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How Colourful is the Future of Naturally Coloured Cotton?

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The views expressed in this column are his own and not that of Cotton Association of India)

Naturally coloured cotton has a history of more than 5,000 years in India, Egypt and South America. The natural cotton fibre colours range widely from dark tan, brown, khaki, grey and green. In Asia, Desi coloured cotton stocks of *Gossypium arboreum* were cultivated by the Aryans of Mohenjodaro and Harappa from 3000 BC in Indo-Pak region. In the American continent, the Mochica Indians of Peru and natives of South and Central America were known to have created several pre-columbian stocks of the American cotton species *Gossypium hirsutum* coloured cotton. Later coloured cotton fibres were grown for centuries in Asia, China and Russia.

In current times, there is negligible area under coloured cotton varieties in India and elsewhere in the world. However, there has been an infrequent resurgence of interest, mostly through environment oriented passion. Over the past 3-4 years, concerns have been raised in the Indian parliament highlighting the need to promote research and development of naturally coloured cotton varieties in India.

There are many questions on coloured cotton, but the answers are not easy. Why do we need coloured cotton? Is there a real need with an ecological perspective or environmental consonance? Or, is it a just a fanciful idea of a few individuals who are somehow inclined to believe that the petrochemical based civilization is not sustainable for mankind? Is it worth investing in research to develop naturally coloured cotton varieties suitable for high speed yarn spinning? Will there be takers? Will there be an assured market? Can we cultivate such varieties all over the country without having to worry about contamination of white cotton? Though difficult, I will attempt to address these questions in this article.

EXPERT'S Column



Dr K.R. Kranthi

What makes the cotton fibre coloured? Brown, grey and tan are due to tannin and phenolics present as vacuoles in the fibre lumen. Green fibre is due to the presence of caffeic acid and cinnamic acid present in wax layers interspersed with cellulose layers that envelope the cotton fibres.

The flavonoids responsible for the lint colour are governed by genes at three loci, LCI, LC2, and LC3 and control more than one trait (pleiotropic). It is now known that dominant or incompletely dominant genes govern inheritance of natural lint colour. The green colour is governed by one gene while brown colour is controlled by two or more genes. It has been reported that some of these genes adversely affect fibre development or length or fineness. Cotton fibres inside

developing bolls are white until the first one month of boll development. Subsequently colour develops in the fibre during the next 10 days. The fibres assume colour just before boll bursting with gradual accumulation of colour in the lumen for brown shades and around the lint for green. The boll colour intensifies within 6-7 days of exposure to sunlight after boll bursting. The pigments in naturally coloured cotton fibres, especially caffeic acid in green fibres are presumed to protect the seed embryo from harmful solar UV radiation. The fabric produced from coloured cotton fibres was found to show high levels of ultraviolet protection factor (UPF) with excellent properties to protect the skin from harmful UV rays. The natural colours are steadfast and become darker over time after repeated washings. The colours were also found to intensify in some fabrics under sunlight, while shades such as green are known to fade or change to light brown or gray after exposure to sunlight or strong detergents.

With the advent of Industrial revolution, there was demand for long and strong fibres suitable

for machine spinning. Since the coloured cotton fibres were mostly of short staple category with low strength, their future dwindled in comparison with the white cotton fibres. Due to shortage in demand, the coloured cotton stocks were neglected and remained poor yielders. White fibre cotton varieties were in high demand because of the myriad possibilities to create fabrics and apparel in various hues and designs using chemical dyes. The interest in naturally coloured cotton resurfaced during the Second World War when chemical dyes were in short supply. During the time of World War-II, the Soviet Union initiated and intensified research on the development of brown and green coloured cotton varieties. Within a few years several varieties were being grown in various parts of the USSR. Later, many countries including China, India and the United States of America re-initiated efforts to explore the possibilities of cultivating coloured cotton varieties. However, due to centuries of neglect, almost all of the genetic stocks of colored cotton continued to remain poor yielders and thus were found unsuitable and unprofitable.

