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# Why this Kolaveri-di syndrome in cotton?

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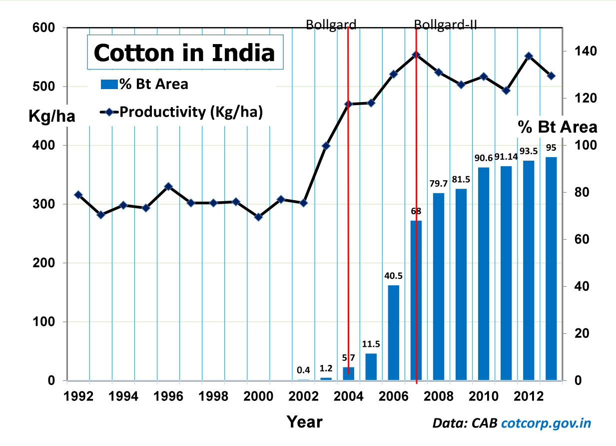
On 16th November 2011, A Tanglish (Tamil-English) song 'Why this Kolaveri di' sung by film star Dhanush, went viral on the net. I learnt that 'Kolaveri' meant 'urge to kill'. While I heard the song, it occured to me that in India, we actually kill good technologies with a drive for 'Kolaveri' over-kill much before they are destined for a natural death. The genetically modified (GM) Bt (Bacillus thuringiensis) based Bt-cotton is one such good technology that is being dragged to the altar due to the Kolaveri syndrome. Other technologies such as hybrids, new GM genes, insecticides and fertilizers are also pushed under the Damocles' sword.

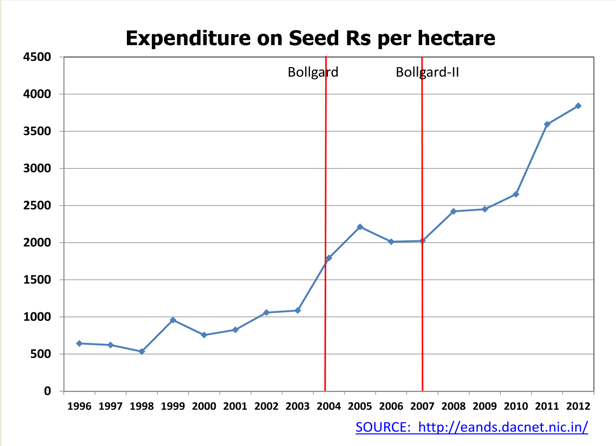
But, we haven't as yet lost the battle. Bt continues to do its job of keeping the dreaded bollworms under control. Despite the hue and cry with whitefly in Punjab this year, whatever one might say, this year, India is poised for a good record yield that would get close to 400 lakh bales. I have no hesitation in saying that India could have harvested more, much more than the current low national average of 500 kg lint per hectare. How do we do it and when? If China can get 400 lakh bales from 44 lakh hectares, why can't India do the same from its 54 lakh hectares of irrigated cotton out of its total 128 lakh hectares of area under cotton? Whatever cotton we may get from the remaining rain-fed 74 lakh hectares would be an additional bonus. I realise that many colleagues get uncomfortable with the thought that the conditions in other countries are completely different and cannot be compared with India. But, the fact is that India has the best of all ideal conditions as are required for cotton, -better than those that any country can ever have for cotton cultivation. In fact, the dry regions of Vidarbha and Telangana with good sunshine, heat units and assured rainfall of 600-900 mm during the kharif season are ideal for great cotton yields. If anything, many major cotton growing countries suffer from climate related disadvantages for cotton cultivation. For example, Brazil has excess rain of about 2000 mm that is not at all suited for cotton. China has odd rainfall distribution in its cotton regions and lesser sunshine in its northern regions, which are not actually good for cotton. There are many such examples, where the yields are high in regions with climate that is not very suitable for cotton. Then how is it that these countries harvest more than three-fold as compared to India?

**EXPERT's Column**

Dr K.R. Kranthi

The simplest answer is: short duration varieties. It is easier to fit a short duration variety into a window where the weather conditions in a short frame of time can be suitable for its production. The average range of cotton duration in the major cotton growing countries such as China, US, Australia, Mexico and Brazil is about 140 to 180 days. Indian cotton is cultivated for 180 to 240 days. Some farmers even extend the crop all round the year. I dwelt on this aspect in my previous articles. I firmly believe that the answers for India's cotton problems are: short duration varieties + early sowing + resistance to sap sucking pests + compact architecture + high density planting of at least 40,000 per acre. If the varieties are endowed with any good technology such as Bt, we win the battle hands down, primarily because it helps in working into the mindset of farmers who have seen the Bt benefits for bollworm control. Farmers wouldn't be worried about bollworms and it would be easily possible to grow the short duration, sucking pest resistant Bt




cotton varieties with least chemical inputs for very high yields. While ICAR-CICR is working its way to give shape to these ideas, let me get back to the Kolaveri syndrome again, with an idea to sensitise whoever matters on what is going wrong in the cotton fields in India.

## THE HYBRID SATURATION KOLAVERI

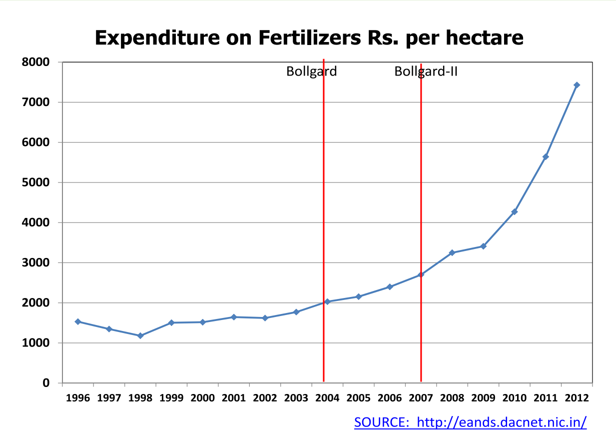
With 95% area under Bt-cotton and more than 1600 Bt-hybrids, the technology developers and the seed companies are overzealously hell bent for overkill –the Kolaveri effect. Knives are getting closer to the golden goose. These days, hundreds of hybrids are created each year, but most of them die as a name even before they are born. It looks more like a lottery ticket. When any one hybrid clicks, the company goes full throttle for a couple of years. Then one fine day the hybrid is replaced by another lottery winner. Many a times, scientists are asked as to why a set of package of practices are not standardised for the Bt-hybrids? I wonder, if this could work at all, with hundreds of new hybrids with odd characteristics of differing growth habit, different duration under different conditions and all of them competing with each other for the same space? It is difficult for any scientist to standardise any kind of package of practices for such ephemeral systems where even the best of hybrids do not live for more than 3-4 years and are replaced with new ones.

