



Silkworm Seed Technology

in brief

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Sericulture Industry

- **Production of Mulberry leaves**
- **Rearing of silkworms & Cocoon production**
- **Silk reeling, processing and textile manufacture**

Quality seed is the backbone of sericulture industry

Quality seed

- **Is free from diseases**
- **Has maximum number of viable eggs**
- **Gives good uniform hatching**
- **Is prepared from healthy and robust parents**
- **Assures a stable and successful cocoon crop**

Silkworm Seed Organization

Constitutes the maintenance of breeders stock and its multiplication

P4 Station: Research Institutes eg. CSR&TI (CSB), KSSR&DI, Universities, etc.,
Breeding (evolving) of new strains and maintenance
Releases small quantity of seeds whenever P3 center demands

P3 Station: Basic Seed forms maintained by Govt. eg. Thandavapura, B R Hills etc.,
Maintain the breeds with cellular rearing or 1 DFL
Release stocks to main stream of seed production

P2 Station: Maintained by Govt. eg. B R Hills, Kollegala, etc.,
First stage of mass multiplication taken up with in batches of 2 DFLs.

P1 Station: Seed Areas - Mass multiplication taken up by the seed rearers (Farmers)

Govt. and Private Grainages for Hybrid Preparation

Hybrid seeds distributed to farmers for commercial silk production

SEED ACT

The salient features of the “THE KARNATAKA SILKWORM SEED, COCOON AND YARN (REGULATION OF PRODUCTION, DISTRIBUTION, SUPPLY AND SALE) ACT 1959”

It is obligatory, to ensure supply of DFLs, to provide facilities for training and to ensure fair trade of reeling cocoons and silk yarns.

- **The Mysore silkworm disease control Act 1943.**
- **The Mysore Silkworm seed (control and Distribution) Act 1952.**
- **The Mysore Silkworm seed and cocoon (Regulation of Production, supply and Distribution) Act 1959.**
- **Later these Acts, mended as The Karnataka Silkworm seed, Cocoon and yarn (Regulation of Production, Supply, Distribution and sale) Act 1959.**

Seed areas

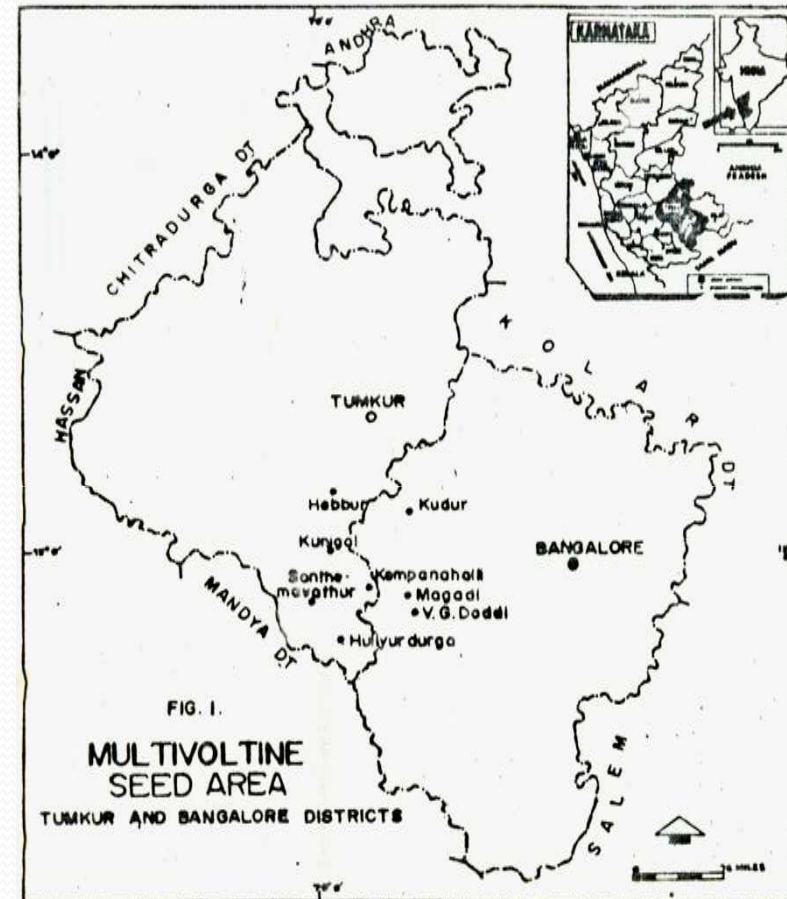
Are of two types:

a. Multivoltine Seed area:

