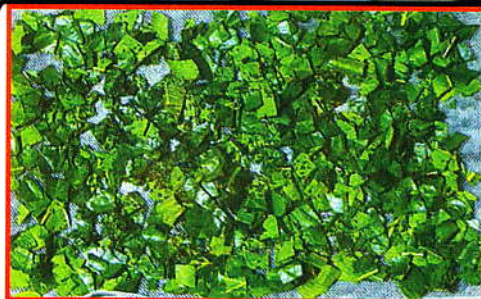




YOUNG AGE SILKWORM REARING TRAINER'S GUIDE



2009
Sri R.Gururaj
Dr. S.B.Magadum
Ed: Dr. S.M.H.Qadri

Regional Sericultural Research Station,
A unit of CSR & TI Mysore, Central Silk Board, Govt. of India,
Chamarajanagar -571 313

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by

**Sri R. Gururaj
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FOREWORD

The Sericulture is an agro based industry catering to the needs of mainly farming and weaving communities of country. It is

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Date: 24th March 2009

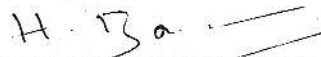


estimated that over six million people are dependent on the sericulture activities for their livelihood. The new sericultural technologies have revolutionized the production and productivity of both mulberry and silkworm in selected parts of Andhra Pradesh, Karnataka & Tamilnadu. Therefore, the training and demonstration of various technologies for disease free and assured cocoon production particularly young age i.e., chawki rearing technology are essential to bring about revolution in other parts of these important sericultural states of India.

It is in this context, I am happy to learn that Scientists of CSB have brought out an excellent compilation entitled "**Youngage Silkworm Rearing - Trainers Guide**", which will be useful to the Students, Teachers, Farmers, Extension functionaries and Officers alike.

The compendium dealt with all the activities of chawki rearing on day to day basis and also included the pre and post evaluation of training which would help the trainees to improve their knowledge and acquire the operational skills to get successful cocoon crops. I am certain that the compendium would be highly relevant to produce skilled manpower required towards reaching the desired level of production of silk in the country and to further augment the income of the sericulturists.

I, whole heartedly, congratulate the efforts taken by the authors in bringing out this compendium at an appropriate time.


Commissioner for Sericulture Devt.
& Director of Sericulture

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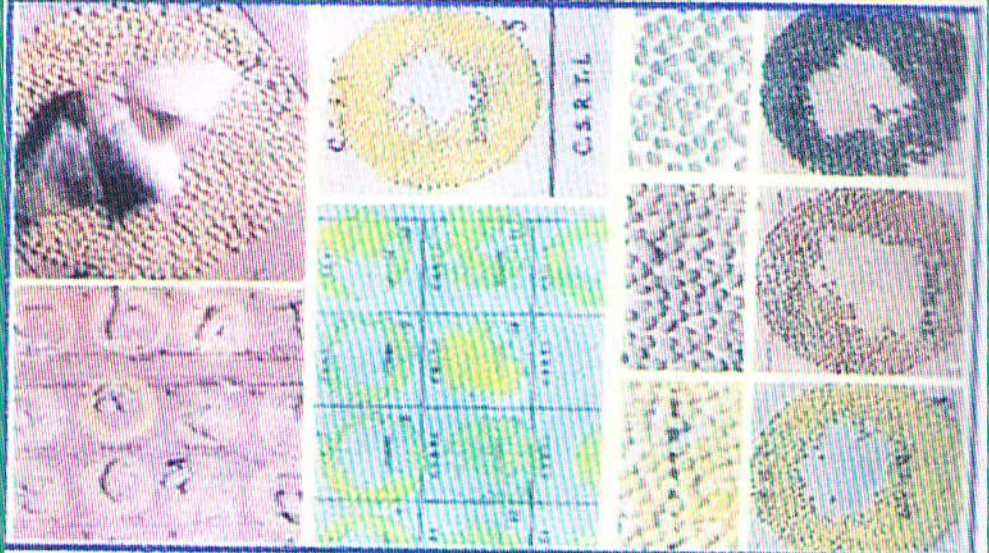


Figure No. 1 : Silkworm Eggs



Figure No. 2 : Disinfectant and Preparation

PART ONE

INTRODUCTION

Knowledge of basic concept of young age rearing is vital aspect in sericulture industry for ensuring good cocoon quality. This is emphasized amply in present training course in which the trainer will apply the participatory diagnosis of problems related to young age silkworm rearing and practical session in rearing robust disease free worm .The objectives are to equip participants with knowledge and skills that should enable them to:

1. have proper incubation and good healthy hatching
2. ensure robust and disease free growth of young silkworm
3. reduce the larval mortality to improve the yield
4. reduce production cost & utilizing saved labour for other activity by consumers.

The recommended duration for conducting this course is eight days with three hours for practical session as detailed in the table.

A. DETAILS OF DAY WISE SCHEDULE TO BE COVERED IN YOUNG AGE TRAINING PROGRAMME

Day	FORENOON	AFTERNOON
1	Reporting & orientation	Handling & transporting of silkworm eggs, leaf moisture estimation, brushing arrangement, requirement of rearing house for chawki- creating microbe free environment & disinfection and its importance
2	Brushing	Calculation of hatching%, Importance of silkworm hybrid rearing incubation, black boxing & time of brushing, number of feed, selection of leaf and feeding habits
3	Attend rearing	Chawki garden – planning; package of practice, pruning methods, disease management during young age.
4	Field visit	Moulting care
5	Resumption of worms from 1 st moult, application of bed disinfectant	Silkworm disease & pest of young age and its management, use of bed disinfectant (theory)
6	Attend Rearing	Importance of commercial Chawki Rearing Centers & maintenance of temperature, humidity and hygiene (theory)
7	Attend Rearing	Testing of chawki worm and Certification. Care for transportation of worms.
8	Silkworm rearing	Evaluation of training programme and presentation of Certificate.

The trainer should go through the following check list for course preparation and delivery before hand.

1. Venue: Training Venue should be within the campus having a separate chawki rearing house & chawki mulberry garden for practical demonstration. Identify a suitable room before hand.
2. Date of training: It should be decided and informed to participants in advance taking into consideration the readiness of chawki leaf and date of hatching of silkworm eggs on the date so fixed for training.
3. Arrange for Audiovisuals, OHP etc., and also food or snacks to be served at an appropriate time.
4. Training assistants: Three trainers i.e., a head trainer and two assistants are ideal.

5. Preparation of teaching materials: Ensure the course teaching materials, such as Books/bulletin for chawki rearing, flip charts, felt pens, white or black board, note books, over head projector, audiovisuals are ready. CD's on young age rearing can also be used.
6. Prepare materials for practical Exercises: Ensure required materials as per check memo are ready for practical exercise before practical session.

B. CHECK MEMO FOR YOUNG AGE REARING : MULBERRY CHAWKIGARDEN:

Area as per requirement (say ½ acre unit)

- 1) Mulberry variety V1 or S36
- 2) Spacing : 3' X 3'
- 3) Irrigation :85,000 gallon/ha/each time (4-6 days once)
- 4) Package of practices as per recommendation 260N: 140P:140K /ha
- 5) FYM 40 MT in two split doses.
- 6) Training of Mulberry: (8crops/plot/year, as per recommendation).
- 7) Use of bio-fertilizers depending upon soil nutrients.

C. YOUNGAGE REARING: EQUIPMENTS AND INPUTS:

1. Rearing house compact, cement floor, plastered & isolated.
2. Size of rearing house as per requirement (based on brushing capacity)
3. Plastic rearing Trays 3'X4' (20 Dfls /Tray)
4. Rearing stand (20Trays/stand)
5. Feeding stand as per requirement
6. Ant well: (4antwell/stand.)
7. Power sprayer - one.
8. Mask – one.
9. Lime. 3-4 kg. /rearing of 2500Dfls.
10. Vijetha-3-4 kg /rearing of 2500 Dfls,
11. Bleaching Powder 1.5 - 2 kg /rearing of 2500Dfls.
12. Sanitech-2.0 liter/rearing of 2500Dfls.
13. Humidifier: as per requirement & need.
14. Plastic bucket, Basin & Mugs
15. Paraffin or Blue Polythene sheets (8-10m/100Dfls)
16. Chop sticks (8-10 pairs)
17. Feathers
18. Old news papers (2.5 – 3.5 kg/100 Dfls)
19. Black sheet & tissue paper as per requirement.
20. Black cloth 1.5 m.
21. Gunny cloth as per need.
22. Cora cloth as per need.
23. Incubation frame: @ one egg case of 50dfls (in case of loose eggs)

D. Silkworm Eggs.

Disease free layings as per requirement of training programme should be brought three days earlier and incubated properly and subjecting eggs to black box for 48 hours. Black boxing should be done prior to brushing. Rearing room should be thoroughly washed along with equipments and disinfected, prior to silkworm incubation. Arrange the required trays with blue polythene sheets and keep the loose egg spread on incubation frames or egg sheets suitably spread and is covered with a polythene sheet and a sheet of black paper. Maintain the requisite temperature and humidity for incubation i.e., 27° – 28°C and 80 % relative humidity. Explain them, importance of maintenance of room temperature, humidity and along with reference to care of disinfection (prevention). Ensure that all these were done in accordance of incubation of eggs before brushing, so as to facilitate the trainees for brushing of works as per programme (Fig. 1)

Make adequate copies of pre evaluation forms as to know their pre-knowledge about their technology expertise about the incubation & brushing.

