An Empirical Analysis of Export of Silk and Silk Products from India

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Abstract

India ranks second position in the exports of textiles and garments with a global share of 6.90 per cent. The export of silk products from India worth Rs.1848.96 crores in 2021-22, which accounted for 0.04 per cent of country's total export earnings. This paper examines the trade performance of India's silk and silk products and its competitors by employing compound annual growth rate, Cuddy-Della Valle Index, Markov chain analysis and Revealed Comparative Advantage using the quantity of exports and their earnings during 2011-12 to 2021-22. The silk products exported were natural silk yarns, fabrics, made-ups, readymade garments, silk carpets and silk waste. Among the exports, silk fabrics and made-ups including ready-made garments constitute highest (80.79 %) value followed by silk waste (11.18 %). The overall export value of silk and silk goods have recorded a significant negative growth of -4.69 per cent. During 2021, China has a major share of the global trade with 44.23 per cent followed by Vietnam (27.45 %). USA was one of the most stable markets among the major importers of Indian silk and silk goods as reflected by the higher probability of retention at 75.16 per cent. The Revealed Comparative Advantage index of silk waste was highest during 2021 with the value of 14.02. The Revealed Comparative Advantage index of woven fabrics was found to be decreasing over the period of time and in the year 2022, it was 2.50 whereas silk yarn, silk waste and yarn spun from silk waste showed increasing trend. Strategic planning of exports of silk goods to selective markets based on comparative advantage and product diversification could be the way ahead to mark India's role in world exports.

One of the most crucial parameters for the attainment of growth and stability in the economy is through enhancement of export performance of a country. In fact, a diversified export portfolio implies that the country is capable of dealing with external economic shocks (Gouvea *et al.*, 2013). Silk occupies a distinct position in the export portfolio of India. The reason behind this is two-fold appropriate infrastructure and manpower for abundant production of raw silk supported by existence of ages old traditionally skilled handicraft and handloom industry. Silk clothes woven by the artisans of India are admired domestically as well as internationally. Silk based garments holds a status of 'pride and glory' in Indian textile industry. Woven fabrics of silk like sarees, dress

material, home décors etc. are exported to leading economies of the world such as U.K, U.S.A, U.A.E, Germany etc. The silk products exported include natural silk yarns, fabrics, made-ups, readymade garments, silk carpets and silk waste.

The silk exports declined at a negative compound annual growth of -4.85 per cent during 2009-10 to 2019-20. All the items except silk wastes and silk carpets recorded negative growth. Though silk is exported to about 170 countries, top 15 countries accounted for 80.52 per cent of the total exports during 2019-20. Indian silk exports to Australia, Sudan, Nigeria, South Africa and Gambia recorded positive growth during 2009-10 to 2019-20. However, the

European countries such as the UK, France, Italy, Germany and Spain reduced the silk imports from India significantly during the period between 2009-10 and 2019-20 (Kumaresan *et al*., 2021). Soujanya *et al*., in 2023 analyzed the export competitiveness of Indian coffee in the international market during 2002 to 2021 which showed that India had competitive advantage in exporting coffee to Italy, Belgium and Russia which are the major importers of coffee in the world. The trade intensity was highest with Italy followed by Russia, Belgium and Germany. There has been a constant trade intensity of India with respect to Italy, Belgium and Russia whereas with Germany the intensity had been fluctuating over the years.

Indian sericulture industry is facing several challenges with regard to supply-demand gaps of quality silk in both domestic and international markets, meeting infrastructure requirements, stagnation in growth of silk exports, increasing input costs and preference of blended/synthetics over pure silk products (Anonymous, 2020). In order to restrict the imports from China, the basic customs duty levied on raw silk and silk fabric import was 15 per cent and 20 per cent respectively (Anonymous, 2023).

With this background, an attempt was made to analyze the trade dynamics and global competitiveness of Indian silk and silk products. The dynamics in the direction of exports and the changing pattern in the trade of major silk products from India by shift in export shares from one country to another over a period of time were also analysed.

METHODOLOGY

The analysis was based on the data for 10 years (2011 to 2022) of value of exports of silk and silk products. USA, UAE, China, UK & France were the major importing countries and Nepal, Canada, Australia, Sudan, Nigeria, Tanzania pooled together as other countries for imports of silk and silk products from India were considered for the Markov chain analysis. The secondary data on exports was collected from the International Trade Centre, Central Silk Board, International Sericulture Commission and United Nations Comtrade Database (United Nations Comtrade Database 2020). Time series data as per 2 digit Harmonized System classification was taken to study the export trends and comparativeness Table 1.

