
Eri: The Silk of the Century.

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ABSTRACT

The textile heritage of India is very rich and old. It dates back to the Vedic period. The finest cottons like muslins, pashmina wool and shimmering silks of India have always been popular all over the world. The craftsmanship of our weavers has been appreciated since the time immemorial. Textiles have been the backbone of the Indian economy and the social structure. The climatic conditions and the biodiversity have also contributed to the availability of a number of natural fibres in this country. An increasing awareness about eco-friendly, sustainable practices and organic products have made us to turn towards the alternative fibres. Eri silk is one such natural fibre which is gaining importance and been the favourite of designers and animal activists. The present article is an effort to understand all about Eri silk including its properties in comparison with the most popular silk, mulberry.

Key words- Indian textiles, silks, wild silk, Eri silk, mulberry silk, properties

1.INTRODUCTION

Silk is a natural protein fibre and one of the earliest fibres discovered by man. China is believed to be the home of silk. A beautiful story about the Chinese empress Shiling T. discovering silk during 2640 BC when cocoon fell in her tea cup, describes the invention of silk in China. The earliest authentic reference to silk is found in the chronicles of Chou-king in 2200 BC. During that period silk was a symbol of royalty and only the members of the royal family were allowed to wear silk. Chinese kept the art of silk weaving as a secret nearly for 3000 years. Later the commercial relations between China and Persia spread silk to other parts of the world. The trade route got the famous name 'SILK ROUTE'. There are numerous stories regarding the spreading of art of silk weaving to the other parts of the world. According to some stories, a Chinese princess married a Tibetan king and she carried some silk worm eggs and mulberry seeds in her head dress. Thus the silk industry spread to Tibet, later to India and Persia. It is said that two Roman monks learned the art of sericulture in Tibet and introduced it in Constantinople in 553 AD. This led to Romans producing their own silk. This can be considered as beginning of silk production in Europe. In the 19th Century sericulture was very well established in France and was at its peak. An epidemic disease 'pebrine' caused the extinction of sericulture in Europe and Middle East. However Sir Louis Pasteur in 1870 saved the industry but complete revival couldn't happen due to various factors.

The present paper is presented with the following objectives:

1. To understand the history and present status of silk in India.
2. To study the scope of Sericulture in India.
3. To compare the properties of Eri silk in comparison with the Mulberry silk.
4. To understand the scope for making new union and blended fabrics using the peace silk, Eri.

2. METHODOLOGY

1. The History and the present status of silk sericulture is collected from various sources.
2. The properties of all the silks and eri and mulberry are studied and compared.
3. The suitability of the Eri silk for new product development is assessed.

2.1 Sericulture in India

According to ancient Sanskrit literature some kinds of wild silks were cultivated in India from time immemorial. It is also said that Arabs during early part of Christian era obtained silk worm eggs and mulberry seeds from India. However by the 4th century AD cultivation of silk and its export was very well established in

India and central Asia. The richness of the silk fibre and also the association of silk with occasions and celebrations, special events have given the title of “Royal fibre” and the extraordinary characteristics like the sheen, high absorbency and the light weight, high strength, resiliency, excellent drape and good affinity to colours and low static current generation make it the ‘queen of fabrics’ to silk. Silk is a profitable trade commodity. It is an object of desire, fabric of fashion, symbol of royalty, back bone of rural economy. It’s a symbol of tradition and living culture in India.

Sericulture is both art and science. It is an agro based activity in India. The tropical climatic conditions in India are favourable for getting a yield of 4 to 6 crops per year, whereas in other temperate countries like Japan, USSR, and South Korea it is only 2 crops per annum. It is a labour intensive, cottage, small scale sector economic activity that requires low investments with a potential of higher returns. It provides an income and employment to small and marginal farmers. It has also supported the sustainable growth of Indian rural and tribal women. The total silk production in India is 28708 metric tonnes (International commission, 2014) The silk industry provides employment to more than 7.6 million people across 51,000 villages, who operate 328,627 handlooms and 45,867 power looms with 8,14,616 weavers. Its exports of silk are worth about US\$ 360 Million.

