

Harvesting and Processing of Cocoons

MOUNTING AND SPINNING


Towards the end of the fifth stage, the silkworm stops eating and becomes the so-called mature larva and starts spinning the cocoon. Properly reared worms, when ripe, will try to spin good cocoons even under unsuitable conditions; but it must be remembered that the object of the worm is spinning the cocoon is to protect itself from external disturbances and natural enemies during the most critical period of its metamorphosis and not to help the rearer by yielding easily reelable cocoons etc. The rearer can get this reward for his labour only; if he cooperates with the worm by making the conditions such that, by spinning a commercially good cocoon it also most efficiently protects itself. This cooperation consists in providing the ripe silkworm with suitable mountages to facilitate its spinning of good cocoons.

The eating period during the fifth stage may last for five to seven days in the case of multivoltine and bivoltine races in the tropical areas and seven to nine days in the case of bivoltine and univoltine races in sub-tropical areas. The mature worm is readily distinguishable by its translucent colour. The body also shrinks in length; there is also a visible constriction at the 4th and 5th segments. The worm loses appetite and begins to look about as though in search of a suitable place to which to attach itself. Generally, the ripening worms move towards the periphery of the rearing trays in search of anchorage to commence spinning of cocoons. This is the time for picking the ripe worms and putting them on mountages. This process is called 'mounting' It must be remembered that all the worms in a tray do not ripen simultaneously. It usually happens that, by the time the majority of worms in a tray are ripe, some of the early worms will be over-ripe. These will have lost a quantity of silk by the time they are picked up, and they are moreover in such a hurry to spin their cocoons that they proceed to do it anyhow, without waiting to select a proper place, and thus produce irregular shaped and flattened or sticky cocoons causing loss to the rearer. If the worms are mounted before they are fully ripe, they will move about and sometimes falloff, and also they defecate in the cocoonage, often soiling and lowering the value of the cocoons which other worms are spinning. The cocoons spun by worms which are mounted too early will be smaller and inferior. It is, therefore, of great importance that the rearer should be ready with the required number of mountages well in time and also mount the worms when they are fully

mature. This is also the time when the rearer should not hesitate to hire enough number of persons to pick up the ripe worms and mount them. Any negligence at this stage is bound to cost the rearer heavily.

Process of Spinning:

As the mature worms are mounted on the mountages they pass out the last excreta in semi-solid condition. During rains when the humidity is high, excess body moisture is also eliminated as liquid urine at the time of mounting. After defecation, the worm starts spinning the cocoon. It anchors itself first to the moutage by oozing a tiny droplet of the silk fluid which immediately hardens and sticks to the moutage. Then by swinging the anterior part of the

body continuously, the silkworm draws out the silk fluid from the two silk glands which lie on either side of the body of it. Silk fluid is excreted in minute quantities and hardens to form the long continuous silk filament. At first, however, the worm spins a loose hammock which provides it with necessary foothold to start spinning of the cocoon proper. The filament is spun in the shape of  and the former type is common in the outer layers of cocoon shells while the latter type is usual in the middle and inner layers. In this way layers after layers of filament are laid to form the compact shell of the Cocoon.

The hammock though formed of a continuous filament forms a labyrinth of highly tangled network and this constitutes the floss of the cocoons which is not reelable. Quantity of floss is comparatively less in uni and bivoltine varieties of silkworms and is about two per cent of the weight of cocoons. In the case of multivoltine races, however, it is high and may amount to as much as ten per cent or even more.

After the compact shell of the cocoon is formed, the shrinking larva finally wraps itself in a gossamer layer and detaches itself from the shell to transform into the pupa or chrysalis. This last layer is only a body sheath of the worm and does not form part of the main shell and as such is not reelable just like the floss layer.

The process of spinning the cocoon by the worms takes about 1 to 2 days in the case of multivoltines and 2 to 3 days in the case of uni/bivoltine worms. It is necessary to keep the silkworm larvae undisturbed during this period, because shaking during cocoon spinning causes suspension of spinning and even breaking of the thread. It is also very necessary to provide good ventilation, as the worms have to get rid of a good deal of moisture in the process of spinning; the silk, though it is solid, is still wet, and needs to dry to set into a firm cocoon.



Mounting of worms:

Collecting mature silkworms and mounting is a laborious job which requires a great deal of labour. Normal practice is to hand picking the mature worms by skilled labour who can identify the ripe worms. The ripe worms are collected in hand trays and later put on the mountages. As mentioned earlier, "chandrike" is the most popular type of mountage in Karnataka and West Bengal. As this entire process is carried out with manual labour it is possible to ensure uniform distribution of mature worms on the mountages and thus reduce the incidence of double cocoons. In this method it is also possible to eliminate the diseased larvae and thus achieve a fair measure of uniformity of cocoons.

