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Life Cycle of Mulberry Silkworm (*Bombyx mori*)

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The silkworm, *Bombyx mori*, is a domesticated insect of great economic importance in sericulture, as it produces silk. It undergoes **complete metamorphosis (holometabola)**, passing through four distinct stages in its life cycle: **egg, larva, pupa, and adult moth**. Each stage has unique structural and functional characteristics and is influenced by environmental and genetic factors.

Systematic Position of Silkworm

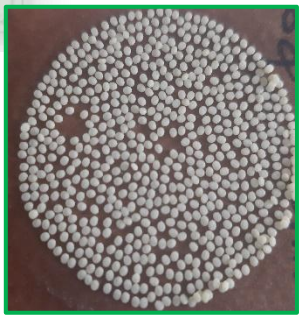
The taxonomic classification of the silkworm is as follows:

- Kingdom: Animalia
- Phylum: Arthropoda
- Subphylum: Mandibulata
- Class: Insecta
- Subclass: Pterygota
- Order: Lepidoptera
- Suborder: Ditrysia
- Superfamily: Bombycoidea
- Family: Bombycidae
- Genus: *Bombyx*
- Species: *mori*

Stages in the Life Cycle

1. Egg Stage

The egg is the first stage in the life cycle. Its size, shape, color, and number vary depending on the silkworm strain.



- Eggs are tiny, oval or ellipsoid, measuring about **1–1.3 mm in length** and **0.9–1.2 mm in width**.
- Approximately **2000 eggs weigh one gram**.
- Freshly laid eggs are **yellowish**, later changing color depending on the breed.
- **Multivoltine eggs** are darker, while **bivoltine/univoltine eggs** turn brown due to hibernation.

Developmental stages within the egg

- **Pinhead stage (Eye spot stage):** Appears around the 8th day as a black spot.
- **Blue egg stage (Body pigmentation stage):** Occurs on the 9th day, indicating imminent hatching.

2. Larval Stage (Caterpillar):

The larval stage is the most active and feeding phase.

- Newly hatched larvae are called **Chawki (India)**, **Ants (China)**, or **Kego (Japan)**.
- The larva lacks compound eyes but possesses **simple eyes (stemmata)**.
- It feeds voraciously on **mulberry leaves**, converting them into silk proteins.
- The larva passes through five instars and four moults.

Key features:

- Maximum growth occurs in this stage.
- The **fifth instar is the longest**, while the **second instar is the shortest duration**.
- After full growth, the larva spins a cocoon and enters the pupal stage.

3. Pupal Stage:

The pupa is a **non-feeding, transitional stage**.

- Enclosed within the cocoon, the larva undergoes transformation.
- Larval tissues break down, and adult structures develop.
- This stage is critical for silk production, as the cocoon is made of continuous silk filament.

4. Adult Moth Stage :

The final stage is the adult moth.

- Adult moths **do not feed** and have a **short lifespan**.
- Their primary function is **reproduction**.
- After mating, the female lays eggs, completing the life cycle.

Duration of Life Cycle

The duration varies depending on the breed:

Stage	Multivoltine/polyvoltine breeds	Uni/biovoltine
Egg	9-12 days	11-14 days
Larva	20-24 days	24-28 days
Pupa	10-12 days	12-15 days
Adult	03-04 days	06-10 days
Total	42-52 days	53-67 days

Duration of Larval Instars

Each instar is followed by a **moult**, allowing the larva to grow.

Instar/ Moult	Multivoltine breeds		Bivoltine breeds	
	Duration	**Temp. & Humidity**	**Duration**	**Temp. & Humidity**
I Instar	3 days	27 ˚C & 80-85 %	3 days	27 ˚C & 85 %
I Moult	20 hr		20 hr	
II Insatar	2 days		2 days	
II Moult	20hr		20 hr	
III Instar	3 days		3 days	25 ˚C & 30 %
III Moult	1 day		1 day	
IV Insatar	4 days	25-26 ˚C &70-80 %	5 days	22-24 ˚C & 75 %
IV Moult	1 day		1 day	
V Instar	6-7 days		9-10 days	20-23 ˚C & 70 %
Total	**22-23days**		**26-27 days**	

Factors Affecting the Life Cycle

Several factors influence the growth and development of silkworms:

1. Breed (Genetic factors): Determines growth rate and duration.
2. Climatic conditions: Temperature and humidity significantly affect development.
3. Quality of mulberry leaves: Influences growth, silk yield, and disease resistance.
4. Pest and disease incidence: Can delay development or reduce survival.

Conclusion

The life cycle of the silkworm is a well-organized process involving complete metamorphosis. Among all stages, the larval phase is the most crucial for silk production, while environmental and nutritional factors play a vital role in determining the overall productivity. Understanding each stage helps in improving sericulture practices and achieving better silk yield.

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