To analyse the trade comparativeness, Revealed Comparative Advantage (RCA) was used, Compound Annual Growth Rate (CAGR) and Cuddy-Della Valle Index (CDVI) were calculated to evaluate the export trends to understand the stability (Mondal, 2022). The following analyses carried in the study are:

TABLE 1
Description of silk and silk products

Heading	H.S. Code	
50.01	5001.00	Silk-worm cocoons suitable for reeling.
50.02	5002.00	Raw silk (not thrown).
50.03	5003.00	Silk waste (including cocoons unsuitable for reeling, yarn waste and garnetted stock).
50.04	5004.00	Silk yarn (other than yarn spun from silk waste) not put up for retail sale.
50.05	5005.00	Yarn spun from silk waste, not put up for retail sale.
50.06	5006.00	Silk yarn and yarn spun from silk waste, put up for retail sale; silk-worm gut.
50.07		Woven fabrics of silk or of silk waste
	5007.10	Fabrics of noil silk
	5007.20	Other fabrics containing 85 % or more by weight of silk or of silk waste other than noil silk
	5007.90	Other fabrics

Source: United Nations Comtrade Database, 2020

Compound Annual Growth Rate of Exports

The compound annual growth rate is estimated from the following form

$$Y = ab_t^e \ \ldots\ldots\ldots (1)$$

where,

'Y' is the dependent variable (exported product)

'a' is the intercept term

'b' is the regression coefficient that measures the relative change in Y for a given absolute change in independent variable t

't' is the dependent variable

'e' is the error term.

Eq (1) is converted to linear form by taking log on both sides of the equation and it forms the following form,

$$\ln Y = \ln a + t \ln b \ \ldots\ldots\ldots\ldots (2)$$

The per cent compound growth rate takes the form

$$CAGR\ (g) = [\text{antilog } b - 1] \times 100 \ \ldots\ldots\ldots (3)$$

Instability Analysis

The study uses Cuddy-Della Valle Index (CDVI) to measure the instability in export of silk and silk products. This index is preferred over the normal coefficient of variation (CV) as it attempts to de-trend the CV by using co-efficient of determination and showing the exact direction of instability. CDVI is obtained for the CV and the form of CV is as follows

$$CV = \text{Standard Deviation/Mean} \times 100 \ldots\ldots\ldots (4)$$

CDVI is estimated as follows

$$CDVI = CV \times \sqrt{1 - R^2} \ \ldots\ldots\ldots (5)$$

where,

CV is the coefficient of variation in percentage,

R^2 is the coefficient of determination from the regression adjusted for its degrees of freedom. If the

index values below 15 per cent then it is categorized as low instability, if the value lies between 15 to 20 per cent then it is categorized as medium instability and more than 20 per cent is categorized as high instability.

Markov Chain Analysis

The trade directions of exports have been analysed by using the first order Markov chain approach (Gogoi *et al.*, 2022). Markov chain analysis is done by the estimation of the transitional probability matrix P. The elements P_{ij} of the matrix P indicates the probability that export will switch from country 'i' to country 'j' with the passage of time. The diagonal elements of the matrix measure the probability that the export share of a country is retained. Hence, an examination of the diagonal elements indicates the loyalty of an importing country to a particular country's exports. In the context of the current application, structural changes will be treated as a random process with selected seven importing regional countries. The average exports to a particular regional country is considered to be a random variable which depends only on past exports to that regional country, which can be denoted algebraically as

$$\Sigma_{JT} = \sum_{i=1}^{r} E_{it-1} * p_{ij} + e_{jt}$$
$$\ldots\ldots\ldots (6)$$

where,

E_{jt} = Exports of silk and silk products from India to j^{th} country during the year t

E_{it-1} = Exports of silk and silk products to i^{th} country during the period t-1

p_{ij} = Probability that the exports will shift from i^{th} country to j^{th} country

e_{jt} = The error term which is statistically independent of E_{it-1}

t = Number of years considered for the analysis

r = Number of importing countries of silk products

The transitional probabilities P_{ij} which can be arranged in a (c * r) matrix have the following properties

$$0 < p_{ij} < 1$$

$$\sum_{i=1}^{n} p_{ij} = 1 \, f \, or \, \text{all} \, i$$

The expected export share of silk product of a country during the period 't' was obtained by multiplying the actual exports in the previous period (t-1) by the transitional probability matrix. The transitional probability matrix is estimated in the linear programming (LP) framework by a method referred to as Minimization of Mean Absolute Deviation (MAD). The linear programming formulation is stated as,

Min OP* + I$_e$

Subjected to

XP* + V = Y

GP* = 1 P* > 0

where, O is the vector of zeros

P* is the vector in which probability P$_{ij}$ are arranged

I is an apparently dimensioned vector of area,

e is the vector of absolute errors

Y is the vector of export of silk products to each country.