Magadi, Kunigal & Hebbur taluks of Tumkur district

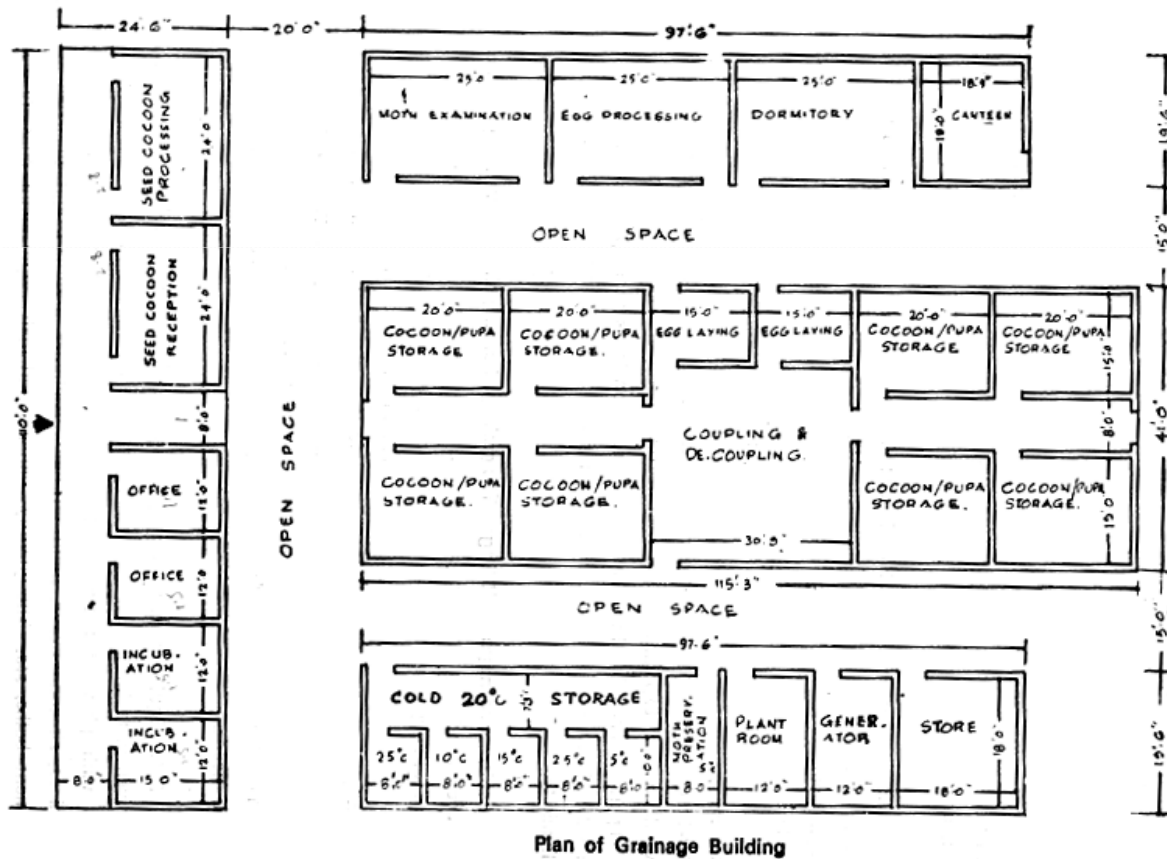
b. Bivoltine Seed Area :

Anekal taluk of Bangalore dist, K R pet taluk of Mandya dist and certain parts of western Ghats. In addition selected seed rearers can also rear seed crops.