E. Check list for course preparation:

- Check list course delivery.
- Conduct participatory introduction.
- Start first session on day 1 with participatory introduction after participant's registration.

Box 1. Examples of question to ask during participatory introduction:

- What is your name?
- When did you start sericulture?
- What is the quantity of dfls you rear & your mulberry acreage?
- Whether you have irrigation facility?.
- Why you are attending the Training Programme?
- What do you hope to get from the course?
- What is the yield of your cocoon crop?
- How many technologies do you practice?

Ask the participant to fill the details based on the said back ground and experience. Elicit what they need before explaining objective of training

Facilitators also to present their expectation.

- What are the expectations of participants from the course?
- What is the expectation of participants from facilitators?
- What are the expectations of facilitators from participants?

Box 2. Examples of expectation of participants from the course.

- Understand the concept of chawki rearing & skills required.
- Learn to select the chawki leaf.
- Learn to know requirement of equipments as well as spacing for Chawki rearing.
- Learn to maintain hygiene in chawki rearing for disease free growth.
- Learn to maintain required temperature & humidity.
- Receive a Certificate of participation.
- Eagerness to run the commercial Chawki Rearing centre after completion of the course.

Box 3: Examples of expectations of participants from the Facilitators.

- Learn about handling of silkworm eggs
- Learn about chawki rearing skill.
- Learn in handling of chawki worms.
- Receive Certificate at the end of course.
- Clarity in Presentation.
- Practical experience in Chawki rearing.
- Time- conscious team.

Box 4. Example of expectations of Facilitators from the participants.

- Attentiveness and interest in the course
 - Free discussion and interaction
 - Co-operation.
1. Try to involve participants by asking question, finding at what they know different views held and treat all responses with respect and pre evaluation test for each participant with set of question.
 2. Evaluate their pre knowledge of each participants, level of their practical knowledge in Chawki Rearing.
 3. Set ground rules with participants from the day one till completion of training, which should be widely accepted.

Box 5: Examples of rules set with participants:

- All the session must start punctually after setting time to start.
- Active participation by every one.
- Every one to attend all the sessions.
- Respect each others opinion.

F. Conducting discussion:

As for as possible arrange daily instruction and discussions. Elicit response to various questions from the participants and appreciate those responses that are correct.

G. Evaluation at the end of each day:

At the end of each day the Trainer should assess the value of sessions covered by asking the participants to list they have learnt.

Ensure active participation in practical exercises:

Ensure active participation of all active participants in the chawki rearing beginning from incubation, black boxing, brushing, selection of quality leaf, chopping of leaf, till feeding to chawki worms on each practical sessions.

H. Review all sessions.

At the start of each day review all sessions delivered on the previous day, before starting the day sessions. Discuss all the cares to be taken on each day and also difficulties faced if any.

Conduct the post evaluation exercise:

This is to help obtain a permanent record, judge whether course objective have been achieved, and to develop and improve your training approach and materials. (Annexure-11)

PART TWO

TRAINING GUIDE – YOUNG AGE SILKWORM REARING

The following part of the training manual comprises the course contents and Training methodologies in the form of Trainers guideline. The guidelines are segregated day by day session, and activities to be conducted in each session. Trainers and participants will have an abridged (smaller version), which includes some of the Text and all illustrations to be used during Training Program.

Day 1:

To equip the participants with background knowledge on course of chawki rearing.

Session 1.1

Introduction to the Training Program

Objective for this session.

- To create a friendly learning environment through self introduction of participants.
- To elicit hopes fears & expectation of participants.
- To set the ground rules.
- To explain the importance of chawki rearing in Sericulture.
- To explain the aim & objective of whole course.

Activity: 1.1.1. Introduction of participants.

Specific objective: To create open & friendly learning environment in which every one is encouraged to participate.

Activity: 1.1.2. Eliciting hopes fears and expectation.

- Participants should introduce themselves & sign in attendance sheet and issue pens & training manuals & folders.
- Ensure expression of participants feeling about training and elicit their participation of training & record their comments and their expectation from the training.

1.1.3. Setting the ground rules:

To ensure consensus and agreement on the conducting of the training program.

Activities Resources:

Present the Time Table of Training Programme.

1.1.4. The importance of Training Program

Present the time table with contents of each sessions and time breaks.

Activity: 1.1.4. The importance of Chawki Rearing

Specific objective: To bring awareness of chawki rearing in silkworm Rearing.

Young age worms grow fast and have resistance to high temperature (26-28°C.) high humidity 80-85%, low air circulation and highly susceptible to diseases.

Why Training on Chawki rearing is felt relevant is a key aspect in Silkworm rearing for cocoon production?

Activities Resources: - Discuss importance of chawki rearing training and their importance in Silk production.

Why Chawki Rearing is considered as integral part of Silkworm Rearing following feed back second question.

Why should Training Programs in Chawki Rearing be important to you?

Facilitator record participant response.

The Cocoon marketing chain (**Annexure - 1**)

Relating causes& effect:-

- Quality silkworm for cocoon production.
- Quality silkworm for disease freeness.
- Quantitative aspect per unit of 100 Dfls.
- Maintenance of Chawki silkworm rearing for disease freeness.
- Maintenance of Chawki silkworm rearing for prevention of disease occurrence.
- Maintenance of Chawki silkworm with adequate feeding for quality Silk productions.
- No mortality – high production, retention of their racial characters & maximum silk production per unit.
- Healthiness of larvae ensure improved silk yield by silkworm rearers to get confidence of silk reelers.
- Improved consumer yield: increased yield/ 100 Dfls to get patronage etc.



Figure No. 3 : Disinfection

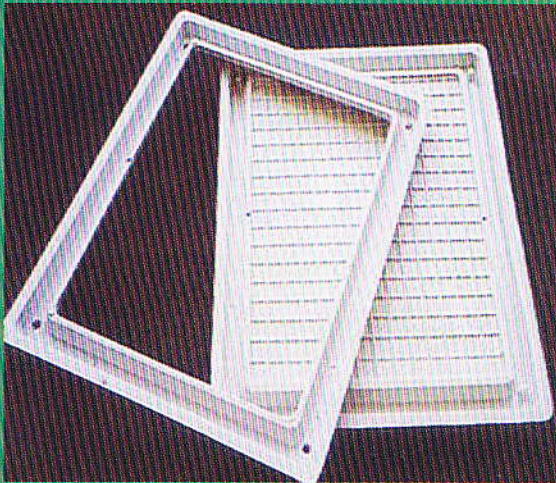


Figure No. 4 : Incubation frame with Loose eggs

Chawki Rearing Centre and its consumers:

Importance of Chawki rearing training on Silkworm crop yield & quality:

- Examples of responses from pilot training exercise.
- Entrepreneurship & Employment generation.
- Chawki worm handling is delicate and needs hygiene
- Make Chawki reared worm accessible.
- Assist poor farmers with healthy chawki rearing.
- Economics and management of CRC.

Activity 1.1.5. Aims and objective of whole course.

Specific objective: - To explain the objective of eight day training programme.

Plenary discussion: Ask the participants what they think, aims of chawki rearing importance in quality silk production. Record the response on an A20 sheet present chawki rearing centre, late age rearing, marketing (silk reeler).

Marketing chains: how can each of the stakes holders get benefit?

Present the aims and objectives of the programs on over head transparency A20 sheet, flip charts and marker pen and over head projector.

Session: 1.2.

Factors relating to brushing arrangement, egg transportation, requirement of rearing house its appliances, leaf quality moisture estimation and importance of disinfection.