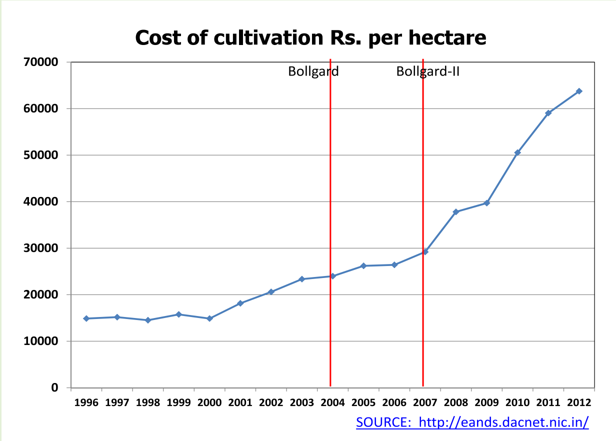
But that is not all. Saturation of the entire cotton area with Bt-cotton hybrids, without any non-Bt cotton as refugia, is part of the over-kill. Surveys conducted by ICAR-CICR showed that there were only a few standard companies who were packing proper non-Bt hybrid seeds in a 120 g pack that are provided with the 450 g pack of Bt seeds. While others tossed the refugia into the sky. Some of the non-Bt refugia seeds had very poor germination, some were F-2 Bt seeds, some had varying proportions of Bt:non-Bt seeds, some were of Gossypium arboreum. One company even supplied Gossypium herbaceum in the 120 g pack as refugia seeds in north India. The common refrain is that farmers are not serious about refugia. There is clear evidence with ICAR-CICR that many seed companies are also not serious about refugia. This over-kill with scant regard for regulatory guidelines does shorten the life of the technology itself.

With more than 1600 Bt-hybrids the problems of insect pests become acute with so many hybrids in the same village or the same region, because of the continuous availability of vulnerable plant parts such as tender foliage, squares and flowers in one or the other hybrid within a narrow geographical range, which actually attract and sustain a number of insect pests. Insect hot spots develop in the regions and spread all over.

## The Bollgard-II Over-Kill

When Bollgard-II was introduced into the market, our observation was that some of the 'Bollgard single gene Cry1Ac based hybrids' were actually much better than the corresponding 'double gene Cry1Ac+Cry2Ab Bollgard-II hybrids' of the same brand. The Bollgard hybrids were relatively stable and uniform. It is quite likely that the overzealous over-drive of the technology providers to replace Bollgard with Bollgard-II, may not just be because of the technological advantage of the two gene product, but IPR issues may have played a role. Seed companies were in a competitive race to launch their new BG-II hybrids in a rapid fast-forward mode in a bid to capture the market early. This went for a toss. Though BG-II was approved in 2005, the area under BG-II increased from 8% in 2007 to 90% in 2012. It was this rapid replacement of BG with BG-II that may have unsettled the cotton scenario. An assessment of the hybrid qualities on the field showed that there were many companies who were actually not geared up to develop good quality homogenous BG-II hybrids. Handling two genes to develop homozygous parent material, identification of good heterotic (hybrid) combinations, testing their suitability for various agro-eco regions and development of commercially viable BG-II hybrids in a short time is a technological challenge that many seed companies are not properly equipped with. As a result, the market was flooded with half-baked products introduced in a mad-rush in a cut-throat competition. The results are there for everyone to see.




There was a reasonable good progress during the years 2004 to 2007, but the scenario was disrupted during 2007 to 2012.

## Scenario during 2004 to 2007

1. The area under BG Bt-cotton increased from 5.7% in 2004 to 67% in 2007. 92% of the Bt cotton area was under the single gene BG hybrids.
2. A total number of 62 Bt hybrids were approved in 2006 and were available in 2007.
3. Cotton yield increased from 453 kg/ha in 2004 (6% Bt area) to a national record of 567 kg/ha in 2007.
4. Insecticide usage declined from 1.12 kg/ha in 2004 to 0.6 kg/ha in 2007.
5. Expenditure on insecticide decreased from Rs. 1543/ha in 2004 to Rs.1238/ha in 2007.
6. Fertilizer usage increased from 98 Kg/ha in 2004 to 140 kg/ha in 2007.

Thus the data clearly show that until 2007, yields were on the rise, insecticide usage on cotton was on a decline and fertilizer use had marginally increased. The scenario changed drastically within four years after 2007, a period that was characterised by a total replacement of BG with BG-II. Was this sudden massive replacement beneficial to the cotton farmer? Data from the Ministry of Agriculture, Government of India showed that during the period 2007-2012, input usage increased drastically as also reflected in high cost of production. The figures 1 to 7 show the trends in insecticide usage, fertilizer usage, yields and production cost. The following points highlight the drastic changes in inputs and the yield decline during the period 2007 to 2012.

