

A COMPREHENSIVE STUDY ON THE RECENT PROGRESS ON THE QUALITY AND PRODUCTIVITY OF TASAR SILK WORMS AND THEIR FIBRES

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ABSTRACT;

Commercially, there are four distinct types of natural silk available. Mulberry silk is the most produced type worldwide, contributing up to 90% of total production. Because of this, the silk produced by the mulberry silkworm is usually referred to when the term "silk" is used in a general meaning. Eri, Tasar, and Muga silks are the three economically significant kinds that are not considered to be mulberry silks. There are also other kinds of silk that are not made from mulberries; these are mainly found in the untamed regions of Asia and Africa. Among them are the silks from Anaphe, Fagara, Coan, Mussel, and Spider.

Keywords: - *Antheraea mylitta*, tasar silkworm, sricin fibroin and sericin, Tropical tasar silkworm, genetic diversity of tasar silkworm.

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1. Introduction

The world's most exquisite textile, silk is referred to as the "queen of textiles" because of its unmatched grandeur, natural sheen, and innate affinity for colors. It is also light weight, soft to the touch, highly durable, and highly absorbent. The raising of silkworms for silk production is known as ericulture or silk farming. With more than 60% of global output each year, China and India are the two leading manufacturers nowadays. India accounts for 18% of the world's total production of raw silk and is the second-largest producer of silk worldwide. India offers a variety of silk, including Mulberry, Eri, Tasar, and Muga. Large amounts of mulberry silk are produced in the states of Jammu & Kashmir, West Bengal, and Karnataka. likewise The Madhya Pradesh, Bihar, and Orissan tribes typically raise tasar silkworms. Assam is the only place where Muga and Eri silk are made. Mulberry is the plant that silkworms eat to make their silk. Similar to how Muga silk generating silkworms feed on scalu or som, Eri silk producing silkworms feed on

Castor (*Ricinus Communis*), while Tasar silk producing silkworms feed on *Terminalia Tomentosa* and *Terminalia Arjuna*.

1.1.0 Back ground and classification

Mulberry Silk

The most often utilized type of silk in the textile industry is mulberry silk. The *Bombyx mori* silkworm, which consumes mulberry leaves for nourishment, produces it. This silk is renowned for being soft, long-lasting, and glossy. Its smooth, even texture makes it perfect for dresses, blouses, and scarves, among other high-end fashion items. Excellent elasticity, moisture absorption, and tensile strength are characteristics of mulberry silk. Its exceptional resistance to creases and wrinkles further renders it a perfect cloth for travel attire. There are several colors of mulberry silk, such as ivory, cream, and white.



Tasar silk (Tussar Silk)

The Tussar silkworms are categorized as wild silkworms and belong to the genus *Antheraea*. There are several different kinds of Tussar silkworms, including the Chinese Tussar silkworm (*Antheraea pernyi* Guerin), which produces the most silk other than mulberries worldwide. The significance of *Antheraea mylittae* Dury, the Indian Tussar silkworm, is closely behind. There is also the native Japanese tussar silkworm, *Antheraea yamamai* Querin, which produces green silk thread. While the Indian Tussar worms consume *Terminalia* leaves and other minor host plants, the Chinese and Japanese Tussar worms feed on oak leaves and allied species. These worms can be uni- or bivoltine, and their cocoons can be unwound to produce raw silk, just like the cocoons of mulberry silkworms. The primary places of production are China, Japan, and India.



Eri Silk

Errandi or Endi silk is another name for eri silk. The *Samia ricini* silkworm, which consumes castor plants, produces it. Because of its warmth and rich texture, this silk fiber is well-suited for winter attire. Like cotton, it has a slightly rough texture and is frequently used to manufacture jackets, shawls, and other warm apparel.

Eri silk is perfect for chilly locations because of its superior insulating qualities. Wearing it in hot temperatures is made comfortable by its high level of breathability. There are several colors of this silk, such as white, beige, and brown. Most eri silk is made in China, Thailand, and India.



Muga Silk

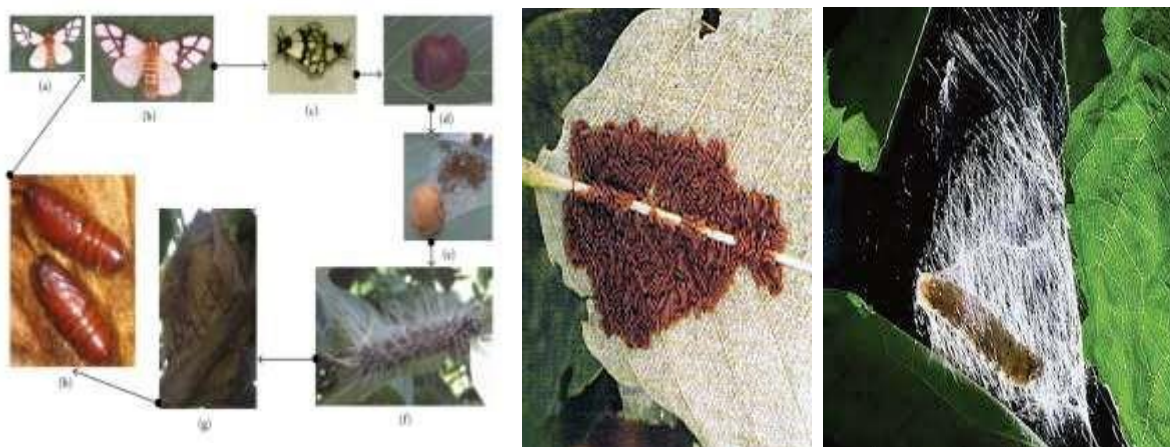
Muga silk is a rare and expensive silk fibre that is produced by the *Antheraea assamensis* silkworm. This silk is known for its natural golden colour, lustrous appearance, and high durability. Muga silk has a unique texture and is commonly used to make traditional Assamese garments, such as mekhela chador and sarees.