However blends of short staple coloured cotton fibres with long staple stronger white fibres have been used in many parts of the world to spin yarn of lighter shades. Patented technologies such as staple-core and filament-core spinning,



Photographs: Vinita Gotmare



are now used to produce composite yarns to envelope long and strong white fibres with an outer layer of naturally colored fibre. The yarn thus produced is strong but retains the natural coloured fibre as the outer core without resulting in a lighter shade as with twisted fibres in yarn produced from machine spinning.

Coloured cotton fibres received a fresh lease of life when thirty years ago, Sally Fox, a graduate entomologist developed several long and strong coloured cotton fibres patented as Fox Fiber of different shades. Sally Fox started a company 'Natural Cotton Colors Inc. in 1989 that generated renewed consumer interest and revived the fate of coloured fibres.

Interestingly, for more than 5,000 years natural dyes were also used to colour yarn. The main sources of natural dyes were from insects, fungi, lichens or plant parts such as leaves, wood, bark, roots, fruits and seeds. Some of the most extensively used sources were cochineal insects, indigo, Isatis, logwood, mulberry, butternut, henna, Acasia, saffron and madder.

There were several land races of the native Desi species *Gossypium arboreum* coloured cotton in India that were cultivated as a perennial trees over centuries. The legendary Dhaka muslins were also known to have been spun from white and coloured lint from the indigenous tree species. During the British period and early years of independent India, the Desi species of tree cotton varieties Cocanada 1 and Cocanada 2 were grown in rainfed parts of coastal Andhra Pradesh and the brown fibre was exported to Japan at premium prices. Buff brown coloured cotton of the Desi species *Gossypium arboreum* race *cernuum* in Assam and the light grey coloured 'Kumta' of *Gossypium herbaceum* species in Karnataka were under cultivation for several decades in the 19th and 20th century.

Some of the attempts in recent times resulted in the development of coloured cotton varieties of the species *Gossypium hirsutum*, of medium staple with high yields, moderate fibre strength and thus suitable for machine spinning. The variety JCC 1 (KC 94-2) was released in 1999 by the Jawaharlal Nehru Krishi Vidyapeeth for commercial cultivation. It showed yield potential of 15-20 q./ha and spun at 30 counts to produce bright almond brown colour. The Nandyal cotton research station of ANGRAU (Acharya NG Ranga Agricultural University, Hyderabad) developed NDH 1, HC 2 in *Gossypium hirsutum* and AC 2 in *Gossypium arboreum*, with shades of brown. The University of Agricultural Sciences (UAS), Dharwad, released a *G. arboreum* variety DDCC-1 (Dharwad desi colour cotton-1). The variety produces good quality spinnable coloured fibre. A few other new cultures were identified by the University. DDB 12 with dark brown lint of 22.0 mm length and 22.0 g/tex strength has high yield potential of 25 to 26 q./ha. The medium brown lint variety DMB 225 has a staple length of 22.8 mm and strength of 20.6 g/tex. The green lint variety DGC 78 has staple length of 24.3 mm, fibre strength of 20.4 g/tex and has yield potential of 13-15 q./ha. Recently, CICR registered a new genotype MSH-53 (Vaidehi-95 - Dark Brown Linted - INGR13032) a multi-species hybrid introgressed reverted tetraploid genetic stock with fibre span length (20.8mm), fibre strength (17.2 g/tex) and micronaire value (4.1) with NBPGR in 2013.

There are more than 50 coloured cotton genetic stocks in the National gene bank of the Central Institute for Cotton Research, Nagpur that were collected indigenously or obtained from other countries such as Mexico, Egypt, Peru, Israel, Soviet and USA. Interestingly, the Desi species of coloured cotton genetic stocks (SP 3936(A), Light Brown, Malvensis, 7869 Brown and Khaki colour 8631) show good fibre traits



Photographs: Vinita Gotmare



of 20.2 to 24.0 mm fiber length, fibre strength of 17.1 to 19.0 g/tex and good ginning percentage of 36-38%. In contrast, 10 out of the 13 main coloured cotton genotypes of American cotton species *Gossypium hirsutum* possess relatively inferior fibre traits at low strength of 12-16.9 g/tex and fiber length of 14 to 21 mm. The rest of three genotypes LC 1-1, Cotanark (DB) and Kampala Brown had fibre length at 23-24 mm, but poor strength of 12-14 g/tex. Majority of the *G. hirsutum* coloured cotton genotypes showed poor ginning percentage of 19-33%.