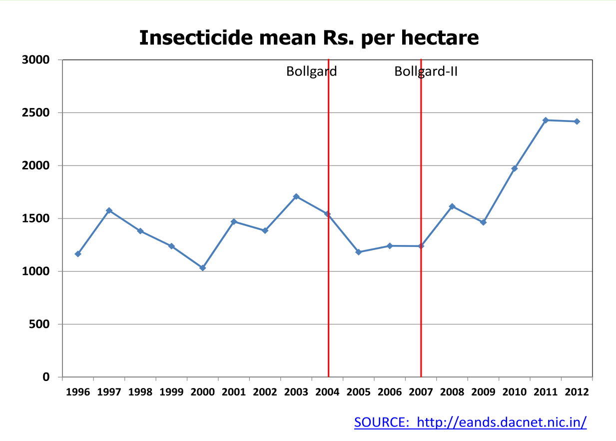
## Scenario during 2007 to 2012

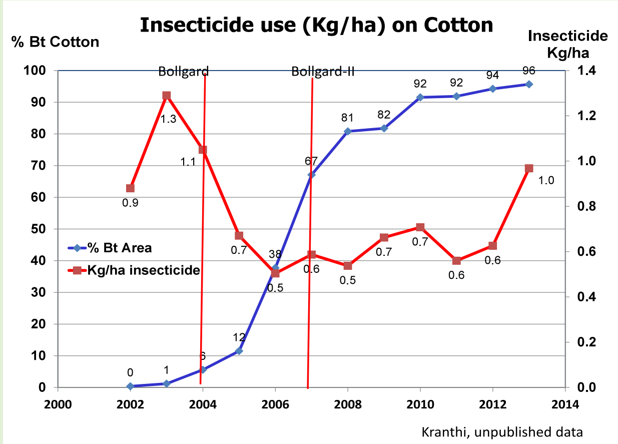
1. The area under BG-II increased to 90% of the Bt area in 2012 from a meagre 8% in 2007.
2. The number of Bt hybrids increased from 62 in 2006 to 1097 in 2012.
3. Yields declined from 567 kg/ha to 496 kg/ha in 2011 (CAB data).
4. The national average expenditure on fertilizer increased from Rs. 2400 per hectare in 2007 to Rs. 7400 in 2012.
5. Fertilizer quantity increased from 140 kg/ha in 2007 to 222 kg/ha in 2011.
6. Seed cost was Rs. 1793/ha in 2004, which increased to Rs. 2023/ha in 2007 followed by a massive increase to Rs. 3842/ha in 2012.
7. Insecticide usage increased from 0.6 kh/ha to 0.96 kg/ha in 2013 (Kranthi, unpublished data)
8. Expenditure on insecticide increased from Rs. 1238/ha in 2007 to Rs.2417/ha in 2007.
9. Cost of cultivation increased from Rs. 23,987/ha in 2004 to 29,196/ha in 2007, but increased drastically to Rs. 63,751/ha in 2012.

Thus it is now becoming clear that introduction of a new gene does not necessarily mean that farmers would be benefitted. There is no doubt that the unwarranted over-kill to launch one thousand hybrids within the 5 year period during 2007-2012 also may have unsettled an otherwise probable positive growth curve. If this is not Kolaveri, then what is?

## The Insecticide Kolaveri

Commercial chemical and seed companies 'make hay while the sun shines'. They instantaneously burn the hay into ashes too. Insecticides such as imidacloprid could have been a very useful tool if retained only as cotton seed treatment. But the spray formulations of the neonicotinoid group of insecticides such as imidacloprid, thiomethoxam, acetamiprid, clothianidin etc., went for an over-kill. Today almost all the sucking pests have developed high levels of resistance to the entire class of neonicotinoid insecticides. Sucking pest infestation is high at just about the squaring and flowering period. Neonicotinoid sprays at the flowering time harm pollinators especially honey bees. With just seed treatment and without foliar sprays of neonicotinoids, we could have preserved the efficacy of this group of insecticides in an ecologically acceptable manner. This isn't the first time that we killed a technology with the Kolaveri syndrome. Synthetic pyrethroids were killed with the Kolaveri factor of rapid indiscriminate overuse to the point of death. Many other useful insecticides such as spinosad, emamection and indoxacarb are also getting into the Kolaveri clutches. Insect resistance




to insecticides prompts farmers to resort to higher doses and excessive repeated usage. This continues finally into cocktail tank mixtures of several groups of insecticides. Disaster follows - as was seen in Punjab this year.

It must be remembered that, somewhere in a dark alley, some worms are waiting for their turn, while some arrive and have a field day. The whitefly made a grand early entry this year and painted Punjab red and blue. Farmers were unanimous that the more they sprayed; the more the flies came back with vengeance. While the tiny insects leave a bloody mark all around like a powerful enemy, the battle field looks deserted without any semblance of defence. All insecticides failed. Most of the insecticides, especially the cocktails, mostly killed the beneficial natural enemies that keep the whiteflies under check, and couldn't control whiteflies because these insects hide under the leaves and have a protective waxy coating. Thus, it may be probably correct to say that the enemy used up insecticides for their advantage for resurgence and outbreaks. Waiting in the wings, the pink bollworm is bracing itself up for the next great innings starting this week in the Saurashtra belt of Gujarat. The un-sustainability factor runs high. As new hybrids come and go one after another, new insecticide molecules are also on a high. Nobody knows how the new hybrids behave under the changing climate and also with interventions of new chemicals. Many a time new insecticide molecules may cause critical disruptions in ecological balance by devastating the naturally occurring biological control and cause resurgence of insect pests. The recent case of the whitefly could have been because of one or two new molecules that were released recently and were used extensively during the past three years, albeit more in Punjab.

There is a need to do a 'Sherlock Holmes' to unravel the mystery of the whitefly menace in Punjab. Though not unexpected, there are many surprise elements in the story. Some explanations seem plausible based on experimental results, but reasons for the humongous scale of damage need to be carefully unravelled. Was it just susceptible hybrids? Was it late sowing? Was it the early hot and humid weather? Was it excess urea? Was it indiscriminate insecticides? Or, was it a combination of any of these factors? Or could it be just the overuse of any particular new insecticide that may have been introduced recently and used extensively either alone or in tank mixes. Why this Kolaveri, and until when?

As many in the seed industries still naively wait for that unknown miraculous gene, something like the Cry1Ac, which could turn their fortunes overnight. But, there seems to be nothing in sight which can now cause a breakthrough for high yields. Unfortunately, the dreams of many seed companies now seem to be driven only by mirage of new genes, that too from lands, far away. The Indian seed companies seem to be waiting for the knight in shining armour, the only hope, the hero on the white horse from yonder lands to rescue their business. Seed companies were indeed banking on new genes in the form of Bollgard-III or wide-strike or twin link or round-up ready flex and on and on. On the same side of the fence but knights of a different kind, the pesticide companies were depressed for a while, but not anymore. The silver lining expanded and for them, the happy days are here again. One after another, insect pests take turns to bring cheers to their business. The mealy bugs, thrips and jassids kept them in good humour until recently. The whitefly returned and signed blank cheques for the insecticide industry. And, now the bollworms are likely to be back in business soon. No wonder the cotton crop is repeatedly forced to listen to the Kolaveri song!