1.2. Activity resources: - Disinfection (practical & theory)

1.2.1: Importance of Disinfection

Objective of this session.

To appreciate the importance of disinfection in chawki rearing & use of eco friendly disinfectants.

Activity:

1. Disinfection of chawki Rearing house, & appliances & its surroundings.
2. Quality of disinfection solution required for spray.
3. Preparation of disinfectant solution. (Fig 2 & 3)

To create awareness of disinfection in chawki rearing and appreciate various disinfectant available and ensure the participants for the use of eco friendly disinfectant for the disinfection. Explain with flip chart showing (annexure-6) schedule to be followed for disinfection.

Awareness of disinfection:

1. To destroy the harmful bacterial / virus.
2. It should be eco friendly and not harmful to human beings.
3. Only recommended disinfectants at proper concentrations be used for good results without affecting the chawki silkworm.
4. Don't allow the appliances to be smeared with cow dung as the source of infection either with bacteria / virus, which was common practice
5. Allow the appliances/equipments for sun drying before preparation of disinfection.

1.2.2; Preparation of disinfections:-

To enable the participants to prepare the quantity of disinfectant solution required for the space of chawki room, ask the participant to disinfect the area measured.

Check the disinfected area with litmus test to ensure the through disinfection.

1.2.3: Materials : Dfls sheet / loose eggs, incubation frame, blue polythene sheets, black sheet, egg transportation bag, hygrometer.

Back ground: There are many constraints or problems for egg transportation availability of suitable chawki rearing house, leaf quality. This includes

- Long distance from egg procurement centre to chawki center.
- Mishandling of silkworm eggs, by not providing requisite temperature & humidity.
- Unhygienic transportation & of eggs.
- Improper preservation/transportation of eggs due to lack of training.
- Requirement of quality leaf for chawki rearing.
- Inadequate space & environment for chawki rearing.

All these factors relate to undue atmosphere for chawki rearing, lead to loss of silkworm crops, & also lead to failure of silkworm crops that result in economic loss.

In training session, the farmer can discuss on these constraints with examples enabling them to rectify their technology in handling the eggs.

1.2.4: Egg Handling

Activity resources:-

Explain the handling of eggs, carrying them disinfected egg transportation bags during cooler hours with requisite temperature & humidity (80%), preservation of egg /dfls on single layer in disinfected trays in between blue polythene sheets incubation (27^o C &80 % RH). In plenary group: Discuss briefly their role and function and care to be taken in handling of silkworm eggs. (Fig 5)

1.3 Selection of Chawki Leaf for brushing:-

1.3.1 Selection of Chawki Leaf for brushing:-

Specific objective: requirement of quality leaf for young age silkworm and production of quality leaf.

Materials: chawki garden (ready for brushing) chart depicting pruning & harvest chawki leaf & harvest schedule

1.3.2: Training of Mulberry

Activity resources:-

Explain the training of mulberry chawki plot for eight leaf harvest schedule by bottom pruning as well as top clipping: (Annexure -2)

1.3.3. : Chawki Plot

Back ground:

Exclusive Chawki plot are not maintained by the Sericulturist. Chawki plot are not properly maintained and trained by the farmers, which requires special attention with regard to input of both organic and inorganic fertilizers doses, as well as maintenance of soil health. The same has been exploited by the farmers without substituting adequate the organic & inorganic matters

Young age worms are resistant to high humidity & highly susceptible to diseases. Hence quality leaf with higher moisture content should be selected. (Annexure -3) Therefore this session is designed to provide relevant knowledge and skill needed for maintenance of chawki plot, application of inorganic & organic fertilizer, as well as proper irrigation, so as to produce the quality leaf for young age. Show the schedule for training of mulberry & selection of leaf for chawki (fig. 7 and Annexure- 8)

1.4: Activity: Brushing Arrangement in Chawki rearing room

1.4.1: Arrangement of room appliances

Specific objective: To enable the participants to understand

- Type & size of rearing house with leaf storage, also to maintain temperature & humidity sufficient light & flow of air.
- Chawki rearing appliances viz., plastic rearing trays, blue polythene, sheets, rearing stand, leaf chopping board, leaf chopping knife, cleaning nets, leaf preservation chamber & baskets. feathers, chop stick as per requirement, enlisted in check memo.

1.4.2: Young age worms physiological parameters

Activities resources:

Discuss maintenance and selection of chawki room; as the young age worms grow fast and has resistance to high Temperature & high humidity, rather requires low air circulation and susceptible to diseases.

Trainer can explain with flip chart the physiological activities during young age silkworm

- Young age silk worm especially during I instar has very high growth rate 15 times, where as growth rate during II instar is only 5 times. Young worms in both instars has low resistance against nutritional deficiencies however growth duration is faster in II instar (2½ -3 days) when compared to I instar (3½- 4 days).

1.5: Effect of temperature & humidity growth of young age silkworm

1.5.1: Effect of temperature & humidity growth of young age silkworm should be emphasized with flip chart. (Annexure-5)

- Trainer can explain newly hatched larvae has low water content but once it starts intake of mulberry feed rapid increase in water content 76-79% (I in star) to 83 – 84%(II in star).
- .Young worms have low percent of ingestion (25%) in terms of intake of mulberry feed but digestion is comparatively high.
- Trainer can explain with flip chart food requirement of young age worms which needs more of carbohydrate (14%) and proteins (26 - 28%) and also variety which was more suited for young age i.e., S36 which has more ascorbic acid in addition to regular proteins & carbohydrates , wherein ascorbic acid induces silkworm for disease resistance in silkworm. However the development of resistance in young age silkworm is poor. Further worms could not resist the prevailing environmental condition, as they require high temperature and high humidity and they are poikilothermic in nature.
- Trainer can explain young age worms consume only 6% of total feed but show 400 times increase in body weight, 300 times in body size & 500 times, in silk gland weight.

Requirement of chawki rearing appliances and its usefulness should be explained with regard to spacing and make arrangement for brushing programme for the Day 2 by participants

1.5.2 : Session Day 1.Summary & Interim evaluation.

Objective for this session:

To recap the main learning points from day 1 importance of disinfection & use of eco friendly disinfectant so as to judge by the participants, handling of silkworm eggs and brushing arrangements and selection of chawki leaf and to get participants feed back of the training so far imparted.

- a) Use a play full game to involve all participants in recapping the main learning points from Day 1. All stand, one facilitator passes the ball in turn to participants who state what they have learnt during the day whilst other trainer records the learning points on A 20 sheet.

Each participant is then given a post- it sheet to write comment about

Day 1& stick it on the prepared A 20 sheet.

- In the “happy” section if they are pleased.
- In the “neutral” section if they are indifferent and
- In the “sad” section if they are disgruntled.

After participants depart and trainer remain there to conduct their own debriefing and assess the participants evaluation comments A 20 sheets, flip charts, marker pens and a ball A 20 sheet with “happy”; “neutral” & “sad” post it pads

Session: 1.6: Pre evaluation on knowledge of chawki rearing

Objective for this session: To obtain back ground information about the participants for record purpose including assessment of the impact of training at a later date.

Activities resources

Ask participants to complete the pre-evaluation questionnaire before the start of day 2.

Many participants find completing this kind of questionnaire difficult and therefore it may be deemed unnecessary, in such case omit this session.(Annexure - 9)

Day 2:

Session2.1

Introduction session to activities of Day 2.

2.1.1: Objective of this session:

To get all participants focused and ready up for day 2.

Activity Resources: Feed back from day 1 and comments day1 evaluation, and summarize the main learning points of day1, the preparation of rearing, arrangements of appliances, egg preservation. Explain the day 2 programme.

Session 2.2

Importance of incubation & Black boxing (Practical)

Objective:- To enable the participants to know the importance of incubation and black boxing of silkworm eggs; brushing of silkworm eggs.

2.2.1. Brushing (Practical Session).

Procedure: - On the day of brushing, remove the eggs (dfls) from black box and expose them to natural light/dim light (15-30 Lux) for 2-3hour, all the eggs will hatch uniformly (Fig.6 & 8)

Take the participants to chawki plot ask them to select & pluck tender leaf in cool hours and quantity (as per requirement) and collect in disinfected bamboo basket cover the mouth of basket with wet cloth.