Muga silk has excellent tensile strength and is highly resistant to wrinkles and creases. It also has a natural sheen that gives it a luxurious look and feel. Muga silk is mainly produced in Assam, India.



Anaphe silk

Silk fibres originating from silkworms belonging to the *Anaphe* genus are produced in central and southern Africa. These silkworm species include *A. moloneyi* Druce, *A. panda* Boisduval, *A. reticulate* Walker, *A. ambrizia* Butler, *A. carteri* Walsingham, *A. venata* Butler, and *A. infracta* Walsingham. These worms spin their cocoons communally, each cocoon being enclosed by a delicate silk layer. These cocoons are collected from the forest by tribal people, who extract the fluff and spin it into a raw silk that is soft and has a moderate sheen. The silk obtained from *A. infracta* is referred to locally as "book", and that from *A. moloneyi* as "Trisnian-tsamia" and "koko" (Tt). *Anaphe* silk is more elastic and stronger than mulberry silk and is often used in velvet and plush textiles.



Fagara silk



The production of Fagara silk involves obtaining cocoons from the giant silk moth *Attacus atlas* L. and several related species or races present in the Indo-Australian biogeographic region, China, and Sudan. The cocoons spun by these moths are light-brown and measure approximately 6 cm in length, with peduncles of varying lengths ranging from 2 to 10 cm.

Coan silk

Pachypasa atus D., a type of larvae found in the Mediterranean biogeographic region (southern Italy, Greece, Romania, Turkey, etc.), primarily feed on trees like pine, ash cypress, juniper, and oak. These larvae spin white cocoons that measure around 8.9 cm x 7.6 cm. In the past, this silk was popularly used for producing crimson-dyed clothing worn by Roman dignitaries. However, commercial production of this silk ceased long ago due to its limited output and the emergence of superior silk varieties.



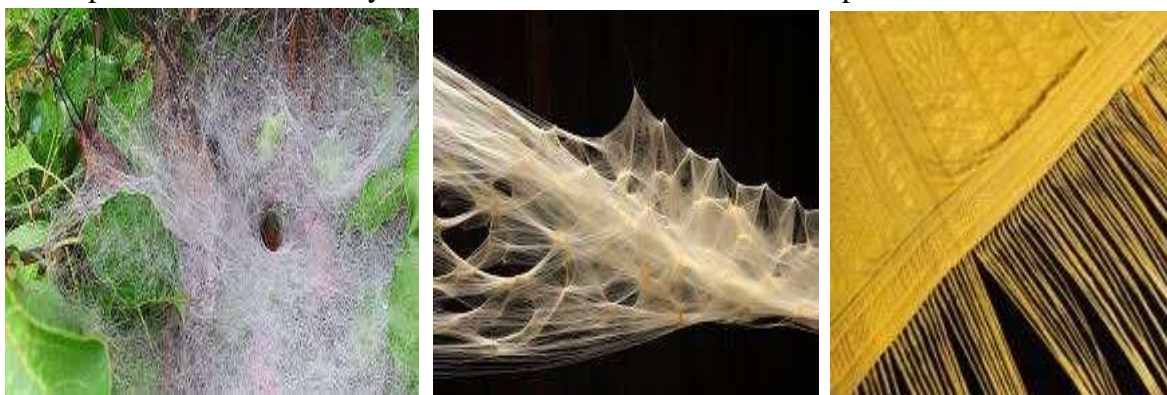
Mussel silk

While the non-mulberry silks discussed earlier are derived from insects, mussel silk is obtained from a bivalve mollusk called *Pinna squamosa*. These mussels are found in shallow waters along the Italian and Dalmatian shores of the Adriatic Sea. The mussel secretes a robust brown filament, also known as byssus, to anchor itself to a rock or other surface. The byssus is combed and spun into a silk popularly known as "fish wool." The production of this silk is mostly limited to Taranto, Italy.



Spider silk

Spider silk, which is another non-insect variety, is known for its softness and fineness, as well as its remarkable strength and elasticity. Commercial production of this silk is derived from certain species found in Madagascar, such as *Nephila madagascarensis*, *Miranda aurentia*, and *Epeira*. The spinning tubes or spinnerets are located in the fourth and fifth abdominal segments of these spiders. About a dozen individuals are confined to a frame by their abdominal part, from which the accumulated fiber is reeled out four or five times a month. Due to the high cost of production, spider silk is not commonly used in the textile industry. However, its durability and resistance to extreme temperatures and humidity make it essential for crosshairs in optical instruments.