Which new genes, new technologies have the potential to break the stagnant yield graph of India, no one knows. But, it is clear that the questions are tough and the challenges are rough. The commercial technology providers seem to have lost the plot. But we must not lose hope. All of us in the public and private must work together to bring cheer to the farmer. There is a need for robust solutions that will lead us to sustainable cotton farming for high yields with low inputs. From the Kolaveri song we must move over with hope to that old but beautiful song "We shall overcome, we shall overcome, we shall overcome one day."

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

# PRODUCTION OF MAN-MADE FILAMENT YARN

*(In Mn. kg.)*

| Month | Viscose Filament yarn | Polyester Filament yarn | Nylon Filament yarn | Poly propylene Filament yarn | Total |
|---|---|---|---|---|---|
| 2005-06 | 53.09 | 1075.82 | 36.84 | 13.58 | 1179.33 |
| 2006-07 | 53.98 | 1270.83 | 32.25 | 13.41 | 1370.48 |
| 2007-08 | 51.07 | 1420.14 | 27.62 | 10.51 | 1509.34 |
| 2008-09 | 42.41 | 1330.45 | 28.07 | 15.08 | 1416.01 |
| 2009-10 | 42.72 | 1434.34 | 30.32 | 14.77 | 1522.15 |
| 2010-11 | 40.92 | 1462.26 | 33.45 | 13.14 | 1549.77 |
| 2011-12 | 42.36 | 1379.51 | 27.94 | 13.19 | 1463.00 |
| 2012-13 | 42.78 | 1287.80 | 23.03 | 17.26 | 1370.87 |
| 2013-14 | 43.99 | 1213.07 | 24.00 | 12.91 | 1293.97 |
| 2014-15 (P) | 43.93 | 1157.41 | 32.46 | 12.76 | 1246.56 |
| 2015-16 (Apr-Aug) (P) | 18.75 | 444.31 | 14.94 | 5.28 | 483.28 |
| 2013-14 | | | | | |
| April | 3.51 | 103.27 | 1.59 | 1.36 | 109.73 |
| May | 3.38 | 108.65 | 1.87 | 0.90 | 114.80 |
| Jun | 3.58 | 105.95 | 1.82 | 0.99 | 112.34 |
| Jul | 3.92 | 99.07 | 1.91 | 1.11 | 106.01 |
| Aug | 3.86 | 106.47 | 1.98 | 1.30 | 113.61 |
| Sept. | 3.72 | 102.65 | 1.94 | 1.03 | 109.34 |
| Oct. | 3.77 | 97.03 | 1.90 | 0.83 | 103.53 |
| Nov. | 3.46 | 93.13 | 1.88 | 1.14 | 99.61 |
| Dec. | 3.75 | 103.81 | 2.05 | 1.16 | 110.77 |
| Jan. | 3.72 | 103.11 | 2.37 | 1.14 | 110.34 |
| Feb. | 3.54 | 91.57 | 2.25 | 1.06 | 98.42 |
| Mar. | 3.78 | 98.36 | 2.44 | 0.89 | 105.47 |
| 2014-15 (P) | | | | | |
| April | 3.74 | 94.92 | 2.30 | 1.12 | 102.08 |
| May | 3.72 | 100.28 | 2.63 | 1.00 | 107.63 |
| June | 3.60 | 102.29 | 2.14 | 1.01 | 109.04 |
| July | 3.83 | 107.71 | 2.49 | 1.12 | 115.15 |
| August | 3.86 | 103.92 | 2.82 | 1.06 | 111.66 |
| September | 3.83 | 86.20 | 2.75 | 0.99 | 93.77 |
| October | 3.68 | 86.44 | 2.53 | 1.02 | 93.67 |
| November | 3.54 | 92.25 | 2.68 | 1.08 | 99.55 |
| December | 3.56 | 99.93 | 2.96 | 1.14 | 107.59 |
| January | 3.59 | 92.48 | 3.16 | 1.08 | 100.31 |
| February | 3.49 | 92.19 | 2.93 | 0.94 | 99.55 |
| March | 3.49 | 98.80 | 3.07 | 1.20 | 106.56 |
| 2015-16 (P) | | | | | |
| April | 3.80 | 95.97 | 3.22 | 1.09 | 104.08 |
| May | 3.70 | 96.03 | 3.01 | 0.99 | 103.73 |
| June | 3.69 | 82.81 | 2.69 | 0.95 | 90.14 |
| July | 3.78 | 82.55 | 3.11 | 1.12 | 90.56 |
| August | 3.78 | 86.95 | 2.91 | 1.13 | 94.77 |

*P - Provisional*

*Source : Office of the Textile Commissioner*

# Nonwoven Uses of Cotton – An Update

This article is an update of two previously published articles on nonwovens. Readers are strongly advised to consult the articles in Volume XXI, No. 3, 2003 and Volume XXVI, No. 3, 2008 of the ICAC RECORDER. The reason is that this article is comprised of papers/summaries presented at the Beltwide Cotton Conferences, organized by the National Cotton Council of America, from 2009 to 2015; papers prior to 2009 are not included here. Cotton continues to account for a small proportion of the nonwoven segment of the industry but, because of its inherent characteristics, has huge potential to enhance its share in this sector. The 2003 article of the ICAC RECORDER focused on technologies used in bonding fibers and on the market for nonwovens. In the 2008 article, which focused on the future of cotton in nonwovens, Amar Paul Singh Sawhney and Brian D. Condon discussed the factors responsible for the more limited use of cotton in nonwovens compared to synthetic fibers. Ultra high speed nonwoven production technologies demand uninterrupted mass-scale production of standardized nonwoven products. So, cotton can improve its share only if continuity in processing can be assured. The current article goes beyond the two previously published articles. All papers and summaries or abstracts of papers published in the Proceedings of the Beltwide Cotton Conferences since 2009 were reviewed and appear here organized by subject matter. The information is consequently limited to US conditions.