- Ask the participant to arrange leaves with petiole on one side, demonstrate cutting of leaf to the size 0.5-2.0 sq.cm after removing petiole. (fig.9)
- Trainer can explain the use of leaf chopping machine for commercial chawki rearing to save labour mandays. (Fig.13)
- Ask the participants to sprinkle chopped leaf on egg sheet/incubation frame where loose eggs were spread covered with brushing net within 1½-2 hrs, all the hatched larva will start feeding on chopped leaves. (fig10)
- Trainer can enlighten them that newly hatched silkworm feeds only on juice i.e., sucking through its proboscis (mouth part) later starts carving and finally cuts the chopped leaf.
- Transfer the hatched worm to the prepared rearing tray with paraffin paper or blue polythene sheet for the rearing bed (Fig. 11)
- Ask the participants to avoid manual handling of hatched larvae, instead ask them to use soft feather/ tapping, to transfer to rearing beds.
- Instructor to show flip chart with regard to standard spacing to be provided at the time of brushing of 100 Dfls.
- Ask the participants to provide bed spacing as per the quantity of DFLs based on flip chart. At the time of brushing (100Dfls) / 50,000 larvae)

1st Instar: 3' X 2' = 6 sq.ft.
 8300 larvae / sq.ft.

* Ask the participants after providing the required space, if required more chopped leaf may be fed. Cover them with blue polythene sheet, transfer the trays to rearing stand.

Afternoon feeding schedule to be done by the participants. With the help of the trainees record the data sheet for brushing.

- 1) No of Dfls brushed:
- 2) Brushing percentage:
- 3) Spacing provided:
- 4) Temperature & humidity of rearing bed/room:
- 5) Quantum of leaf fed:

Activity resources:-

Open question for discussion in group in the following:

- 1) No of Dfls to be brushed in 3' X 2' size of plastic tray
- 2) Quality & quantity of leaf to be fed / feed.
- 3) Larval spacing to be increased.
- 4) Maintenance of temperature & humidity in rearing bed/room.

Flip chart, OHP can be used for illustrations in the trainee's manual.

Session: 2. 3: Calculation of Hatching Percentage

How to calculate hatching percentage, with an objective to know the quantum of worms brushed. 2-3 egg sheets after brushing to be issued to each group.

Ask the group to identify the 5 average number of eggs / Dfls. Select dfls, which has average uniform eggs as representative. Ask them for physical count of hatched eggs using colour sketch pen, similarly count use unhatched eggs as well as dead eggs. Different colours can be used to differentiate difference. Record in the flip chart.

No. of Hatched eggs

No. of Unhatched eggs

No. of Dead eggs

Add all the numbers which is the total number of eggs laid by the moth, calculate the percentage of hatching. Record the actual number of worms hatched and calculate percentage. (Annexure- 4)

Session 2.4: Importance of incubation & black boxing (Theory)

Activity: To know the importance of incubation & black boxing.

Maintenance of temperature & humidity during incubation (Fig. 4)

Objective for the session: Incubation of eggs which is usually neglected by the sericulturist. As per the practice, after bringing the dfls, they are either hanged on the wall or left to nature.

- Eggs are not laid at once by the moth, hence are at different developmental stages.
- This stage needs optimum temperature of 27⁰ C & 80% humidity. Participants should be enlightened on the importance of incubation. After the eggs turns to blue pin stage (8th day after egg laying) should be black boxed, for uniform hatching.
- Participants should be educated, after black boxing of eggs it should not disturbed till 48hrs and only it should be opened at the time of brushing.

Session 2.5: Summary & Interim evaluation Day 2:

Summary and Interim evaluation.

Objective for this session

To recap the main learning points of Day 2 to get participants feed back on the training so far.

Participants can highlight the event what they learnt with Facilitator & Trainer records the learning points on A20 sheet.

Each participant is given a sheet to write their comment in Day 2 & stick it on prepared A20 sheet.

- In the “happy” section if they are pleased.
- In the “neutral” section if they are indifferent.
- In the “sad” section if they are disgruntled.

After participants depart and trainer remain there to conduct their own debriefing and assess the participants evaluation comments A 20 sheets, flip charts, marker pens and a ball A 20 sheet with “happy”; “neutral” & “sad” post it pads.

Day 3:

Session 3.1.1: Introduction to activity day 3

Objective of this session: To get all participants focused and ready for day 3.

Activity Resources: Feed back from Day 2 and comments on Day1 evaluation, and summarize the main learning points of Day2, the preparation of rearing. Explain the Day 3 programme.

3.1.2: Chawki Rearing practical:-

To enable participants to attend chawki rearing including collection of required quality & quantity of leaf from chawki plot & also feed the chawki worms as per schedule.

Trainer briefs them on what they are expected to do. Give them a chance to ask question on what is not clear especially if any one has difficulty in carrying at out feeding & maintenance room temperature & humidity. Ensure that each participant should have a copy on schedule of feeding & spacing to be provided & temperature & humidity to be maintained.

(Annexure 5&7)

Activity Resources:

Previous day brushed and fed larvae are now available on the rearing stand. Ask the participants to take their chawki brushed trays on to feeding stand. Remove the blue polythene sheet to allow drying of the rearing bed, and keeping the trays back in the stand for 30 minutes aeration before every feeding to allow fresh air & light to dry the bed, with the help of chopping stick extend the bed spacing

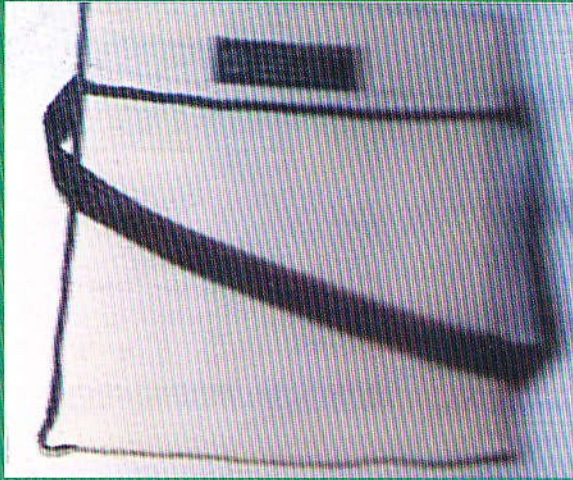


Figure No. 5 : Silkworm eggs transportation bag

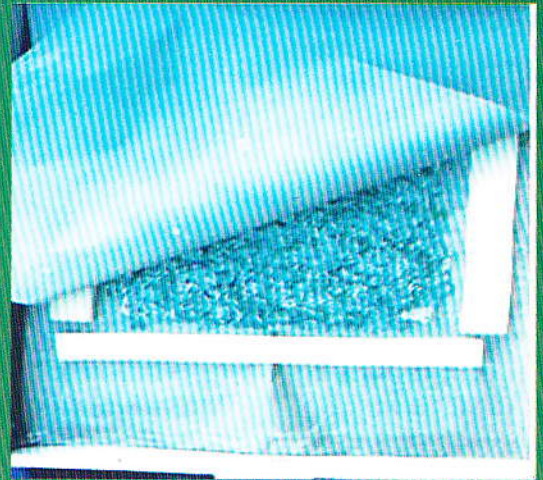


Figure No. 6 : Brushed Larvae



Figure No. 7 : Selection of Chawki leaf

Ask participant to select the quality & quantity of leaf arrange the leaf for chopping, feed them for larvae in the trays , cover again with blue polythene sheet for each tray and transfer them to rearing stand.

Ask the participant to do leaf feeding as scheduled to other trays.

Ask the participant to record the following:

1. Quantity of leaf fed to larvae.
2. Bed spacing provided to larvae.
3. Temperature & humidity of chawki room as well as rearing bed.

3.2 Practical session. (Chawki Rearing - Practical)

To feed the chawki worms as per quality & quantity as detailed in the schedule.(Annexure -7) Remove the polythene sheet allow them to dry the bed and feed the quality & quantity and also provide required spacing & cover the rearing bed with blue polythene sheet & shift the trays to rearing stand.

3.3 Disease management during young age

Activity: To bring awareness of the occurrence of diseases as silk worm are also affected by various diseases caused by viruses, bacteria, fungi & microsporidia. It's effective control/ prevention through disinfection as well as use of proper bed disinfectant and maintenance of hygiene.

