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# Chemical Composition of Coir Fiber

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**Abstract.** *The shell of the cocoon consists of a thin fiber, which is called silk fiber. Silk fiber is a thick, stretchy liquid in the body of the worm and is produced by a special gland. The silk gland is a pair of tubular organs located on both sides of the worm body cavity. Each side of the gland begins with a septum, followed by a fluid bladder, connected to the fluid bladder by pairs of silk ducts, which in turn merge into a single odd silk duct. The dark silk road is located in the head of the worm, and its outer end connects to the silk tube located in the middle of the lower lip in the mouth apparatus, and the silk liquid comes out from here. The silk that comes out consists of two fibers, and these fibers are firmly attached to each other. There is a compression device in the middle of the odd silk path, with the help of which the thickness and thickness of the silk that the worm separates for wrapping the cocoon is controlled to a certain extent under the influence of temperature..*

**Keywords:** *Cocoon shell, thin fiber, silk gland, fibroin, sericin, cocoon, air temperature, air humidity, alkali solution, colorless, odorless, incomplete substance.*

**Introduction:** Silk fiber mainly consists of pure silk - fibroin and a thin layer of viscous substance sericin that surrounds it. 70-80% of silk fluid is fibroin and 20-30% sericin. Fibroin is produced in the silk-producing part of the silk gland, and sericin is produced in the fluid vesicles.

Fibroin is a natural high-molecular protein compound, the complex molecule is chain-like and consists of many amino acid residues. The structure of the fibroin molecule includes almost all amino acids included in natural protein bodies, but in 100 g of isolated amino acids, glycine (36-44 g), alanine (24-25 g), tyrosine (11-13 g), serine (10.5- 11g), valine (3-3.2 g).

**Main part:** Depending on the breed of silkworm, the composition and amount of amino acids in the fibroin molecule can change.

The chain of amino acids in fibroin is very long, up to 0.9 microns. Individual molecules join together in bonds (each of which has up to 600 chains). Such connections - micelles - can be seen under an electron microscope. Micelles, in turn, connect to fibrils (fibers). Looking at silk under an ordinary microscope, you can see that it is made up of such fibrils. When the silk passes through the double conducting paths, not all its micelles are located parallel to the longitudinal axis of the thread. The reason for this is that the silk mass is in a liquid state, as the silk mass is stretched, especially after passing through the pressing apparatus, the arrangement of the micelles is arranged, and most of them are located along the fiber axis, which makes the silk increases the high mechanical properties of the fiber.

Fibroin is characterized by non-breakability, very firmness and elasticity, insolubility in alcohol, ether and other solvents, resistance to alkali and acids, and non-decomposition. Fibroin does not dissolve in water, but swells without changing its structure. Fibroin's physical and chemical properties make textiles and technical goods made of silk extremely soft, elastic, hygroscopic, durable, shiny, beautiful and have many other useful qualities.

**Results and Discussions:** Sericin is also a protein substance consisting of amino acids, but its composition is quite different from fibroin: it is mainly composed of serine (25-35%), aspartic acid (13-18%), glutamic acid (up to 10%) and glycine (up to 11%). consists of Sericin differs even more from fibroin in its molecular structure. Its molecule has a globular (spherical) shape, in which micelles of amino acid chains are formed not by fibrils, but by globules, which is typical for water-soluble proteins. The globular structure of sericin determines many of its properties, first of all, it is very hygroscopic, elastic, viscous, water-soluble. However, these properties change greatly under the influence of a number of factors of the external environment: temperature, humidity, light, time, etc. For example, under the influence of high temperature (this happens during the drying of cocoons with heated air), sericin loses its solubility in water, the viscosity increases, and the spinability of the fiber decreases.

In general, it can be concluded that sericin is an unstable compound, its physical and chemical properties are changed especially by steaming and drying of cocoons and steaming them before silking. Sericin is a colorless, odorless, tasteless substance, insoluble in alcohol, ether, acetone and other similar solutions, soluble in aqueous solutions of alkalis and acids, except for water. Water is the only neutral solvent of sericin, the melting point of sericin is 70-800.