In order to save labour involved in picking mature worms, some simple techniques have been evolved involving the use of green branches or nets. In the "branch method", branches with green leaves are placed over the rearing bed and when the worms crawl into them they are taken out and shaken off over a mat to dislodge the worms which are later collected and put on the mountages. Similarly, in the case of "net method" also, a net is spread on the bed after feeding and the mature worms which do not feed any more will come up and crawl on to the net which are taken out and shaken off the net over a mat and mounted as in the case of branch method.

In shoot rearing method, larvae maturing early which constitute 10 to 20 per cent of the total larvae can be picked by hand as they ripen. Later on, when the remaining larvae mature uniformly and almost simultaneously, these can be collected by shaking off the larvae from the upper layers of mulberry branches to mats. They are then mounted on the mounting frames.



Bamboo Mountages horizontal and vertical



Plastic sheet of Mountage with folds.

Harvesting and marketing of Cocoons

Introduction:

In the previous units, you have learnt about the techniques of handling of silkworm eggs, rearing of silkworm larva, identification of mature (ripen) larva and placing of the mature larva in the spinning trays (mountages). When the mature larva is placed in the mountage, it will spin a cocoon by ejecting a silk filament from its silk gland through an opening (spinneret). Silk filament is protein in nature, which hardens in contact with the air. You know that mature silkworm larva will take 3-4 days to spin a cocoon. After complete ejection of silk and formation of the cocoon, metamorphosis takes place and the larva transforms into pupa. In between, there is pre-pupal stage. This transient phase is very delicate. Normally, within ten days, the pupa again undergoes metamorphosis and emerges as a moth by piercing the cocoon. Now the question comes how to handle the cocoons and what to do with cocoons? Let us try to learn how to handle the cocoons.

Time of Harvest:

Harvest is commonly used to mean gathering or collection of ripen crops, especially in agricultural produce. In sericulture, harvest signifies to the collection and gathering of produced cocoons from spinning tray or mountage. In the previous chapter, we have discussed that after spinning a cocoon, the larva undergo metamorphosis (complete change in morphology) and transforms into pupa. For completion of spinning and metamorphosis, about 5-6 days are required and you have to allow the larvae for this process. While harvesting, it may also be considered that during summer, the process is faster, whereas, in cooler months, it is slower. After pupation, when the integument of the pupa turns brown and hard on the 5th day (Fig.1.1), the cocoons may be harvested. The safest method is checking the condition of pupae by slit open a few pupae. Premature collection of cocoons or harvesting may lead to loss of silk content of the cocoons due to incomplete spinning or killing the delicate pre-pupa or pupa within the cocoons. Killing of pre-pupa or tender early pupa inside the cocoon will lead to stained cocoons, rendering it unfit for reeling. To avoid this, harvest cocoons at 6th day after completion of full 5 days in mountage, counted from the last day of mounting. The pupa will be hard and cocoon shell will be dry. This condition will be suitable for safe handling and transportation of cocoon. Cocoons release moisture even after completion of spinning. Delayed harvest will lead to weight loss of cocoons. So, you should stick to the time of harvest.

Methods of Harvest:

You might have realized the importance of timely harvest of silk cocoons. Now, the question comes how will you harvest?



Fig: Harvesting from Chandrika by hand picking method and sorting of cocoons

Methods for harvesting of silk cocoons varies, depending upon the mountage (spinning tray) used. Whatever the methods of harvest, first you remove litters and left-over of leaves, dead or un-spun larva, naked pupa (without cocoon), flimsy and melted cocoons from the mountage. Flimsy and melted cocoons may spoil the good cocoons by spilling stain. Spiral bamboo mountage (Chandrika) is most commonly used in our country. You may harvest the cocoons from Chandrika by hand, simply by moving your fingers in between the ridges. In case of plastic collapsible mountages, you may harvest manually by hand picking. In the rotary cardboard mountages, harvesting by hand is rather difficult and time consuming. You can use a wooden harvester for quick harvesting. It has two parts. First one is a wooden frame on which cardboard mountage can be fixed. Another is pusher, made up of wooden pegs, that fits with the hole of mountages. After removing dead worms, flimsy and stained cocoons, fix cardboard mountage on the harvester. Then, place the wooden pusher on the holes and push gently so that cocoons come out of cardboard holes. Now, you may collect the cocoons by hand by folding the mountages.

Stifling chamber



Fig: The Stifling chamber in which cocoons are heat dried



BRUSHING / DEFLOSSING

- Hand brushing
- Mechanical brushing



REELING

- Charkha reeling
- Cottage basin
- Multi end reeling
- Automatic reeling machine



Brushing and Reeling of cocoons

References:

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