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A Background Note on BT Cotton in India

GUEST COLUMN

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Cotton has been considered an important cash crop in the agrarian economy of India. The Indian sub-continent has a long history of cultivating traditional varieties of cotton. It is believed that cotton was first cultivated in the Indus-Delta, and the first evidence of cotton use found in India dates back to 6000 BC. The work on varietal improvement of cotton was initiated way back in 1904, and further strengthened with the constitution of Indian Central Cotton Committee (ICCC) in 1923. With the inception of All India Coordinated Cotton Improvement Project (AICCIP) in April 1967, the varietal improvement work gained momentum.

The world's first cotton hybrid "H 4" was released from the Cotton Research Station of Gujarat Agricultural University, Surat, in 1970 and soon became extremely popular among farmers because of its high yielding potential and wide adaptability. Subsequently, large numbers of hybrids were released. Still cotton continued to be a highly vulnerable crop due to its high susceptibility to diseases and insect-pests like bollworm, whitefly, aphids, sucking pests, etc., which used to cause severe yield loss in the crop. This resulted in indiscriminate use of highly toxic insecticide/ pesticide (in India about 45 percent of total crop pesticide application, used to be on cotton) gradually developed resistance in bollworms and white fly.

About BT Cotton

Bt cotton is a genetically modified organism (GMO) cotton variety, which produces an insecticide to kill bollworm. It is produced by the gene coding technique by inserting Bt toxin into cotton as a transgenic that causes it to produce this natural insecticide in its tissues.

The Bt toxin is obtained from the strains of the bacterium Bacillus thuringiensis which is only harmful to different insects including larvae of moths and butterflies, cotton bollworms, beetles but are harmless to other forms of life.

Gene and its Incorporation:

- Gene: Cry1A (c).
- Donor: Bacillus *thuringiensis* var. kurstaki (B.t.k.) strain HD73.
- Agro-bacterium *tumefician*s mediated transformation used.
- Coker 312 transformed.

How It Works

Bt cotton was created through the addition of genes encoding toxin crystals in the Cry group of endotoxin. When insects attack and eat the cotton plant, the Cry toxins are dissolved due to the high pH level of the insect's stomach. The dissolved and activated Cry molecules bond to cadherin-like proteins on cells comprising the brush border molecules. The epithelium of the brush border membranes separates the body cavity from the gut while allowing access for nutrients. The Cry toxin molecules attach themselves to specific locations on the cadherin-like proteins present on the epithelial cells of the midge and ion channels are formed which allow the flow of potassium. Regulation of potassium concentration is essential, and if left unchecked, causes the death of cells. Due to the formation of Cry ion channels, sufficient regulation of potassium ions is lost and results in the death of epithelial cells. The death of such cells creates gaps in the brush border membrane.

Description

Strains of the bacterium Bacillus thuringiensis produce over 200 different Bt toxins, each harmful to different insects. Most notably, Bt toxins are insecticidal to the larvae of moths and butterflies, beetles, cotton bollworms and flies but are harmless to other forms of life, as mentioned above. The gene coding for Bt toxin has been inserted into cotton as a transgenic, causing it to produce this natural insecticide in its tissues. In many regions, the main pests in commercial cotton are lepidopteron larvae, which are killed by the Bt protein in the genetically modified cotton they eat.

Categorisation of Released Transgenic Hybrids

The transgenic hybrids released in the country can be categorised in different ways on the basis of transgenic involved. They can be categorised in to two groups viz.,

(i) BollgardI (single gene) and

(i) Bollgard II (double gene)

And based on species involved these can again be classified into two distinct types

(i) Intra-*hirsutum*

(ii) Inter-specific hybrids (*hirsutum* x *barbadense*).

Why Do We Need Bt Cotton?

Natural insecticide produced in tissues of GM crops eliminates the need to use large amounts of broad-spectrum insecticides to kill lepidopteron pests (some of which have developed parathyroid resistance). This spares natural insect predators in the farm ecology and further contributes to non-insecticide pest management.