In Conclusion, Silk is a beautiful and adaptable fiber that has been used for ages in textiles. Because each variety of silk fiber has distinct qualities and traits of its own, it can be used to make a variety of clothes and home furnishings. Designers and manufacturers may produce high-quality items that satisfy their clients' wants and preferences by having a thorough understanding of the physical and chemical qualities of each type of silk fiber.

Commercial Cultivation

The commercial cultivation of the silkworm is also known as Sericulture in scientific language. Production of silk through sericulture is a tedious process and involves many stages.

Tasar is a type of pure silk is also known as *Vanya* (forest in hindi) silk because it involves a partial process of outdoor (forest) cultivation. A coarse yet valuable fabric for the manufacturing process it involves is very tedious and requires a lot of attention. Its beauty is not comparable to no other hand woven fabric or otherwise. Tasar silk is a tropical, wild silk, indigenous to India, has positioned the nation as the 2nd largest producer of pure silk in the world (number 1 being China), and about 60% of which is produced by Indian state of Jharkhand.

Cultivation



It is important to grow right kind of trees and to provide favorable conditions in order to allow the cultivation of the silk worm. Sericulture or cultivation of silk worm may involve a lot of outdoor (and controlled indoor) process. For example -- cultivation of Tasar silkworm is more like a forest based activity. The very famous Tasar worm is cultivated on the trees of *Terminalia Arjuna* (also called Arjun), *Terminalia Tomentosa* (Aasan) and Sal. The worm feeds on the tender leaves of these trees. Tasar is the only wild silk among the four natural silks namely - Tasar, Eri, Muga and Mulberry. Raw or Mulberry silk worm is cultivated over Mulberry plants under protected and controlled environment.

Jharkhand's natural climate and diverse flora and fauna is favorable for silk worm cultivation. The state government has introduced some really scientific procedures to back the sericulture in Jharkhand. Jharkhand is not only a major producer of Tasar silk but it also produces mulberry silk in ample quantity every year.

Production of Eggs and Hatching

A stage of the silkworm's life cycle is represented by eggs. The female moth, an adult butterfly, unites with the male after feasting on the delicate leaves of trees. She produces 300–400 eggs at a time and passes away soon after. After that, the eggs are incubated for one to ten days at a temperature and humidity that is strictly regulated. After hatching in a controlled setting, the little larva emerges from the egg and begins feasting on

sensitive leaves right away. Up to two weeks, the caterpillars—another form of larva—continue to feast on leaves. and begin releasing a sticky liquid protein called sericin from its two sericteries for the next three to eight days. We refer to this stage as pupating.



Collecting the cocoons

Handpicked cocoons are collected in baskets made of wooden sticks with *pupa* still inside the cocoon. After collecting them at one place, workers sit and separate healthy and clean cocoons from the bad ones. To get a continuous, long thread, it is important to collect it before the pupa cuts the cocoon and comes out to enter the next stage of its lifecycle -- *the moth*.

Spinning the Cocoon

To collect uncut silk yarn from the cocoon, they are boiled or blasted with steam or hot air. This kills the pupa inside the cocoon and also softens the sericin so it becomes easier to collect the yarn without breaking it.

a). Machine Spinning - where machine and manual work is involved. About 4-8 cocoons can be spun at a time while spinning on a machine. It is easier and less time taking process.



b). Manual Spinning - the spinning is done manually by separating the yarn by hand. This is a rather tedious and time taking process as one could understand just by looking at the picture given below.

Reeling and Weaving



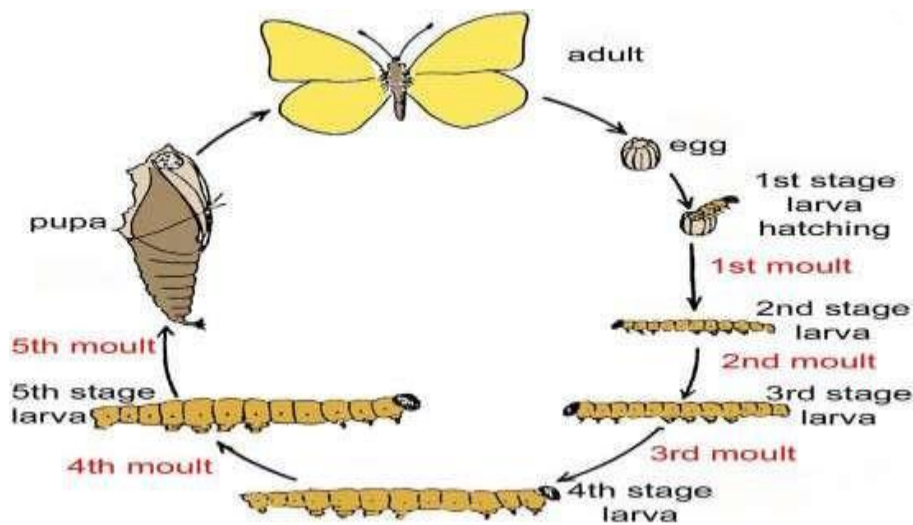
The weaving process may involve - manual weaving, machine weaving or both types of weaving.

Raw Silk

Raw silk is made using the yarn that still has some part of unsoftened sericin in it. It is considered a completely different type of silk and beauty of this silk lies in its imperfect weaving. This silk has natural sheen of the silk and knots of raw silk here and there.

