

SILKWORM Rearing Guidelines

Georgia, 2025

About these Guidelines

These guidelines offer clear and practical instructions for anyone interested in silkworm farming to rear healthy silkworms and produce raw silk cocoons.

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Glossary

Pupa: The phase during which the silkworm finishes spinning its cocoon and transforms into a pupa inside the cocoon before emerging as a moth.

Moth: The adult stage of the silkworm, which emerges from the cocoon after transforming from the pupa. The moth's primary role is to mate and lay eggs, starting the life cycle anew.

Larva: The caterpillar stage of the silkworm's life cycle, which feeds on mulberry leaves and grows rapidly before forming a cocoon.

Cocoon: The protective shell spun by a mature silkworm larva, made of silk thread, from which raw silk is derived.

Instar: A developmental stage in a silkworm's life cycle. There are five instars before cocooning.

Moulting: The time when a silkworm stops eating and sheds its old skin to grow into the next instar. During moulting, silkworms are still and do not appear to move.

Rearing House: The building or room where silkworms are reared.

Rearing Bed: The surface where silkworms are kept and fed during their larval stage.

Mountage: A plant based (e.g. branch or twig) or artificial structure, used to allow mature silkworms to spin their cocoons.

Cocoon Harvesting: The process of collecting silk cocoons after silkworms have finished spinning.

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Understanding the Silkworm Lifecycle

Silk is a natural fiber made from threads spun by silkworms to form their cocoons. The silkworm, as a member of the insect class that undergoes complete metamorphosis, goes through four life stages during its lifespan, which are egg, silkworm, pupa, and moth. The silkworm lifecycle begins with the egg, which hatches into a silkworm known as a 'larva'. The silkworm feeds on mulberry leaves and grows through five stages known as 'instars'. After the final stage or instar, it spins a cocoon and transforms into a pupa. Eventually, an adult moth emerges, lays eggs, and the cycle begins again.

Silkworms develop through five instar stages, each differing in duration (see *table 1*). Every stage, except the final one, ends with moulting and resting. Moulting, is a process where the silkworm stops eating and sheds its old skin to grow into the next instar. Resting refers to the short inactive period just before and during moulting, during which the silkworms become still and stop feeding.

Instar	Duration	Moulting and Resting
I	5 days	5 th day
II	4 days	4 th day
III	5 days	5 th day
IV	6 days	6 th day
V	8 days	N/A

Table 1. Silkworm Instar stage duration, moulting and resting

The Stages of the Silkworm

 <p>Silkworm Eggs</p>	<p>Tiny, round eggs, which should be kept at the right temperature (23-26°C) and humidity (80-85%) during incubation, until they hatch. Good eggs mean strong silkworms and better silk. Taking care of eggs well is the first step to a good silk crop.</p>
 <p>Silkworm (Larvae)</p>	<p>A black silkworm hatches from the egg, which gradually changes color and becomes white. In this phase, the silkworm continuously feeds on mulberry leaves, grows rapidly, and stores up nutrients for the pupa and moth stages. After a few weeks, they start spinning silk. Healthy silkworms are the key to getting good quality silk.</p>
 <p>Cocoon</p>	<p>Cocoons are made by silkworms using silk thread when they finish growing. At the end of the fifth instar, the silkworm begins spinning its cocoon, a process that takes three-four days. The worm then remains inside the cocoon for twelve–fifteen days, undergoing the transformation from larvae to pupa, and then from pupa to moth. Each silkworm spins one cocoon to cover itself. Big, strong cocoons give more and better-quality silk.</p>
 <p>Pupa</p>	<p>The stage inside the cocoon, after the worm finishes spinning. On the fourth or fifth day after cocoon spinning begins, the silkworm undergoes its fifth moult, marking the transition to the pupal stage. It then rests and slowly turns into a moth. To protect the silk thread, farmers collect the cocoon before the pupa turns into a moth and comes out. To prevent pupas from emerging, farmers either gently dry or freeze cocoons or cut them open and remove the pupa by hand. This keeps the silk thread long and clean.</p>
 <p>Mulberry leaf</p>	<p>Mulberry leaves are the food of silkworms. The silkworm is a monophagous insect, feeding exclusively on one type of food—mulberry leaves. The leaves are full of nutrients that help silkworms grow well and produce good silk. Healthy leaves lead to strong silkworms and better silk quality.</p>
 <p>Moth</p>	<p>The mature stage of the silkworm is the moth stage. After the silkworm finishes spinning its cocoon, it enters the pupa stage. If the cocoon is not harvested for silk, the pupa eventually develops into an adult moth and breaks out of the cocoon. The fully developed moth, having shed its pupal skin, moistens the cocoon with a fluid secreted from its mouth (sericinase), creates a hole with its legs, and emerges from the cocoon as a wet moth, which soon dries and takes on a whitish color. The healthy moth's lifespan lasts seven–fifteen days, during which its primary purpose</p>