About 162 species of insects occur in cotton at various stages of growth, out of which 15 are key pests. Before the introduction of Bt cotton, insecticide quantity applied on cotton was the highest, relative to other cultivated crops. About 9400 metric tons of insecticides worth Rs. 747 crores were used only for bollworm control in 2001, as mentioned by Dr. K. R. Kranthi, Ex Director CICR, Nagpur. Subsequently, it reduced drastically once Bt cotton cultivation started.

History Of Bt Cotton

Bt was first discovered by a Japanese scientist Isiwata in 1901. The Bt gene Cry1Ac was used to

develop the first Bt cotton variety. Bt cotton was first approved for field trials in the United States in 1993, and first approved commercial use in the United States in 1995. Bt cotton was approved by the Chinese government in 1997.

In 2002, a joint venture between Monsanto and MAHYCO introduced Bt cotton to India.

In 2011, India grew the GM cotton crop on 10.6 million hectares. The U.S. GM cotton crop was 4.0 million hectares, the second largest area in the world, followed by China with 3.9 million hectares and Pakistan with 2.6 million hectares. By 2014, 96% of cotton grown in the United States was genetically modified and more than 93% of cotton grown in India was GM.

Bt Events in India:

- First event known as Bollgard I (BGI), featuring the Cry1Ac gene was developed by MAHYCO sourced from Monsanto and approved for sale.
- The second event, Bollgard II (BG II with event MON 15985) also developed by MAHYCO and sourced from Monsanto, featured the stacked genes Cry1Ac and Cry2Ab, was approved for sale for the first time in a total of seven hybrids for use in the Central and South regions.
- The third event, known as Event 1 was developed by IIT, Kharagpur, and adopted by JK seeds featuring the Cry1Ac gene, and approved for sale for the first time in a total of four hybrids for use in North, Central and South regions during 2006.
- The fourth and last event, the GFM event was developed by Nath Seeds, sourced from China, featured the fused genes Cry1Ab and Cry1Ac and approved for sale for the first time in a total of three hybrids, one in each of the three regions of India during 2006.

Chronology of Bt Cotton in India

March 10, 1995: Department of Biotechnology (DBT) of the Government of India permitted import of 100 gm of transgenic Cocker-312 variety of cottonseed cultivated in the United States by MAHYCO. This variety contained the Cry 1 Ac gene from the bacterium Bacillus thuringiensis.

April 1998: Monsanto-MAHYCO tied up. Monsanto was given permission for small trials of Bt cotton 100 gm per trial by Department of Biotechnology (DBT).

January 8, 1999: Review Committee for Genetic Manipulation (RCGM) expressed satisfaction over the trial results at 40 locations.

April 12, 1999: RCGM directed MAHYCO to submit applications for trials at 10 locations, before Monitoring & Evaluation Committee (MEC).

2000-2002: ICAR trials were conducted at different All India Coordinated Cotton Improvement Project (AICCIP) centers of Central and South Zone locations.

February 20, 2002: The Indian Council of Agricultural Research (ICAR) submitted a positive report to the Ministry of Environment on the field trials of Bt cotton. With this, it was expected that the Genetic Engineering and Approval Committee (GEAC) of the environment ministry would approve commercial use of Bt cotton soon.

March 25, 2002: Commercial Release of Bt Hybrids in India.