Saving the seeds for next cultivation

It is important to let a good number of pupa become the moth by cutting the cocoon and coming out of hibernation. This new generation of pupa would turn into a healthy moth after metamorphosis. The weaker ones will die, of course at some phase of their life. The healthy couples would mate and lay eggs to give birth to a new generation of silkworm.



Ahimsa Silk

As the name suggests, *Ahimsa* (non-violence in hindi) silk is obtained without killing the pupa inside the cocoon. But one should not confuse that this process doesn't harm pupae at all. The world is divided into two for the conflict that is born in the process of Ahimsa silk extraction. Many people don't want to buy silk at all while some would buy only specific kind of silk made using ethical means and through less violent ways.

Other Types of Silks.

Types and qualities of silk fabrics Part - I

I. Wild Silk As the name suggests, the wild silk is produced from a number of undomesticated silk worms. Wild silk is obtained from caterpillars other than mulberry silkworm 3 *Bombyx mori*. The term “wild” refers that these silkworms cannot be domesticated and artificially cultivated like the mulberry worms. The wild silkworm feeds on oak, plum, jujube or castore bean plant. This type of silk is generally difficult to reel and after being processed, it is worked up as spun silk.

II. Properties of Wild silk

Ø Wild silk filaments are more resistant to acids and bleaches which makes dyeing the filaments difficult.

Ø They are highly lustrous and are available in a wide range of qualities

Ø The silk is comparatively cheaper than cultivated silk and is used for making a wide range of home furnishing items.

Ø Available in multiple shades, wild silk colors range from light beige to a deep tan, due to the tannin found in the leaves, which affect the color of the silk.

Tussah Silk (Tasar silk)

Tussah silk, also known as Kosa silk is copper color coarse silk, obtained from an East Indian silkworm *Antheraea mylita*. The worm feeds on the leaves of oak and other plants. Kosa silk is widely popular for its softness and elegance. Being a shiny, lustrous and soft silk. Kosa is extensively used for making traditional Indian dresses including sarees, jurtas, salwar suits, shirts and many more garments. Tussar Silk Tussar is less lustrous than mulberry silk, but has its own feel and appeal. The silk is extensively used for making exclusive jackets for men and women or traditional costumes like the salwar-kurta.

Shantung Silk

Shantung silk is a dupion type of silk that is chiefly produced in the Shantung Province of China. It is a plain weave fabric with a slight rib. The fabric has slubs that give them an uneven surface texture, firm hand and are moderately crisp. Originally made from hand-reeled tussah silk. Depending on the filling yarn, shantung may be lustrous or dull. The fabric has a firm, semi-crisp hand and tends to ravel.

Rajah Silk

Rajah silk a variety of wild silk, which is made from certain silk wastes or tussah silk. The fabric belongs to the pongee family of silks having a pebble like feel and appearance, the silk is widely used for making quilt covers, dress materials and home furnishing items. 4 Rajah silk fiber is compact, strong, irregular, thicker and available in variety of shades. Noil Silk Also known as raw silk in the fashion trade,

Noil silk is very versatile silk, spun thick with a matte surface. The silk is soft, sporty in appearance and crafted from short fibers. The silk is made from short fibers, often from the innermost part of the cocoon, which are left after combing and carding of silk fiber.

Eri Silk Also known as Endi or Errandi, Eri is a multivoltine silk spun from open-ended cocoons, unlike other varieties of silk. This silk is produced by the eri silk worm, *Philosamia ricini*, which feeds mainly on Castor and Kesseru. In many parts of the North East India, eri cocoons are produced for their edible pupae and silk is the byproduct known for its warmth, eri is a white colored, non-mulberry silk fabric, which is also known as Ahimsa silk or the fabric of peace.

Muga Silk It is a golden-yellow colored silk produced by the silkworm *Antheraea assama*. The muga silk is found only in the Brahmaputra Valley of India. Raising of muga worms is a tradition in Assam. The high priced muga silk products are known for their shine and elegance and are very popular in both domestic and international markets. The highly valued muga silk is extensively used for making vibrant Sualkuch sarees, mekhalas, chaddars, etc

Types and qualities of silk fabrics Part -II

Pure Silk Pure silk is a protein fibre spun by the silk worm that feeds on mulberry leaves. It has a luxurious sheen with a fine texture and extreme softness. Being a natural fibre, pure silk often shows slight variations in weave and thickness of the fibre that may look like small flaws.

Apart from its luxurious sheen and fine texture, pure silk is characterised by its excellent thermal insulation properties in hot and cold weather. The silk keeps the body cool in warm conditions and warm in cold conditions. The fabric is known for its high moisture absorbency feature.

Jacquard Silk

Jacquard silk provides various woven patterns, using matte and reflective threads to create a light and dark effect in the fabric. The effect is similar to brocade, although the Jacquard is originally created in one color. Jacquard imparts a soft feeling and its beautiful sheen makes it ideal for stylish dress materials and accessories. The silk is very good for sensitive skin.