- At chawki stage occurrence of fungal disease can be high, particularly when rearing bed thickness is more creating very high humidity and also over crowding forcing larvae to feed less nutritious leaves.
- Muscardine a fungal disease due to *Aspergillus* sp., is common, where infected larvae will be lustrous & die, later become dark green or rusty brown mycelia cluster found on dead body.
- Grasserie caused due to virus infects early instar worms when egg surface is not properly disinfected. It gets further aggravated due to high temperature and body volume being smaller virus spreads to all tissues. This result in destruction of moulting hormone and worms fail to undergo moult.
- Pebrine is a microsporidian disease where worms show uneven growth and fail to moult due to non-release of moulting hormone.
- Trainer can explain out break of diseases. All suspected /diseased larvae to be removed and disposed carefully to avoid contamination.
- Periodical dusting the mixture of bleaching powder & lime powder (1: 10) in surroundings and floor arrests the growth of pathogen thereby helps prevention of diseases.

3.4 Summary and recap of the day 3.

To recap the main learning points of the Day 3 and to get participants feed back on the training so far undergone.

Participant can be enlightened what they learnt with regard to quantity of feed. Maintenance of temperature & humidity as well as hygiene the chawki rearing room and larval space provided.

Each participant should have chart of feeding schedule and also quantum of disinfectant to be used per unit area, so as to enable them to use in their future practices.

Day 3: Summary and Interim Evaluation.

Objective for this session

To recap the main learning points of Day 3 to get participants feed back on the training so far imparted.

Participants can highlight the event on what they learnt with Facilitator & Trainer records the learning points on A20 sheet.

Each participant is given a sheet to write a comment in day 3 & stick it on prepared A20 sheet.

- In the “happy” section if they are pleased.
- In the “neutral” section if they are indifferent.
- In the “sad” section if they are disgruntled.

After participants depart and trainer remain there to conduct their own debriefing and assess the participants evaluation comments A 20 sheets, flip charts, marker pens and a ball A 20 sheet with “happy”; “neutral” & “sad” post it pads.

Day 4:

4.1 :Introduction to activities of Day 4 chawki rearing (practical) & care during Moulting.

4.1.1: Introduction to activities of Day 4 and feed back:

Objective: To get all participants focused and livened up for Day 4.

Activity resources:-

Feed back from the previous training day, comments by the Trainer evaluation. Summarize the training programme and chawki rearing practical events up to day3 and explain the activity of the day 4.

4.2 :Practical session:- (Chawki Rearing)

Ask the participants to remove the rearing tray from the rearing stand on to a stand and from trays remove the blue polythene sheet. With the help of chop stick break the rearing bed, so as to facilitate drying & extend the spacing by spreading the rearing bed.

Ask the participant to observe the changes in the few larvae, which were preparing for the moulting. Trainer can show the larvae preparing for moulting to the participants for identification (Fig.12)

4.2.1: Care during Moulting

Show the participant with flip chart for identification of larvae settling for moulting.

As the larvae settle for moult, body shines & loses their appetite and will start raising their head & keeping pointed mouth portion up.

Trainer can explain physiological basis of moulting, where in larvae change entire skin for further growth, lose appetite and have no movement due to decrease in level of juvenile hormone and increase in level of moulting hormone (ecdysone) which triggers moulting.

Ask the participant to reduce the quantity of feed as well as size of leaf chopping (cover feeding).

Trainer can explain need for less handling of larvae during first instar as such no bed cleaning during first instar, and also for the last feeding before settling should be provided, so as to enable all the Larvae can feed sufficient quantity before settling for moult.

Ask the participant to take care of maintenance of the temperature & humidity during moulting, as it requires high temperature 28^o C & low humidity during moulting. Blue polythene sheet cover should be removed during the period.

4.3 Field visit to participant:-

Objective: To give first hand information on established commercial chawki centre, requirement of rearing building and rearing equipments for commercial chawki rearing, maintenance of chawki plot size area to rear minimum 5000 Dfls/per batch as scheduled as well as cultural operation and its input application etc.

Interactive session: With Lead Farmer to participant.

To explain the role of commercial chawki centre and planning with brushing capacity of 2500 Dfls /10 days (32 crops/year), requirement of chawki leaf (500kg /2500 Dfls), extent of chawki garden & its maintenance to get harvest of 32 crops, i.e., whole plot of one acre can be subdivided into 4 subplots of 0.25 acre to rear 2500 – 3000 Dfls at a time for every 10 days. Thus 32 crop can be reared in a year such that from each chawki plot leaf harvest for 1st, 3rd, 5th and 7th crops be done by individual leaf plucking whereas for 2nd, 4th, 6th and 8th crops the shoot lets be harvested. This cycle can be repeated once in 80 days.

And also explain the importance of manure & fertilizer requirement for each plot. Trainer can explain the same with flip chart, and schedule of fertilizer dosage / plot as per recommendation. (Annexure -8)

FYM @ 40 mt/1ha/yr & fertilizer 260: 140: 140 NPK kg / ha/ yr. and Irrigation once 4-5 days.

The Trainer can explain the viability of commercial chawki centre by explaining the cost involved for chawki rearing & its distribution on cost basis and also net returns.

The participants can interact with owner of chawki centre, with regard to cost of production of chawki leaf and also annual brushing, so as to facilitate the participant to know the net profit by running the Chawki Rearing Centre on commercial scale.

4.4. Summary & interim evaluation of day 4

Objective:

To get the feed back from the participants since beginning to day 4 review the lessons by high lighting the areas of much importance & need for due care in chawki rearing as well as viability of commercial chawki Rearing centers.

Activity resource:

Use a play full game in ordering all participants in recapping the main events of Day 4 as well as events from day 1.

And pass the ball to participants to explain what they have learnt up to day 4. Trainer can record the main learning points on A 20 sheet. Each participant is given post at sheet to write a comment about day 4 and stick on the prepared A20 sheet.

Each participant is given a sheet to write his comment in Day 4 & stick it on prepared A20 sheet.

- In the "happy" section if they are pleased.
- In the "neutral" section if they are indifferent.
- In the "sad" section if they are disgruntled.

Later participants depart and trainer remain there to conduct their own debriefing and assess the participants evaluation comments A 20 sheets, flip charts, marker pens and a ball A 20 sheet with "happy"; "neutral" & "sad" post it pads.

Day 5

5.1 Introduction to activities of Day 5 chawki rearing (practical) & care during resumption.

Objective: To get all participants focused and ready for Day 5.

5.1.1. Activity resources:-

Feed back from the previous training day, comments by the Trainer on the evaluation. Summarize the training programme and chawki rearing practical events up to day4 & explain the activity of the day5.

5.1.2: Care during resumption from moult.

Objective of session: To get participant focused to resume the worms out of 1st moult & precaution to be taken to handle freshly moulted worms. And precaution to be taken by way of use bed disinfectants and quality of leaf fed to freshly moulted worms. Care to be taken for quality feed & spacing.

5.2 Practical session:

Activity: Ask the participants to observe the rearing tray, trainer can show the freshly out of moult worms, which are active & participant to identify all the worms which are out of 1st moult.

- Take the participant to collect the required quality & quantity of chawki leaf from the chawki plot.
- Ask the participant to dust bed disinfectant. Trainer can show the manual chart regarding quantity of bed disinfectant (3g/sq.ft bed area) to be used after moulting, but before providing the fresh feed to the worms.
- Trainer can explain the following precautions while using bed disinfectant.
 - a) Don't cover the bed with paper/sheet after dusting.
 - b) Feed silkworm after 30 minutes after dusting.
 - c) Keep the bed disinfectant in air tight container after its use.
- Ask the participant to arrange the plucked chawki leaf for chopping to required size, after half an hour dusting the bed disinfectant, ask the participant to give feeding to worms followed by covering the rearing bed with blue polythene sheet & transfer it back to the rearing stand.
- Trainer should explain the importance of use of bed disinfectant & participant should be explained about the adequate and regular use of eco friendly bed disinfectant during each instar as scheduled.

5.3 Activity: Diseases and pest of silkworm & their Management.

Objective of the session:-

To enlighten the participant for the awareness of occurrence different silkworm disease and How to prevent them. Attack of pest during early instar and its control.

Trainer with flip chart can explain the silkworm disease caused by bacteria, viruses, fungi and pests of silk worm and their control.

Participant should be enlightened how disease will appear, its causative agent and control and also those pebrinised larvae never moult due to non release of moulting hormone.

As silkworms having shorter larval duration, the best option is to prevent diseases, rather than its control or cure.

Trainer should enlighten the role of eco friendly bed disinfectant & its usage in the silkworm rearing the control of diseases as well as quality of feed to be fed to silkworm and also to rearing of silkworm in disease free environment.

Trainer should enlighten the pest of silkworm especially ants in early instar and preventive physical method like use of antwells for rearing stands may be emphasized.