It is also interesting that all the four cultivated species and 22 wild species possess coloured cotton lint. Brown coloured lint is present in *G. aridum*, *G. armourianum*, *G. darwinii*, *G. mustelinum*, *G. anomalum*, *G. capitiviridis*, *G. somalense*, *G. arboreum*, *G. stocksii*, *G. areysianum*, *G. incanum*, *G. australe*, *G. sturtianum* while other colours are present in rest of the species. The wild species *G. gossypoides*, *G. harknessii*, *G. herbaceum*, *G. longicalyx*, *G. robinsonii*, *G. sturtianum* var *nandewarense* possess greyish fibre.

Should coloured cotton varieties occupy an area equivalent to that of white cotton? Can coloured cotton varieties be grown commercially in an extensive manner? The answers are difficult indeed. Currently, there is very limited demand of naturally coloured cottons in India. In the last few years, the demand of naturally coloured cotton has increased in some European countries, which is estimated to be about 5-6 lakh bales per annum. The requirement of textile industries is for the varieties which possess fibre length 25-29 mm and fibre strength 20 - 23 g/tex. A few of the recently developed varieties may be considered for the purpose as per the acceptability of the spinning mills. Coloured cotton varieties having short fibre (<24 mm) could be used by the handloom industries in collaboration with the Khadi Gram Udyog. It is clear that there is no premium price policy for coloured cotton. Plus, there is a lack of interest from purchaser groups and lack of assured market. Further, the market yards do not provide any special facilities for coloured cotton to be stocked or sold separately. Thus there is lack of isolation-infrastructure in market yards to prevent contamination of white cottons by the coloured cottons. It is necessary to develop marketing facilities before starting cultivation of coloured cotton on a commercial scale

There is a need to address the impending problem of contamination if commercial cultivation of coloured cotton has to be taken up. Cotton is an often cross-pollinated crop. In natural conditions, cross-pollination occurs to the extent of 5-10 per cent. Growing of naturally coloured cotton and white cotton in close proximity will facilitate the chances of contamination of white linted genotypes with coloured cotton and vice-versa. One argument is that with the existing scenario of 95% area under Bt-hybrid cotton in India, the coloured cotton varieties can now be cultivated in close proximity to the hybrids, since the seeds from the hybrid cotton fields are not used for sowing. Thus the possibility of genetic contamination of white cotton is no longer a concern. Another possibility of establishing a system for peaceful co-existence of white cotton with coloured cotton is to consider the cultivation of Desi species (*Gossypium arboreum*) of coloured cotton in proximity to American species (*Gossypium hirsutum*) of white cotton. Since the two are genetically incompatible, the possibilities of contamination through pollination is ruled out. Therefore with good planning, it should be possible to cultivate the white hybrid cotton adjacent to coloured cotton, only to ensure that physical mixture does not take place. Needless to emphasise that care must be ensured to avoid any physical contamination that may occur during picking, stacking, ginning, delinting, packing, transport and storage. Growing of white cotton in fields wherein coloured cotton of the same species was grown in the previous year may also lead to contamination through volunteer plants. However, wherever white cotton varieties (not to be confused with hybrids) are cultivated, coloured cotton should be cultivated with an isolation distance of 50 metres to avoid genetic contamination of white cotton and also to avoid the coloured cotton from getting contaminated with white cotton. Clearly, there is lack of proper incentives for such protective cultivation.

In conclusion, the future of naturally coloured cotton will eventually depend on how strong the market demand grows. Currently there is a limited niche market from special consumer groups who may prefer organically grown naturally coloured cotton. While naturally coloured cotton is a precious natural resource that needs to be conserved, the future would depend on how preciously and collectively we treat this precious resource.



