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Disease-Free Seed Production Technology of Muga Silkworm: Strengthening the Foundation of Golden Silk

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Abstract: -

Muga silk, renowned for its natural golden luster, occupies a unique position in the sericulture sector of India. The sustainability and productivity of this heritage silk largely depend on the availability of high-quality, disease-free silkworm seed. However, a significant proportion of muga seed production is still carried out under unorganized conditions, often without scientific grainage practices, leading to disease incidence and yield instability. This article highlights the importance of scientific muga silkworm seed production and presents standardized grainage and seed production technologies, with emphasis on sanitation, cocoon selection, moth examination, and egg disinfection. Adoption of these practices can significantly improve cocoon yield, seed quality, and farmer's income while ensuring long-term sustainability of muga sericulture.

Introduction:

Muga silk, produced by the silkworm *Antheraea assamensis* Helfer, is one of the costliest and most exclusive silks in the world. Endemic to the North-Eastern region of India, particularly Assam and adjoining areas, muga silk is deeply interwoven with the culture, economy, and traditional livelihood systems of the region. Despite its high market value and global demand, muga sericulture faces several challenges, among which poor quality silkworm seed remains a major constraint. Silkworm seed, commonly referred to as Disease Free Layings (DFLs), forms the foundation of the entire sericulture production chain. Any compromise in seed quality directly affects larval health, cocoon yield, and silk quality. At present, a major share of muga seed production is carried out by private

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graineurs under unorganized conditions, often without adequate disease control measures. Therefore, scientific seed production through proper grainage management is essential for strengthening the muga silk industry.

Importance of Scientific Grainage Management

A grainage is a specialized facility where silkworm moths are allowed to mate and lay eggs under controlled hygienic conditions. Since muga silkworms are highly susceptible to diseases, especially pebrine, strict grainage hygiene is indispensable.

Ideal environmental conditions for muga grainage operation include:

- Temperature: **24–28°C**
- Relative Humidity: **75–85%**
- Well-ventilated structure with cross ventilation
- Restricted entry and clean surroundings

Maintaining these conditions helps in proper moth emergence, successful mating, and production of viable eggs.

Sanitation: The Cornerstone of Disease-Free Seed

Grainage sanitation plays a decisive role in preventing disease outbreaks. Prior to commencement of grainage operations, the grainage hall and all appliances must be thoroughly disinfected using bleaching powder and formalin solutions. Flame gunning, fumigation, and lime application further reduce pathogen load. During grainage operation, daily cleaning of floors, disinfection of tools, proper disposal of wastes, and use of foot mats are essential. Slides, crushing sets, centrifuge tubes, and other appliances used during moth examination must be disinfected regularly. Effective sanitation not only prevents disease transmission but also enhances the overall efficiency of seed production.

Selection and Preservation of Seed Cocoons

Selection of healthy and uniform seed cocoons is critical for synchronized moth emergence and successful mating. Only well-

Selected healthy muga silkworm seed cocoons for grainage

formed, compact cocoons collected during the mid-period of cocoon harvest (bhorpok ± 2 days) should be selected. Cut, pierced, malformed, or undersized cocoons must be rejected. Seed cocoons should be preserved in a single layer at a temperature of **26–28°C** and relative humidity of **80–85%**. Protection from natural enemies such as ants and rats is equally important. Proper cocoon preservation ensures uniform moth emergence and better pairing efficiency.

Moth Emergence, Mating, and Oviposition

Muga moth emergence generally occurs during dusk and continues for a few hours. Emerging moths are transferred to mating cages at a recommended ratio of three males to one female. Natural coupling is preferred, and a coupling rate of 80–90% indicates healthy grainage operation. After successful mating, fertilized female moths are placed in oviposition devices such as khorikas or cloth bags and allowed to lay eggs for three days in a clean, aerated environment. Careful handling during oviposition is necessary to prevent moisture loss and egg damage.

Muga silkworm moth laying eggs on khorika

Moth Examination for Pebrine Detection

Pebrine disease is one of the most serious threats to muga silkworm seed production, as it spreads primarily through infected eggs. Therefore, examination of every mother moth after oviposition is mandatory. Using the Fujiwara method, the abdomen of the moth is crushed, processed, and examined under a microscope to detect pebrine spores. Egg layings of infected moths are immediately rejected and destroyed by burning. Only eggs from moths found free from pebrine are supplied as Disease Free Layings. This single step plays a crucial role in ensuring healthy silkworm crops and preventing large-scale crop failure.

Egg Surface Disinfection and Supply

After harvesting, eggs are disinfected by washing in 2% formalin solution followed by thorough washing in clean water. At higher temperatures, dipping time is reduced to prevent egg damage. Eggs are dried in shade and packed in suitable egg boxes for safe transport and distribution. Use of poly bags for egg transport should be strictly avoided.

Waste Disposal and Bio-Safety Measures

All grainage wastes, including crushed moths, rejected eggs, diseased slides, and used materials, must be disposed of safely through burning or soak pits located away from the grainage hall. Proper waste disposal minimizes

environmental contamination and reduces the risk of disease recurrence.

Impact of Scientific Seed Production

Adoption of scientific muga seed production technology offers multiple benefits:

- Production of disease-free silkworm seed
- Improved larval survival and cocoon yield
- Enhanced silk quality and market value
- Reduced crop loss and production risk
- Increased income and confidence among farmers

Conclusion

Scientific seed production is the backbone of sustainable muga sericulture. By adopting standardized grainage practices, strict sanitation measures, proper cocoon selection, moth examination, and egg disinfection protocols, both government and private graineurs can ensure the availability of high-quality disease-free muga silkworm seed. Strengthening the seed sector will not only improve productivity but also safeguard the rich heritage of muga silk for future generations.

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