At the end of the session participants should be able to know about distinctive reason of disease occurrence, mode/route of infection and its multiplication ,occurrence of infectious pathogen in rearing environment and mode of pathogen entry into rearing house and susceptibility of silkworm at different instar, and its management through use of eco friendly bed disinfectant as well as use of adequate quality and quantity mulberry leaf also spacing and maintenance of hygiene during different instar.

Lastly the participants can able to know how successful silkworm crop can be harvested by:

- Disinfection & maintenance of hygiene.
- Quality of feed & adequate spacing.
- Use of proper mountages.
- Selection of breed based on season & quality seed.

Ultimately quality seed, breed, feed and management are key factors responsible for success of silkworm crop.

5.4: Practical session: Bed cleaning.

Ask the participant to take out rearing trays from the stand & remove the blue polythene sheet.

Trainer can demonstrate cleaning of the rearing bed using cleaning net (Fig. 14)

Objective of the session: To enable the participant to avoid manual handling during cleaning of rearing bed.

After 30 minutes of drying of bed, put chawki nylon cleaning net on the bed so as to cover entire bed, and then sprinkle the freshly chopped leaf over the net. After 1-2 hours all the larvae will come on fresh feed over the net, transfer the worms along with net to fresh tray. Remove the old bed and shift them to dust bin/litter bag, without spilling on the floor, transport them to compost pit.(out side).

At the end of session participant can be able to clean the bed with minimum handling of worms.

5.5: Recap of the event of Day 5. Summary & Interim evaluation

Open question session for discussion amongst the group. Use the illustration chart on different diseases & pests. Ask the participant to identify them and tell about their management. Get the feed back from the participants Trainer records the learning points on A 20 sheet & each participant can make comment.

Each participant is given a sheet to write the comment in Day 5 & stick it on prepared A20 sheet.

In the "happy" section if they are pleased.

In the "neutral" section if they are indifferent.

In the "sad" section if they are disgruntled.

After participants depart, trainer remain there to conduct their debriefing participants evaluation and comments on A20 sheet, with "happy" , "neutral" And "sad" post it pads.

Day 6:

6.1: Introduction of activities on day 6:

6.1.1: Introduction to activities of day 6 chawki rearing (practical).

Objective: To get all participants focused and ready for day 6.

Activity resources:-

1. To get feed back from the practical day out (day5) and review of lesson on practical skill in chawki rearing and ensure the quality of feed. Spacing and environment are maintained.
2. Explain the days programme.

Session 6.2.1

: Practical session: Chawki rearing of II instar 2nd day.

- Ask the participants to remove the rearing trays from rearing stand.
- Remove blue polythene sheet enabling bed to dry. Provide required space.

- Ask the participant to pluck the required quality & quantity chawki leaf from chawki garden. And demonstrate the preservation of leaf in leaf chamber covered wet gunny cloth.
- Ask each participant to arrange the leaf for chopping of required size. After half an hour drying, sprinkle freshly chopped leaf on bed. Cover the rearing bed again and transfer back on to the rearing stand.
- After feeding floor area should be swept with disinfectant solution..
- Ask the participant to look out temperature & humidity provided in the rearing bed.

Session 6.2.2 : Maintenance of Hygiene, Temperature & Humidity in chawki rearing room.

Objective to enlighten on the importance of hygiene in chawki room as well as required temperature & humidity in chawki trays.

Activity:

1. Trainer can demonstrate reading & recording of temperature using thermometer, and also humidity recording using hygrometer.
2. Trainer with flip chart explain necessity of hygiene in chawki rearing room as young worms are more susceptible to disease by contamination and enlighten.
3. Participants to minimize manual handling of chawki worms which are delicate.
4. The young age worms require higher temperature 27-28° C and higher humidity (80%). Hence trainer can explain how the temperature & humidity are maintained in chawki rearing room in different season using heaters & humidifiers. (as per needs/ requirement of season).

Day 6.3 Session: summary of Day 6.

Specific objective: To recap the main learning points from Day 6 and get feed back on the training so far.

Activity resource:

Ask the participants to recap the main learning events of the Day 6 in handling II (second) instar worms, their spacing & quality of feed & maintenance of environmental conditions for development of young larvae during chawki stage.

The facilitator passes the questionnaire to participant so as to elicit suitable reply based on what they learnt in grasping the technical tips, acquired during chawki rearing.

Trainer can record their learnt points on A 20 sheet. Such participants are given a sheet to record their comments & stick in A 20 sheet.

- In "happy" section if they use pleased.
- In neutral section if they use indifferent.
- In sad section if they are disgruntled.

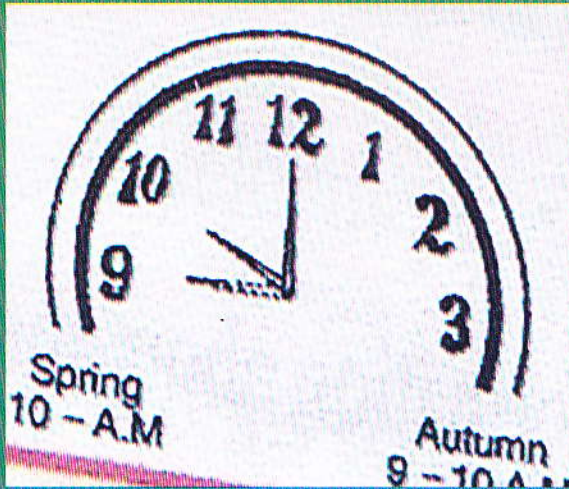


Figure No. 8 : Brushing Time



Figure No. 9 : Chopping of mulberry leaf



Figure No. 10 : Brushing



Figure No. 11 : Transfer of Chawki worms

Trainer can evaluate the training & participant responses for the course.

After participants departure the trainer remain there to conduct their own debriefing and assess the participants evaluation comments.

Day 7:

7.1: Introduction to Activity Day 7 & feed back

7.1.1: Activity:

Specific objective: To get all participant focused and livened for day 7.

Feed back from the previous training day, comments by the trainer evaluation. Summarize the training programme and chawki rearing practical events up to day6 & explain the activity of the day7.

Trainer can bring the activity of day 7 on what they are expected to do. Give them a chance to ask question like repetition of care during moulting as already taken while settling for I moult.

7.2 Practical Session: worms preparing for II moult.

Objective: To enable the participant to feed the 2nd day II instar worms & care to be taken settling of worms for II moult and care to be taken for transportation of worms (Theory).

Activity resources:

Ask the participants to recall the worm's identification while settling. And also to ask to identify the worms which were preparing for moult.

Ask participants to observe the percentage of worms prepared for moulting by their experience and ask participant to arrange the plucked leaf for chopping and feeding by its age i.e. before settling and thin chopping and sprinkle it on rearing bed as most of the worms are preparing for moult, which have less appetite & also raised their head for settling. If percentage of eating worms is more, feed the worms and cover with blue polythene sheet & later transfer them to rearing stands.

7.3 Session: Testing of Chawki worms :

Objective: To create awareness to identify the disease larvae on the rearing bed as well as microscopic examination of pathogens before distribution of young age silkworm.

Activity:

Trainer can explain the importance of testing as silkworm disease occur through per-oral or integument infection by the pathogen, which extrude along with faeces, vomit or through injuries. These pathogens contaminate other silk worm and form the source of secondary infection for diseases.

The diseased silkworm, dead larvae are the source of pathogen for secondary contamination of mulberry and silkworm rearing house.

Trainer can explain the material for microscopic examination including rearing house dust, unhatched / dead eggs, and silkworm faeces. Diseased silk worm based on behavioral, external and anatomical symptoms are collected from rearing bed.

7.3.1: Practical session Testing

Trainer can demonstrate the standard procedure (Fujiwara.T - 1992) for microscopic examination.

The testing materials are homogenized in 0.6% potassium carbonate solution in 4 volume in case of silkworm eggs, whereas 8 times by weight in case of feces and silkworms. Allow the homogenized solution to stand for 5 minutes. Decant clear solution first and floating tissues through muslin cloth or cotton and centrifuge them at 5000 rpm for 5 minutes. Suspend the sediment and examine them at 600 x magnification under the microscope.

Trainer can show participants with flip chart for identification of different pathogens with standard samples and also distinguishing characters under microscope and staining method using Indian ink.

