

# Mulberry silkworms

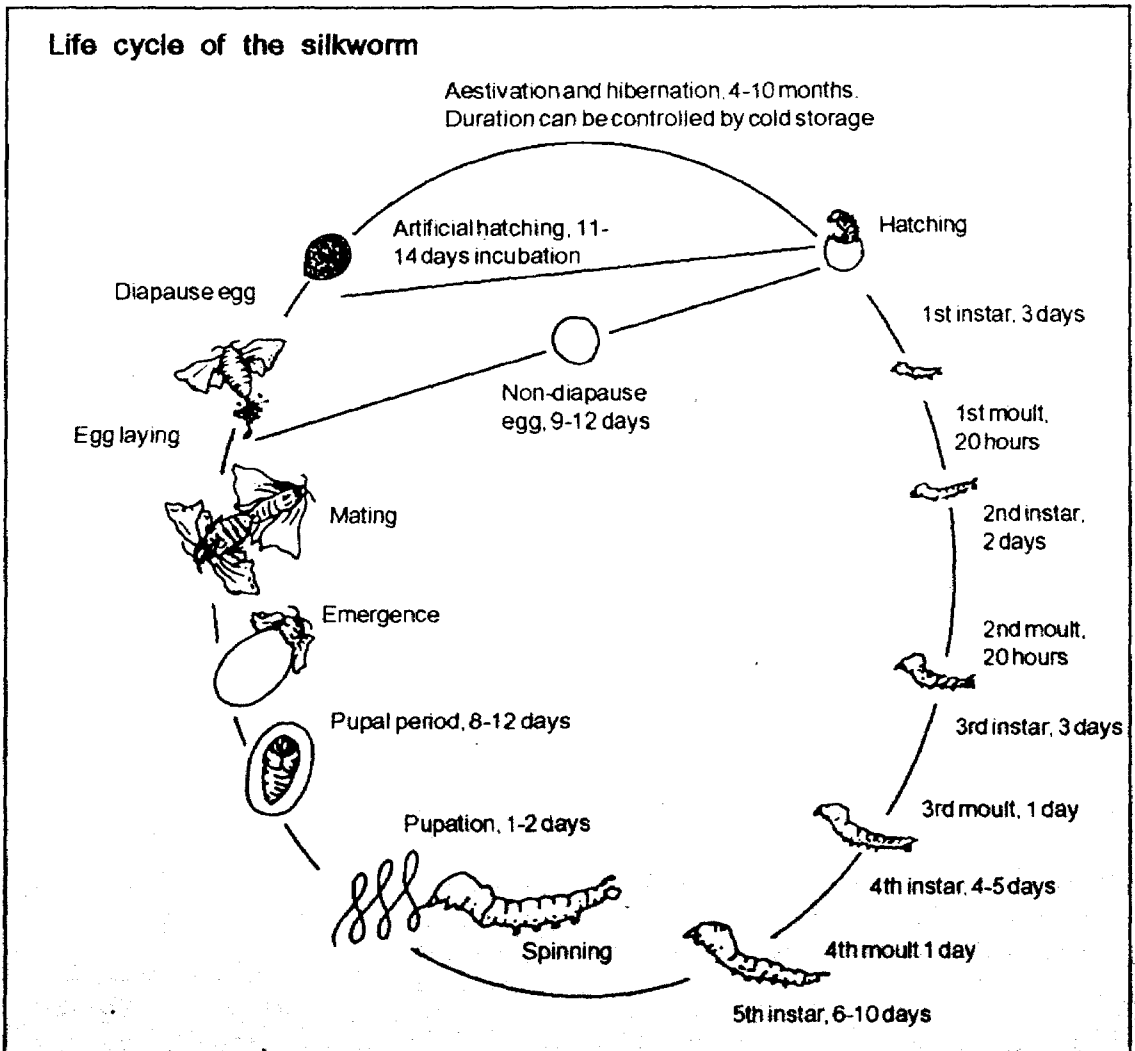
Silk--that beautiful, light cloth made into the most expensive saris--has humble origins. It is produced by insects called silkworms as a vital part of their growth.