## Use of Cotton in Mattresses

Cotton is readily flammable and requires chemical modification to become flame-resistant for safety and high volume uses. The use of cotton in mattresses was quite widespread until the early 1970s, when the US government enacted a smolder ignition standard (16 CFR 1632) for all mattresses produced and sold in the country. The standard for the flammability of mattresses and mattress pads provided for a test to determine the ignition resistance of a mattress or mattress pads, based on exposure to a lighted cigarette. The standard also provided optional test methods for ticking and edge tape substitution that can be used to reduce the number of additional prototype tests. This test method only evaluated the ignitability of mattresses. To evaluate the burning behavior, the mattress needed to be tested with larger ignition sources. Polyester and polyurethane foam could easily comply with the smolder ignition standard but not with an open flame standard. Cotton researchers tried to develop a product that could enable cotton to comply with the requirement but were unable to devise a successful product in due time. Consequently, cotton started losing its share in mattress raw materials. Later, in February 2006, the US Consumer Product Safety Commission adopted a new regulation (16 CFR 1633) that required mattresses, mattress sets, and futons manufactured on or after July 1, 2007, to resist ignition by an open flame source, such as a candle, match or cigarette lighter. Cotton performed better to an open flame source than competing raw materials. A lot of work has been done to develop a fire-resistant feature for mattresses. The two commonly used means by which cotton is made fire-resistant are: treatment with boric acid (boron) and phosphates. Much research has been done to improve the safety and durability of these products. As a result, cotton continues to perform better and recover market share in the mattress raw material industry.

Researchers have been working to improve the flame-retardancy of cotton in nonwovens. Technologies were explored successfully, but the problem was that the flame-retardancy property was not durable to washing. Wash durability does not apply to mattresses, but is required in some nonwoven applications. The flame-retardancy feature has to be induced using a treatment that is economically feasible at the commercial use level. The third important issue is that mutual/combined suitability of flame-retardant materials and binders must be achieved such that some degree of permanency is maintained. On the other hand, most durable materials treated for flame-retardancy exhibit lower strength properties and permeability, shortcomings that need to be avoided. Mercimek et al. (2009) concluded from their studies that chemical binders have an important effect on the wash durability of cotton-based, flame-retardant nonwoven webs. The effect of binders on the durability of a web is much more pronounced in samples that have 10% binder in the formulation of their flame-retardancy solutions. In the samples studied in their research, as chemical binder levels increased, so too did the percentage loss of flame retardant chemicals used in the retardancy treatment. The tests revealed that a chemical bonding agent is required for the investigated flame retardant chemicals in order to achieve wash durability in cotton-based nonwoven webs. The Limiting Oxygen Index tests showed that the cotton web is able to pass this test even after washing if the desired level of flame-retardant chemical can be obtained.

In the light of the new regulation 16 CFR 1633, the Southern Regional Research Center of the USDA is working on an approach to delay the flash burst of a mattress when it catches fire. The mattress would burn slowly and flashover would occur 30 minutes later, thus allowing occupants to escape safely. Limiting the intensity of a mattress fire will save lives and reduce injuries from home fires. The 'green barrier fabric' is unique in the sense that it is made from a renewable source; it is biodegradable and economical to produce since it employs unbleached cotton, thus increasing its marketability. Work is also proceeding on the Moisture Vapor Transport Rate (MVTR), which is a critical factor in determining the use of lightweight cotton nonwovens in chemical and biological protection materials.

## High Loft and Flame-Retardancy in Nonwovens

It is estimated that about 14,000 household fires occur in the USA every year, causing 330 deaths and property losses estimated at US$300 million (Uppal et al., 2010). Some other numbers in different terms are also quoted, but there is no doubt that undesired fires are extremely dangerous and result in huge losses. According to Uppal et al. (2010), flame-retardancy has been a serious bottleneck in the development of cotton-blended high volume bulky high loft fabrics. Various mixes of cotton-blended high loft fabrics were tested in order to improve flame resistance and physical resiliency. Flame-retardant cotton fibers that had been chemically treated with a flame resistant chemical (developed at the Southern Regional Research Center) were used. The flame-retardancy formulation consisted of MDHEU (5%), diammonium phosphate (10%), urea (5%), Triton X-100 (0.7%), polyethylene emulsion, MgCl2, 6H2O (1%), citric acid (1%) and water (75.8%). Thirteen different blends were prepared by mixing greige cotton, Southern Regional Research Center For Retardant cotton, fire retardant Lenzing rayon and binder in order to form high lofts for evaluation. Binder limits ranged from 15 to 25% while the three materials varied from zero to 85%. Samples were tested for flammability employing the Limiting Oxygen Index, the most common test for textile materials, and the small open flame test (TB604 or 16CFR part 1634). The samples produced in the experiments were subjected to the flammability test after conditioning them for at least 24 hours under standard laboratory conditions (21˚±1˚C and 65%±10 relative humidity). The Limiting Oxygen Index method described the tendency of a material to sustain a flame. The flame retardancy of fire-retardant cotton blends with varying degrees of binder fibers (from 15 to 25%) was the highest among the 13 blends tested in this experiment. Blend samples containing greige cotton in some proportion showed poor Limiting Oxygen Index performance. The results demonstrated that the Southern Regional Research Center formulation for flame retardancy was quite effective, since the formulation imparted flame-resistance to the high lofts, and that greige cotton definitely required flame-retardancy treatment.

A paper on a similar topic was presented at the 2011 Conferences wherein Rohit Uppal and his collaborators tested five blends in various mixes of fire-retardant grey cotton, antibacterial grey cotton and bicomponent binder fiber, comprising 13 total entries, as above. They observed that blended high loft nonwoven fabrics showed high Limited Oxygen Index except for the cases in which cotton was not treated with any fire retardant. Antibacterial properties from the treatment for bacterial activity were also verified. Hence, since there is no need for a coating, the product retains a soft feel. In this study, the Southern Regional Research Center flame-retardant cotton or fire-retardant rayon was blended with a binder to form high lofts and then evaluated. Using the Limited Oxygen Index test, the Southern Regional Research Center flame-retardant cotton with a binder yielded a Limited Oxygen Index value of up to 31.5, whereas flame-retardant rayon with a binder yielded a Limited Oxygen Index of up to 26 only. Results showed that the formulations imparted flame resistance to the high lofts.

Diammonium phosphate (DAP) compounds offer resistance to combustion by lowering the decomposition temperature of cellulose, favoring dehydration and thus reducing the formation of a combustible volatile fuel compound. In addition, DAP decomposes at a temperature lower than the degradation of the cotton and leaves a large insulating char residue that prevents further burning. Any deficiencies in the process are complemented by addition of urea. Nam et al. (2010), of the Southern Regional Research Center, tested the phosphorus-nitrogen (P-N) synergism of DAP and urea to determine their optimum ratio in flame-retardant greige cotton nonwoven fabrics. They concluded that, compared with the treatment of DAP alone, the addition of urea at %P:%N = 2.5:4.6 enhanced the flame resistance of fire-retardant nonwoven fabric made from greige cotton. The Limited Oxygen Index increased by 13% from 32.3% to 36.6% while the char length decreased from 10.9 cm to 7.1 cm, a 54% decrease. They linked the synergistic flame retardancy to the increased activation energy of thermal decomposition and the formation of nonflammable insulated coating on the fiber surface. Further increase of the nitrogen percentage did not show any improvement in flame retardancy.