	is reproduction. Its only job is to mate and lay eggs to start the next generation of silkworms. After laying eggs, the moth dies shortly afterward.
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The Silkworm Rearing House and Equipment

Certain conditions are essential in the silkworm-rearing house for successful silkworm rearing and cocoon production. Silkworms are highly sensitive, and the simple guidelines outlined in this chapter should be followed to reduce the risk of low productivity, disease and death.

Silkworm Rearing House Conditions

Ensure the rearing house is dry, well-lit, properly insulated, well ventilated, and clean, with adequate protection against dust, insects, rodents, and birds.

Silkworm Rearing House Equipment

Silkworm Shelves/ Rearing Beds	A clean, well-ventilated surface typically made of mesh with a wooden or metal frame around, where silkworms are placed to grow, feed, and develop, ensuring proper airflow and space to prevent overcrowding and disease.
Paper	A soft, chemical-free, and absorbent, used to keep the bed clean and make waste removal easier.
Thermometer & Humidity Meter	Tools used to measure and monitor the air temperature and humidity levels in the silkworm rearing room to ensure optimal growing conditions.
Heater	Electric or gas heaters to warm the room in case of low temperature.
Facemask & Gloves	Wear a mask and gloves while disinfecting the silkworm rearing house.
Container & Sprayer	Tools to use for disinfection.

Temperature and Humidity Control

Being able to maintain stable temperature and humidity are essential in the silkworm rearing house as silkworms are highly sensitive to temperature and humidity fluctuations. Optimal levels are described in the table below.

Instar	Temperature °C	Humidity (%)
I	24-26	65-75
II	24-26	65-75
III	24-26	65-75
IV	21-24	65-70
V	21-24	65-70

Table 2. Temperature and Humidity in the rearing house per Instar

These standard temperature conditions should be maintained from early morning until around 10–11 PM, when silkworms are actively feeding on mulberry leaves. **After midnight, the temperature can be lowered by 1–2°C**, this keeps the worms inactive at night, reducing the need for feeding.

Insulation

Insulate the silkworm rearing house, so that the temperature can be controlled more easily. Insulation in a silkworm rearing house is essential to maintain optimal temperature and humidity. In China and India, where sericulture is widespread, eco-friendly ceiling insulation like straw or hay mats and old quilts is commonly used.

To adjust humidity in the rearing house: hang wet sheets into the rearing house to increase humidity. Open the windows to ventilate the rearing house to decrease humidity.

To adjust the temperature in the rearing house: use electric or gas heaters¹ to raise the temperature. Hang wet sheets to decrease the temperature.

Ventilation

Open windows to ventilate the silkworm rearing house. Avoid using air conditioners, as they dry out the air. Ventilation is important to provide fresh air, regulate temperature and humidity, and support healthy silkworm growth. Inadequate airflow can lead to diseases. Table 3 below shows how often to ventilate the rearing house during each developmental stage.