Charmeuse Silk

Charmeuse is a popular, lightweight fabric widely used for wedding dresses and prom dresses. It is typically made of silk or polyester. Charmeuse is made with a satin weave which is soft, yet supple and drapes beautifully. The fabric is woven with a satin weave, where the warp threads cross over three or more of the backing threads. The front side of the fabric has a satin finish, lustrous and reflective and the back has a dull finish.

Satin Silk This is a fabric that has a satin weave with a plain back. The fabric usually has a glossy surface and a dull back. Satin is actually a warp-based weaving technique that forms minimum number of interlacing in a fabric. If a fabric is formed with a satin weave using filament fibers like silk, nylon or polyester, the resulting fabric is termed as “satin”. Silk satin is a blend of silk and has a high luster due to the maximum number of floats on the fabric surface. The float on the fabric gives it a smooth and glossy touch.

Thai Silk

Thai silk owes its origin to Thailand. Thailand is one of the major silk producing nations of the world and Thai silk is very popular worldwide. Thai silk stands apart from many varieties of silk in terms of texture, appearance and structure. Thai silk displays the natural mix of textures and patterns that is unique to South-East Asia. The silk is smooth and lustrous, owing to layers of protein. This produces a natural sheen on the fabric and is comprised of triangular fibres, which creates a prismatic effect on exposure to light.

Brocade Silk

Brocade weaving, especially with gold and silver, has been an age-old tradition in India. Brocades can be divided into two broad classes. One is brocade of pure silk or silk and cotton blends and zari brocades with gold and silver threads. 6 Silk is considered as the most important material in brocade weaving. Silk is fine, smooth, durable and the strongest natural fabric, which facilitates lovely weaves. There are many different varieties of raw silk and only the superior varieties are used for brocade weaving.

Cotton Silk The combination of cotton and silk is considered as the best natural from of silk. The blend of both these natural fibers give a rich look and soft finish to the fabric. The best part about this particular fabric is that it withstands high temperature. The fabric can be easily dyed and painted beautifully according to the various demands. Cotton silk fabrics are the strongest of all natural fabric and is famous for its shine and luster. A wide array of cotton silk fiber is used for producing garments and home furnishing items. This fabric is quite substantial because of its distinctive and elegant surface texture.

Types and qualities of silk fabrics Part -III

Organza Silk Organza is a thin, light weight and crisper fabric made from high quality silk. It is perfect for decorating the interiors of the house or making apparels. The products made from this fabric are stiff just like the fabric itself. It is mostly used as an underlining in loose fitted outfits, to make them more fitted or for adding stiffness to a dress. Organza fabric appears equally appealing when decorated with sequins or bead work. It is highly durable and embroidery work on this fabric is undoubtedly eye catchy. It can hold crease well because of its stiffness and is well suited for making curtains. Patch work with soft texture and beautiful patterns looks flawless on decorative curtains.

Velvet Silk

Velvet silk is another variety of silk which is very popular for its softness and smoothness. It is a variant of woven fabric which includes even scattering of trimmed threads with a short thick set up, giving it a well defined appearance. It is light in weight and very supple. Mostly silk velvet fabric is available in clear colors which make excellent evening wear outfits. Rich style and subtle designs are the two most top qualities of the products made of fabric.

Silk Noil

Silk noil fabric is also known as raw silk fabric. Noil is referred to as the short fiber, obtained by combing wool or spinning silk. People involved in spinning silk, spin the obtained material into a textured yarn. It often added as a decorative material for various spinning projects like rovings and yarns. Noil silk fabric is a comparatively

miner fabric and as a result, it is considered less valuable and weak. Silk noils are non-uniform and short length, so the yarn spun from it is also not very strong.

Pongee Silk

Pongee is a plain woven, thin, normally tan fabric that has a rough weave effect. The fabric is very light, plain weave and sheer. The silk is mostly used for making scarves. Pongee is a traditional summer fabric and is also used for making blouses, summer suits, dresses and linings. The fabric is also widely used for making silk paintings. Pongee silk is obtained either from low quality, unclean dupion cocoons that was a byproduct of silkworm rearing process or from wild tussah silk or other silk wastes. The fiber is spun and hand woven into a plain weave.

Dupioni Silk

Dupioni is a plain-weave fabric with slubbed ribs. It is a light to medium weight elegant and classy fabric popular for its nubby texture and shiny streaks. Most suitable for making loose fitting dress materials. The fabric is generally avoided for making tight fitting dresses as the fabric cannot withstand stress and ravel easily.

Types and qualities of silk fabrics Part -IV

Mulberry Silk It is fact that the bulk of the commercial silk produced in the world comes from this variety and the silk is generally referred to as mulberry silk. The silk is exclusively obtained from the silkworm, *Bombyx mori* L. the worm solely feeds on the leaves of mulberry plant. Mulberry silk is also known as pure silk. The fabric is very smooth, soft in texture, strong and have a shimmering luster. Considered as the world's finest silk fabric, mulberry silk is widely used for making sarees like Benarasi sarees, decorative zari sarres, chiffon sarees; and various other products like stoles, shawls, embroidered garments of all varieties.

Blended silk

Blended silk is the strongest of all natural fabrics and is known for its shine and lusture. A wide variety of silk fabrics are used for making garments and home furnishing items of various types. In order to impart a better look and to ensure better durability, silk is often blended with other natural fabrics. Silk blends are also used extensively to make various fashion garments.