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Technical Analysis

Price outlook for Gujarat-ICS-105, 29mm and ICE cotton futures

(The author is Director of Commtrendz Research and the views expressed in this column are his own and the author is not liable for any loss or damage, including without limitations, any profit or loss which may arise directly or indirectly from the use of above information.)

We will look into the Gujarat-ICS-105, 29mm prices along with other benchmarks and try to forecast price moves going forward.

As mentioned in the previous update, fundamental analysis involves studying and analysing various reports, data and based on that arriving at some possible direction for prices in the coming months or quarters.

Some of the recent fundamental drivers for the domestic cotton prices are:

- Cotton prices extended their fall for the second straight day on higher planting area in the US while simultaneously, the Indian Cotton Federation revised its output estimates higher.

- Indian cotton production has been revised upwards to 37.6 million bales from the previous forecast of 36.1 million bales.

- China, the world's biggest consumer of the fibre, has cut the minimum price mills must pay when bidding on its reserve stocks of cotton, a move that could reduce imports and pressure prices for the fibre.

- China will complete its current season stockpiling by the end of March, when the government is set to end the season with an estimated 12.6 million tons of the fibre in its reserves, or 60% of global stocks, the US Department of Agriculture said Thursday.

Some of the fundamental drivers for international cotton prices are:

- Cotton futures were slightly lower on Monday after the U.S. Department of Agriculture estimated U.S. farmers will increase their cotton-acreage this spring by 7% from last year. U.S. growers will likely sow 11.1 million acres with cotton this spring, up from 10.4 million last year, according to the USDA's annual Prospective Plantings report.

- The gap between cotton for delivery this May and fibre for December widened to a record Monday as tight supplies this season are expected to ease in the next harvest. Cotton for delivery in May on ICE Futures U.S. was up 0.9% at 94.59 cents a pound, while December-delivery cotton was nearly unchanged at 79.90c. The close to 15 cent gap is record for the two contracts.

- China is reducing the minimum price mills must pay when bidding on its reserve stocks of cotton, a move that could reduce imports and pressure prices for the fibre.

- Since late 2011, China's seemingly bottomless appetite for the fibre encouraged farmers around the world to boost production and kept global supplies tight. At the end of the current season on July 31, the U.S. Department of Agriculture expects China - the No. 1 grower, importer and consumer of the fibre - will have 60% of the world's cotton stocks in its warehouses.