- The Government of India through GEAC, Ministry of Environment and Forests considered the proposal for the commercial release of Bt cotton in its meeting held on 25th March, 2002. After the careful and in-depth consideration, accorded approval for release of Bt cotton (with Cry1Ac gene), which confers resistance to Lepidopteron pests of cotton. Initially, approval was accorded only for the Central (Gujarat, Maharashtra and Madhya Pradesh) and South zone states (Tamil Nadu, Andhra Pradesh and Karnataka).
- GEAC had approved the commercial cultivation of Bt cotton in North zone from the year 2005-06 and the permissions had been granted to the four seed companies including MAHYCO-Monsanto.
- During 2007-08, GEAC approved the Boll Gard II (BG II). Three Bt (BG II) cotton hybrids of M/s. MAHYCO were also approved for their commercial cultivation

Area Coverage Under Bt Cotton

In India, the area under Bt cotton hybrid has increased from a mere 0.294 lakhs ha during 2002 to 10.148 lakhs ha in 2005. It was observed that in the year 2006-07, the area under Bt cotton has increased to 34.61 lakhs ha which was more than 3 times. Nearly 93.14 per cent of the country's cotton area during 2014-15 was covered by Bt hybrids. Bt technology has helped India to treble its cotton output from 13 million bales in 2002 (when it was introduced) to about 40 million bales in 2014.

India – Largest Cotton Producing Country

The use of Bt cotton in India has grown exponentially since its introduction in 2002. Recently, India has become largest cotton producer in the world. Socio-economic surveys confirm that Bt cotton continues to deliver significant and multiple agronomic, economic, environmental and welfare benefits to Indian farmers and society, including halved insecticide requirements and a doubling of yields till the recent past. But since the last couple of years, Pink bollworm and whitefly attack on Bt cotton has become a matter of concern.

Bt Seeds – Lost Vigour

Monsanto's cotton seeds incorporated the Cry1Ac gene from the soil bacterium Bacillus thuringiensis (Bt), making the cotton toxic to bollworms, lose its vigour after one generation. In parts of India, cases of acquired resistance against Bt cotton have occurred. Monsanto has admitted that the pink bollworm is resistant to the first generation transgenic Bt cotton that expresses the single Bt gene (Cry1Ac).

Bt Cotton Variety Release

Being hybrids, Bt seeds are expensive. This prompted the Indian Council of Agricultural Research (ICAR) and State Agricultural Universities (SAUs) to develop cheaper Bt cotton varieties instead of Bt hybrids. Farmers can use their own seeds of these Bt varieties rather than buying new seeds of Bt hybrids every year.

ICAR has identified three varieties, namely PAU Bt 1, F1861 and RS 2013, for cultivation in Punjab, Haryana, Rajasthan. It is a cheaper alternative to Bt cotton hybrid seed.

Committees Associated in Transgenic Crops

- Genetic Engineering Approval Committee (GEAC) under Ministry of Environment and Forests
- Multi-Ministry Committee (Health, Agriculture, etc)
- Review Committee of Genetic Manipulations (RCGM) under Ministry of Science & Technology (DBT)
- Senior Scientists from various Research Institutes
- Institutional Bio-safety Committee (IBSC)
- Applicant's committee includes DBT nominee and external independent members
- Monitoring and Evaluation Committee (MEC)
- State Biotechnology Co-ordination Committee (SBCC) headed by the Chief Secretary of the State.
- District Level Committee (DLC) headed by the District Magistrate.

Cultivation of BT Cotton Prior to 2002 (Before Approval)

The survey revealed that around 16.13% of the sampled farmers were cultivating Bt-cotton even before the formal approval in 2002. The farmers of Andhra Pradesh took a lead where 47% of the respondent reported to have cultivated Bt-cotton before 2002. This was followed by farmers of Gujarat and Punjab where 30% & 21% respectively, reported to be cultivating Bt-cotton prior to 2002. This happened as spurious seeds were believed to have been introduced in India even before approval of Bt cotton for commercial production by Genetic-Engineering-Approval-Committee (GEAC), under the Ministry Of Environment & Forests, Government of India.

Controversies

Despite widespread adoption of genetically modified cotton, heated controversies about their advantages and disadvantages continued. Even though the performance of Bt cotton has been estimated to be satisfactory by the Government, great discontent and strong views both for and

against Bt technology have surfaced in different regions regarding Bt cotton.