Grainage

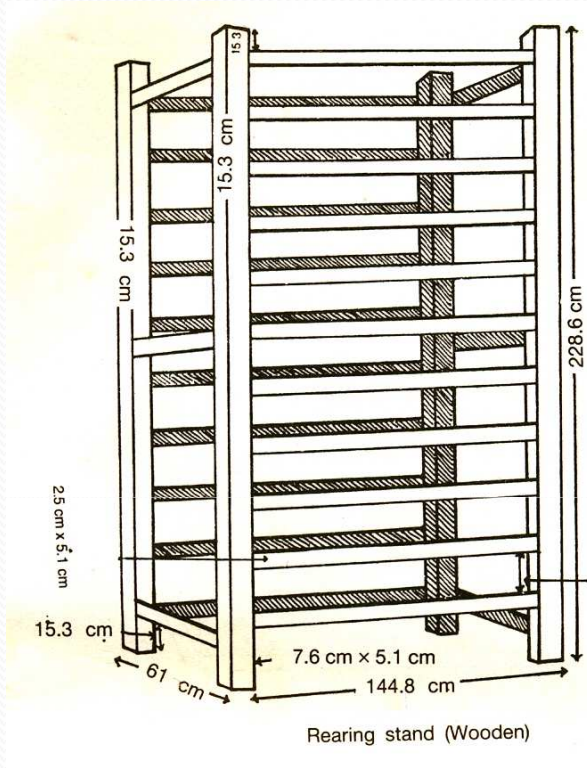
Grainages are establishments where disease free and quality seeds are produced on scientific lines.



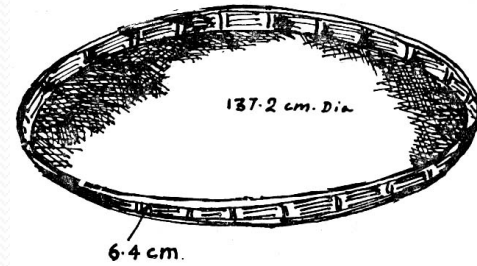
Facilities

1. Accommodating cocoons /Pupae of different strains
2. Coupling & oviposition
3. Incubation
4. Laboratory
5. Egg processing
6. Cold storage
7. Dormitory
8. Office

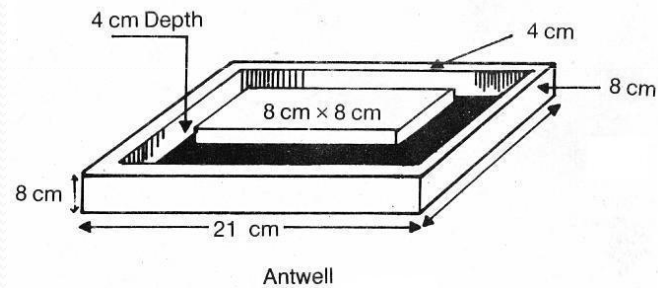
Grainage Equipments continued



Keeping the trays containing cocoons/pupae

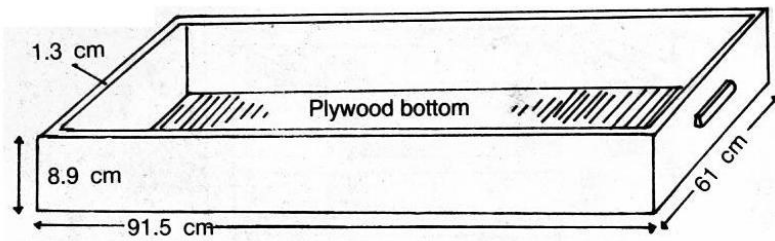


Used to spread the pupae/cocoons



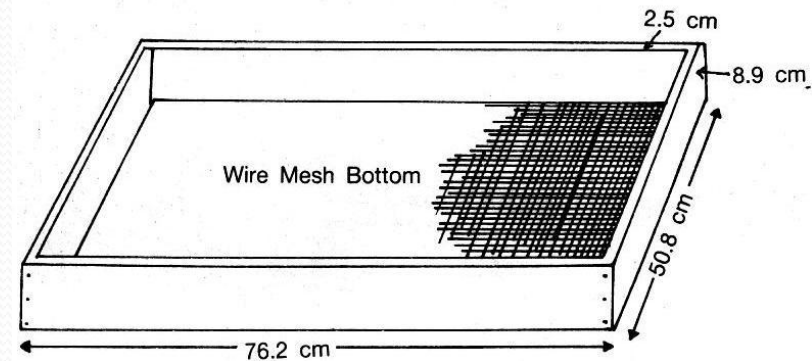
Prevents the ants & other crawling insects

