

Silkworm

Carolina™ CareSheet

Immediate care and handling

When your silkworm eggs arrive, immediately open the shipping container and inspect your shipment. Place the eggs in a clean, sterile 9-cm petri dish or other small container with lid. If the humidity is low, add a small piece of dampened paper towel, but do not allow the moist towel to touch the eggs. If condensation develops, the humidity is too high.

Keep the eggs at room temperature or incubate them at 29° C (84° F). They will develop more quickly at the warmer temperature. Do not put the cultures in direct sunlight, which can cause them to overheat.

Hatching will begin in about 1 to 3 weeks. The eggs become slightly paler and bluer just before they hatch. When the larvae begin to hatch, add either a young, tender mulberry leaf or a small portion of artificial diet to the petri dish, next to the eggs. Do not put artificial diet in direct contact with any unhatched eggs.

After the larvae have all hatched and crawled onto the food, brush out the egg cases or transfer the food and larvae to a new petri dish lined with a piece of filter paper or paper towel. See the “General larva care,” “Feeding with mulberry leaves,” and “Feeding with artificial diet” sections below for further care information.

General larva care

Silkworms spend 26 to 30 days as larvae and molt 4 times, passing through 5 larval instars (an **instar** is the stage between molts). Keep the larvae within a temperature range of 22 to 30° C (72 to 86° F). For optimal results, maintain the larvae at 29° C (84° F) for the first 3 instars, then lower the temperature to 24.5 to 27° C (76 to 81° F) starting at the 4th instar (approximately 12 days after hatching). Do not put the cultures in direct sunlight, and do not expose the silkworms to temperatures below 20° C (68° F).

We recommend petri dishes as a convenient culture container; as larvae grow, you will need to separate them into multiple dishes to prevent overcrowding. You can also transfer older larvae to larger glass or plastic habitats with a lid or screen. Containers must be clean and free of any soap residues. Place a piece of filter paper or paper towel on the bottom of the container and add food as directed below.

Silkworms are vulnerable to disease from molds and bacteria. Check often to ensure all larvae have moist, fresh food and remove feces with a brush or small spoon every other day. After larvae molt, or at least once a week, remove everything from the dish and disinfect it with boiling water or use a new, sterile petri dish. If mold develops, transfer the larvae to a new sterile dish and replace all food.

Starting about 24 days after hatching (days 6 to 8 of the 5th instar), the larvae shrink slightly and become somewhat translucent or yellowish. This indicates that they are ready to spin their cocoons. See the section on “Pupae care” below.

Feeding with mulberry leaves

Feed larvae either mulberry leaves (*Morus* sp.) or our Silkworm Artificial Dry Diet (item #143966). If using mulberry leaves, you must hatch the larvae in early spring when tender new leaves are available. More mature leaves will be too tough for young larvae, although older larvae will eat them.

Be aware that larvae that have fed on mulberry leaves may not accept artificial diet later, so only feed mulberry leaves if you have a sufficient supply available. (Larvae started on artificial diet generally have no problem switching to mulberry leaves later.)

Collect a large supply of leaves and soak them for 3 minutes in a disinfecting solution made by adding 3 tablespoons of bleach (sodium hypochlorite) and a drop of dishwashing detergent to a gallon of water. After soaking, carefully rinse the leaves under running tap water. Remove all traces of soap from the leaves because it can kill the larvae. Shake off the excess water and refrigerate the leaves in plastic bags until you need them.

To feed the larvae, place a piece of filter paper in the bottom of the petri dish and moisten it so that it is damp but not soggy. Wrap the stem end of a young, tender mulberry leaf with a piece of moist paper towel and place it in the petri dish. During the first week, replace the leaf every day. Allow the larvae to crawl to the new leaf or gently transfer them with a soft paintbrush before removing the old leaf. After the first week, add several leaves bunched together to keep up with the larvae’s expanding appetites. Continue to remove feces at least every other day.

Feeding with artificial diet

Prepare the artificial diet (item #143966) according to the directions printed on the packet. The cooked diet will keep for 1 to 2 months in an airtight container in the refrigerator. Be careful not to contaminate the diet with your hands or dirty utensils, and discard it if it dries out or develops mold.

Place a piece of filter paper or paper towel in the bottom of a petri dish and add a small portion of the prepared food. Allow larvae to crawl to the new food or gently transfer them with a soft paintbrush. The food is the larvae’s only source of water, so be sure to replace it immediately if it becomes dry. To prevent mold and bacterial build-up, brush or scoop out feces and replace uneaten food every other day.