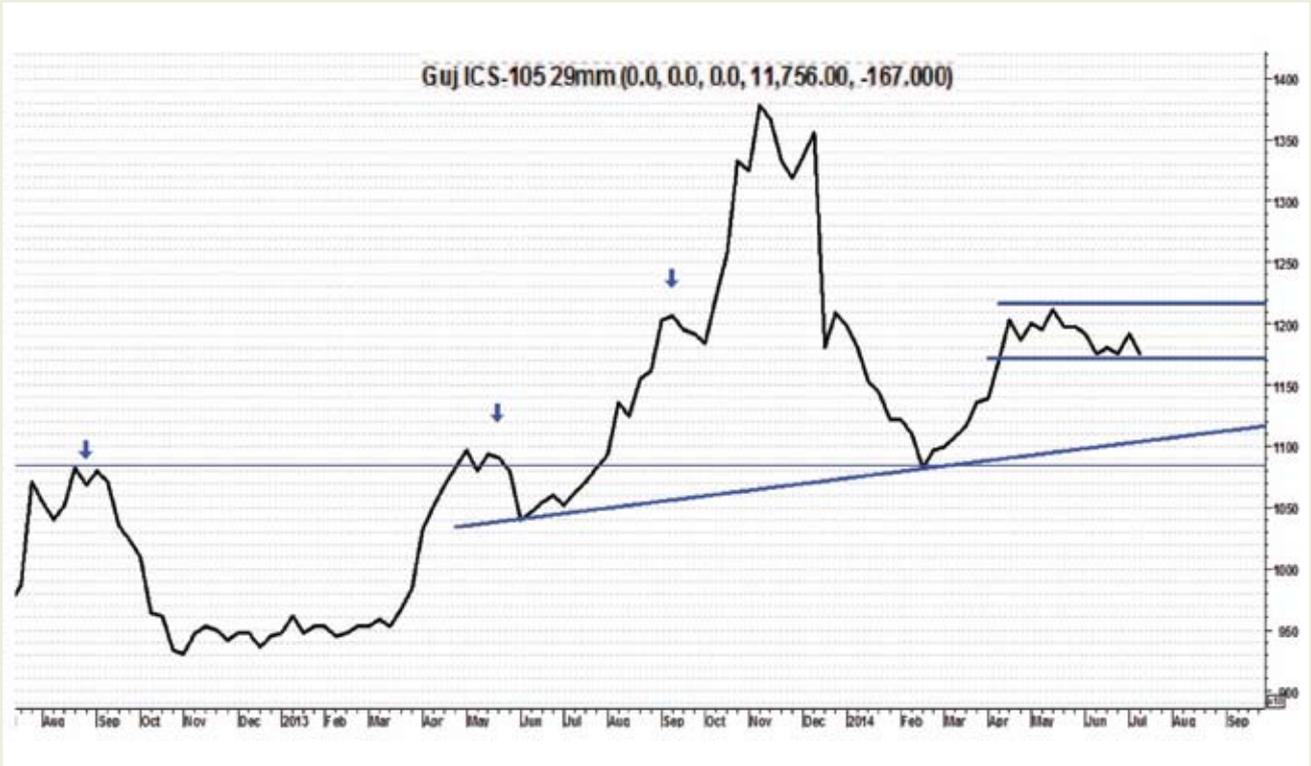
The domestic prices have fallen sharply while and international prices have managed to hold on to gains so far. We will now dwell into the various tools in technical analysis and forecast possible direction.

As mentioned in the previous update, price could move down to supports around 11,700/qtl and a fall below here could dash our bullish hopes and such a fall could push prices lower to