Silkworms are the larvae or caterpillars of silk moths. When the time comes for the larva to change into its next growth stage, a pupa, it secretes a long thread of sticky silk. It forms this into a cocoon around itself. Inside the protective cocoon, the larva gradually metamorphoses. After 8-12 days, a moth emerges.

## Industrious insects

Many insects are useful to humans, but only two are reared on a large scale: silkworms and honeybees.

Silkworms are fed a diet of mulberry leaves grown especially for this purpose. The practice of raising silkworms is called "sericulture". This industry has led to the diversification of silkworm races and of the mulberry trees used to feed them. It has



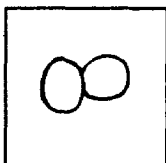
## Silk

The cocoons of insects and webs of spiders consist of light, but extremely strong threads. A mulberry silk thread is stronger than a steel wire of the same thickness.

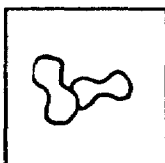
The raw silk is spun into threads and woven into very light, fine cloth. Because silk is highly elastic, it can be woven into a wide range of cloth types, including satin, crêpe and voile.

The Western Ghats states—Maharashtra, Karnataka, Kerala, part of Tamil Nadu and, of late, Goa—produce more than 60% of India's silk output. Sericulture is also being introduced in new areas, such as Sirsi Siddapur (North Kanara).

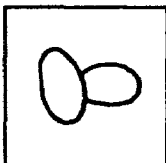
## Cocoon shapes and silkworm races



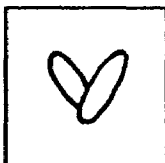
Round,  
KA race



Dumbbell,  
NB18



Oval, NB7



Spindle,  
PM

not so far led to major negative impacts on the wild races of either the silkworms or trees.

Ten species of butterflies produce silk, but only five spin silk that can be wound onto a reel: the Mulberry silkworm, Eri, Muga, Tasar and Anaphe. By far the most important is the Mulberry silkworm, which produces 92% of the world's silk output. This silkworm is the only species widely reared for commercial use. It has been domesticated for so long that it can no longer survive in the wild.

The silk from silkworms is used for making cloth because of its beauty, strength, softness and durability.

## Silkworms

The Western Ghats has a wide range of silkworm races. The most commonly used is Pure Mysore, or PM for short. This race is hardy and resists diseases.

Silkworm races differ in certain important characteristics of interest to sericulturists:

- **Voltinism:** The number of generations completed by an organism in a year is known as voltinism. Univoltines complete one life cycle (from egg to adult to egg) in one year. Bivoltines complete two such cycles, and multivoltines (or polyvoltines) complete more than two. In the Western Ghats region, people use bivoltine silkworms such as Kalimpong-A (also known simply as KA), as well as multivoltines (such as Pure Mysore).
- **Moultinism:** This is the number of times the larva moults during its lifetime. Different races of silkworms moult as many as six times or just twice. In the Western Ghats, only those that moult four times are used because they are most economical.
- **Place of origin:** Silkworm races are classified as Japanese, Chinese, European and Southeast Asian. Western Ghat sericulturists make use of all except the European races because these require colder temperatures.
- **Cocoon shape:** Different silkworms spin cocoons of different shapes. Silkworms spin round, oval, dumbbell- and spindle-shaped cocoons. All of these types are raised in the Western Ghats.
- **Cocoon colour:** Different silkworms spin cocoons of various hues: white, green, yellow, golden and flesh. In the Western Ghats, KA, NB7 and NB4D2 races spin white silk; PM spins green cocoons.