The voices against Bt cotton raised various issues like:

- Concern over spreading of the gene/ toxin.
- Unforeseen long-term impact on the ecosystem.
- Farmer need to purchase expensive seeds from private companies every year.
- Monopoly of the private companies on Bt seed market.
- Bt seed cake might cause harm to animals.
- Loss in biodiversity in the country.
- Resistance development in insects leading to tedious task to control pests.

BT Cotton v/s Pink Bollworm / Whitefly

Genetically modified or Bt cotton is no longer resistant to PBW.

Even during 2017, pink bollworm (PBW) attacked cotton, especially in Maharashtra and also in Telangana, Andhra Pradesh and Karnataka. The infestation of this insect pest (whose larvae bore into cotton bolls through the lint fibre to feed on the seeds) happened during October, just when the crop was maturing and almost ready for its first-flush pickings. It was further aggravated by unseasonal rains at that point.

Any technology, gets obsolete with time, thus requiring replacement, including upgraded versions. The second-generation BG-II Bt cotton was introduced in India in 2006, four years after commercialisation of the original Bollgard technology. Isn't it strange that the last 15 years had seen just one technology with an upgraded version being commercialized in the agro-biotech field? Bt cotton, moreover, targeted specific pests – namely, insects of the heliothis species.

Bt cotton is vulnerable to whitefly attack too. This has been more serious in North India since 2015-16. Pesticides sprayed against whitefly are more harmful to its natural enemies. Whitefly causes more damage to Bt cotton when monsoon have failed / delayed.

Technologies to Tackle PBW

While there is no alternative to continuous focus on research and long-term policies supportive of new technologies with science-based evaluation, the threat posed by PBW can be tackled, (may be in the short term) through a sustained campaign focusing on breaking the life cycle of the pest. Various measures that may enable managing the pest problem, at least in the coming season or two, are as follows:

- Adoption of crop rotation
- Complete ban on hybrids not approved for commercial cultivation
- No cultivation of long duration Bt hybrids
- By ensuring that the previous crop is not just terminated by end-January or mid-February but also its stalks be utilised for pellet making, fuel briquettes and other purposes
- To adopt technique of at least two deep ploughings during the prior summer period, so as to destroy all crop residues and obtain the advantages of natural soil solarization
- By installation of light/ pheromone traps near cotton godowns, ginneries and market yards to attract post-season moths
- Cultivation of only recommended hybrids/ varieties ideally which are of 140-160 days duration and resistant to pests
- Use Bt seeds supplied by companies with established R&D facilities etc.

Coverage Under BT Cotton

Bt cotton was planted on about 117 lakh hectares out of total area of about 125 lakh ha covered under cotton in India during 2017-18 thus whopping 93.6% per cent of the country's total area was under this crop. Area under Bt cotton in India was 119.40 lakh ha out of 128.19 lakh ha (93.14%) during 2014-15

This article is based on information I have gathered during my lifelong service in R&D activities on cotton and collected from public & private publications, for the benefit of our readers.

(The views expressed in this column are of the author and not that of Cotton Association of India)

Consumption Projected at a Record 27.5 Million Tonnes in 2018/19

International cotton prices have risen in 2017/18 reaching a high of 101.7 cents/pound in mid-June based on the early projections of tightening supplies in 2018/19 with strong global demand coupled with lower expected production. As global trade tensions actualised in the beginning of July, prices moved downward to 92 cents per pound, yet still above the season average of 88 cents per pound. Even with tariffs enacted on a range of goods including cotton by China, the world's leading importer, on the USA, the world's leading cotton exporter, prices recovered, moving upward to close the season at 98.7 cents per pound reflecting strong demand particularly in Asia and Southeast Asia. Although global trade relations are showing little improvement, with the possibility of escalation and the addition of tariff lines, global economic expansion is expected to continue albeit less evenly across regions, with Asia expecting the most robust growth.