¹ Avoid heaters that raise the room temperature too quickly, as sudden fluctuations are harmful and can lead to disease in silkworms

Instar	Frequency	Duration
I	N/A	N/A
II	Once a day	30 min.
III	Twice a day	30 min.
IV	2-3 times a day	30 min.
V	3-4 times a day	30 min.
During cocoon spinning	More often	Longer

Table 3. Silkworm rearing house ventilation

Rearing-Space Management

Use rearing beds/shelves made of mesh with a frame for support. The mesh allows proper airflow, which is essential for silkworm health. Avoid using solid materials like wood or boards, which block ventilation. Without proper ventilation, silkworm waste can become moldy, leading to disease in the silkworms.

Shelves can be either hanging or tiered, depending on the space available and preference. Leave plenty of space between the shelving units to ensure good airflow, to allow easy access for placing moutage and for cleaning and monitoring silk worm development. Shelves should be spaced forty-fourty-five cm apart and positioned at least eighty cm away from the ceiling and walls. This helps maintain proper ventilation, prevents heat buildup, and reduces the risk of pest infestation.



For tiered shelves, a good preventive measure against ants is to place their legs in bowls or trays filled with water or wood ash, creating a barrier they cannot cross.

Avoid narrow spaces in the silkworm rearing building and on the shelves. If the worms are confined to tight spaces, it can lead to overcrowding, causing them to produce diseased or poor-quality silk cocoons.

Instar	Space Required (Sq.m)
I	0.16-0.2
II	0.3-0.4
III	0.9-1
IV	2.1-2.3
V	4-4.2

Table 4. Required silkworm rearing/feeding shelf area by instar stages

The feeding area should account for approximately 60% of the total area of the room.

Disinfection

Disinfect the silkworm rearing house and shelves two weeks prior to the start of silkworm rearing.

Usually, disinfection takes place if there was rearing in the same house last year. But if not, disinfecting is still advisable. Silkworms are highly susceptible to bacterial, fungal, protozoal, and viral diseases, so disinfecting the rearing house is essential to prevent infections.

Disinfection can be carried out using either of the following methods². In both cases, ensure that all windows and doors are tightly sealed to maintain a controlled and hygienic environment.

Spray Method

Mix one litre of 40% Formalin with nine litres of water to make ten litres of a 4% Formalin solution. Spray this solution thoroughly throughout the rearing room and on equipment.

Fumigation Method

Mix one litre of 40% Formalin with nine litres of water to make ten litres of a 4% Formalin solution. Place the solution in a container in the center of the rearing room on an electric stove (or other suitable heat source). Allow the solution to evaporate completely to disinfect the space.

In both cases, after 48 hours, the doors and windows should be opened and kept open until the smell of Formalin has completely dissipated.

² The quantities mentioned above are calculated for a room of 100 cubic meters. The amounts of Formalin and water should be adjusted according to the actual volume of the rearing room

Silkworm Rearing and Harvesting

This chapter covers the full rearing process from planning to harvest. It also provides essential guidelines for feeding, cleaning, mounting, and cocoon collection. It also helps producers estimate the required yield according to their resources, like time, space and feed needed for successful rearing.

Yield planning

The box below gives the full example of how to calculate the resources needed to produce a certain yield.

Salome and Lekso from the Kvemo Kartli region (first time silk producers)

Salome and Lekso remember silk rearing from their childhood, and last year they saw a neighbor doing it again. This spring, they want to try it themselves. They initially planned to rear 4 grams of silkworm eggs, just like their neighbor did.

Before getting started, they sat down to review some important details and used the information from this guide to figure out what they would need.

Space:

They have a 20 m² room available for rearing. After doing the calculations, they realized that rearing four grams of silkworms requires around 27 m² of space, which is more than what they have. So, they decided to reduce the quantity of silkworms to match the space available (20 sq.m).

To fully grow and harvest their silkworms, they will need around 12 m² of rearing shelves (since each gram of silkworms needs about 4 m²). Because the feeding area should take up 60% of the total room, their rearing room must be at least 20 m² in size.