Grainage Equipments continued



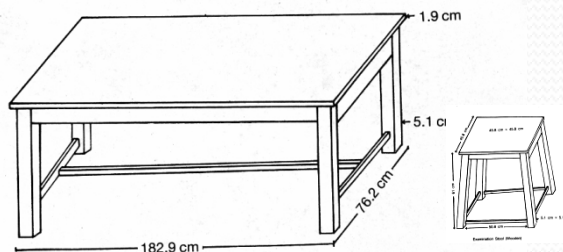
Grainage Tray (Wooden)

Used to egg laying



Grainage-wiremesh Tray

Used to pairing



Moth Testing Table (Wooden)

For moth examination

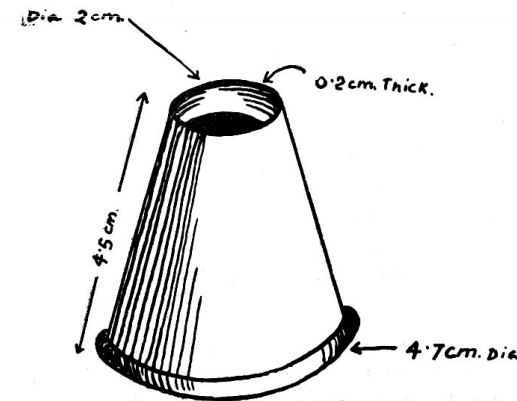
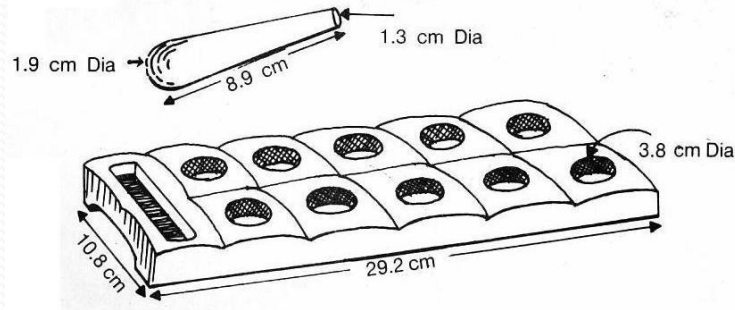


Figure 11. Cellule

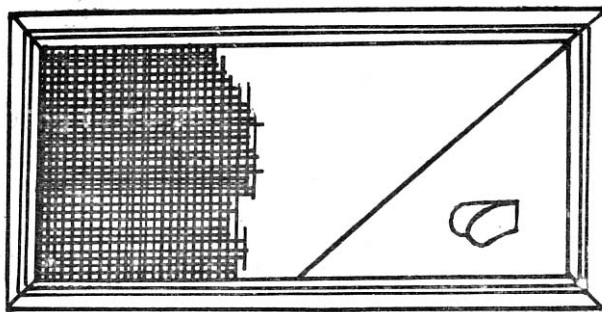
To provide total darkness during pairing & egg laying

Grainage Equipments continued



Moth Crushing Set (Porcelain)

