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Biology and Life Cycle of *Bombyx mori*

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Bombyx mori, commonly known as the domestic silk moth, is a species that has been domesticated and belongs to the family Bombycidae. The silk comes from the larvae of this insect, which produce a protein-based material. Bombyx mori is closely related to Bombyx mandarina. The silkworm mainly feeds on the leaves of the white mulberry tree, though it can also eat other types of mulberry leaves and sometimes leaves from different plants. The process of raising silkworms and making raw silk is called sericulture.

Scientific Classification

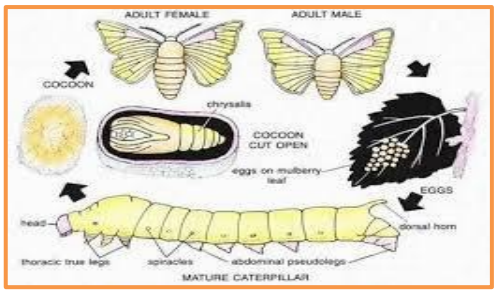
Phylum: Arthropoda
Sub-phylum: Mandibulata
Class: Insecta
Sub-class: Pterygota
Division: Endopterygota
Order: Lepidoptera
Sub-order: Heterocera
Super Family: Bombycoideae
Family: Bombycidae
Genus: Bombyx
Species: mori

Types

Bombyx mori is divided into three types depending on the number of generations it produces in a year.

- **Univoltine:** These have only one generation per year and are mostly found in Europe. They lay diapause eggs, which are in a dormant state and help them survive the winter.
- **Bivoltine:** These produce two generations each year and are commonly found in East Asia.
- **Multivoltine:** These can have more than two generations in a year and are usually found in areas with mild winters, especially in tropical regions.

Life Cycle

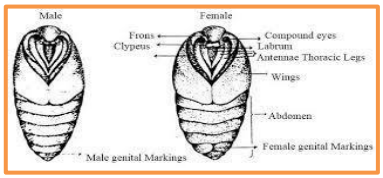


Bombyx mori is also referred to as the mulberry silkworm. It is dioecious, meaning that males and females are separate. Fertilization takes place internally after mating. The life cycle includes four stages: egg, larva, pupa, and adult.

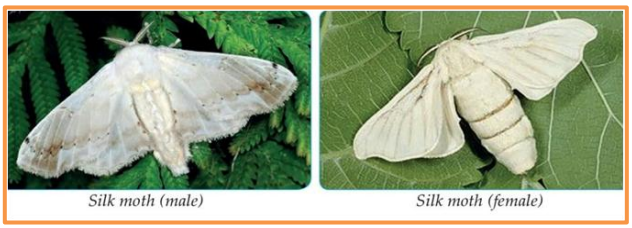
Eggs: After mating, the female lays between 300 and 400 eggs on mulberry leaves, usually in groups. She spreads a gel-like substance over the eggs to stick them to the leaves. The eggs are small, oval-shaped, and resemble seeds. They start off black but turn light yellow over time. The structure of the egg has three layers: an outer chorion layer, a middle serosa layer, and an inner vitelline layer that contains yolk.

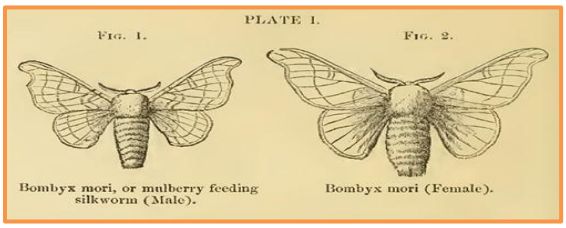
Larvae: The newly hatched larvae are about 4 to 6 mm long, and when fully grown, they can reach up to 6 to 8 cm in length. The body of the larva is divided into three main parts: head, thorax, and abdomen. The head has chewing mouthparts and compound eyes. A special structure called the spinneret is present, which allows the larvae to produce silk from their inner silk glands. The thorax has three segments, each with a pair of legs. The abdomen has ten segments, with pseudo or prolegs on some segments. In the eighth and ninth segments, female larvae develop sexual markings due to the presence of Ishiwada glands. The larvae are very active eaters and mainly consume the leaves of the white mulberry tree. They are attracted to the scent of cis-jasmone, an odor associated with mulberry leaves. Though they prefer mulberry, they can also eat leaves from other species in the Morus genus and some other plants in the Moraceae family, like Osage orange. The larval stage lasts between 14 and 21 days, during which the larvae molt four times, forming five larval stages. In the final stage, the larvae stop eating and start secreting a clear, sticky substance from their salivary glands through the spinneret. This substance hardens when exposed to air, forming long, thin threads known as raw silk.