Duration: The feeding period of the silkworm lasts 28–35 days, depending on the breed/hybrid of the silkworm, air temperature, and humidity. In addition, 10–12 more days are required from the end of the feeding period to cocoon formation, making the entire process last approximately 38–40 days.

Feeding: One gram of silkworms consumes around 45-50 kg of mulberry leaves during its life. So, for three grams, they will need about 150 kg of fresh mulberry leaves (3 × 50 kg).

Raw silk cocoon yield: One gram of silkworms produces about 2.5-3 kg of raw silk cocoons. With three grams, Salome and Lekso can expect around 7.5-9 kg of cocoons (3 × 2.5 kg).

Note

Depending on the breed, one gram of silkworms may contain around two thousand worms. Each silkworm consumes about 20-25 twenty-five grams of mulberry leaves during its lifecycle, one gram of silkworms would therefore require approximately $2,000 \times 20/25 = 50,000$ grams, or 45-50 kg, of fresh mulberry leaves throughout all five instar stages.

List of Food & Equipment

Mulberry Leaves	The primary source of food for silkworms, essential for their growth and development.
Loppers & Pruners	Tools to cut mulberry shoots and leaves from trees and chop into suitable sizes for feeding silkworms.
Basket And Damp Cloth	To keep mulberry leaves before giving to silkworms.
Mountage Material	Mounting is the process of moving mature silkworms, at the end of the fifth instar, to special structures called mountages where they spin their cocoons. These mountages, whether natural or artificial, should be odorless and are typically placed directly on the feeding beds.
Step Ladder	Equipment to safely reach the upper sections of the silkworm rearing bed.

Feeding

Feed the silkworms with mulberry leaves throughout all five instar stages. Clean, fresh, tender leaves are essential, particularly during the first three instars.

During early stages (I-III instar stages), store the whole leaves in a basket covered with a damp cloth to preserve moisture and freshness.

During the fourth and fifth instars, store leaves in a cool, well-ventilated area, spread in a thin layer, and cover with a damp cloth. During these stages, both leaves and tender shoots may be used.

Do not store chopped leaves, as they dry out quickly and silkworms may refuse to eat them. Feeding dried leaves can lead to poor nutrition and result in low-quality silk cocoons.

Do not feed silkworms old, wilted, wet, decayed, or pesticide-sprayed leaves, as these can cause diseases, digestive issues or even death. Contaminated leaves may weaken the worms and reduce silk quality.

Do not feed silkworms mulberry leaves during moulting and resting, as they do not eat at that time. Feeding during this stage can disturb their rest and affect healthy development.

Do not move or touch silkworms or their mulberry leaves while moulting and resting, as any disturbance can affect their growth and health.

Feeding frequency and leaf size vary depending on the instar stage. Volume of feed increases rapidly at each stage, especially in the fifth stage. *Table 5* below provides detailed information on feeding schedules for each instar.

Instar	Instar Duration (Days)	Feeding Frequency/ Day	Mulberry Leaves (Cm)	Amount of Feed Per Gram	When?
I	5	5	0.5 (chopped)	0.63 kg	From early morning to 10-11 pm
II	4	5	0.5-1 (chopped)	2 kg	
III	5	4	1-2 (chopped)	3 kg	
IV	6	4	Whole leave	8 kg	
V	8	4-5	Whole leave, shoot	37 kg	

Table 5. Feeding Schedule

Bed Cleaning

Clean rearing beds regularly, maintaining hygiene and reducing the risk of disease outbreaks among silkworms. Old mulberry leaves, silkworm droppings (frass), and shed skins can create a breeding ground for harmful bacteria, fungi, and viruses. Clean rearing conditions contribute to the overall health of the silkworms, resulting in stronger, better-formed cocoons with higher silk yield and quality.