For individual moth examination

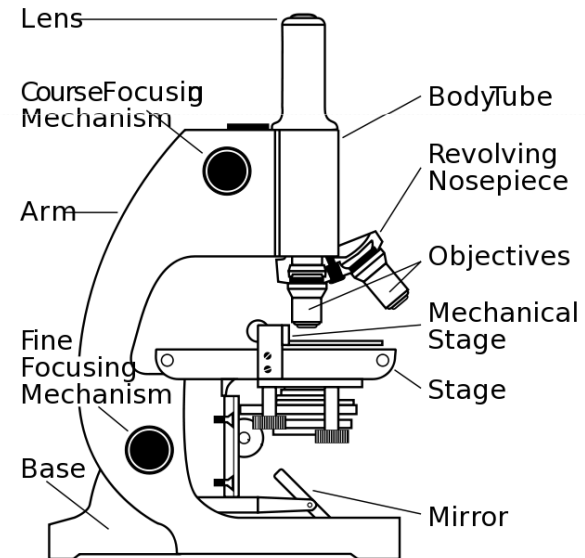


Loose Egg Container



Mortar and Pestle

For mass moth examination

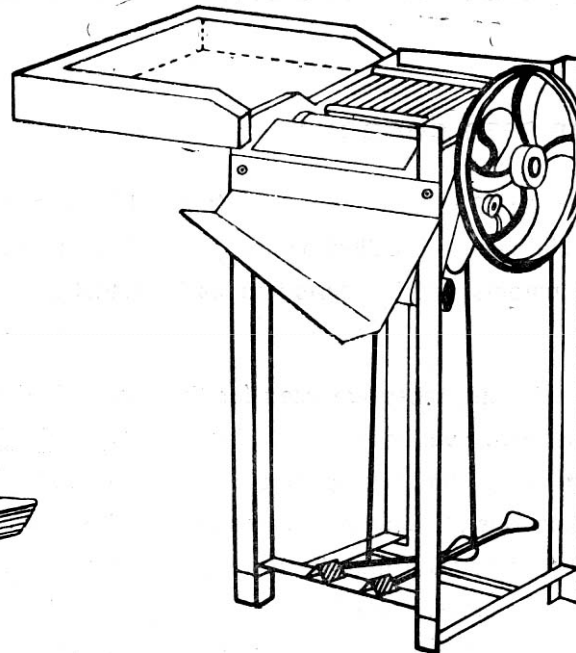


For moth examination

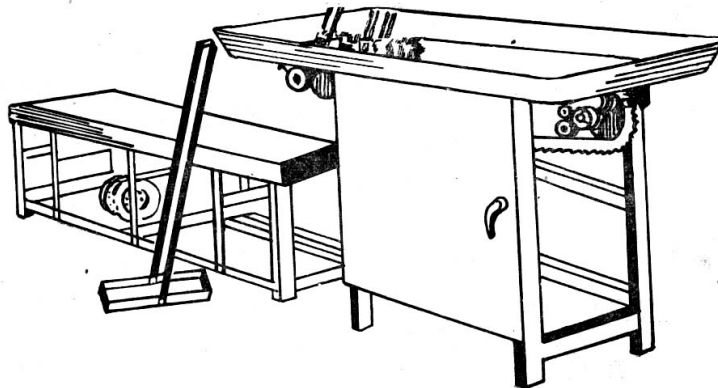
Grainage Equipments continued



Hygrometer



Deflossing Machine

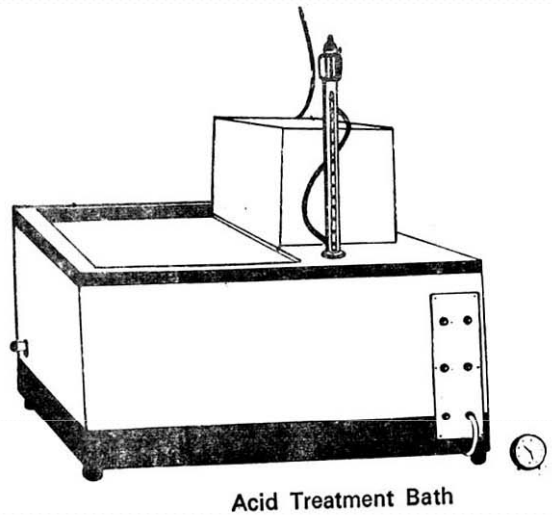


Cocoon Cutting Machine

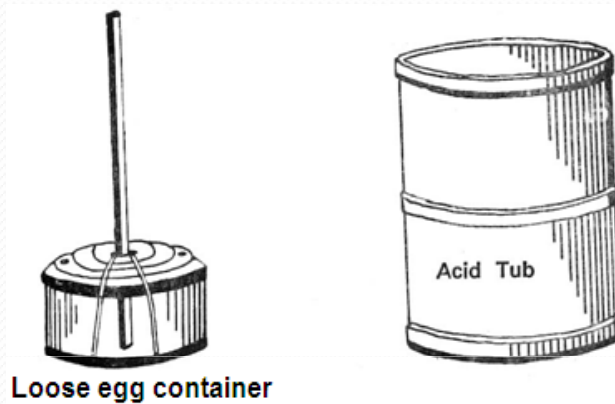


Dry and Wet bulb thermometer

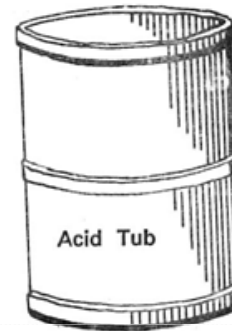
Grainage Equipments continued



Acid Treatment Bath



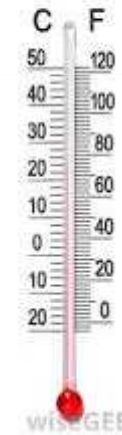
Loose egg container



Acid Tub



Hydrometer



Thermometer

Basin Stand
Hot air oven
Zinc Trays
Foot mats
Refrigerators
Basin Stands
Egg Cabinets
Etc.,

Grainage Activities

Production of silkworm seeds

The aim of a grainage is the production of quality seeds. This process involves different steps as

- **Procurement of seed cocoons**
- **In the cocoon market, the grainage authorities will purchase the required quantity of multivoltine cocoons from the seed cocoon market.**
- **Half quantity of the bivoltine cocoons should also purchased from bivoltine cocoon markets for the preparation of hybrid seeds.**
- **The seed cocoons are packed loosely in perforated boxes or bamboo baskets in small quantities and are transported during cooler hours of the day.**



Grainage Activities continued

- **Preliminary Examination/Selection and sorting of cocoons**

The seed cocoons arriving at the grainages are subjected to rigid selection. In selection only sound and uniform cocoons conforming to the characteristics of the race are selected and defective cocoons *etc.*, are rejected.

Grainage Activities continued

Advance detection of pebrine disease, if any before the commencement of operation of each batch helps in averting great loss to the grainages. This is facilitated by investigations at three stages

Pupal test

Forced eclosion test

First day moth examination.

Pupa Test

The pupa is cut ventrally just below the wing bud by a scissor by holding the pupa between thumb and for finger in left hand. After cutting the pupa is pressed gently. The midgut oozes out as a brown body from the cut portion. This midgut is collected and crushed with few drops of potassium hydroxide in a moth crushing set. The fluid is taken on the slide and examine under the microscope with 600 X magnification.



Grainage Activities continued

- **Preservation of seed cocoons**

The cocoons are preserved in single layer in well ventilated rooms under natural light and dark conditions. Exhaust fans in cocoon preservation and emergence rooms are essential to expel foul gases and dust. Different component races are to be preserved in separate rooms.