- Pebrine spore are oval, highly refractive exhibit Brownian movement
- Viral polyhedra are pentagonal/hexagonal/tetragonal and less refractive
- Bacterial spores are small oval and do not exhibit Brownian movement
- Muscardine conidia are spherical and less refractive(white muscardine) and oval and one end pointed(green muscardine)

7.3.2: Certification:

Objective: To know the importance of certification of young age silkworm for disease freeness & healthiness before distribution.

Activity:

Trainer can explain the necessity of issue of certification and young age silkworms before distribution. He should also explain the participants to ensure the quality and disease freeness of silkworm eggs from the silkworm seed production centers by observing the processed lot details with laid on and tested on dates & source of seed cocoons and chawki rearing centre can ensure proper incubation of eggs and disease free environment during the young age silkworm rearing.

The microscopic testing of worms for disease freeness is must, as pebrine one of most of dreaded pathogen which is transovarian can destroy silkworm crop and hence certification should be done before distribution.

Participant can be shown the details of certificate to be issued by chawki rearing centers before distribution the farmers.(Annexure 9).

Session 7.4: Practical session: Settling of chawki worms for II Moul

Objective:

To enable the participants to understand settling of the worms which were prepared for II moult.

Activity:

Ask the participant to pull the trays from the rearing stand and remove the blue polythene cover.

Ask the participant to observe the rearing bed, since majority of worms have been settled for II moult.

Ask the participant to feed whenever required by observing the worms in trays. Otherwise advise them to keep open and also advice them if no feed is required, wait for 1-3 hrs, then trainer can ask them to dust lime as per the observation of worms. In case some worms are found feeding when majority of them are settled, advice the participants to give a cover feed and allow the worms to settle for moult. Dust the lime only after all worms are settled.

7.5 Session: Transportation of Chawki worms

Objective: To know the participants about care to be taken for transportation of worms from chawki rearing centre to rearers rearing house.

Activity:

Trainer can explain the care to be taken, while transporting chawki reared worms using do's & don't as explained:

- Don't transport the chawki worms while settled for II moult and transport after resumption.
- Don't transport when the temperature & humidity are not conducive.
- As far as possible ask the participant to take chawki worms during cooler hours of day and also out of moult chawki worms.
- Ask the participant to transport the chawki reared worms in specially designed disinfected boxes, wherein required spacing and proper aeration can be provided to silkworm during transportation.
- Ensure transportation without disturbing the spacing, feed & environmental condition (minimum) to designated places.
- Trainer can explain the effects of unhygienic & overcrowded conditions and untimely transportation on healthiness & productivity of chawki worms at receiver end.
- Ensure proper precaution as explained, while transporting the chawki reared worms.

- Ensure that before distributing the chawki worms, the receiver (sericulturist) must complete the disinfection of his rearing house so that no further contamination can occur.

At the end of the session participants may be able to understand precaution as well as care taken in distribution of chawki reared worms.

7.6 Summary of day 7 and Interim evaluation.

Recap of the event of Day 7.

Open question for discussion in group & feed back form the training.

Activity:

To recap the events for preparation and settling of II instars for third moult, care taken, quality of feed and spacing provided and care to be taken for transportation of worms.

The facilitator passes the questionnaire to the participant, so as to elicit the suitable reply. Based on response, trainer can record the revaluation on A 20 sheet.

Each participant can record their comment in given paper sheet and same can be stucked A 20 sheet.

“Happy” section they are pleased.

“Neutral” section they are indifferent.

“sad” section they are disgruntled.

Day 8: Review and evaluation of the course:

1. To get feed back from the day 7 and review lessons on practical skills acquired in chawki silkworm rearing and ensure correct interpretation of results.
2. To evaluate the effectiveness of the training course.
3. To present certificates to the participants.

Materials:

Flip charts, Flip chart stand, felt pens, certificate.

Session 8.1: Introduction to day 8 and feed back.

Specific objectives:

To get all participants ready and livened by for Day 8.

Activity resources:

Ice breaks and introductory exercise starts recalling skills acquired. Each participant may indicate points learnt which he can recollect from day 1 to 7 and cofacilitator notes the points in an A 20 sheets, Flip charts & marker pen.

Trainer obtains feedback and discusses with the group on different tasks from the handling eggs, incubation, black boxing, brushing, quality of feed, maintenance of temperature & humidity, care to be taken during moulting up to transportation and handling of chawki worms.

Participants are divided into three or four groups to discuss the above topics. The most effective results are obtained when participants are asked to indicate:

- Positive (Worked well) and
- Negative (did not work well) aspects under the above topics the group heads can present their results on A 20 sheet and with discussion guided by the facilitator.

Review and feed back of the session to assess the participant progress made during the practical exercise.

Session 8.2 : Evaluation of the Training Programme.

Activity :

Course evaluation exercise.

Specific objective is to obtain over all evaluation of the course from the participants.

Activities Resources:

Individual participant evaluation.

Trainer can hand over prepared questionnaire; on the skills taught, technologies demonstrated and importance of quantity & quantity feed, etc. to each participants and ask them to write what they had learnt from the training course.

Group evaluation: Write the points raised on A 20 sheet under following heading.

- What did you like about the course?
- What did you dislike about the course?
- What is the most important things you have learnt?
- What can be done to improve the course?

Trainer can collect the participant responses for the pre prepared questionnaire and also complete the individual evaluation sheets. And record his comments on individual participants for the course. (annexure-10)

Session 8.3: Closing ceremony and presentation of certificate.

Activity: Presentation of Certification.

Specific objective: To ensure that course gets formal recognition from the official authorities and the participants are recognized for their efforts.

Activity Resources:

Formal closing speech by the officers /guest/dignitaries presentation of course certificates and distribution of course training kits to each participants.

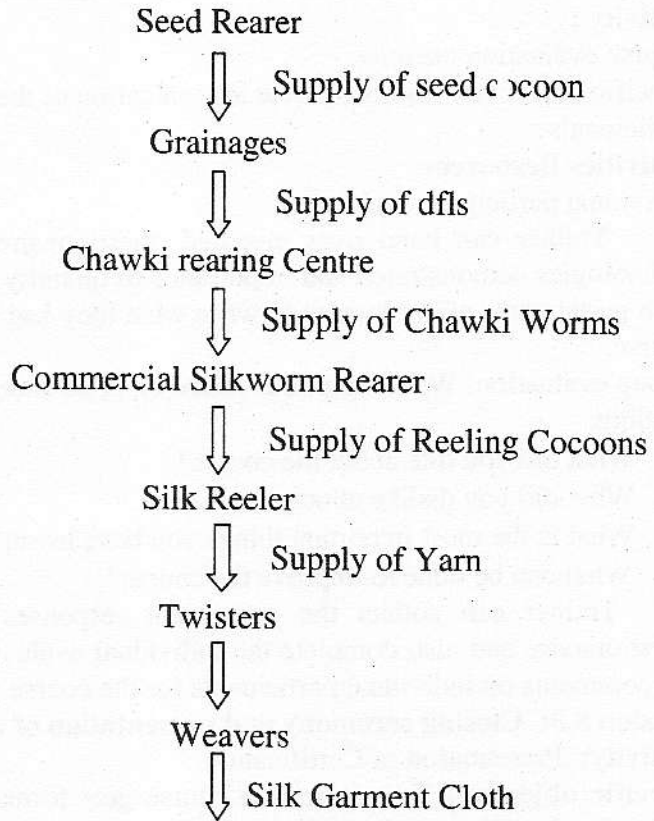
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ANNEXURES

Part 3

Annexure - 1

Marketing Chain



Annexure -2

Training of chawki plot :

Schedule	1/ 2acre plot (chawki)
a) 1 st pruning	Jan. 1.
1 st harvest Top clipping	(B.P) Feb. 5-11 Feb. 15
b) 2 nd harvest B. pruning	March 12-18 March 22
c) 3 rd harvest Top clipping	April 26 May 2 May 6
d) 4 th harvest B. pruning	June 1-6 June 10
e) 5 th harvest Top clipping	July 15-21 July 25
f) 6 th harvest B. pruning	August 20- 25 August 29
g) 7 th harvest Top clipping	October 3-9 October 13
h) 8 th harvest B. pruning	November 7-13 November 17

Note: BP: Basal Pruning 30cm above ground level

Annexure -3

a) Calculation of Moisture % in Mu'berry leaf.