Do not drop waste on the floor. The silkworm rearing building must be kept clean at all times. Excess waste is a major source of infection. If the worms were diseased, their waste must be burned, otherwise, it can be used as fertilizer in the vegetable garden³.

How to clean the rearing bed?

- 1.** Spread fresh mulberry leaves over the silkworms
- 2.** Wait for some time for the silkworms to crawl up and settle on the fresh leaves
- 3.** Lift the new layer (with the silkworms attached)
- 4.** Remove the old bed material, including droppings, leftover leaves, and shed skins
- 5.** Place the new layer back onto the cleaned and new rearing surface (paper).
- 6.** Gently adjust spacing if needed to prevent overcrowding.

³ To promote sustainable farming practices and reduce waste, after leaf-picking, mulberry branches can be processed using a shredder to turn them into mulch, which can be composted or used as a soil conditioner or soil top dressing in vegetable gardens.

The cleaning frequency differs according to instar stages. *Table 6* below shows the frequency of bed cleaning during each instar.

Instar	Frequency	When?
I	N/A	N/A
II	Clean once, on the second day after resting	After completing the first morning feeding
III	Clean twice, on the second day after resting and before the next rest	
IV	Clean twice, on the second day after resting and before the next rest	
V	Clean 3-4 times, starting on the second day after resting and every third day until they start spinning	

Table 6. Bed cleaning frequency according to instars

Mounting

Mounting is the process of moving mature silkworms, at the end of the fifth instar, to special structures called mountages where they spin their cocoons. These mountages, whether natural or artificial, should be odorless and are typically placed directly on the feeding beds.

Start preparing natural mountages (commonly used in Georgia) such as chamomile, yarrow, fern, or hornbeam branches, at the beginning of the fifth instar. These materials need time to dry properly, as they must not be raw or wet at the time of mounting. Freshly picked plants should be stored in the shade to dry gradually, avoiding direct sunlight to preserve their structure and prevent wilting.

Place the mountages, arranged like flower bouquets on the feeding beds on the seventh day of the fifth instar. This allows the mature silkworms to begin spinning their cocoons. It should be spacious enough to prevent **overcrowding** and allow the silkworms to crawl and spin freely.



Artificial Mountage



Plant-based Mountage

Harvesting

Collect the cocoons once the silkworms have finished spinning, but before the moths begin to emerge. The box below provides guidance at the right timing to start harvesting for the best cocoon quality.

When is Right Time to Start Harvesting?

1. On the eighth and ninth days of the fifth instar, the silkworms start spinning.
2. Mass spinning starts after three days.
3. Cocoon harvesting should begin on the seventh or eighth day after the start of mass spinning.

Do not move or shake the shelves and mounts during cocoon spinning.

Avoid early harvesting, i.e. removing the cocoons from the mountages earlier than the seventh day after mass spinning, as the spinning process will not be complete, and the worms will not have fully transformed into pupae. Premature harvesting can crush the worms, making the cocoons dirty and causing a loss in quality.

Disease Management

Silkworms are susceptible to various diseases, which can significantly affect their health and the quality of the silk produced. These diseases can be caused by bacteria, viruses, fungi, or parasites, and often result in symptoms like poor growth, deformities, or death. Common silkworm diseases include **bacterial, viral, fungal and protozoan infections**. Maintaining clean rearing conditions, proper nutrition, and a stable well-ventilated environment is essential to minimizing disease risk.

Upon noticing the disease, immediately isolate the suspect worms. Early detection and prompt treatment can help reduce losses and ensure healthy silkworm production. **Contact an appropriate specialist to identify the disease and provide advice.**

Table 7 below lists common silkworm diseases, their symptoms, the stages at which they appear, and recommended prevention or treatment methods.