EXPERT'S Column

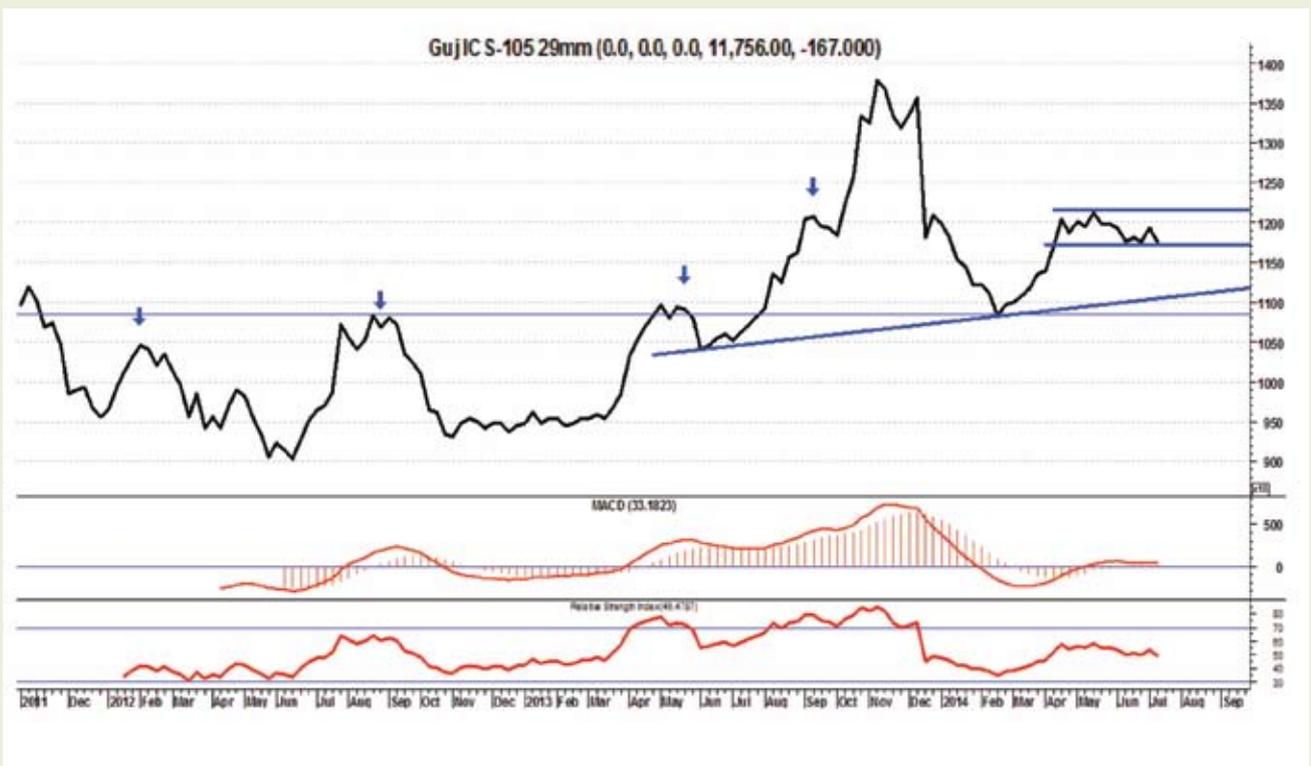


Shri Gnanasekar Thiagarajan



11,350-400 /qtl levels or even towards 11,000/ qtl levels being a rising trend line support point as seen in the chart below. As mentioned earlier, technical picture still looks friendly and the current fall looks like a downward correction within a strong up trend.

As we have been maintaining for the last few months, the chart indicates further upside to 12,365 or even higher to 12,725 levels in the coming sessions. As mentioned in the previous update, there are signs of technical weakness and it looks likely that prices could edge lower





in the coming weeks. Prices now have to go below 11,300, for the picture to turn weaker. Indicators are displaying bearish signals, which make us believe we could see lower levels again. Only an unexpected cross over above 12,100/ qtl could revive bullish hopes again.

We will also look at the ICE Cotton futures charts for possible direction in international prices.

As explained in the previous update, further upside is there to eventually test 94c on the upside in the coming weeks. Prices moved exactly in line with our expectations. Prices are unable to sustain at the present high levels, though there is some scope for the upside to continue towards 97-98c. Subsequently, we expect prices correcting lower towards 87-88c where minor support can be seen. Failure to hold support here could drag prices even lower to 83-84c in the coming weeks. As explained earlier, technical indicators are hinting at a possible bullish trend reversal. The

averages in MACD have gone above the zero line indicating a bullish reversal. So, though the overall trend remains bullish, but possibility of a downward correction is likely in the coming sessions.

CONCLUSION:

Both the domestic and international prices have corrected lower from recent highs, more so the domestic prices. Potential exists for prices to correct even lower in the coming weeks for Gujarat- ICS. But such a correction does not necessarily alter the uptrend significantly. Supports are seen both for ICE March cotton futures at 87-88 followed by 84-85c and for Gujarat-ICS-105 29mm at 11,350 followed by 11,000/ qtl levels. The Guj-ICS-105 29mm could initially correct sharply lower towards 11,000 /qtl levels. This is our favoured view. Only an unexpected rise above 12,100/ qtl could change the picture to bullish again.

Legacy

- Shri Shripatlal Bangdiwala

Born on August 5, 1917, in Surat, Shri Shripatlal Bangdiwala never had it easy and his struggles began from a young age itself. He was very young, when his father Shri Surchandlal Bangdiwala passed away, leaving the 10-year-old Shripatlal to shoulder the responsibility of his 28-year-old widowed mother and three younger siblings. It is said that the child maketh a man, and young Shripatlal showed his indomitable spirit when he would attend school as well as trudge three miles daily to get the family's meagre daily ration of Rs. 3 from an uncle. Always a bright student he did not let the family's dire financial straits deter him, and continued to study through hard won scholarships. His maternal uncle, Shri Champaklal Zaveri who was based in Bombay saw the potential in this bright nephew, and brought him to the metropolis, where he completed his B.Com from Sydenham College.

