operations are major limitation or constraint in the leaf yield of mulberry crop. Mulberry is hardy plant and can grow on any soil type however red-sandy loam soil is preferred with a pH around 6.5. Gypsum or lime can be used to fix the pH of soil if its acidic or alkaline. Prior to planting season, the land has to be dugged 30 to 35 cm deep to loosen up the soil. This would enable the proper saturation of the field.

2. Pit preparation:

Standard pit of 35x35x35 cm size are made with a spacing of 90x90 cms are used for planting.

3. Preparation and planting of cutting:

Mulberry is commonly vegetative propagated using cuttings. Cuttings of one-year-old branches with 12 -15 mm diameter are selected. These selected healthy branches are then cut down into pieces of 20-25cm length with 3-5 healthy buds.

4. Inter-cultivation:

Light hoeing should be done from two month of planting to remove the weeds and open up the soil a little for aeration and absorption of water. Secondly weeding is done after another two to three months. When the plant attains thickness of 22-25mm after one year of plantation first pruning should be done. Commonly the plants are pruned in June every year coinciding with onset of monsoon.

5. Manure and Fertilisers:

Ten tonnes of FAM is added after pruning and inter-cultivation per hectare per year. Green manure crop such as sunhemp can be used as organic manure. N:P:K at rate if 100:50:50 kg should be applied in addition to FAM. The fertilisers are split into two dose i.e. first dose of 50:50:50 kgs of N:P:K after 6 to 8 week after application of organic manure while the second be applied during late November.

6. Harvesting:

After plant attain proper full growth, mature leaves are plucked, leaving the tender leaves and terminal bud. First year
crop can be harvested two times, first harvest after 6 to 7 months and the second harvest after 10 to 11 months of planting. From second year onwards the crop yields 5 to 6 times a year, leaves can be harvested at interval of 8 to 9 weeks.

### III. HOUSE PLAN FOR REARING

1. A rearing house provides adequate bed space to silkworms and enough working space for the labourers to perform the raising activities
2. Good ventilation support to replace ammonia, carbon dioxide and different toxic gases that are exhaled by growing larvae.
3. There should be space for leaf safeguarding, putting away different machines and synthetics or disinfectants utilized in raising.
4. The doors and windows of rearing should be fitted with mesh or net to avoid entry Uzi-fly and the house should have an ante-room to avoid any contamination.
5. Proper water facility such as water facility for cleaning or brushing the larvae in such as water facility for cleaning or brushing the larvae in.
6. Provision of exhaust fan are important to excavate the humidity of rearing house at rear end on a rainy day
7. Wall height of 10 m should be maintained and roof can be made either using slab or tiles or asbestos

### IV. REARING REQUIREMENT OF YOUNG AND LATE AGE WORMS

#### Hatching:

Silkworm has two different types of eggs i.e. hibernating and non-hibernating eggs. Depending upon the type of egg, they are processed differently. Common criteria for processing is checking the egg is diapausing or the non-diapausing type. Univoltine lays diapausing eggs while multivoltine lay only non-hibernating eggs and bivoltine eggs have intermediate behaviour. Generally, univoltine and bivoltine race eggs are hibernating type. Special kind of treatment is required to artificially awake them from diapause or they are stored till next season. Eggs of silkworm are available loosely or on egg cards. The newly hatched larvae are hairy, black and are similar to that of small ants. To maintain the homogenous hatching of eggs, eggs when reaches blue egg stage are shifted to dark black box or cloth and are kept in dark. Not only does this provide enough time for late maturing embryo to develop and mature but further prevents the hatching of early maturing embryo. Eggs hatches in response to phototropic stimulus. This method favours more than 90% hatching. If hatching is not uniform and hatching percentage is below 50 to 60% then brushing can be postponed to the next day. If required the hatched eggs can be refrigerated at 10°C in a tissue paper on the first day and when the second batches hatches on the next day the first day egg are mixed with second batch and brushed with second batch together.

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\text{Total No of eggs} = \text{Good eggs} + \text{Dead eggs}
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\text{Hatching percentage} = \frac{\text{Total No of eggs hatched}}{\text{Total No of eggs}} \times 100
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\text{Unfertilised egg percentage} = \frac{\text{Total No of dead or unfertilised eggs hatched}}{\text{Total No of eggs}} \times 100
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#### Brushing:

Separating the larvae from the eggshell on to the frame is known as brushing. It is always better to brush the larvae in the morning. The optimum time for brushing is 10 am in the morning when the temperature is around 27°C and the humidity is 80-90 %. The rearing facilities should be prepared for the brushing of worms. Tender nice leaves should be chopped so that the worms can crawl on to the leaves. The worms can be disinfected by dusting formalin (3%) using a fine mesh-sieve. Brushing is of two type using loose egg or using egg cards.