X is the block diagonal matrix of lagged values of Y

V is the vector of errors

G is the grouping matrix to add the row elements of P arranged in P* to unity

Export Performance of Silk and Silk Products

To analyze the trade comparativeness, Revealed Comparative Advantage (RCA) was used to indicate whether a country export has 'comparative advantage' or 'comparative disadvantage' in trade of that particular commodity. A country is said to have comparative advantage over another country, if it can produce a particular commodity more efficiently than the other country. RCA Index was used to compute the 'relative advantage' and 'relative disadvantage'.

The numerator represents the share of a country's export of silk in its total export and the denominator represents the share in world total export.

The formula for RCA is

$$RCA_{JK} = \frac{\dfrac{X_{JK}}{X_J}}{\dfrac{X_{KW}}{X_W}} = \frac{S_{Jt}}{S_{wt}}$$

.... (7)

where,

X$_{ik}$ = India's export of commodity k

X = India's total export i

X$_{wk}$ = World export of commodity k

X = World total export w

RCA index ranges from 0 to ∞.

RCA greater than 1 indicates that the county is having 'comparative advantage' in trade of that commodity while RCA less than 1 indicates that the country is having 'comparative disadvantage' in trade of that commodity.

RESULTS AND DISCUSSION

India is the 3rd largest exporter of textiles and apparel in the world. India's textiles and clothing industry is one of the mainstays of the national economy. The share of textile and apparel (T&A) including handicrafts in India's total merchandise exports stood at a significant 10.50 per cent in 2021-22. India has a share of 4.60 per cent of the global trade in textiles and apparel.

Product Concentration of Silk Exports

The export of silk products from India worth Rs.1848.96 crores (US$ 248.56 million) in 2021-22, which accounted for 0.04 per cent of country's total export earnings. India ranks second position in the exports of textiles and garments with a global share of 6.90 per cent. Fig.1 indicates the composition of exports of silk and silk goods at four level HS classification. The product concentration in exports was higher in import during the study period.

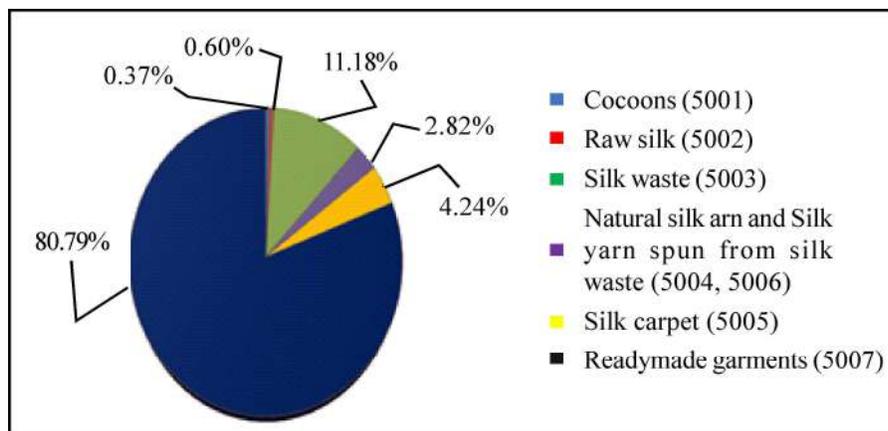*The Mysore Journal of Agricultural Sciences*

Fig. 1 : Product concentration of exports of silk and silk products during 2021-22

The exports were covered by silk fabrics and made-ups including ready-made garments (HS code 500700) with 80.79 per cent, silk waste (HS code 500500) with 11.18 per cent and yarn spun from silk waste along with silk yarn for retail sale (HS code 500600) and silk-yarn non-retail (HS code 500400) contributes very negligible amount, with a share of 3.42 per cent to the total export value. Share of silk cocoon (HS code 500100) is negligible with only 0.37 per cent. Therefore, it was evident that the value-added products were more concentrated on the global market of silk.