His family business was selling bangles, as the surname connotes, and even now there is a lane in Surat named 'Bangdiwala no Khacho'. However, Shri Shripatlal decided to chart his own destiny and jumped at the opportunity when a vacancy became available at the Baroda State Cotton Market Union, in Surat, in the year 1939. His first salary here was the princely sum of Rs. 60 per month. By 1942 he had moved to Bombay to work in Navnitlal Mahavir Prasad & Company. His salary was now Rs. 90 per month. During his almost 20-years stint here, he travelled widely to places like Amravati, Akola and Wardha, on work. As a cotton salesman, he made purchases for three cotton mills - Prahlad Milla, Hirji Mills and Colaba Mills.

In 1962, the company stopped business and Shri Shripatlal started a cotton brokerage business, B. Shripatlal Bangdiwala & Co., Cotton Merchant & Commission Agent, for many upcountry cotton merchants. He supplied cotton not just to Bombay mills but also to a few mills all over in India. He was founder member of the Bombay Ready Cotton Brokers Association along with Shri Manubhai Marfartia, Shri Devjibhai Patel, Shri Pranlalbhai Damani and Shri Chimambhai Dani and other members. Such was his affable nature and his popularity, that he was unanimously elected every year for almost 30 years! He was also presented a Lifetime Achievement Award from the Bombay Ready Cotton Brokers Association, on July 27, 2002.

Married in 1937 to Manjulaben, the couple had six children-threesons and threedughters, and the family continued to live in three rooms, in Jadav Bhuvan, in Dadar. 'That's because my father never chased after money,' says his eldest son, Shri Bhadrakumar.



Shri Shripatlal Bangdiwala receiving the Lifetime Achievement Award from the Bombay Ready Cotton Brokers Association in 2002

"He has lived an extremely hard life," says his daughter-in-law Nitaben. "There were no couriers in those days, so he would have to go to railway stations at all times of the day or night to collect deliveries of the cotton samples. There was no telephone facility in the office, so he would frequent PCOs to make urgent calls. But his immense faith in God, saw him overcoming all obstacles."

While his three sons, Bhadrakumar, Pankaj and Manoj have joined the business and taken it to new heights of success, his love for academics has been reflected in the achievements of his three daughters. While daughter Vasanti did her MA, Vidula completed her MSc and went on to acquire a P.HD in the USA, and Geeta has done her MA.

Extremely non interfering, he hardly came to office once his sons took over the reins of the business. The only advice he ever gave his son when they joined the business was - "I don't want you ever to lie or cheat. Let go of the money, but no fighting. It's ok if you lose money, but I never want anybody complaining to me that one of my sons has lied or cheated."

This advice was very much in keeping with his deeply spiritual nature. In 1996, he started a Jain religious school in Surat called Mahima Vijay Jain Dharmik Pathshala. Here free religious education is given to both boys and girls. In addition, students excelling in their daily lessons are given a daily allowance ranging from Rs. 2 to Rs. 10. Since 1975, he has led a semi retired life, not interfering in the business but preferring to concentrate on religious activities.

When CAI President, Shri Dhiren Sheth decided to make Independence Day a special event at the Association, by requesting senior members to hoist the flag, Shri Shripatlal, then 93-years-old, was the first senior member chosen for the honour, in 2009.

Still alert, this 97-year-old veteran has no trouble remembering the cotton market in 1940. Like, for instance, that the cotton price in 1940 was Rs. 150 per khandi of Bengal Cotton, and when he retired, the prices ranged from Rs. 700 to Rs. 900 per khandi!

His advice to the present cotton fraternity is simply, "There should be total honesty and trust among the members."