Disease	Symptoms	Time of Appearance	How to Avoid?
FLACHERIE (ფლაჭერია)	Vomiting, brownish-green liquid, loss of appetite, crawling toward the edges of the shelf, spilling of dark, thick liquid.	4 th and 5 th instars	<ul style="list-style-type: none"> ✓ As soon as disease symptoms are observed, you must IMMEDIATELY isolate diseased worms from the healthy ones and burn them ✓ Disinfect equipment, ensure proper ventilation, temperature and humidity ✓ Maintain hygiene ✓ Avoid overfeeding ✓ Avoid overcrowding ✓ Help prevent disease by feeding the worms once a day with dried mulberry leaves soaked in a garlic solution during the fourth and fifth instars.
PEBRINA (NOSEMA BOMBYCIS, პებრინა)	Small brownish-black spots, stunted growth, loss of appetite, dirty greenish coloration.	Throughout larval period	
GLASSERIE ბირთვული და ციპოპლაზმური პოლიედროზი <i>Polyhedrosis</i> სიყვითლე)	Loss of appetite, rapid movement, restlessness, crawling toward the edges of the shelf, falling to the floor, abnormal enlargement, and swelling. These symptoms can occur at any developmental stage, especially in the 5th instar during cocoon spinning.	4 th and 5 th instars	
MUSCARDINE (BEAUVERIA BASSIAN, მუსკარდინა, გაკირვა)	Pinkish color gradually darkening, prolonged moulting, moulted silkworm turns brown, then becomes chalky.	Throughout larval period	

Table 7. List of common diseases, symptoms, time of appearance and preventive measures

10 THINGS TO REMEMBER FOR SILKWORM SUCCESS

1. Source Quality Eggs

Always get disease-free eggs from trusted sources.

2. Set Up Your Rearing House Correctly

Ensure you have the proper space and equipment. Keep it dry, well-ventilated and insulated with steady temperature.

3. Pay Attention to Hygiene

Cleanliness is key. Regularly clean the rearing house to avoid diseases.

4. Feed Fresh Mulberry Leaves

Only give fresh, tender leaves. Avoid wilting, old or pesticide-sprayed leaves.

5. Follow the Feeding Schedule

Adjust leaf size to silkworm growth stages and feed the silkworms four to five times a day.

6. Ensure Airflow in the Bedding

Use meshed rearing beds to allow proper airflow in the bedding.

7. Clean the Beds Frequently

Remove waste and old leaves to prevent health issues.

8. Handle Silkworms with Care

Avoid disturbing the silkworms especially during moulting, to reduce stress.

9. Watch for Disease

If you notice signs of a disease, isolate infected worms immediately!

10. Harvest Cocoons Carefully

Wait until the worms are finished spinning. Harvest gently to avoid crushing.



GSA Georgian Silk Association

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History of Sericulture in Georgia



Silk production in Georgia has a deep-rooted history, dating back to the fifth century, when King Vakhtang Gorgasali brought silkworm eggs to Georgia from India. Historical sources indicate that silk production and weaving were practiced in Georgia from early times.

More detailed records emerge from the mid-nineteenth century, during the Imperial Russian Empire. By 1844, there were more than 3,000 domestic looms in Eastern Georgia and nearly 1,000 in the Imereti region of Western Georgia. These looms were used by local artisans to produce fabrics from cotton, wool, and silk. In Eastern Georgia, artisans primarily wove headscarves and bags, while in Western Georgia, the focus was on headscarves, quilts, socks, gloves, and similar items.

At that time, the silk industry in Europe faced a major setback due to the spread of Pebrine, a silkworm disease that posed a serious threat to production. This also negatively affected silk production in Georgia.

In 1887, in Tbilisi a Caucasus Sericulture Station was established. It included laboratories, educational facilities, various buildings, and a museum, of which only the museum and its library remain today.

During the Soviet era, especially in the 1960s, sericulture in Georgia became highly organized. At its peak, the country produced around four thousand tons of silkworm cocoons annually, with over 100,000 households involved in cocoon production. This made silk a significant source of income for many Georgian families.

Following the collapse of the Soviet Union, however, the silk industry in Georgia went into steep decline and is now nearly extinct.

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