Chiffon Silk

Chiffon is transparent soft and light silk. It can also be woven of cotton or man-made fibers. Chiffon creates the billows of fabric that add dimension to garments. The fabric generally requires some kind of lining or backing unless it is used for scarves. It is a plain woven sheer fabric with a soft drape.

China Silk

China silk is known for its sheen, texture and luxurious feel since time immemorial. It was revered mostly by the people of royal and noble families in the ancient and medieval times. Enriched by beautiful adornments and patterns, China habotai silk has not lost its glamor even today. China silk is a soft, lightweight, lustrous, plain weave silk made of very fine yarns. It is a wonderful silk, originally handwoven in China of hand-reeled silk. China silk has a loose, soft, thin hand and a slippery, smooth texture.

Georgette Silk

Silk Georgette is a lightweight, semi sheer silk fabric that has a fine, barely discernible crepe surface. The fabric has a softer hand but is slightly heavier and less transparent than chiffon. Silk crepe georgette is durable and is less lustrous than crepe silk. The fabric is usually made of silk or polyester. The twisted fibers from which silk georgette is made offers it a springy quality that makes it seem to move on its own. Silk georgette drapes very easily and falls into soft ripples. The fabric imparts a sophisticated look and is perfect for draping loose, evening wears, dresses etc.

Taffeta Silk

Taffeta is a crisp, smooth, plain-woven silk fabric with a slight sheen and a fine cross rib. The silk is made from white silkworm cocoons. It is considered as one of the oldest luxury fabrics that was first woven around the 3rd Century. The fabric is smooth with a sheen on its surface and a plain weave. The fabric is usually flat and the back and front ends are almost similar.

Crepe Silk

Silk crepe is a luxurious fabric with an extraordinary sheen and luster. The fabric is very light and its pebbly texture adds to its uniqueness. Its versatility makes it perfect for semi-fitted or loose-fitted outfits. Clothings made of crepe fabric are very easy to wrap yourself in. This fabric carries a shine of its own which makes it the most popular choice for manufacturing Indian dresses. It is an affordable fabric but there exists a perception, that the more is the cost, the better is the quality.

Drapery Silk

Drapery silk is beautiful, elegant and luxurious. The fabric is full of richness and exuberance. One chief characteristic of silk drapery is that it is durable and robust. It is also a good insulator as it keeps the house warm in winter and cool in summer.

Alpaca Silk Alpacas are passive animals which are domesticated since many years. They are highly priced because they produce luxurious and high quality fiber which is quite rare. Alpaca fiber when twisted with silk results in alpaca silk. Softness of this fabric is similar to cashmere but alpaca silk yarn is more delicate and resistant to piling than cashmere. It is strong and rich in luster. Garments made from this silk fabric are light in weight and perfect for winters because they are warm

IMPROVEMENT IN PRODUCTIVITY

During the past decade a few highly productive breeds have come to use in India. The mulberry variety, V1 for the irrigated gardens has been reported to yield about 65 MT of leaf per hectare per year (i.e., the world's highest) with the recommended inputs at the most ideal situation and the CSR series of bivoltine silkworm breeds, which can yield international grades of silk (2A to 4A) and high productivity with a renditta of 6 (around 6 kg cocoons yielding 1kg of raw silk). It is claimed that about 65 kg of bivoltine cocoons are produced from 100 disease free layings (dfls) of CSR breeds on an average, while the multi-bivoltine hybrids, which constitutes over 90 percent of the silk production in the southern region, yields around 55 kg per 100 dfles. The fodder consumption also varies 8-15 kg per dfl by different breeds and correspondingly the cocoon production. It is possible to produce 2A or 3A grade silk from the CSR breeds using the improved reeling machinery coupled with improved package of practices. However, in the light of X Plan experience, it is to be seen that this increased productivity has been in limited areas and with those farmers who were either exposed to Government schemes or could adopt it otherwise. Consequently, this increased productivity has failed to make any significant difference in over all production. Cross breed production constitutes about 95 percent of the silk produced in India dominating the bivoltine silk production.