While global stocks are expected to increase to 19.3 million tonnes in 2017/18 based on global production outpacing consumption, stocks in China have decreased to 9.2 million tonnes with stocks outside of China increasing to 10.1 million tonnes. Global demand in 2017/18 has increased 8% to 26.38 million tonnes. Consumption in China on four years of growth, has increased 8% from the previous season to 8.65 million tonnes with imports increasing 24% to 1.36 million tonnes. Consumption in India, the world's second largest consumer of cotton with a textile industry not dependent upon imports, is expected to remain stable at 5.2 million tonnes. Consumption in Pakistan is expected to increase 9% to 2.35 million tonnes while consumption in Bangladesh is expected to increase 18% to 1.66 million tonnes. Consumption in Vietnam is expected to increase 35% to 1.58 million tonnes.

Global production in 2017/18 has increased 16% to 26.87 million tonnes with production increases expected from all major producers including India, China, USA, Brazil, Pakistan, West Africa, Turkey, Australia and Uzbekistan, accounting for 90% of global production. Broadly speaking, production increases have come from increases in harvested areas and favourable weather conditions as global yields have remained stable with a marginal increase of 1%.

While higher cotton prices have traditionally driven planting decisions, environmental conditions and water availability remain influencing factors for production in the 2018/19 season with several major producers projecting reductions in cotton area. India, leading the world with area under cotton, is projected to harvest 11.9 million hectares, a 3% decrease, with farmers planting on fewer hectares following losses from the previous seasons pest issues. While the Cotton Corporation of India increased the Minimum Support Price (MSP) for cotton, MSPs for other commodities have also been increased and thus unlikely to influence cotton area in the short term. Harvested area in the USA is expected to decrease 5% to 4.25 million hectares due to ongoing drought conditions and potential pest issues. Cotton area in China is expected to remain relatively stable with 3.3 million hectares in 2018/19.

ICAC

With trade issues affecting the export market, USA cotton may be less attractive to Chinese buyers at a 25% premium. USA cotton may be more competitive in other markets, while other leading exporters may find greater demand from China. An overall global environment of strong cotton demand may indicate an opportunity for new patterns of trade for export markets. Production increases in 2018/19 are expected in Brazil where additional land is available for cotton while production is expected to decrease considerably in Australia to 630,000 tonnes based on projected water availability. With stronger investment, West Africa production is expected to increase 13% in 2018/19 to 1.3 million tonnes.

Global production in 2018/19 is currently projected at 25.9 million tonnes which would represent a 4% decrease. Global consumption is currently projected to increase 4% to 27.5 million tonnes exceeding the previous high of 26.7 million tonnes in 2007/08. With global consumption at a new high, pressure on stocks is expected to reduce the global reserve by 1.6 million tonnes to finish the 2018/19 season at 17.7 million tonnes. Stocks in China are projected to reduce to 7.5 million tonnes continuing five years of decline, while stocks outside are currently expected to remain stable at 10.2 million tonnes.