*(to be continued)*

*Source : The ICAC Recorder, Vol. XXXIII No.2, June 2015*

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| 3 Insertions, get 4 (Half Page) | 9,000 | 10,000 |

**Mechanical Data:**

**Full page print area:** 172x250 mm (Non Bleed Ad)
210x297 mm (+ Bleed)

**Half page print area :** 172x125 mm (Non Bleed Ad)
148x210 mm (+ Bleed)

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# SITUATION IN NORTHERN REGION A CAUSE OF CONCERN BUT NOT A CAUSE OF PANIC

The Cotton Association of India (CAI) has released its September estimate of the cotton crop for the 2015-16 season, which began on 1st October 2015. The CAI has estimated cotton crop for the season 2015-16 at 370.50 lakh bales of 170 kgs. each which is lower by 12.25 lakh bales than the crop of 382.75 lakh bales estimated for the cotton season 2014-15. The projected Balance Sheet drawn by the CAI estimated total cotton supply for the season 2015-16 at 463.15 lakh bales while the domestic consumption is estimated at 325.00 lakh bales thus leaving an available surplus of 138.15 lakh bales. A statement containing the State-wise estimate of the cotton crop and the Balance Sheet for the season 2015-16 with the corresponding data for the previous crop year is given below.

The crop damage in the northern zone due to the whitefly attack this year is certainly a cause of concern but it is not a cause of panic. Despite a lower crop this year, its impact will be softened by the highest ever opening stock available at the beginning of the season 2015-16. Moreover, domestic consumption of cotton also seems to be softening now.

**CAI's Estimates of Cotton Crop as on 30th September 2015 for the Seasons 2014-15 and 2015-16**

*(in lakh bales)*

| State | Production * | | Arrivals As on 30th September 2015 (2014-15) |
|---|---|---|---|
| | 2015-16 | 2014-15 | |
| Punjab | 10.00 | 13.00 | 13.00 |
| Haryana | 19.00 | 23.50 | 23.50 |
| Upper Rajasthan | 6.50 | 6.50 | 6.50 |
| Lower Rajasthan | 11.50 | 10.50 | 10.50 |
| **Total North Zone** | **47.00** | **53.50** | **53.50** |
| Gujarat | 103.00 | 108.00 | 108.00 |
| Maharashtra | 83.00 | 78.50 | 78.50 |
| Madhya Pradesh | 19.00 | 18.00 | 18.00 |
| **Total Central Zone** | **205.00** | **204.50** | **204.50** |
| Telangana | 58.00 | 55.25 | 55.25 |
| Andhra Pradesh | 27.00 | 25.75 | 25.75 |
| Karnataka | 20.00 | 30.50 | 30.50 |
| Tamil Nadu | 7.50 | 7.25 | 7.25 |
| **Total South Zone** | **112.50** | **118.75** | **118.75** |
| Orissa | 4.00 | 4.00 | 4.00 |
| **Others** | **2.00** | **2.00** | **2.00** |
| **Total** | **370.50** | **382.75** | **382.75** |

*Note: (1) * Including loose*

*(2) Loose figures are taken for Telangana and Andhra Pradesh separately as proportionate to the crop for the purpose of accuracy*

The Balance Sheet drawn by the Association for 2015-16 and 2014-15 is reproduced below:-

*(in lakh bales)*

| Details | 2015-16 | 2014-15 |
|---|---|---|
| Opening Stock | 78.65 | 58.90 |
| Production | 370.50 | 382.75 |
| Imports | 14.00 | 12.00 |
| **Total Supply** | **463.15** | **453.65** |
| Mill Consumption | 285.00 | 278.00 |
| Consumption by SSI Units | 29.00 | 27.00 |
| Non-Mill Use | 11.00 | 10.00 |
| Exports | | 60.00 |
| **Total Demand** | **325.00** | **375.00** |
| Available Surplus | 138.15 | |
| Closing Stock | | 78.65 |

# UPCOUNTRY SPOT RATES

(₹\Quintal)