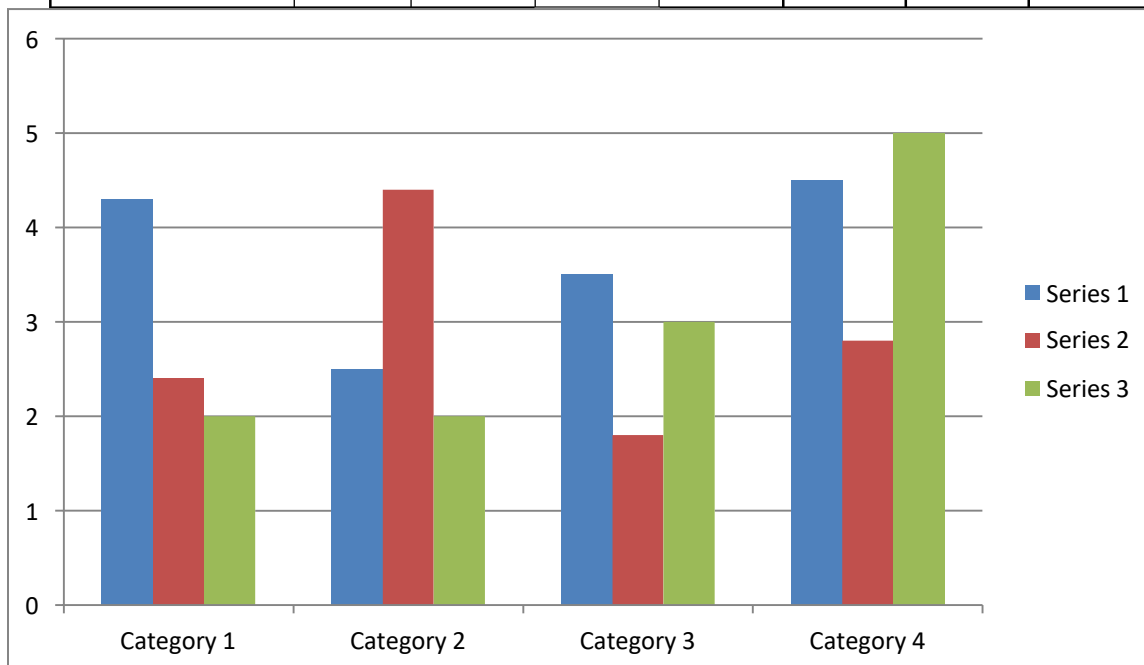
2.0 RESEULT AND DISCUSSION

Table 1

Year-wise Silk Production

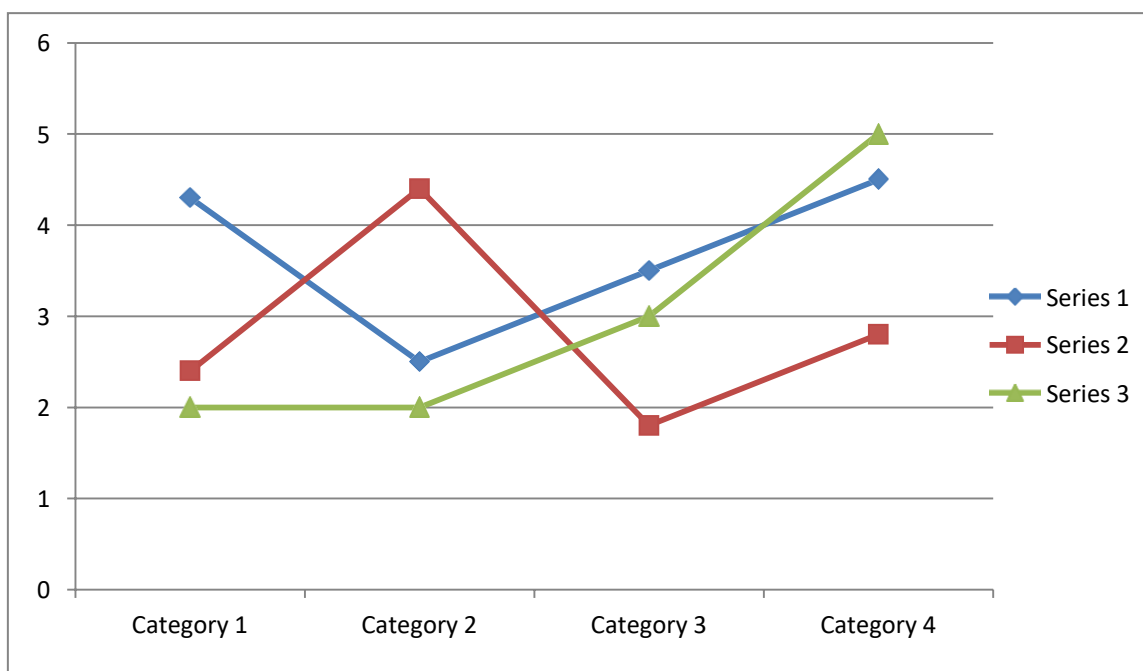
Particulars	Unit	2019-20	<i>X Plan Target</i>	2020-21	2021-22	2022-23	2023-(P)
Mulberry							
Area	Lk. ha	2.32	2.00	1.94	1.85	1.72	1.79
Raw Silk							
Bivoltine	M.T.	840	6,700	685	609	893	971
Multivoltine	MT	15002	17450	13932	13361	13727	14474
Sub-Total:	MT	15842	24150	14617	13970	14620	15445
Non-mulberry							
Tasar Raw silk	MT	249	450	284	315	322	308
Eri Spun Silk	MT	1160	1700	1316	1352	1448	1442
Muga Raw silk	MT	100	150	102	105	110	110
Sub-Total		1509	2300	1702	1772	1880	1860
Total Raw silk	MT	17351	26450	16319	15742	16500	17305
Silk Waste							

Mulberry	MT	4655		4514	3764	3587	3707
Non-mulberry	MT	319		336	373	365	297
Total :	MT	4974	4850	1702	4137	3952	4002
Employment	Lk	55.00	60.03	56.00	56.50	58.00	59.50
Exports (Rs. crore)			3200.0	2294.1	2779.2	2879.6	3158.2