Source : ICAC Cotton This Month, August 1, 2018

Supply and Distribution of Cotton

August 1, 2018

Seasons begin on August 1 — Million Metric Tons

	2013/14	2014/15	2015/16	2016/17 Est.	2017/18 Est.	2018/19 Proj.
BEGINNING STOCKS						
WORLD TOTAL	**19.428**	**21.331**	**22.967**	**20.312**	**18.80**	**19.29**
China	10.811	13.280	14.118	12.650	10.63	9.22
USA	0.827	0.512	0.795	0.827	0.60	0.90
PRODUCTION						
WORLD TOTAL	**26.225**	**26.235**	**21.476**	**23.075**	**26.87**	**25.89**
India	6.766	6.562	5.746	5.865	6.35	6.05
China	7.000	6.600	5.200	4.900	5.89	5.72
USA	2.811	3.553	2.806	3.738	4.56	4.03
Pakistan	2.076	2.305	1.537	1.663	1.80	2.00
Brazil	1.734	1.563	1.289	1.530	1.96	2.02
Uzbekistan	0.910	0.885	0.832	0.789	0.80	0.80
Others	4.928	4.767	4.066	4.590	5.51	5.26
CONSUMPTION						
WORLD TOTAL	**24.101**	**24.587**	**24.139**	**24.516**	**26.38**	**27.46**
China	7.600	7.550	7.600	8.000	8.65	8.95
India	5.087	5.377	5.296	5.148	5.20	5.25
Pakistan	2.470	2.467	2.147	2.147	2.35	2.46
Europe & Turkey	1.611	1.692	1.687	1.612	1.63	1.85
Bangladesh	1.129	1.197	1.316	1.409	1.66	1.81
Vietnam	0.673	0.875	1.007	1.168	1.58	1.73
USA	0.773	0.778	0.751	0.708	0.73	0.74
Brazil	0.862	0.797	0.660	0.690	0.72	0.73
Others	3.896	3.854	3.675	3.635	3.85	3.93
EXPORTS						
WORLD TOTAL	**9.015**	**7.764**	**7.532**	**8.185**	**9.08**	**9.47**
USA	2.293	2.449	1.993	3.248	3.53	3.27
India	2.015	0.914	1.258	0.991	1.13	1.13
CFA Zone	0.973	0.966	0.963	0.972	1.04	1.30
Brazil	0.485	0.851	0.939	0.607	0.93	1.12
Uzbekistan	0.615	0.550	0.500	0.403	0.30	0.39
Australia	1.058	0.527	0.616	0.812	0.91	0.79
IMPORTS						
WORLD TOTAL	**8.858**	**7.800**	**7.575**	**8.125**	**9.08**	**9.47**
Bangladesh	1.112	1.183	1.378	1.412	1.67	1.80
Vietnam	0.687	0.934	1.001	1.198	1.57	1.72
China	3.075	1.804	0.959	1.096	1.36	1.55
Turkey	0.924	0.800	0.918	0.801	0.82	0.83
Indonesia	0.651	0.728	0.640	0.746	0.80	0.83
TRADE IMBALANCE 1/	**-0.157**	**0.036**	**0.042**	**-0.060**	**0.00**	**0.00**
STOCKS ADJUSTMENT 2/	**-0.063**	**-0.047**	**-0.034**	**-0.013**	**0.00**	**0.00**
ENDING STOCKS						
WORLD TOTAL	**21.331**	**22.967**	**20.312**	**18.798**	**19.29**	**17.71**
China	13.280	14.118	12.650	10.632	9.22	7.52
USA	0.512	0.795	0.827	0.599	0.90	0.92
ENDING STOCKS/MILL USE (%)						
WORLD-LESS-CHINA 3/	**49**	**52**	**46**	**49**	**57**	**55**
CHINA 4/	**175**	**187**	**166**	**133**	**107**	**84**
COTLOOK A INDEX 5/	**91**	**71**	**70**	**83**	**88**	

1/ The inclusion of linters and waste, changes in weight during transit, differences in reporting periods and measurement error account for differences between world imports and exports.
2/ Difference between calculated stocks and actual; amounts for forward seasons are anticipated.
3/ World-less-China's ending stocks divided by World-less-China's mill use, multiplied by 100.
4/ China's ending stocks divided by China's mill use, multiplied by 100.
5/ U.S. Cents per pound

Source : ICAC Cotton This Month, August 1, 2018

UPCOUNTRY SPOT RATES

(Rs./Qtl)

Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Strength /GPT	Spot Rate (Upcountry) 2017-18 Crop AUGUST 2018 6th	7th	8th	9th	10th	11th
	Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [By law 66 (A) (a) (4)]											
1	P/H/R	ICS-101	Fine	Below 22mm	5.0-7.0	15	12598 (44800)	12598 (44800)	12598 (44800)	12598 (44800)	12598 (44800)	12598 (44800)
2	P/H/R	ICS-201	Fine	Below 22mm	5.0-7.0	15	12738 (45300)	12738 (45300)	12738 (45300)	12738 (45300)	12738 (45300)	12738 (45300)
3	GUJ	ICS-102	Fine	22mm	4.0-6.0	20	9280 (33000)	9420 (33500)	9420 (33500)	9420 (33500)	9420 (33500)	9392 (33400)
4	KAR	ICS-103	Fine	23mm	4.0-5.5	21	10179 (36200)	10236 (36400)	10236 (36400)	10236 (36400)	10236 (36400)	10208 (36300)
5	M/M	ICS-104	Fine	24mm	4.0-5.0	23	11107 (39500)	11164 (39700)	11164 (39700)	11164 (39700)	11164 (39700)	11135 (39600)
6	P/H/R	ICS-202	Fine	26mm	3.5-4.9	26	12879 (45800)	12935 (46000)	12935 (46000)	12935 (46000)	12935 (46000)	12879 (45800)
7	M/M/A	ICS-105	Fine	26mm	3.0-3.4	25	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)	11079 (39400)
8	M/M/A	ICS-105	Fine	26mm	3.5-4.9	25	11360 (40400)	11360 (40400)	11360 (40400)	11360 (40400)	11360 (40400)	11332 (40300)
9	P/H/R	ICS-105	Fine	27mm	3.5.4.9	26	12935 (46000)	12991 (46200)	12991 (46200)	12991 (46200)	12991 (46200)	12935 (46000)
10	M/M/A	ICS-105	Fine	27mm	3.0-3.4	26	11585 (41200)	11585 (41200)	11585 (41200)	11585 (41200)	11585 (41200)	11557 (41100)
11	M/M/A	ICS-105	Fine	27mm	3.5-4.9	26	11951 (42500)	11951 (42500)	11951 (42500)	11951 (42500)	11951 (42500)	11923 (42400)
12	P/H/R	ICS-105	Fine	28mm	3.5-4.9	27	12991 (46200)	13048 (46400)	13048 (46400)	13048 (46400)	13048 (46400)	12991 (46200)
13	M/M/A	ICS-105	Fine	28mm	3.5-4.9	27	12935 (46000)	12935 (46000)	12935 (46000)	12935 (46000)	12935 (46000)	12907 (45900)
14	GUJ	ICS-105	Fine	28mm	3.5-4.9	27	13216 (47000)	13273 (47200)	13273 (47200)	13273 (47200)	13273 (47200)	13244 (47100)
15	M/M/A/K	ICS-105	Fine	29mm	3.5-4.9	28	13357 (47500)	13413 (47700)	13413 (47700)	13413 (47700)	13441 (47800)	13413 (47700)
16	GUJ	ICS-105	Fine	29mm	3.5-4.9	28	13526 (48100)	13582 (48300)	13582 (48300)	13582 (48300)	13582 (48300)	13554 (48200)
17	M/M/A/K	ICS-105	Fine	30mm	3.5-4.9	29	13638 (48500)	13694 (48700)	13694 (48700)	13694 (48700)	13723 (48800)	13694 (48700)
18	M/M/A/K/T/O	ICS-105	Fine	31mm	3.5-4.9	30	13863 (49300)	13919 (49500)	13919 (49500)	13919 (49500)	13919 (49500)	13891 (49400)
19	A/K/T/O	ICS-106	Fine	32mm	3.5-4.9	31	14397 (51200)	14454 (51400)	14454 (51400)	14454 (51400)	14454 (51400)	14426 (51300)
20	M(P)/K/T	ICS-107	Fine	34mm	3.0-3.8	33	17659 (62800)	17716 (63000)	17491 (62200)	17491 (62200)	17266 (61400)	17041 (60600)

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