India is the only producer of all the commercial varieties of silk namely – Mulberry, Tasar, Eri and Muga. Mulberry is domesticated and contributes 83% of total silk production majority of which is produced in Karnataka and Tamilnadu. Different states of India are known for producing different silk textiles. Karnataka is known for Mysore silk, Bangalore silk, Molakalmur and Ilkal sarees. Kanchipuram, Pochampally, Uppada, Dharmavaram, Paithani, Bhalochari, murshidabad silk, Bhagalpuri, Sambhalpuri, ikats, Banaras, Maheshwari and Chanderi are a few famous silks of India. Each of them is a story of cultural heritage in itself. The tradition of bride wearing a silk saree during weddings is still persistent in South India.

The wild silks on the other hand are mainly produced in Assam and a very small amount of it in other states. The wild silks/ Vanya silks are distinct and are known for their special characteristics. Though Eri is the second largest silk cultivated silk which contributes to 8% of the total silk production in India it is the lesser known and the only domesticated wild silk. It is known for its special characteristics, similar to that of cotton and wool. Eri silkworms are hardy, which means that they are less susceptible to diseases hence relatively easier to grow Eri compared to Mulberry. Due to these features, Eri is creating waves in the textile and fashion industry these days.

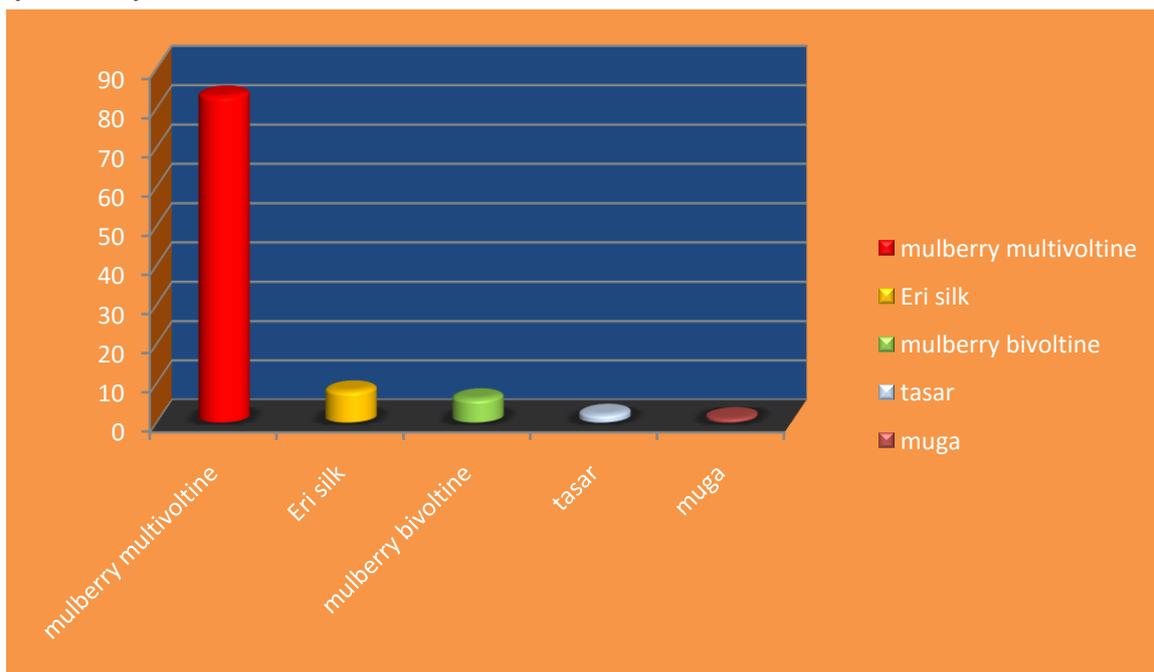


Figure 1-The percentage of different silks grown in India.

Multivoltine Mulberry contributes maximum (83%) followed by Eri silk(8%), Mulberry bivoltine(6%), followed by Tasar(2%) and Muga(1%).

2.2 Cultivation:

Silk is a protein fibre. It is a fibroin made of proteins secreted by silk worm.

Figure-1 The life cycle of the silkworm.



Figure 2-The life cycle of the silkworm.

The life cycle of any silkworm consists of four important stages namely egg, larva, pupa, moth. It is during the pupal stage that that pupa forms a protective shell cocoon and spins silk around it in the figure of 8 by secreting the protein fluid. The life cycle of eri silk from egg till egg is around 6 weeks in summer and 12 weeks in winter.