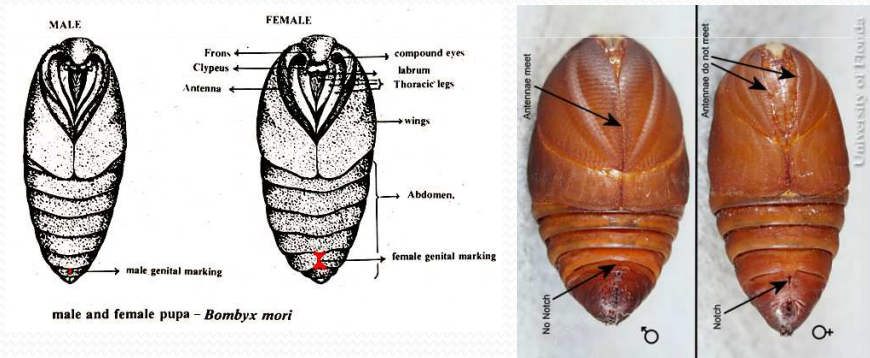


Grainage Activities continued

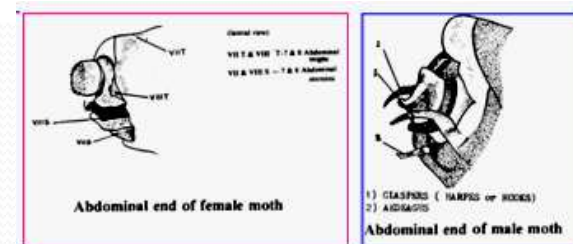
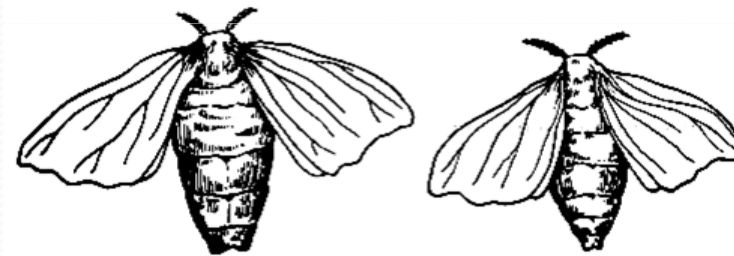
In the case of preparation of industrial **hybrid seeds**, the sexes must be separated before selfing occurs in the same parental race. This sexing may be carried out either in the larval or pupal or moth stage.

- Sex separation at Pupal and Moth stages

Male and Female



Female and Male



Grainage Activities continued

- **Synchronization of Moth Emergence**

Moths of the component races are made to emerge on the same day, so that male and female moths are readily available for hybridization. This is referred to as synchronization. Planning starts at the brushing time. Otherwise emergence of moths in the two races may be adjusted by selecting cocoons of matching date.

In case of synchronizing batches are not available; emergence of the earlier batches can be delayed by refrigerating the cocoons at 5-10°C. Such refrigeration should be limited to 3 days for females and 7 days for males.

The moths may also be refrigerated at 5°C up to 10 days in case of males and 2-3 days in case of females.

Grainage Activities continued

Coupling and Decoupling:

As soon as the moths emerged they start to get pair.

The female moths are spread in a tray and the male moths of the desirable hybrid component are evenly distributed over the females. In about 15 minutes, the male and female moths pair.

After the required period of coupling, the pairs are separated by holding the female moth and gently sliding the male. This facilitates easy separation without injury to the female reproductive organs.



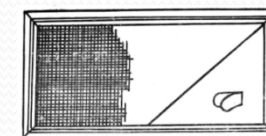
Grainage Activities continued

- **Oviposition:** This is nothing but the process of egg laying by the female moth.

When eggs are required to be laid on cards, the mated females are placed on the egg sheets and each moth is enclosed in a cellule. The cellule isolates the eggs laid by each moth, facilitate individual moth examination and elimination of eggs laid by diseased moth.

In case of preparation of loose eggs, a unit number of female moths are allowed to lay eggs on starched paper or cloth, with in a wooden or plastic frame. The number of moths vary from 30-200 according to the health of the batch and convenience.

Moths are allowed to lay eggs for 24 hours in a dark room with 25°C and 75-80% RH. Then mother moths are examined for the pebrine disease and eggs free from pebrine disease are qualified for rearing.



Loose Egg Container

Grainage Activities continued

Mother moth examination

- **Individual Mother Moth Examination**
- **Sample Testing**
- **Mass examination**

Surface Disinfection of Eggs

After mother moth examination, the egg sheets or loose eggs in a container are dipped in 2% formalin solution.

- 1. This helps in eliminating surface contamination.**
- 2. Formalin increases the adhesive capacity of eggs to the egg sheets.**

Subsequently, the sheets are washed and dried under shade and preserved under optimum temperature (25°C) and RH of 80%.

Artificial Hatching

Multi Voltines never undergoes diapause, but uni and Bi Voltines undergo diapause or hibernation. So to check the diapause ARTIFICIAL HATCHING is done by either

Cold treatment or Hydrochlorination

Cold treatment is nothing but refrigeration depending upon schedule *i.e.*, Hibernation Schedule

Hydrochlorination is hydrochloric acid treatment

- 1. Cold acid treatment – HCl 1.1 sp.gr.60-90 min at 24°C**
- 2. Hot acid treatment –HCl 1.075 sp.gr. 5-6 min at 46.1°C**

Then was the eggs in running water to remove acid traces and dry under shade.

“Now the eggs are ready for Incubation”



**Reference/Acknowledgements
to**

MANUAL ON SILKWORM EGG PRODUCTION, CENTRAL SILK BOARD, INDIA 1988.