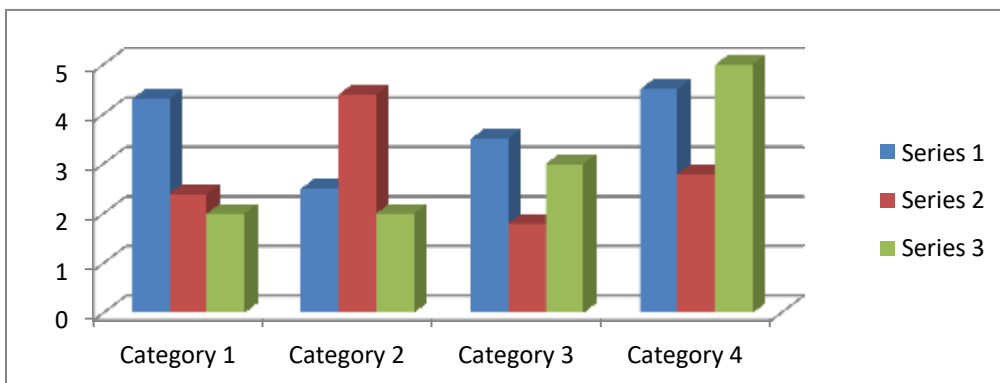


HISTOGRAM 1

Cross breed silk is very conveniently used on handlooms while bivoltine silk forms an essential requirement of power-looms at least for the warp and this is now being imported from China.

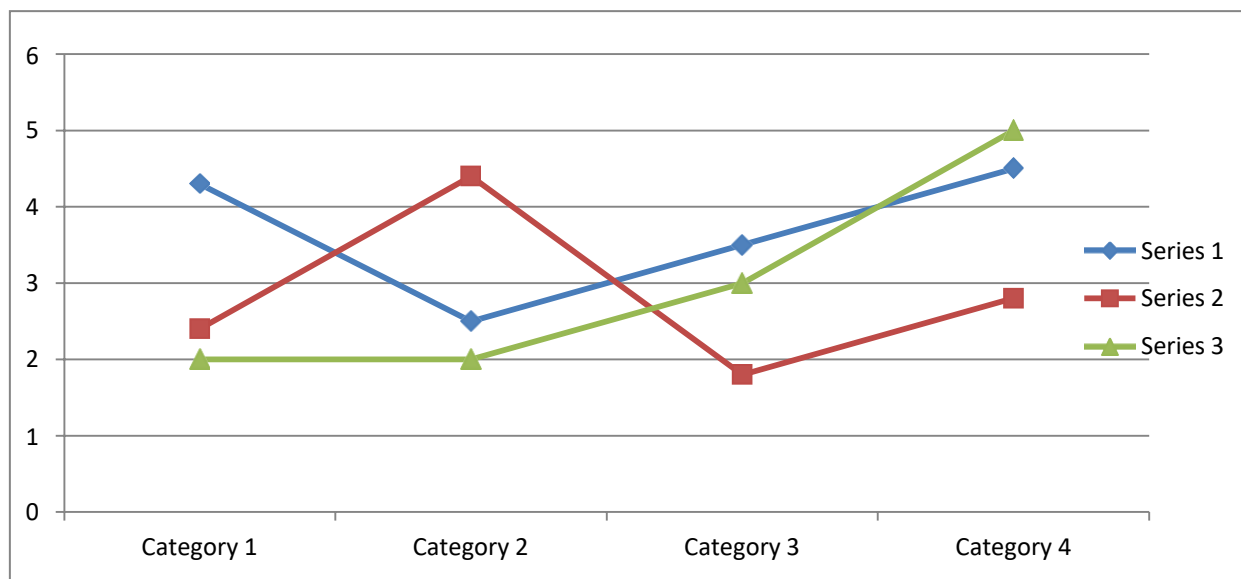


HISTOGRAM 2



HISTOGRAM 3

Cross breed silk is very conveniently used on handlooms while bivoltine silk forms an essential requirement of power-looms at least for the warp and this is now being imported from China.

**HISTOGRAM 4****RESULTS AND DISCUSSION**

The data analysis results, which are displayed as tables under several parts, have been discussed. The type and nutritional content of the host plant affect the cocoon yield and seed quality of *Bombyx mori* and *Antheraea mylitta*, although farmers choose alternate feeding plants for economic gain based on accessibility and availability. An essential component in silkworm rearing and grainage performance is the rate of leaf production, quantity, and gestation length of host plants in relation to the primary food plant and their commercial feasibility. The study demonstrates that feeding *Terminalia arjuna* food plant to larvae improves their tasar raising and graninage behavior, but it also improves their commercial features, such as cocoon weight, silk ratio, and egg fertility.

3.0 CONCLUSION

After a long quantitative analysis, following conclusion may be drawn; globalization is change in its dimension of approach which identifies a number of trends. A new type of trade with several core characteristics characterizes the multifaceted approach of globalization. Globalization, then, refers to the process of reducing and lowering barriers to the entry of products and services and allowing for increased foreign investment. It has been noted that environmental factors like demotic shift frequently result in floods and droughts, which lower the region's mulberry plant productivity. Similar to this, economic factors are also very important in the diminishing production of raw silk and reeling cocoons. The capital-intensive industry of sericulture is confronted with significant economic obstacles and challenges, such as inadequate funding for the financial credit system, insufficient funds for investments in the mulberry sector, and a lack of resources for short-term financial support. Next, enticing employment opportunities

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