Pupa: The pupa is the resting stage of the life cycle, also called the inactive stage. The caterpillar spins a cocoon around its body using the silk it produces. The cocoon is formed over 3 to 4 days and has a white or yellowish color, thick texture, and an oval shape. It is made from a single, continuous strand of silk, with the outer layers being irregular and the inner layers forming a structured layer that supports the pupa inside. During this stage, the pupa is dormant but goes through a transformation where the larval structures break down and the adult structures, such as wings, antennae, and reproductive organs, begin to develop. The pupal stage lasts approximately 2 to 3 weeks before the adult moth emerges.

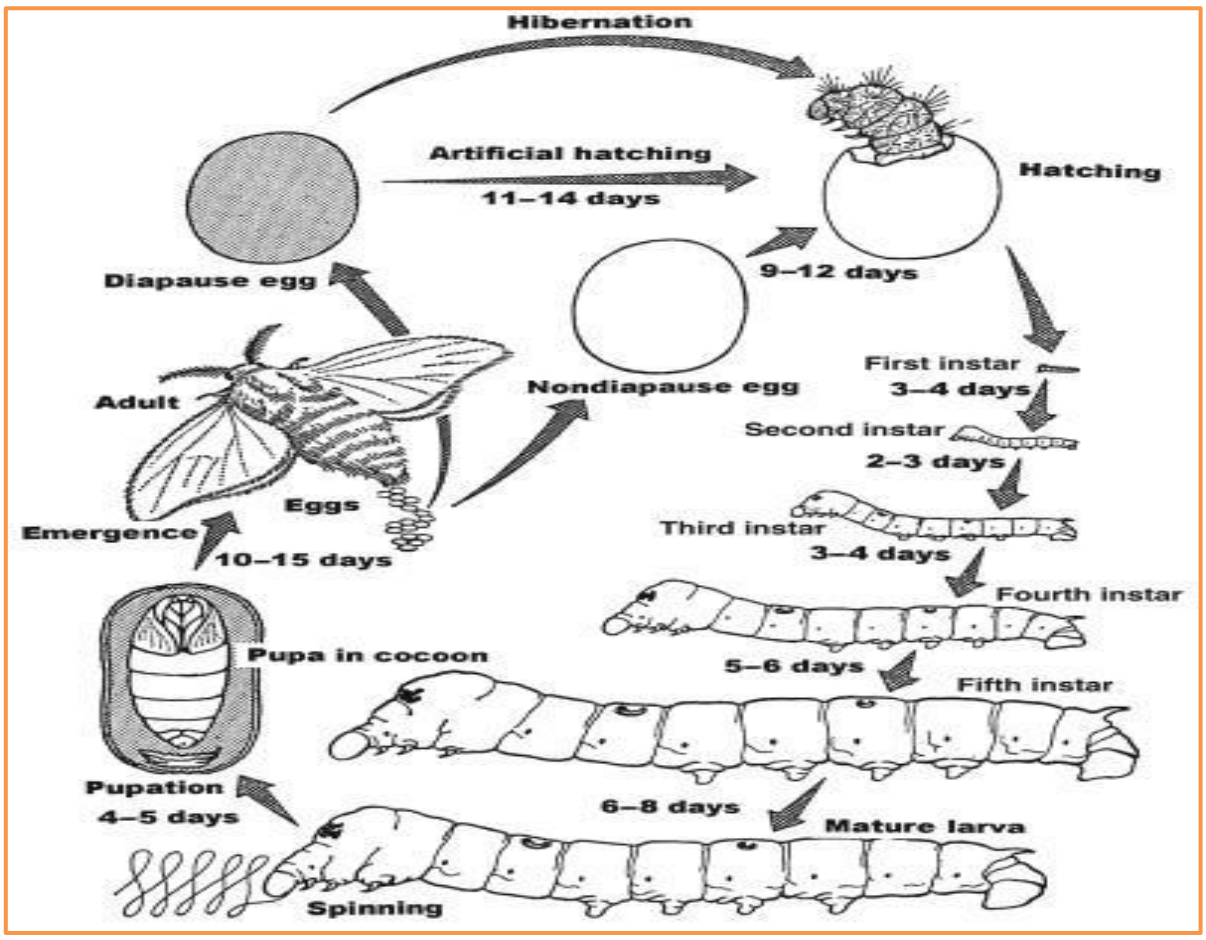


Adult: The adult moth is the last stage of the life cycle.


Silk moth (male) Silk moth (female)



It emerges from the cocoon through a small opening at the end. Adult silkworm moths have a wingspan of 3 to 5 cm and a white, hairy body. Female moths are usually two to three times heavier than males because they carry a large number of eggs. Adult Bombycidae moths have reduced mouthparts and do not eat. After they emerge, they mate. The male typically dies after mating, while the female lays her eggs and then dies.



Conclusion

The life cycle of the mulberry silkworm takes between 45 to 55 days to complete and includes four distinct stages: egg, larva, pupa, and moth. The egg stage lasts for 9 to 10 days. The larval stage, during which the silkworm grows and feeds, lasts between 24 to 28 days. The pupal stage, where the silkworm transforms into a moth, lasts 8 to 10 days. Finally, the moth stage lasts 3 to 4 days.

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