$$\frac{(\text{Fresh weight} - \text{dry weight})}{\text{Fresh weight}} \times 100$$

a) Leaf yield Assessment

i) Expected number of plants in the plot =

$$\frac{\text{Standard number of plants / area} \times \text{Area of plot}}{\text{Plant spacing (SQ ft)}}$$

ii) Effective plant density=

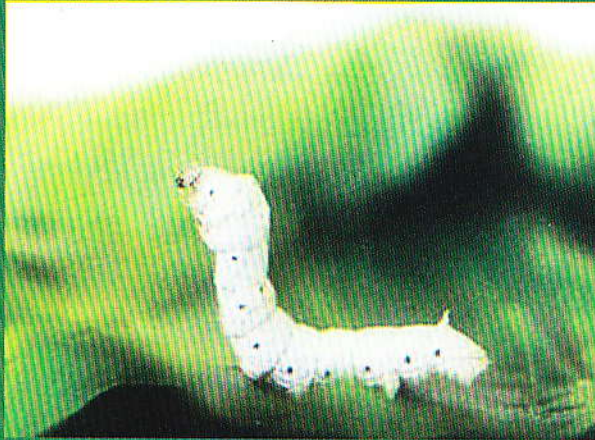
$$\frac{\text{Actual plant number} \times 100}{\text{Actual plant expected (standard)}}$$

iii) Actual no of plant in plot =

$$\frac{\text{expected number of plant in plot} \times \text{Effective density (\%)}}{100}$$

Iv) Leaf yield / plant based on actual harvest (random)=

$$\frac{\text{Weight of leaves harvested}}{\text{No of plants}} \times \text{Actual no of plant in plot} = \text{Actual Leaf yield from the plot}$$



**Figure No. 12 :
Worm under moult**



**Figure No. 13 : Chopping
of mulberry leaf by machine**



Figure No. 14 : Bed Cleaning

Annexure - 4

Calculation of hatching percentage:

Hatching % = Number of eggs hatched / Total number of eggs X 100.

No of eggs hatched. = (Number of eggs hatched (Actual) – No. of Late born Larvae.) Total No. of eggs = (Hatched (white shells + unhatched (black eggs) + unfertilized (yellow) + Dead (brown eggs)

Good hatching % => 95% , Average hatching >90 % , poor hatching =>75 %

Annexure -5

Standard Chawki rearing norms (100 Dfls)

FACTORS	I INSTAR	II INSTAR
Temperature(°C)	28-29° C	27-28° C
Humidity (%)	80-85	75-80
Leaf size (Sq cms.)	0.5-20	20-40
Quantity of Leaf (kg)	4-6 kg	15-20 kg
Bed area Sq cm :In beginning	0-36	1.35
At the end	1-35	4.05
Rearing space (Sq .ft)	6-0	24-00
In the beginning	(8300 Larvae / Sq.ft)	(2100 Larvae / Sq.ft)
At the end	24-00 (2100 Larvae / Sq. ft)	65-00 (800 Larvae / Sq .ft)
Bed cleaning	----	Once

Annexure -6

Disinfection

- i) Estimation on the requirement disinfectant

Floor area : Length of floor X Breadth of floor.

A) (In Sq mt) @ 1.5 litre / Sq mt floor

Disinfectant solution (litre) = 1.5 X (Sq. mt . floor) + 10 or 35 %*

B) SQ ft. @ 140 ml / Sq ft floor

Disinfectant solution (litre) = 0.140 X (Sq ft . floor) + 10 or 35 %*

10 % is shelf rearing 35 % is for tray rearing.

- ii) **Preparation 2 % bleaching powder in 0.3 % slacked lime solution.**

Disinfectant solution (L)	2 % Bleaching powder in 0.3 % Slacked Lime.		
	Bleaching Powder (g)	Slacked lime (g)	Water (L)
1	20	3	1
10	200	30	10
25	500	75	25
100	2000	300	100

- iii) **Preparation of 2.5 % Sanitech in 0.5 % slacked lime solution**

Disinfectant Solution (L)	2.5 % Sanitech in 0.5 % slacked lime.			
	Sanitech (ml)	Activator (g)	Slacked Lime (g)	Water (L)
1	25	2.5	5	1
10	250	25.0	50	10
25	625	62.5	125	25
100	2500	250.0	500	100

iv) Quantity and use of Bed disinfectants (100Dfls)

Sl. No.	Dusting time	Disinfectant	g / sq.ft . rearing Bed area	Rearing tray (g)
1	Larvae settling for I moult	Slacked Lime	3	50
2	Resumption from I moult	Vijetha (green)	3	50
3	Larvae settling for II moult	Slacked Lime	3	150
4	Resumption from II moult	Vijetha (green)	3	150

Annexure -7

Quantity of mulberry leaf for feeding(100 dfls)

Instar	Eating day	Quantity of leaf (kgs)	
		Cross breed	Bivoltine hybrid
1	1	0.600	1.000
	2	1.200	1.800
	3	1.600	2.500
	4	0.600	0.600
Total		4.000	5.900
II	1	4.000	5.000
	2	8.000	8.000
	3	3.000	3.000
Total		15.000	16.000

Annexure -8

Required fertilizer and farm yard manures (0.5 acre)

chawki plot. X4=2.0 Acres

Manure/ fertilizer	Quantity (tons/kg)
Farm yard manure	8.0 MT in four 2MT/ split
Ammonium Sulphate	32.5 kg/crop x8 crops
Single Super Phosphate	22.5 kg/ crop x 8 crops
Muriate of potash	6.0 kg/ crop X 8 crops

Annexure - 9

Chawki Certificate

This is to certify thatnos. of dfls of.....breed/hybrid having lot no.....were sourced from SSPC/Govt. Grainage..... and recorded% of hatching. The silkworm samples were tested on and found free from the disease and fit for distribution among the farmers. Approximately..... nos. of silkworms were available per 100 dfls at the time of distribution.

Date:

Place:

Authorized signatories

Seal of the Chawki Centre

Annexure - 10.

Pre - evaluation Questionnaire:

Dear participant,

Welcome to the course on "young age silkworm rearing". Let me congratulate you for having spared time from your regular activities to attend the course. In order to serve you better we would like to get some back ground information about you. This is necessary to enable us fine tune our training to meet your needs and those of the group as a whole. Please take a few minutes to answer the question spelt out on this form. The purpose of this question is to learn more about your experience, skills and interest in sericulture activities. All the information given in questionnaire will be kept confidential.

Name of the participant:

Village, taluk, district

Practice of sericulture

✓ Tick the appropriate answer

- own
- main occupation
- Subsidiary occupation,
- Others.(please specify)

Mention the present status in sericulture

- practicing sericulture own / employee with others

No of years' of sericulture experience.

Quantity of dfls rearing if it is own enterprise

Quantity of dfls brushing if it is private enterprise / year.

1. How important is the training to your sericulture practice?

- Critical
- Very important
- Important
- Marginal
- Not at all.

2. Have you previously participated in other programmes designed to improve your skills as a sericulturist

- Yes
- No.
- If yes, give the title of the courses (s) and duration(s).

1)

2)

3)

3. What did you find useful in these courses?

.....
.....

4. Narrate present practice of chawki rearing followed by you ?

5. What are the most important aspects your feel essential for successful chawki rearing? (Not more than five)

.....
.....

6. What do you know about young age silk worm rearing?

.....
.....

7. Give reason why you think young age silkworm rearing is important in the sericulture practice.

.....
.....

8. What do you expect from this training?

.....
.....

Annexure - 11.

Post evaluation questionnaire.

Each participant should complete the evaluation sheet provided to him with a suitable score for each aspect given below. Scores should be between 1 and 5 (1 very poor, 2 poor, 3 average, 4 good and 5 excellent)

Achievement of the course objectives.

Relevance of the course content.

Relevance of the daily group practical exercises.

Duration of the training course

Usefulness of the training manual.

Resourcefulness of the trainers.

General organization of training including facilities.

Usefulness of the training to their sericulture practice.

Any other comments you would like to make.

Annexure - 12

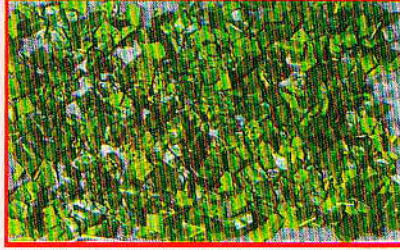
Certificate of participation.

This is to certify that Sri /Smtvillage.....
taluk.....participated in the young age silk worm rearing
course held at..... from ,
..... , 20.... to..... , , 20... , and completed the said
training course successfully.

Date & Seal of the training organization.

Coordinator

Name & Signature



YOUNG AGE SILKWORM REARING TRAINER'S GUIDE