## October 2015

2014-15 Crop

| Growth | P/H/R | P/H/R | GUJ | KAR | M/M | P/H/R | M/M/A | M/M/A | P/H/R | M/M/A | M/M/A | P/H/R | M/M/A | GUJ | M/M/A/K | GUJ | M/M/A/K | M/M/A/K/T/O | A/K/T/O | M(P)/K/T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G. Standard | ICS-101 | ICS-201 | ICS-102 | ICS-103 | ICS-104 | ICS-202 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-105 | ICS-106 | ICS-107 |
| Grade | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine | Fine |
| Staple | 22 mm | 22 mm | 22 mm | 23 mm | 24 mm | 26 mm | 26 mm | 26 mm | 27 mm | 27 mm | 27 mm | 28 mm | 28 mm | 28 mm | 29 mm | 29 mm | 30 mm | 31 mm | 32 mm | 34 mm |
| Micronaire | 5.0-7.0 | 5.0-7.0 | 4.0-6.0 | 4.0-5.5 | 4.0-5.5 | 3.5-4.9 | 3.0-3.4 | 3.5-4.9 | 3.5-4.9 | 3.0-3.4 | 3.5-4.9 | 3.5-4.9 | 3.5-4.9 | 3.5-4.9 | 3.5-4.9 | 3.5-4.9 | 3.5-4.9 | 3.5-4.9 | 3.5-4.9 | 3.0-3.8 |
| Strength/GPT | 15 | 15 | 20 | 21 | 23 | 26 | 25 | 25 | 26 | 26 | 26 | 27 | 27 | 27 | 28 | 28 | 29 | 30 | 31 | 33 |
| 1 | 8464 | 8605 | 6833 | 7227 | 8183 | 9026 | 8070 | 8380 | 9111 | 8295 | 8717 | 9251 | 8858 | 8942 | 8942 | 9083 | 8998 | 9139 | 9420 | 12513 |
| 2 | | ... | | ... | | ... | | | HOLIDAY | | | | ... | | | ... | | ... | | |
| 3 | 8464 | 8605 | 6805 | 7199 | 8155 | 8998 | 8070 | 8352 | 9083 | 8295 | 8689 | 9223 | 8830 | 8914 | 8914 | 9055 | 8970 | 9111 | 9392 | 12513 |
| 5 | 8464 | 8605 | 6805 | 7199 | 8155 | 9026 | 8070 | 8352 | 9111 | 8295 | 8689 | 9251 | 8830 | 8914 | 8914 | 9055 | 8970 | 9111 | 9392 | 12513 |
| 6 | 8520 | 8661 | 6861 | 7199 | 8155 | 9055 | 8070 | 8352 | 9139 | 8295 | 8689 | 9280 | 8830 | 8970 | 8970 | 9111 | 9026 | 9167 | 9448 | 12513 |
| 7 | 8520 | 8661 | 6861 | 7199 | 8155 | 9026 | 8070 | 8352 | 9111 | 8295 | 8689 | 9251 | 8830 | 8970 | 8970 | 9111 | 9026 | 9167 | 9448 | 12513 |
| 8 | 8436 | 8577 | 6861 | 7199 | 8155 | 8998 | 8070 | 8352 | 9083 | 8295 | 8689 | 9223 | 8830 | 8970 | 8970 | 9111 | 9026 | 9167 | 9448 | 12513 |
| 9 | 8436 | 8577 | 6861 | 7199 | 8155 | 8970 | 8070 | 8352 | 9055 | 8295 | 8689 | 9195 | 8830 | 8970 | 8970 | 9111 | 9026 | 9167 | 9448 | 12513 |
| 10 | 8436 | 8577 | 6861 | 7199 | 8155 | 8970 | 8070 | 8352 | 9055 | 8295 | 8689 | 9195 | 8830 | 9026 | 8970 | 9167 | 9055 | 9195 | 9448 | 12513 |
| 12 | 8520 | 8661 | 6889 | 7227 | 8183 | 9055 | 8099 | 8380 | 9139 | 8323 | 8717 | 9280 | 8858 | 9055 | 8998 | 9195 | 9111 | 9251 | 9505 | 12654 |
| 13 | 8520 | 8661 | 6889 | 7227 | 8183 | 9111 | 8099 | 8380 | 9195 | 8323 | 8717 | 9336 | 8886 | 9083 | 9026 | 9223 | 9111 | 9251 | 9505 | 12654 |
| 14 | 8577 | 8717 | 6889 | 7227 | 8183 | 9083 | 8099 | 8380 | 9167 | 8323 | 8717 | 9308 | 8886 | 9111 | 9026 | 9251 | 9111 | 9251 | 9505 | 12654 |
| 15 | 8577 | 8717 | 6749 | 7227 | 8183 | 9111 | 8099 | 8380 | 9195 | 8323 | 8717 | 9336 | 8886 | 9111 | 9026 | 9251 | 9111 | 9251 | 9505 | 12654 |
| 16 | 8633 | 8773 | 6693 | 7171 | 8127 | 9111 | 8070 | 8352 | 9195 | 8295 | 8689 | 9336 | 8858 | 9083 | 8998 | 9223 | 9083 | 9223 | 9476 | 12654 |
| 17 | 8577 | 8717 | 6636 | 7114 | 8127 | 9111 | 8070 | 8352 | 9195 | 8295 | 8689 | 9336 | 8858 | 9083 | 8998 | 9223 | 9083 | 9223 | 9476 | 12654 |
| 19 | 8633 | 8773 | 6636 | 7114 | 8127 | 9167 | 8014 | 8295 | 9251 | 8239 | 8633 | 9392 | 8802 | 9026 | 8942 | 9167 | 9083 | 9223 | 9476 | 12654 |
| 20 | 8633 | 8773 | 6636 | 7114 | 8127 | 9167 | 8014 | 8295 | 9251 | 8239 | 8633 | 9392 | 8802 | 9026 | 8942 | 9167 | 9083 | 9223 | 9476 | 12654 |
| 21 | 8633 | 8773 | 6636 | 7114 | 8070 | 9167 | 7958 | 8239 | 9251 | 8183 | 8577 | 9392 | 8745 | 8970 | 8914 | 9111 | 9055 | 9195 | 9448 | 12654 |
| 22 | | ... | | ... | | ... | | | HOLIDAY | | | | ... | | | ... | | ... | | |
| 23 | 8689 | 8830 | 6636 | 7114 | 8070 | 9223 | 7958 | 8239 | 9308 | 8183 | 8577 | 9448 | 8802 | 8970 | 8970 | 9167 | 9083 | 9223 | 9476 | 12654 |
| 24 | 8689 | 8830 | 6636 | 7114 | 8070 | 9251 | 7958 | 8239 | 9336 | 8183 | 8577 | 9476 | 8802 | 8970 | 8970 | 9167 | 9083 | 9223 | 9476 | 12654 |
| 26 | 8689 | 8830 | 6636 | 7114 | 8070 | 9280 | 7958 | 8239 | 9364 | 8183 | 8577 | 9505 | 8802 | 8970 | 8970 | 9167 | 9083 | 9223 | 9476 | 12654 |
| 27 | 8661 | 8802 | 6636 | 7114 | 8070 | 9195 | 7930 | 8211 | 9280 | 8155 | 8548 | 9420 | 8802 | 8970 | 8942 | 9111 | 9055 | 9195 | 9448 | 12654 |
| 28 | 8605 | 8745 | 6636 | 7114 | 8070 | 9083 | 7902 | 8183 | 9167 | 8127 | 8520 | 9308 | 8773 | 8942 | 8914 | 9055 | 8998 | 9139 | 9392 | 12654 |
| 29 | 8605 | 8745 | 6636 | 7114 | 8070 | 9055 | 7874 | 8155 | 9139 | 8099 | 8492 | 9280 | 8745 | 8914 | 8886 | 8998 | 8970 | 9083 | 9336 | 12654 |
| 30 | 8605 | 8745 | 6636 | 7114 | 8042 | 8998 | 7845 | 8127 | 9083 | 8070 | 8464 | 9280 | 8745 | 8858 | 8858 | 8942 | 8942 | 9055 | 9308 | 12654 |
| 31 | 8661 | 8802 | 6636 | 7114 | 8042 | 9055 | 7845 | 8127 | 9139 | 8070 | 8464 | 9336 | 8773 | 8886 | 8886 | 8998 | 8970 | 9083 | 9336 | 12654 |
| H | 8689 | 8830 | 6889 | 7227 | 8183 | 9280 | 8099 | 8380 | 9364 | 8323 | 8717 | 9505 | 8886 | 9111 | 9026 | 9251 | 9111 | 9251 | 9505 | 12654 |
| L | 8436 | 8577 | 6636 | 7114 | 8042 | 8970 | 7845 | 8127 | 9055 | 8070 | 8464 | 9195 | 8745 | 8858 | 8858 | 8942 | 8942 | 9055 | 9308 | 12513 |
| A | 8570 | 8710 | 6740 | 7163 | 8123 | 9092 | 8014 | 8297 | 9176 | 8239 | 8634 | 9321 | 8820 | 8988 | 8955 | 9129 | 9044 | 9182 | 9443 | 12609 |