Written by Jayashree Menon



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Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Strength /GPT	24th	25th	26th	27th	28th	29th
1	P/H/R	ICS-101	Fine	Below 22mm	5.0-7.0	15	10826 (38500)	10686 (38000)	10686 (38000)	10686 (38000)	10686 (38000)	10686 (38000)
2	P/H/R	ICS-201	Fine	Below 22mm	5.0-7.0	15	10967 (39000)	10826 (38500)	10826 (38500)	10826 (38500)	10826 (38500)	10826 (38500)
3	GUJ	ICS-102	Fine	22mm	4.0-6.0	20	7536 (26800)	7452 (26500)	7508 (26700)	7452 (26500)	7452 (26500)	7452 (26500)
4	KAR	ICS-103	Fine	23mm	4.0-5.5	21	8717 (31000)	8717 (31000)	8717 (31000)	8661 (30800)	8661 (30800)	8661 (30800)
5	M/M	ICS-104	Fine	24mm	4.0-5.0	23	10348 (36800)	10404 (37000)	10404 (37000)	10348 (36800)	10348 (36800)	10348 (36800)
6	P/H/R	ICS-202	Fine	26mm	3.5-4.9	26	11895 (42300)	11754 (41800)	11867 (42200)	11867 (42200)	11867 (42200)	11867 (42200)
7	M/M/A	ICS-105	Fine	26mm	3.0-3.4	25	10770 (38300)	10686 (38000)	10742 (38200)	10686 (38000)	10686 (38000)	10686 (38000)
8	M/M/A	ICS-105	Fine	26mm	3.5-4.9	25	10911 (38800)	10854 (38600)	10911 (38800)	10854 (38600)	10854 (38600)	10854 (38600)
9	P/H/R	ICS-105	Fine	27mm	3.5-4.9	26	11923 (42400)	11810 (42000)	11923 (42400)	11923 (42400)	11923 (42400)	11923 (42400)
10	M/M/A	ICS-105	Fine	27mm	3.0-3.4	26	11051 (39300)	10967 (39000)	11023 (39200)	10967 (39000)	10967 (39000)	10967 (39000)
11	M/M/A	ICS-105	Fine	27mm	3.5-4.9	26	11192 (39800)	11164 (39700)	11220 (39900)	11164 (39700)	11164 (39700)	11164 (39700)
12	P/H/R	ICS-105	Fine	28mm	3.5-4.9	27	12204 (43400)	12092 (43000)	12204 (43400)	12204 (43400)	12204 (43400)	12204 (43400)
13	M/M/A	ICS-105	Fine	28mm	3.5-4.9	27	11389 (40500)	11360 (40400)	11417 (40600)	11360 (40400)	11360 (40400)	11360 (40400)
14	GUJ	ICS-105	Fine	28mm	3.5-4.9	27	11726 (41700)	11614 (41300)	11670 (41500)	11614 (41300)	11614 (41300)	11614 (41300)
15	M/M/A/K	ICS-105	Fine	29mm	3.5-4.9	28	11670 (41500)	11614 (41300)	11670 (41500)	11614 (41300)	11614 (41300)	11614 (41300)
16	GUJ	ICS-105	Fine	29mm	3.5-4.9	28	11867 (42200)	11754 (41800)	11810 (42000)	11754 (41800)	11754 (41800)	11754 (41800)
17	M/M/A/K	ICS-105	Fine	30mm	3.5-4.9	29	11810 (42000)	11726 (41700)	11782 (41900)	11726 (41700)	11726 (41700)	11726 (41700)
18	M/M/A/K/T/O	ICS-105	Fine	31mm	3.5-4.9	30	11951 (42500)	11867 (42200)	11923 (42400)	11867 (42200)	11867 (42200)	11867 (42200)
19	A/K/T/O	ICS-106	Fine	32mm	3.5-4.9	31	12176 (43300)	12148 (43200)	12204 (43400)	12148 (43200)	12148 (43200)	12148 (43200)
20	M(P)/K/T	ICS-107	Fine	34mm	3.0-3.8	33	17350 (61700)	17153 (61000)	17153 (61000)	17013 (60500)	17013 (60500)	17013 (60500)

(Note: Figures in bracket indicate prices in Rs./Candy)