



Silk's Hidden Steps: The Art of Stifling, Drying, and Reeling Cocoons

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Silk production is a painstaking procedure that converts tiny cocoons into beautiful threads, and each stage is critical to achieving high-quality silk. *Bombyx mori* cocoon is formed of a single, continuous silk strand kept together with sericin, a natural adhesive. Several stages are taken to prepare these cocoons for reeling, including stifling, drying, boiling, deflossing, and riddling. Stifling, which includes procedures such as sun drying, steam stifling, and heated air conditioning, seeks to kill the pupa within the cocoon while preserving the silk filament. The final step, drying, ensures that the cocoons are ready for long-term preservation or immediate usage. Cooking destroys sericin, releasing silk fibres, whereas deflossing and riddling prepare the cocoons for efficient reeling. Understanding these steps highlights the intricate craftsmanship behind silk production and the advances in methods that enhance the quality and efficiency of this ancient art.

Reeling

The process of unwinding the single long silk filament by dissolving the sericin and winding the same as to the small reel is called "Reeling".

Steps followed prior to reeling are as follows:

Stifling

Drying and storing

Cooking and boiling

Deflossing and Riddling.

Stifling

It is the 1st step taken up as soon as the cocoons are purchased and harvested with the objective of killing pupa inside without breaking the silk filament in the cocoon shell.

There are 3 methods of Stifling they are as follows:

- ❖ Sun drying
- ❖ Steam stifling
- ❖ Hot air conditioning.

Sun drying: Cocoons are exposed to scorching action of sunlight till the pupa inside is killed and dried.

Advantages

Easy and cheap and the dried cocoons can be stored for any length of times.

Disadvantages

Prolonged exposure to sunlight affects the quality of silk and increases proportion of silk waste during reeling.

The shell hardens affecting reel ability.

Steam stifling: Hot and wet steam is used depending on the number of cocoons

1. Basket steaming
2. Barrel steaming
3. Chamber steaming is used.

1. Basket steaming

- Used for small amount of cocoons
- About 10-15kg of cocoons loosely filled in the bamboo basket loosely woven at the bottom.
- The mouth of basket is tightly closed with cloth
- Basket is kept over boiling water in vessel.
- The steam penetrates through the basket and stifles the cocoon.
- Heating is stopped when dense smoke start coming out of the sides of basket with the characteristic smell of stifled cocoon.
- Stifling takes approximately ½ hour and stifled cocoons are dried in air.

2. Barrel steaming

- Adopted for small and moderate number of cocoons.
- A metal barrel with a tight-fitting lid is used in addition to basket.
- It has elevated platform at the bottom.
- Water is filled to 2/3rd height of platform and heated from an oven below
- When barrel is filled with steam, the basket holding 10-15kg of cocoon is lowered in to barrel which is then closed with the lid.

3. Chamber steaming

- This method is used in large filature units where large quantities of cocoons have to be stifled.
- Stifling is done in huge steam chambers supplied with steam from a main boiler unit by perforated steam pipe.
- Stifling is over in 15-20 minutes.
- Steam chamber are provided with either permanently fixed or portable cocoon shelves.

Advantages

- ❖ Cocoons are stifled more uniformly and quickly than in sun drying.
- ❖ Large quantity can be stifled.
- ❖ Can be done in all seasons.

Disadvantages

- It only kills the pupa inside and doesn't dry it.
- The cocoons have to be dried at least 3 days prior to reeling or storing – called Seasoning.

Hot air stifling

- Fresh cocoons are dried by means of hot air.
- It is suitable for good quality cocoons such as Bivoltine.
- The stifled cocoons can be stored for longer periods.

Advantages

Completely dries the cocoons so that weight become reduced to 1/3rd the original weight.

Disadvantages

- The equipment is costly and is suitable only for very large establishment.
- Suitable only for very good quality and uniform sized cocoons.

Storage of Cocoons

The seasoned and conditioned cocoons can be reeled immediately but generally required to be stored for varying period in reeling units.

- ❖ Cocoons can be stored for 1 month → Steam stifled
- ❖ 4-6 month → Hot air dried.

Sorting of cocoons

- After stifling the cocoons are sorted for a 2nd time.

- Prior to reeling so that cocoons of uniform size are reeled at a time.
- Workers who do this are called as Sorters.

