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The Significance of Breeding Rearings In Silkworm Cultivation

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Abstract: This article highlights the issues of breeding work with the mulberry silkworm, which encompasses a complex set of activities aimed at the creation, improvement, and reproduction of silkworm breeds, as well as hybridization and the production of the most productive first-generation hybrids. New silkworm breeds are developed over many years and undergo state competitive and production trials in comparison with regionally approved breeds. Based on the results of these trials, silkworm breeds and hybrids are zoned according to the climatic regions of the country. The breeding process also includes the multiplication of silkworm breeds and the maintenance of their economically valuable traits at a high level in order to supply grainage factories with high-quality purebred elite silkworm eggs.

Keywords: Zoning, staged laying, pebrina, elite grana, infestation, disinfection, revival, incubator, worm farm, breeding farms, breeding feeding, caterpillar, cocoons, butterflies, selection, aestivation, winnowing, granage plant, agricultural technology, agricultural technician, box, feeding organization, breed, labor force, mulberry leaf reserve.

Introduction: Grainage factories receive elite silkworm eggs from breeding sericulture stations. In the breeding farms assigned to these grainage factories, the elite eggs are incubated, and the hatched larvae are distributed to sericulture units. From the breeding cocoons obtained, the factories produce commercial hybrid silkworm eggs, which are supplied to farms in the following year for the production and procurement of commercial cocoons.

The suitability of farms for conducting breeding rearings is assessed based on the yield and quality of the cocoons produced, as well as the level of infection with pebrine and other diseases. The termination of breeding rearings in such farms and their replacement with new ones are carried out only with the permission of the higher governing authority.

When organizing a breeding base, it is necessary to strictly adhere to two fundamental principles:

1. For breeding rearings, regions with the most favorable natural and climatic conditions should be selected, ensuring the productive development and growth of the mulberry silkworm.

2. The breeding base must be thoroughly studied in all respects by the grainage factories so that they can subsequently manage breeding rearings efficiently and rationally.

Newly established breeding farms are prepared over a period of two years. The evaluation of the cocoons obtained in terms of yield, grade quality, and pebrine infection is carried out at the grainage factory. To determine the presence of diseases, examinations are conducted on underdeveloped larvae of the third, fourth, and fifth instars, as well as on pupae and moths from each box of cocoons in the batch delivered.

Farms engaged in breeding rearings must be isolated from farms conducting commercial rearings and, whenever possible, should be located in different climatic zones. The plan for distributing larvae to farms producing breeding cocoons is established in strict accordance with the available mulberry plantations and with consideration for maintaining a 10% reserve feed supply.

In farms carrying out breeding rearings, the entire complex of sericulture and mulberry cultivation activities is performed throughout the year under the supervision of grainage factory specialists. Preparatory work in these farms includes the organization of incubation facilities and silkworm-rearing houses, disinfection measures, preparation of lists of silkworm rearers, agrotechnical management of the feed base, and other related activities.

For incubation facilities, rooms consisting of two or more chambers are allocated. Shelving units containing silkworm eggs should be placed at a distance of at least one meter from walls and heating systems. The area designated for the incubatory should be calculated at a minimum rate of 1.6 square meters and a volume of 1.25 cubic meters for every ten boxes of silkworm eggs. In addition, the quantity of eggs incubated in a single incubatory should not exceed 50–60 boxes and should consist of only one breed or hybrid.

To ensure the systematic delivery of cocoons to the grainage factory and to achieve synchronized emergence of moths from the breeds and hybrids intended for crossing, the established procedures must be strictly followed. Mulberry silkworm larvae in breeding farms are reared in accordance with the agrotechnical requirements established for breeding silkworms.

Organization of Breeding Silkworm Rearing

Preparation for breeding rearing begins at the start of the year. The grainage factory develops calendar schedules covering the incubation of eggs from different breeds, egg hatching periods, cocoon deliveries to the factory, moth emergence, and labor requirements.

Breeding rearings are conducted in special facilities that meet the requirements of silkworm cultivation. These facilities are equipped with wooden or metal racks arranged in three tiers. The productivity of breeding rearings and the average cocoon weight depend both on the start of the rearing period and on its duration.

The duration of rearing is determined not only by the hatching time of the eggs but also by the availability and quality of feed, air temperature, humidity, ventilation, and the size of the rearing area. The more tender and nutritious the mulberry leaves provided to the larvae, the faster the rearing process proceeds, resulting in heavier cocoons and higher productivity.

Breeding rearings require an abundant supply of high-quality feed. Insufficient feeding reduces the size of the ovaries and the number of eggs produced. The leaf requirement for one box of breeding silkworms is established at 1,200 kg. In breeding rearings, it is particularly important to maintain uniform development of the larvae, ensuring age homogeneity within the population. The agricultural specialist must visit each breeding rearing unit at least every other day, inspect its condition, record the age and condition of the larvae in the agricultural passport, monitor the presence or absence of diseases, provide necessary instructions, and verify their implementation. In addition, from each box, the specialist selects 30 underdeveloped larvae of the third, fourth, and fifth instars for examination for pebrine disease.