*H = Highest L = Lowest A = Average*

## UPCOUNTRY SPOT RATES

(Rs./Qtl)

| Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [ By law 66 (A) (a) (4) ] | | | | | | | Spot Rate (Upcountry) 2015-16 Crop OCTOBER 2015 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sr. No. | Growth | Grade Standard | Grade | Staple | Micronaire | Strength /GPT | 26th | 27th | 28th | 29th | 30th | 31st |
| 1 | P/H/R | ICS-101 | Fine | Below 22mm | 5.0-7.0 | 15 | 8689 (30900) | 8661 (30800) | 8605 (30600) | 8605 (30600) | 8605 (30600) | 8661 (30800) |
| 2 | P/H/R | ICS-201 | Fine | Below 22mm | 5.0-7.0 | 15 | 8830 (31400) | 8802 (31300) | 8745 (31100) | 8745 (31100) | 8745 (31100) | 8802 (31300) |
| 3 | GUJ | ICS-102 | Fine | 22mm | 4.0-6.0 | 20 | 6636 (23600) | 6636 (23600) | 6636 (23600) | 6636 (23600) | 6636 (23600) | 6636 (23600) |
| 4 | KAR | ICS-103 | Fine | 23mm | 4.0-5.5 | 21 | 7114 (25300) | 7114 (25300) | 7114 (25300) | 7114 (25300) | 7114 (25300) | 7114 (25300) |
| 5 | M/M | ICS-104 | Fine | 24mm | 4.0-5.0 | 23 | 8070 (28700) | 8070 (28700) | 8070 (28700) | 8070 (28700) | 8042 (28600) | 8042 (28600) |
| 6 | P/H/R | ICS-202 | Fine | 26mm | 3.5-4.9 | 26 | 9280 (33000) | 9195 (32700) | 9083 (32300) | 9055 (32200) | 8998 (32000) | 9055 (32200) |
| 7 | M/M/A | ICS-105 | Fine | 26mm | 3.0-3.4 | 25 | 7958 (28300) | 7930 (28200) | 7902 (28100) | 7874 (28000) | 7845 (27900) | 7845 (27900) |
| 8 | M/M/A | ICS-105 | Fine | 26mm | 3.5-4.9 | 25 | 8239 (29300) | 8211 (29200) | 8183 (29100) | 8155 (29000) | 8127 (28900) | 8127 (28900) |
| 9 | P/H/R | ICS-105 | Fine | 27mm | 3.5.4.9 | 26 | 9364 (33300) | 9280 (33000) | 9167 (32600) | 9139 (32500) | 9083 (32300) | 9139 (32500) |
| 10 | M/M/A | ICS-105 | Fine | 27mm | 3.0-3.4 | 26 | 8183 (29100) | 8155 (29000) | 8127 (28900) | 8099 (28800) | 8070 (28700) | 8070 (28700) |
| 11 | M/M/A | ICS-105 | Fine | 27mm | 3.5-4.9 | 26 | 8577 (30500) | 8548 (30400) | 8520 (30300) | 8492 (30200) | 8464 (30100) | 8464 (30100) |
| 12 | P/H/R | ICS-105 | Fine | 28mm | 3.5-4.9 | 27 | 9505 (33800) | 9420 (33500) | 9308 (33100) | 9280 (33000) | 9280 (33000) | 9336 (33200) |
| 13 | M/M/A | ICS-105 | Fine | 28mm | 3.5-4.9 | 27 | 8802 (31300) | 8802 (31300) | 8773 (31200) | 8745 (31100) | 8745 (31100) | 8773 (31200) |
| 14 | GUJ | ICS-105 | Fine | 28mm | 3.5-4.9 | 27 | 8970 (31900) | 8970 (31900) | 8942 (31800) | 8914 (31700) | 8858 (31500) | 8886 (31600) |
| 15 | M/M/A/K | ICS-105 | Fine | 29mm | 3.5-4.9 | 28 | 8970 (31900) | 8942 (31800) | 8914 (31700) | 8886 (31600) | 8858 (31500) | 8886 (31600) |
| 16 | GUJ | ICS-105 | Fine | 29mm | 3.5-4.9 | 28 | 9167 (32600) | 9111 (32400) | 9055 (32200) | 8998 (32000) | 8942 (31800) | 8998 (32000) |
| 17 | M/M/A/K | ICS-105 | Fine | 30mm | 3.5-4.9 | 29 | 9083 (32300) | 9055 (32200) | 8998 (32000) | 8970 (31900) | 8942 (31800) | 8970 (31900) |
| 18 | M/M/A/K/T/O | ICS-105 | Fine | 31mm | 3.5-4.9 | 30 | 9223 (32800) | 9195 (32700) | 9139 (32500) | 9083 (32300) | 9055 (32200) | 9083 (32300) |
| 19 | A/K/T/O | ICS-106 | Fine | 32mm | 3.5-4.9 | 31 | 9476 (33700) | 9448 (33600) | 9392 (33400) | 9336 (33200) | 9308 (33100) | 9336 (33200) |
| 20 | M(P)/K/T | ICS-107 | Fine | 34mm | 3.0-3.8 | 33 | 12654 (45000) | 12654 (45000) | 12654 (45000) | 12654 (45000) | 12654 (45000) | 12654 (45000) |

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