The Indian silk industry has traditionally concentrated on the vast and growing domestic market. However, the Indian silk has been in demand outside India for its special qualities like lustre, intricate embroidery and fine embellishment with 'zari'. In recent years,

silk export is emerging as an important sector in earning the much-needed foreign exchange. With substantial government and international subsidies for silk projects and marketing schemes, the industry has been expanding rapidly over the last few years. Silk exports too are growing rapidly. Value added finished silk goods such as readymade garments, scarves and stoles and dress materials are the major items of exports among Indian silk goods (Kumaresan *et al*. 2021).

Share of Different Silk Products in Silk Exports

Fig. 2 provides the status of Indian silk goods export which shows that the share of cocoons and raw silk in the exports was very meager and has recorded an overall growth rate of 1.32 per cent and 2.17 per cent
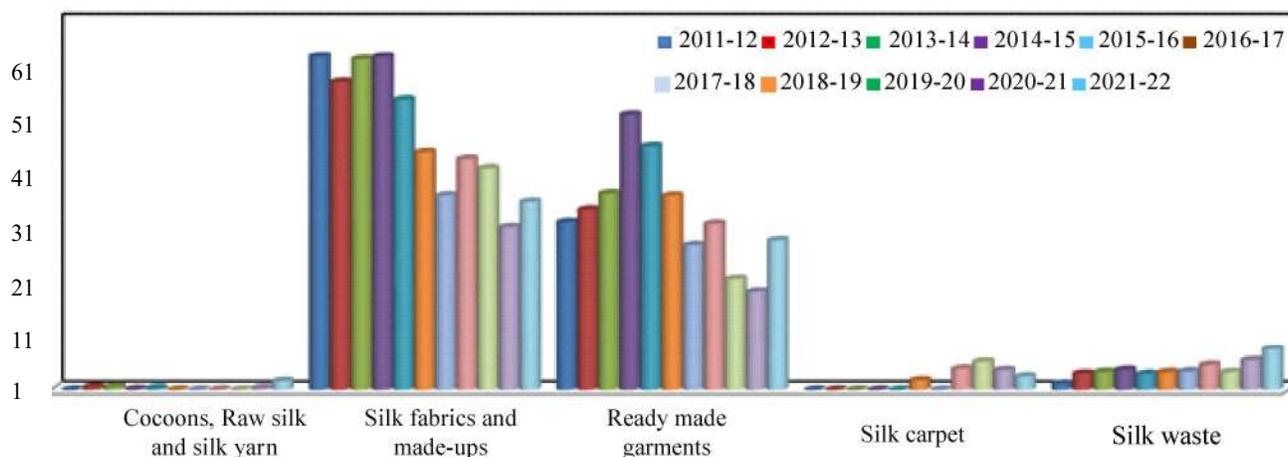

Fig. 2 : Export share of silk products in total silk exports during 2011-12 to 2021-22 (per cent)

respectively, but not significant. The overall export value of silk and silk goods has recorded a significant negative growth of -4.69 per cent. The readymade garments recorded a significant negative growth rate of -5.49 per cent. The growth rate was highest for silk waste (10.07%) followed by silk carpet (2.73%) and natural silk yarn (2.09%). Kumaresan and Indumati (2008) also found that silk waste being utilized as a raw material, its exports have witnessed a strong growth during the last few years due to strong demand for it from China. Halagundegowda *et al.* (2021) also found that the exports all the items except silk waste witnessed negative growth during the post liberalization period and the exports of silk waste grew at a higher rate of 19.84 per cent in the post-liberalization period.

Performance of Exports

The performance of exports of silk and silk goods is presented in Table 2. On an average, India earns Rs. 2094.42 crores every year from exports. The CAGR calculated shown that there was a decreasing trend of -5.27 per cent in the exports of silk products from India during the study period (2011-12 to 2021-22).

During 2009, the total export value of silk and silk products was found to be Rs.2892 crores, which decreased to Rs.1849 crores during 2021. Similarly, the value of imports of silk and silk products also decreased from Rs.1839 crores to Rs.1144 crores. Overall, the imports of raw silk was decreased due to the increased domestic production level. Along with the recorded growth rates of silk production in the country, demand for silk is also increasing on the other hand, thereby the volume of exports was also declining.