Pupae care

Before pupating, larvae shrink slightly and become more yellowish or translucent. They will leave the food and search for a sheltered location to spin cocoons, such as the corner of their habitat. You may also provide the larvae with sections of toilet paper roll to pupate in, or you can transfer them to cocoon nests made of paper towels or newspaper. To construct a cocoon nest, roll a piece of paper into a tube the size of 2 larvae, twist 1 end, put a larva in it, and twist the other end closed. Choose larvae that appear close to pupation (based on their behavior and change in size and coloration), but do not disturb larvae that have already begun to spin their cocoons. Remove all uneaten food and feces after the larvae have formed their cocoons.

A mature larva needs about 3 days to spin its cocoon. If you disturb it during that time, it will have to start over and may die. After the larva completes its cocoon, it takes another 2 to 3 days to pupate. When you are sure pupation is complete, you can remove some pupae from their cocoons for observation. To do this, cut open the end of the cocoon with a razor blade and gently extract the pupa. The females are larger than the males and their next-to-last abdominal segment has a ventral interruption. Return the pupae to their cocoons. If you handle them carefully, they should still emerge as adults.

Silk collection

Note: *Silk collection kills the pupae.* The single strand of silk that makes up a silkworm's cocoon may be 300 to 900 meters long. Since the adult's emergence cuts the strand into pieces, silk farmers collect silk from intact cocoons with the pupae still inside. Boil some intact cocoons in water for 5 minutes while repeatedly turning them over with a dissecting needle or similar instrument. The cocoons will begin to loosen, and you will see some tangled strands around each cocoon. Remove the cocoons from the heat. Use the dissecting needle to pick up strands until you find a single strand of silk that pulls away easily. Tie the end of the strand to a pencil and turn the pencil to wind the silk around it.

Adult care

Adult moths begin emerging about 2 weeks after cocoon formation and tend to emerge in the early morning. The females are larger and less active than the males. The males flutter their wings (neither sex can fly) and crawl around to search for females. The females will lay 200 to 500 eggs within 24 hours of a successful mating. Adults do not feed and live for only a few days.

Newly laid eggs are pale yellow and darken in 1 to 3 days. Any eggs that do not darken are infertile. Occasionally some eggs may hatch in 2 to 3 weeks at room temperature, but most often the eggs will be in diapause (a resting stage). You must refrigerate eggs that are in diapause for at least a few months, or they will not hatch. The eggs may stay viable in the refrigerator for as long as 5 years, although the hatch rate will slowly

decline. Return the eggs to room temperature (or ideally incubate at 84° F) to induce hatching after refrigeration.

Disposal

The following is for your information only. It is your responsibility to know and follow any regulations and procedures for disposal of organisms as specified by your lab protocols, school district, or other responsible authority. None of the following should replace, negate, or modify such local regulations in any way.

Adult silk moths only live for a few days, so you can easily keep them to the end of their natural lifespan. Thoroughly freeze unwanted eggs, larvae, or pupae, and then place the frozen material in a sealed plastic bag and dispose of it in the trash.

FAQs

I received my silkworm eggs, but I am not ready to use them. Can I refrigerate them?

Yes, you can prevent the eggs from hatching by refrigerating them at 10° C (50° F). Be careful not to expose them to temperatures lower than that or they may not hatch.

My silkworms have stopped eating. What is wrong?

They may be preparing to molt. Before molting, larvae become somewhat brighter in color and stop eating. If they are not preparing to molt and you are raising them on mulberry leaves, replace the leaves with fresh ones. If you are raising them on artificial diet, it may have become too dry. Replace it with fresh diet.

The larvae grew large but now seem smaller. What is happening?

During days 6 to 8 of the 5th instar, the larvae shrink slightly and become somewhat translucent. This indicates that they are ready to spin their cocoons. See the “Pupae care” section above.

My silkworm eggs have not hatched.

Allow enough time. It may take 2 to 3 weeks for the eggs to hatch, and cooler temperatures may extend that time. Mist the eggs lightly to keep them from drying. The eggs change color slightly just before hatching. Check them frequently for hatchlings.

My silkworms hatched, but they do not seem to be eating.

If you are growing them on mulberry leaves, the leaves may be too mature or too old, or you may not have mulberry leaves. Make sure you are feeding them fresh, young mulberry leaves. If you are growing the silkworms on artificial diet, the diet may have become too dry. Replace it with fresh diet.

The silkworms were growing, but now they have stopped and are turning black and dying. What is wrong?

The silkworms are overcrowded. As they grow larger, they need more space, and you will need to prepare more habitats for them. See the “General larva care” section for details.

The moths have emerged, but they cannot fly. What is wrong?

Nothing. Silk growers do not want their moths flying away, so they have selected and bred moths that cannot fly.

What should I feed the moths?

Nothing. The moths do not feed. In fact, they do not have mouthparts. Their only job is to reproduce.

Problems?

We hope not, but if so, contact us. We want you to have a good experience.

Orders and replacements: 800.334.5551, then select Customer Service.

Technical support and questions: caresheets@carolina.com



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