## Major mulberry silkworm breeds in India

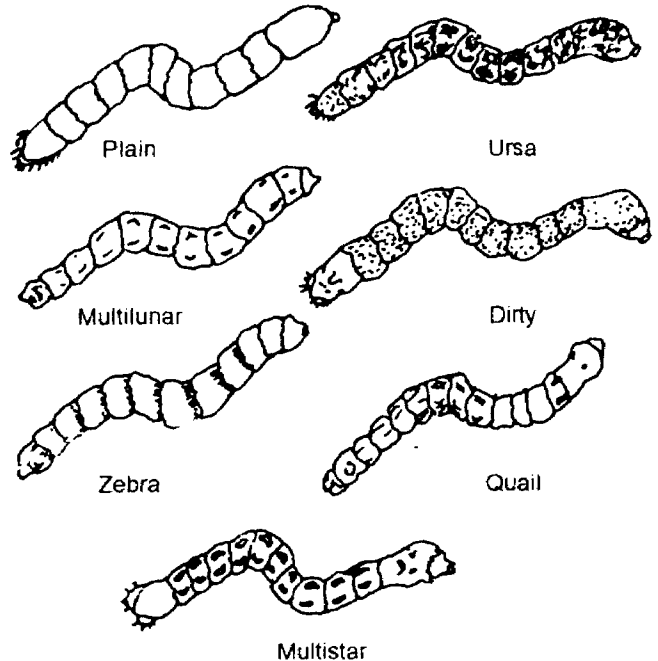
### Bivoltines

- CAC (hardy, oval)
- NCD (hardy, dumbbell)
- CDS (temperature tolerant)
- PCN (hardy suitable for rainfed conditions)
- CPC (hardy, oval)

### Multivoltines

- MY1 (short larval duration)
- MHN (high yielding)
- MW1 (long filament)
- MU11 (hardy)
- MY3 (high silk content)

## Markings of silkworm larvae



## Mulberry varieties

Various varieties and species of mulberry are used to rear silkworms. They include both Indian and introduced species.

### Indian species

- Morus alba* (var. *indica*)\*
- Morus alba* (var. *laevigata*)\*
- Morus alba* (var. *moretti*)
- Morus serrata*\*
- Morus glabrata*
- Morus pabularia*
- Morus bombycis*
- Morus latifolia*\*\*

### Introduced species

- Morus nigra* (var. *lacinata*)
- Morus multicaulis*
- Morus sinensis*\*
- Morus philippinensis*
- Morus atropurpurea*\*\*
- Morus japonica*

\* Found in the Western Ghats

\*\* Tree variety

## Mulberry varieties

The local K-2 variety of *Morus alba* is the most common type of mulberry in the Western Ghats. This variety resists drought and needs little maintenance, but is susceptible to disease. Although the mulberry is native to India, few varieties are found in the country.

New mulberry varieties can be developed through a variety of methods: selecting seeds from productive plants, cross-breeding with other breeds, tissue culture, self-pollination, and other techniques.



### **Mulberry silkworm species**

*Bombyx mandanna* (wild ancestor)\*

*Bombyx mori* (currently used commercially)\*

*Bombyx textor*

*Bombyx croesi*

*Bombyx fortunatus*

*bombyx arracanensis*

*Bombyx sinensis*\* (= *B. meridionalis*)

*Theophila religiosa*

*Rondotia menciara*

\* Found in the Western Ghats

*Information kit produced by WWF-India, Goa Division and the International Institute of Rural Reconstruction.*

## **Breeding silkworms**

Sericulturists face various problems with existing types of silkworms:

- Lack of seasonal and regional silkworm races.
- Lack of hardy, productive, disease-resistant silkworm races.
- Shortage of bivoltine breeds (that produce two generations a year).

More silkworm breeds should be bred to give rearers a choice of the most suitable race for particular situations. Some 34 desirable characteristics have been identified. Breeding is difficult because almost all of these characteristics are controlled by more than one gene. This makes it impossible to develop a silkworm race with all the good characters. Researchers are trying to breed races that have just one or two of the desired characters. For instance, CAC and HR14 races are hardy and bivoltine; NCD has superior dumbbell-shaped cocoons; CDS2 is temperature tolerant. It is also necessary to conserve existing local races of silkworms to conserve the biodiversity of this important species.

### **Origins of silk**

The silk industry originated 45 centuries ago using wild silkworms in North China along the banks of the Huang Ho river. In 195 AD sericulture was introduced to Korea and other places.

But Indian scholars refer to silk as *chinon shuka* in ancient Sanskrit literature that appears to show that silkworms were domesticated independently in the foothills of the Himalayas.

By Dr. I. K. Pai