Rearing Calendar Schedule

Any delay in rearing compared with the established schedule indicates a violation of one or more required conditions. Therefore, each silkworm-rearing facility must maintain a calendar schedule to monitor the progress of rearing. The schedule specifies the standard dates for the onset of each larval stage, the beginning of cocoon spinning, and the harvesting of cocoons from the mounting frames.

During cocoon collection, cocoons spun at different times are often mixed together, resulting in differences in maturity and quality. To avoid this problem, a fractional (day-by-day separate) spinning system is used. Harvested cocoons are cleaned of waste materials and sorted into four categories:

1. Breeding cocoons;
2. Variety mixture;
3. Defective cocoons;
4. Double or malformed cocoons (karapachakh).

Breeding cocoons are defined as dense cocoons containing live, fully developed pupae, without significant deviations from the average cocoon size within the batch, possessing the shape, grain texture, and color characteristic of the particular breed, and free from shell defects.

Proper organization of breeding rearings is one of the most important factors in the successful operation of a grainage factory. Breeding rearings ensure the supply of the necessary quantity of breeding raw material, guarantee its quality, and enable the grainage factory to achieve maximum economic efficiency in its operations.

Breeding rearings must satisfy the following conditions:

1. **Location and accessibility**. Breeding rearing units should be located in areas situated at relatively short distances from the grainage factory and connected to it by transportation routes that allow the rapid and convenient delivery of breeding cocoons to the factory.

2. **Concentration in specialized farms**. Breeding rearings should be concentrated in designated farms where commercial rearings should, whenever possible, not be permitted. This significantly reduces the risk of introducing infectious diseases into breeding stocks and facilitates supervision and technical guidance of breeding operations.

3. **Selection of healthy regions**. Farms selected for breeding rearings should be located in the healthiest areas, free from endemic disease outbreaks and geographically well suited for successful breeding activities.

4. **Systematic distribution of breeding lots**. The distribution of breeding batches among selected farms should follow a planned system. Rearing should begin earlier in warmer regions and later in cooler climatic areas so that cocoons from the latter arrive at the grainage factory approximately one month after the first batches. This allows intensive seasonal operations of the factory—such as cocoon reception, inspection, grading, and moth emergence management—to be spread over a longer period. Proper organization of breeding rearings therefore requires a detailed preliminary survey of the region and the preparation of comprehensive geographical maps containing all information relevant to the grainage factory.

5. **Selection of skilled rearers**. Breeding rearings should be entrusted to skilled, conscientious, and experienced silkworm rearers who possess spacious and healthy rearing facilities, sufficient labor resources for proper larval care, and adequate feed supplies for raising the assigned number of silkworms.

6. **Contractual obligations**. Silkworm rearers conducting breeding rearings must be bound to the grainage factory through a special contract. The contract should guarantee fair compensation for their work while obligating them to carry out rearing operations according to factory instructions and under factory supervision. Rearers must deliver all cocoons produced to the grainage factory at the agreed price and within the specified timeframe. They must not rear any silkworms other than those supplied by the factory, must comply with all instructions issued by factory inspectors, and must allow disinfection of their facilities when necessary. Rearing should begin on the dates specified by the factory, and feeding must follow factory-established standards.

7. **Distribution of hatched larvae**. Whenever possible, silkworms should be supplied to rearers from incubatories in the form of newly hatched larvae rather than as eggs.

8. **Continuous supervision**. Breeding rearings must remain under the constant supervision of specially trained inspectors employed by the grainage factory. Depending on the experience of the rearer and the progress of rearing, inspectors should visit farms at regular intervals and record the date and results of inspections on special monitoring cards. These records should include observations on larval development uniformity, cocoon spinning, disease occurrence, and mortality rates.

9. **Timing of cocoon harvest**. Cocoons should be harvested no earlier than the seventh day and no later than the tenth day after the last major mass ascent of larvae onto the cocooning frames. The cocooning process itself should not extend beyond six days.

10. **Transportation of cocoons**. Harvested cocoons must be delivered to the grainage factory immediately. Transportation methods should protect cocoons from excessive shaking, compression, compaction, suffocation due to inadequate ventilation, and overheating caused by direct sunlight or by the accumulation of large masses of cocoons. The most suitable method is transportation in special narrow baskets.

11. **Selection for line breeding**. For the rearing of pure-line breeding stocks, the most qualified silkworm rearers should be selected—those who satisfy the above-mentioned requirements to the greatest extent possible.

CONCLUSION

Breeding work with the mulberry silkworm plays a crucial role in the overall development of sericulture.

Therefore, special attention is given to the development of new silkworm breeds, their evaluation through state competitive and production trials, the multiplication of superior breeds, and the maintenance of their economically valuable traits at a consistently high level. Particular emphasis is also placed on supplying grainage factories with high-quality purebred elite silkworm eggs. These measures are undertaken to ensure that the commercial silkworm eggs produced are of the highest quality, thereby contributing to increased cocoon productivity, improved silk production, and the sustainable development of the sericulture industry.

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