#### Young age silkworm rearing:

In tray of 4’x3’x3’” size 20 disease free laying are brushed and reared till the end of second age. Silkworm are cold-blooded animals, temperature will have an effect on various development activities. Optimum temperature for normal growth of silkworm is 20°C to 28°C. Temperature above 30°C can have a different effect on the health of the worm if the temperature falls below 20°C will retard all the physiological activities of worm. Humidity has direct and indirect effect on the silkworm development. It directly influences various physiological activities of worm on other hand it indirectly influence the withering rate of leaves in beds. Temperature of 23-27°Cand 90% humidity, the worms can be grown without being greatly affected. The mulberry leaves are the exclusive food for the worms. So succulent leaves with good nutrient content are considered edible for silkworm for better growth. Application of balanced fertilisers plays an important role to provide required nutrient for physical and chemical development of the leaves. Large glossy leaf method is adapted to select the top tender leaves for young worm rearing. Further details of chop size and no of feeding are mentioned in the late age silkworm rearing. The silkworms of third, fourth and fifth age are considered as late age worms. The temperature and humidity requirement comes down as the stage advances. The adult silkworm is vulnerable to high temperature. The larval mortality increases when young worms are reared in low temperature (24°C) and late age rearing in high temperature around 28°C. The larval mortality increases when young worms are reared in low temperature (24°C) and late age rearing in high temperature 28°C. Daily variable temperature within a range of 25± 4 °C is preferable over constant temperature. Late instar worms are sensitive to high humidity. The humidity requirements during feeding and moulting are quite different in silkworm. The optimum humidity required for IV and V instars is 75% and 70% respectively. Silkworms are fond of dim light of 15 to 20 lux and avoid strong light and darkness. Late age worms thrive better in 16 hours light and 8 hours dark periods. In glossy leaf method selection, the mature leaves remained on the mulberry twigs after chawki rearing are fed to IV and V instar worms plucking from top to bottom. Leaves of medium maturity are fed in the third and fourth age and coarser leaves are fed in the fifth age. Over matured and yellow leaves is rejected . The silkworm beds should be cleaned three times during this stage. During fourth and fifth ages, cleaning is done every day.

#### Preservation of Leaf:

Wet gunny bags or basket made of bamboo are used to transport the harvested leaves. Such leaf should be preserved in a separate room or in a corner of rearing room or in specially designed leaf preservation chamber made up of wood with sufficient number of ventilators. The leaf chamber should contain a good number of ventilators covered with wet gunny
cloth. This will help in maintaining leaf quality. Other wise leaf should be scattered on the floor in a single layer so that the water droplets on surface of leaf will be evaporated. Leaf should never be preserved on heaps. This will increase the humidity. Leaf scattered on floor should be frequently sprinkled with water and tilted in summer.

**Rearing method & Cleaning:**
The rearing trays are arranged in tiers one above the other on rearing stand leaving enough space for attending, cleaning and feeding. Each stand has ten trays arranged and worms are feed with leaves. The feeding interval differs depending upon the stage of worms. Net are used to clean the trays. Generally cleaning preferred after first feeding. The net size used for trays are 20 sq.mm which is spread over the trays before feeding. The bed cleaning is done before the next feed where the entire net along with worms are transferred to fresh bed. Precaution should be taken during to prevent any contamination or disease.

**V. CONCLUSION:**
Central and state government have provided many schemes subsidies and loans to increase the silk production in India. Other institutes such as NABARD and Banks are also providing loans and subsidies to increase the silk rearing industry in India. NABARD and bank need certain detailing to be eligible to avail loans from the banks. As per NABARD bank rules and regulation, the bank sanctions a loan based on marginal income. If the amount sanctioned is more than one lakh it sanctions only 10-15% and may varies accordingly. Tropical country like India are unique country in world were all different varieties of silkworm are produced. Encouraging participation of large number of women in sericulture and proper management practices will develop & help in creating sustainable employment option in the sericulture industry.

**VI. REFERENCES**