The calculated CV of overall silk products was accounted to 20.58 per cent. It was highest for cocoons, followed by raw silk (127.09%) and silk carpets (83.83%). Results of the CD VI showed that, exports of silk products from India have low instability (4.38%). Though the export of silk products was stable, the growth was negative. Among the different silk products, high instability was found in cocoons and raw silk with 76.25 per cent and 62.98 per cent respectively. The CAGR was highest for cocoons (47.12%) but not significant, followed by significant growth for silk carpets of 30.17 per cent. But, the CAGR was negative for natural silk yarn, silk fabrics and made-ups and ready-made garments.

Export Share of Different Countries

During 2021, the global trade of silk and silk products was US$ 255.14 million, out of which China is having major share (77%) followed by Vietnam (7%), these countries together share 84 per cent of global market and other countries have less share as presented in

TABLE 2

Growth and instability in export of silk and silk products of India (2011-12 to 2021-22)

Particulars	Mean value (Rs. In Crores)	CV (%)	CAGR (%)	Cuddy Della Valle Index (%)
Cocoons	0.76	282.44	47.12 [NS]	76.25
Raw silk	2.60	127.09	3.27 [NS]	62.98
Natural silk yarn	25.83	33.93	-0.20 [NS]	16.96
Silk fabrics and made-ups	1104.31	24.21	-7.05 [**]	2.31
Readymade garments	785.24	30.28	-7.05 [*]	7.39
Silk carpets	58.95	83.83	30.17 [**]	13.36
Silk waste	116.71	29.43	6.51 [*]	6.39
Overall exports	2094.42	20.58	-5.27 [**]	4.38

Note: * and ** indicate significant at 5 per cent and 1 per cent level of probability, NS – non significant.
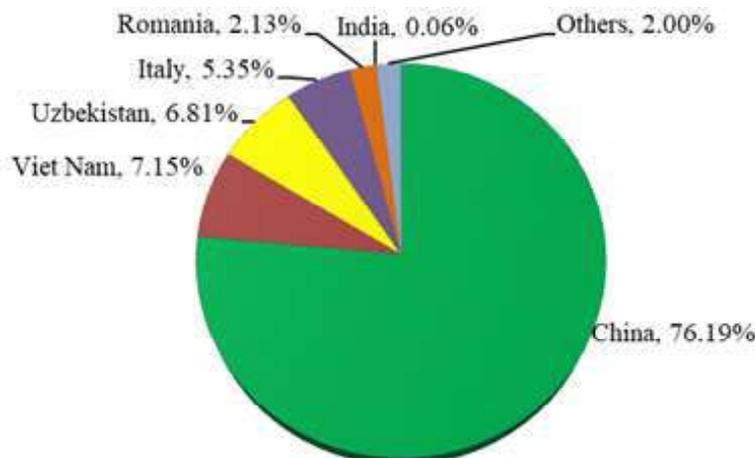
Fig . 3: Share of major silk exporting countries in global exports of silk and silk products (2011-12 to 2021-22)

Fig. 3. India is contributing only 0.01 per cent of the raw silk export value, due to high domestic demand. Among the major exporters highest positive growth rate was recorded in Vietnam (52.13%) followed by Bulgaria (51%), though its contribution to global raw silk exports was very less. China has recorded negative growth rate in exports value, as the raw silk production over the years has recorded -21.50 per cent growth rate.

Dynamics of Exports of Silk Products

The dynamics in the direction of exports and the changing pattern in the trade of silk and silk products from India by shift in export shares from one country to another over a period of time were analysed by employing the first order Markov chain model. The trend in sustaining the existing markets and the gains

and losses in the export share of silk and silk products from India by the major importing countries were obtained from the transitional probability matrices.

The estimated transitional probability matrix is presented in the Table 3, depicts that USA was one of the most stable markets among the major importers of Indian silk and silk products as reflected by the higher probability of retention at 0.751, i.e., the probability that USA retains its export share over the study period was 75.16 per cent. Thus, USA was one of the loyal markets of Indian silk trade. Though, USA is the major importer from India, it is more likely to gain from UAE (14.97 %). Further, it was noted that, other countries, UAE and France have 66.44 per cent, 59.97 per cent and 43.61 per cent probability of retention, respectively. Although UAE was a major importing country from India, it is more likely to gain