Deflossing

- Floss is unreelable tangled mass of silk found outside the cocoons.
- This is done to find out the true reeling end of the cocoon and proceed with continuous reeling.
- The floss layer has to be removed.
- This process of called Deflossing.
- It is done just before reeling as the floss form a protective covering to the reelable compact shell.

Cocoon riddling

Separating the cocoons according to the size so as to facilitate easy reeling in automatic reeling units.

Cocoon mixing or Blending

- ✓ In filature units, raw silk of specific denier is reeled.
- ✓ For this purpose, the riddled cocoons are mixed in certain proportion prior to reeling.

Cocoon cooking

- The silk baves are gummed together by the sericin in the cocoons.
- In order to unwind the bave, the sericin has to be dissolved.
- This is done by putting the cocoons in hot water and this process is called Cooking or Boiling.

Methods of Cooking

Open pan Cooking

- Vessel and cooking basin made up of earthen ware and copper vessel are used.
- In which water is directly boiled over fire,
- cocoons are put into boiling water and kept immersed in it by wooden ladle till they are cooked {Dull translucent and soapy to touch}

Advantages

- ✓ Easy, Cheap and requires less labours

Disadvantages

- All the layers of the cocoon are not cooked to the same degree i.e. when the outer layers are completely cooked, the inner layers are not cooked and when the inner layer are cooked, outer layer are over cooked.
- Wastage of cocoons due to over cooking and under cooking is common.

Three pan cooking

Two methods are followed in this system they are as follows

1st System:

The cocoons are initially subjected to cooking at:

- ✓ High temperature (98°C) in the 1st pan,
- ✓ Lower temperature (65°C) in the 2nd pan
- ✓ Finally, to high temperature (97°C) in 3rd pan.
- The wire mesh cage is filled with 60-70 kg of cocoons and immersed in to 1st chamber for 60 second.
- Due to the action of hot water, the outer cocoon layers are softened and air in the cocoon cavity gets heated, expands and it expels.
- Next, the wire mesh cage is transferred to next chamber and hold for 30-40 second.
- The temperature of water in this chamber being lower, the air in the cocoon cavity gets condensed and water from the basin is sucked into the cocoon, completely soaking the sericin and loosening the cocoon layers.

- Next the cocoons are transferred to 3rd chamber and kept immersed in its water electron the help of wooden ladle for 1-2 minutes till the cocoons are cooked.
- Then they are transferred to a bucket of water at 45°C for 10 minutes before carried to reeling basins.

2nd System:

- The cocoons are 1st cooked at low temperature {65°C→60 second} in the 1st pan,
- A high temperature {98°C → 90 second} in 2nd pan
- and once again to low temperature {65°C → 60 second} in the 3rd pan.
- The cocoons are collected in bucket of water at 45°C and kept for 10 minutes before taken up to reeling basin.

Improvements achieved in these systems are:

- Large number of cocoons are cooked in a short time
- Reeling quality is improved.
- Cooking is uniform for all the batches.
- Change of water is easy.

Traditional methods

- Cocoons are kept in a basin containing water at 83 to 93°C under cover and heated for some time.
- Then boiling is continued after removing the cover for 1/3rd of the total cooking time.
- Cold water is sprinkled on hot cocoon for the air inside it to contract and water in the basin to be sucked in boiling is again continued for some time.
- After cutting off the heat supply, cocoons are sprayed with cold water once again and conveyed to reeling basins having temperature 40-45°C.
- This method effectively fills up >90% of cocoon cavity with water.

Conclusion

The process of producing silk, from the first stifling of cocoons to the final reeling, is a precise and detailed journey that highlights the expertise behind this beautiful fabric. Each stage, whether stifling, drying, frying, or sorting, is crucial to maintaining the silk's quality and guaranteeing effective reeling. Stifling techniques, including as sun drying, steam stifling, and hot air conditioning, are critical for killing the pupa while preserving the silk filament. The choice of cooking technique has a significant impact on quality, with methods ranging from open pan to modern three-pan systems that optimise sericin dissolution. Effective deflossing and riddling improve the end product, resulting in smooth and continuous reeling.

Through advancements in technology and techniques, modern silk production has enhanced efficiency and quality, continuing the legacy of an age-old art form while meeting contemporary demands for excellence.