2.2 Ericulture

The rearing of Eri silkworm is known as Eri culture. Eri is also known as Erandi or Endi. The north-eastern state of Assam has been the home of Eri silk. Eri culture is an integral part of rural economy as it provides economic activities, especially for rural and tribal women. They utilize their leisure time in rearing of Eri silkworms and weaving of Eri fabrics using their traditional knowledge.

Eri silkworms belong to two species, namely *Samia Ricine* and *Philosamia Recine*. Among these two, P. recine is domesticated and fed on castor leaves and it produces white or brick red silk. The name Eri is derived from the Assamese word 'Era' which means castor. It is also referred to as the 'Ahimsa Silk' or the 'Peace Fabric', as the pupae is not killed to obtain the silk. The traditional method of killing cocoons for reeling mulberry silk is an ethical problem for animal activists. To make one pound of the finest silk, 2600 silkworms must die. Eri is the only completely domesticated silk worm other than Bombyx Mori, the Mulberry silk. The other food plants include Tapioca and Kesseru, Papaya. Eri is grown as a multivoltine. It takes ten days to hatch for the eggs. The moth is allowed to emerge. Hence the filaments are not continuous. Since they are not uniform in thickness and cannot be reeled they are spun to produce Eri silk yarn. The ease in growing the food plants everywhere makes Eri culture a possibility in almost every part of the country.

2.3 Properties of silk

Eri is an open mouthed cocoon thus suitable only for spinning. The soft cocoons are used for mechanical spinning whereas the hard and big ones for hand spinning. Eri fresh cocoon weighs about 3-5 g and the shell weighs .4-.6 g. The size of the cocoon is 4.8x3.5 cm.

- **Micro structure and appearance**

Two important silk proteins are Fibroin and Sericin. Like any other protein they are made up of chains of amino acids. Fibroin has high crystalline regions and Sericin amorphous regions. Mulberry silk has smooth, uniform longitudinal appearance and triangular cross section. Whereas wild silks have significant rough surface, fibrillar striations in the longitudinal directions, flat and elongated triangular like cross-sectional appearance.

- **Renditta**

It is defined as ‘the quantity of silk cocoon required to produce one kg of yarn’. Lower renditta indicates superior yarn producing quality of the cocoon. Renditta for Eri is about 8 . It means that 8 kg of cocoons are required to produce 1 kg of yarn. Renditta of silk in general is about 8 for all the four types of silks. The recent improvements in the technology and practices have brought down the renditta from 10 to 8 which is a great achievement.

Table-1 Chemical Composition(%) of all types silk cocoons.

Component	Mulberry	Tasar	Muga	Eri
Fibroin	66-72	78-85	80-86	82-88
Sericin	25-32	14-17	12-16	11-13
Wax	.3-.4	1-2	.5-1	1.5-2.2
Minerals ,ash and other	.7-.8	3-4	2-3	2-3

90% of the cocoon is protein and 4 to 5% is waxes, mineral salt and ash.

Eri silk shell has lower Sericin content among all the silks i.e. 11-13%. Mulberry has the highest followed by Tasar and Muga.

Wax, mineral, ash and other impurities level is highest in Eri(1.5-2.2) followed by Tasar, Muga and mulberry. The lower sericin content of the Eri silk requires milder degumming process compared to mulberry silk.

Table-2 Physical properties of silks

Type of silk	Fibre density g/cm ³	Fibre fineness Den	NBFL M	Total filament length (m)
Mulberry bivoltine	1.34	2-3	700-800	1200-1600
Mulberry multivoltine	1.34	2-3	400-600	900-1200
Tasar	1.31	8-12	100-250	750-900
Muga	1.30	4-7	150-250	600-800
Eri	1.30	3-4	.05-2	400-500

- **Fibre fineness.**

A silk fibre fineness decreases from outer to the inner layer of a cocoon. Denier is the unit of fineness in silk. One denier is the mass of 9 kilometre fibre expressed in grams. One can see from the table that mulberry is the finest, Eri is the second finest followed by Muga and Tasar is the coarsest silk. The fineness of Eri fibre is between 14 to 16 microns.

- **Filament length**

Total filament length of Eri is 400-500 m whereas it is 1200-1600m in case of bivoltine and 900-1200m in case of multivoltine Mulberry silk.