TABLE 3

Transitional probability matrix of Indian silk and silk products exports

Country	UAE	USA	China	UK	France	Italy	Germany	Others
UAE	0.59978	0.14974	0.01885	0.14756	0.00000	0.02495	0.05340	0.00573
USA	0.00000	0.75165	0.23453	0.00000	0.01382	0.00000	0.00000	0.00000
China	0.52520	0.00000	0.33907	0.00000	0.10252	0.03321	0.00000	0.00000
UK	0.00000	0.05718	0.00000	0.07966	0.00000	0.00000	0.00575	0.85741
France	0.00000	0.00000	0.00000	0.03357	0.43618	0.27891	0.25133	0.00000
Italy	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
Germany	0.00000	0.00178	0.00000	0.69622	0.00000	0.00000	0.00000	0.30200
Others	0.18452	0.00000	0.00000	0.00787	0.04461	0.04813	0.05043	0.66444

from China (52.5 %) and other countries (18.5 %). Though other countries import Indian silk and silk products in very small quantities, they have probability of retention next to USA (66.44 per cent), which was the leading importer. Other countries include Nepal, Canada, Australia, Sudan, Nigeria, Tanzania, were involved in trade of silk and silk products over the years and could retain their original share with a gain of 85.74, 30.20 and 5.73 per cent from UK, Germany and UAE respectively. The entire share of Italy and Germany was directed to UK and other countries whose markets were gaining in popularity, which shows that markets were becoming diversified.

The results obtained were in line with the findings of Kumaresan *et al.* (2021) wherein they reported that Indian silk exports to Australia, Sudan, Nigeria, South Africa and Gambia recorded positive growth during 2009-10 to 2019-20, however, the European countries such as the UK, France, Italy, Germany and Spain reduced the silk imports from India significantly.

Revealed Comparative Advantage of Silk and Silk Products

Table 4, represents the Revealed Comparative Advantage of India's silk trade and it is seen that silk waste, silk yarn and yarn spun from silk waste and woven fabrics were found to have comparative advantage during all the years of the study period. The RCA index of silk waste was highest during 2021 with the value of 14.02. The RCA index of woven fabrics was found to be decreasing over the period of time and in the year 2022, it was 2.50 whereas for silk yarn, silk waste and yarn spun from silk waste showed increasing trend. The RCA index of cocoons has decreased from 0.32 during 2011-12 to 0.01 during 2021-22 as the quantity of cocoons exported was very meagre of the total exports of silk products.

The number of reeling units were increased and upscaled with focus on obtaining quality silk yarn for further value addition. The assistance provided under the Central Sector Scheme *viz.,* 'Silk Samagra-2', which is an integrated scheme for development of silk industry with special focus on export promotion has enabled to strengthen the value chain of silk industry. It could make the domestic silk weaving market segment stronger and Indian silk export sector highly competitive also.

TABLE 4

Revealed Comparative Advantage of silk and silk products

Year	Cocoons	Silk yarn	Raw silk not thrown	Silk waste	Yarn spun from silk waste	Silk	Silk yarn and yarn spun from silk waste	Woven fabrics
2011	0.18	0.41	0.09	9.72	1.17	0.22	3.31	6.27
2012	0.32	0.27	0.09	11.47	0.58	0.30	1.55	4.39
2013	0.25	0.10	0.09	12.77	1.12	0.34	1.52	3.85
2014	0.26	0.24	0.04	10.96	0.99	0.34	4.13	3.75
2015	7.21	0.17	0.04	11.93	0.73	0.35	6.75	3.84
2016	0.75	0.09	0.01	13.40	0.55	0.39	4.38	3.41
2017	0.12	0.06	0.02	10.59	0.67	0.46	6.36	3.06
2018	0.03	0.09	0.03	11.47	1.22	0.44	5.99	2.85
2019	0.05	0.05	0.02	9.68	1.00	0.41	4.68	3.25
2020	0.11	0.10	0.05	12.78	1.96	0.24	6.39	5.54
2021	5.84	0.54	0.35	14.02	1.35	0.23	6.00	5.23
2022	0.01	0.26	0.13	13.53	0.63	0.44	5.72	2.50

The study concluded that there are immense opportunities for Indian textile industry in world market as most of the products have shown positive growth of export. Enhancing silk production and improving quality to meet the domestic demand and exports are to be focussed to be globally competitive. Strategic planning of exports of silk goods to selective markets based on comparative advantage and product diversification could be the way ahead to mark India's role in world exports.

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