Sericin plays a very important role in the technological processes of obtaining silk fibers, as well as in the production of textiles and technical goods. Due to the presence of sericin in its composition, the cocoon shell not only protects the silkworm cocoon, but also regulates the temperature and humidity inside the cocoon. When the sericin swells, its volume increases, as a result, the cocoon openings narrow or widen, thereby regulating the entry of external air into the cocoon cavity (inside). When sericin absorbs water vapor, it releases a small amount of heat, which affects the temperature inside the cocoon, and on the contrary, sericin releases part of the absorbed water vapor and takes part of the heat from the air inside the cocoon, thereby reducing its temperature. As a result of the comprehensive manifestation of all the properties of sericin, the temperature and humidity of the air inside the cocoon is regulated. Observations have shown that when the outside air temperature is 14-150, the temperature inside the cocoon is 17-180, when the outside temperature is 27-280, the temperature inside the cocoon is 24-250, even when the outside air temperature is 310, the temperature inside the cocoon is only 280 will be. The cocoon, in particular, keeps the humidity of the air inside the cocoon constant, when the relative humidity of the outside air is 70-73%, the relative humidity of the air inside the cocoon is 76-77%, and when the relative humidity of the outside air drops to 35-40%. humidity in the cocoon is 80-84%. Such regulation of air temperature and humidity creates favorable conditions for the development of the sponge inside the cocoon. Of course, such a sudden change in the external environment cannot be favorable for the processes taking place in the mushroom. Such regulatory properties of sericin are adaptive, and these properties may have arisen in the process of silkworm evolution.

Due to the viscosity of sericin, during the exit of the silk thread from the silk-separating tube and as a result of its hardening very quickly, firstly, the silk fibers stick together (silk consists of two fibers), and secondly, as the silkworm falls, the end of the silk is always attached to a branch or something else ( gluing) and the other end is clamped in the clamping device, then the clamping device slowly releases the process and slowly falls to the ground. The viscosity of sericin is very important for the worm to stick to something during shedding. If we try to remove the cocoon from which the worm has shed, we will find that it is attached to something (paper or a branch) with its silk fibers, and finally, due to the viscosity of sericin alone, the silk fibers in the cocoon are at thousands of points (they are a -wherever they touch each other) are glued together, which ensures that the overall shell of the cocoon is mechanically extremely rigid.

During silking, the properties of sericin play a very important role for the normal progress of this process. If sericin maintains its solubility in water well, the viscosity of the cocoon shell is much relaxed and the silk fiber is easily separated from the cocoon, therefore, its solubility property if it deteriorates, the viscosity of the husk fibers is not sufficiently reduced, the silk fibers do not come out of the cocoon well and, often, break, which leads to a decrease in silk quality and labor productivity. The state of sericin is also of great importance for the subsequent processes in the production of silk products, the smoothness of the silk fibers in raw silk winding, the dense wrapping of raw silk cocoons, the resistance of silk fibers in the process of gas weaving and washing, the tendency to flower and, even the level of electrification with electric current generated as a result of rubbing against machine parts - all this depends on the state of sericin.

From all of the above, it is known that in the cocoon shell, fibroin mainly plays the role of a mechanical skeleton, and sericin is an active substance. Thanks to sericin, the sponge is protected from sudden changes in the hygrothermal conditions of the outside air, and at the same time, the cocoon is provided with sufficient aeration, which is also very important, because the only form of metabolism in the sponge is respiration.

Fibroin is resistant to changes in external conditions, it can keep itself at a temperature of 0-50 degrees without changing its physical and chemical properties. Fibroin quickly draws moisture from the outside air and easily evaporates it when the temperature rises.

Fibroin is insoluble in water, but very sensitive to direct sunlight. Sericin, on the contrary, is quickly affected by water, it quickly dissolves due to a change in its physical properties in hot water. Sericin has a globular structure when it leaves the silkworm body. Then, under the influence of external conditions (including the influence of air heat, humidity, temperature and other conditions), it begins to lose the properties of absorbing moisture and releasing it, because as a result of such an effect, the globular turns and before into a chain substance, then into small fragments, as a result of which it becomes slowly or hardly soluble in hot water.

Compared to dry cocoons, silk does not pose a significant fire hazard, as it burns under the influence of a flame, rather than catching fire. When the burning flame moves away, it stops burning. Burnt silk fiber does not produce ash, but turns black like coal, and if rubbed between the fingers, it is easily crushed.

**Conclusion:** Determining how alkali and acids affect silk fiber. For this, a piece of cocoon and some cotton wool are taken, and both are placed in a strong alkaline solution. After they have absorbed the alkali, the solution is removed using small forceps, placed on a separate glass plate or watch glass, and then 2-3 drops of copper sulfate solution (totoyo) are dripped onto the cocoon shell and a piece of cotton. Under the influence of these drops, a purple color (spots) is formed on silk, but there is no change on cotton. This indicates that the silk has a biuret reaction (sensation, exposure), which means that it is of protein origin. In another container, the same experiment is repeated, instead of a strong alkali solution, nitric acid is taken, and 2-3 drops of it are dropped on the cocoon shell and cotton fiber, the appearance of a yellow spot on the cocoon shell indicates that there is a xanthoprotoin reaction. that is, it confirms once again that the origin of silk consists of a protein substance. A piece of cotton does not undergo any change under the influence of acid (like copper sulfate).

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