Reeling is the process of extracting silk filaments from the cocoons. Non breaking filament length (NBFL) is the length of silk filament that is continuous in a cocoon. Eri is not a continuous filament. The length of the filament may vary from 5 to 200 cm or more. It can successfully be blended with wool, cotton and other fibres. Eri cocoon like any other silk contains sericin on the surface and therefore be degummed. The sericin content is very less compared to that of Mulberry silk (10-12% vs. 20-24%). Hence, mild degumming is necessary to retain the structure of the fibre and a smooth cocoon opening without damaging the non-filament fibres without any fibre loss is essential. Then, the fibres are cut to the required size to spin or to blend with any other fibre. Then, the cut of fibres of accurate length are parallelized and delivered in the form of a uniform sliver. After carding the sliver, drawing is done, combed and then finally spun.

- **Chemical properties**

Eri silk like other silks has good resistance to acids, but hot and concentrated acids damage the peptide bonds. They have low resistance to alkaline and damaged when exposed to weak alkali at an elevated temperature.

- **Moisture properties**

Silk is very hygroscopic fibre. Silks can absorb 30% moisture without feeling damp. They swell 30% of their volume under wet conditions this property leads to lower dimensional stability and loss of strength in wet conditions.

Mulberry silk as a raw fibre has 11% regain which is reduced to 9% after degumming. Eri has 10% moisture regain value.

Table 3-Tensile Strength.

Property	Mulberry	Tasar	Muga	Eri
Tenacity(g/denier)	4.5	3.9	4.2	3.1
Elongation(%)	19	28	30	22

Silk is a very strong fibre. It is the only natural fibre available as a filament with high tenacity. It is very comfortable and durable fibre. As a whole all the silk fibres have exceptionally good elastic recovery.

Mulberry has the highest modulus and strength. Eri has the least tensile strength and modulus. But Eri has a higher elongation compared to Mulberry.

- **Lustre and optical properties**

Silk is highly lustrous fibre. Uniform cross-sectional area of the filament has made mulberry a very lustrous fibre. Eri is also lustrous due to higher translucency with uniform cross sectional area.

- **Other Properties**

Studies have shown that the silk is thermally stable below 100 degree centigrade but turns yellow at 110 degree centigrade after 15 min.s of exposure. An ironing process to remove wrinkles from silk fabric must be carried out at 140 to 165 degree centigrade within a very short time. Sprinkling water is not advisable. The damage and the strength loss due to temperature is more compared to other synthetic and cotton and regenerated fabrics. Silk is very good insulator of heat. The specific heat of dry silk fibre is better than that of cotton. Eri is warm in winter and cool in summer.

They are susceptible to moth mildew bacteria fungi and beetles. Prolonged exposure to sun light causes yellowing and damage of the silk fibre. They are due to irreversible bio chemical properties.

Eri silk has got excellent thermal insulation, comfort of cotton, better lustre and texture than wool. Eri can be washed. It can easily be produced to comply with sustainable and organic and ethical standards for silk and be manufactured into silk eco-fashion and organic clothing. Thus eri is creating waves in the fashion world.

3. Research and development

Central Silk Board is the apex body for overall development of sericulture and silk industry in India. Major functions include promoting the development of the silk industry by undertaking, assisting and encouraging scientific technological and economic research, improvement of cultivation, production and distribution of

healthy silk worm seeds, production of quality raw silk and promotion of silk market, advising and reporting all matters of development of the raw silk industry to government of India including import and export of raw silk. Since in India sericulture is vast and widely dispersed and multi-disciplinary, CSB also coordinates and implements collaborative research activities with various institutions, research organisation and universities etc. the contribution of CSB towards the research and development of Eri silk is significant. Two spun silk mills for eri silk are established in Kokrajhar in Assam and Hindupur in Andhra Pradesh.

4. Conclusion

“If fashion is a fine art, then silk is its biggest canvas and if silk is the canvas then all its weavers, dyers, designers and embroiders are the artists”. Fashion is a cycle. It is in constant search for something new and creative. Designers all the time experiment with fibres, fabrics, blends and ideas to create something beautiful, appealing all the time. Now it is the era of Eri! Textile designers are trying to blend or make Eri union fabrics with wool, cotton and synthetic fibres. Vegan designers like [Lucy Tammam](#) uses Eri silk, in her couture evening and bridal wear collections. Traditionalsarees, dress materials, jackets, shawls, baby dresses, bedspreads, cushioncovers, quilts, wall hangings, from Eri and its blends are extremely popular. The luxury of silk along with the comfort of other natural fibres has increased the demand for Eri.

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