Weekly Publication of
Cotton Association of India
COTTON STATISTICS & NEWS
Edited & Published by Amar Singh
2020-21 • No. 11 • 25th August, 2020 Published every Tuesday
Cotton Exchange Building, 2nd Floor, Cotton Green, Mumbai - 400 033
Phone: 3006 3400 Fax: 2370 0337 Email: cai@caionline.in
www.caionline.in

Cotton Dyeing - A Living Art

Dr. T.R. Loknathan has a Ph. D. in plant breeding. He is currently working as a Principal Scientist in the Division of Crop Improvement at ICAR-CICR, Nagpur. He is pursuing his research on genetic enhancement of cotton.

GUEST COLUMN

Dr. T.R. Loknathan
Principal Scientist, Division of crop improvement, ICAR-CICR, Nagpur

Introduction

There is always a certain amount of colouring matter prevalent in the form of endochrome (colour imparting organelle) located in the walls of the fibre immediately surrounding the inner cavity or lumen. In Egyptian cotton it is more pronounced, assuming a reddish brown or golden colour. It turns whiter in colour when exposed to sunlight and darker when exposed to moist heat like the steaming process involved in doubling. Dr.Schunk, after a careful examination of the colouring matter associated with the Egyptian and East Indian cotton, noticed two kinds, one of which is readily soluble in alcohol which he called A and the other soluble in boiling water, which he termed B.

These natural colour manifestations were limited and man felt the need to resort to artificial colouring. Dyeing is the application of dyes (colouring matter) to the yarns, fabrics, cloths and attain colour fastness. The practice of dyeing is quite ancient, existing in many civilizations. With the development of yarn, fabric and cloth-making, dying became more popular as plain white textiles gained an ornamental value once they were coloured.

History of Dyeing

The word dye originated in the 12'th century AD and is derived from middle English 'diei' and from the ancient English 'dag' and 'dah'. The primary source of dyes has been natural dyes extracted from plants, animals and insects since ancient times.

Dyes have been prevalent in old civilizations viz., Peruvian (red dye), Indus Valley civilization (indigo) in Mohenjo-dharo, Harappan remains (purple, etc).

Plant extracts used as dyes were common from plants like madder, woad (northern indigo, indigo (tropical woad) American logwood, Brazil-wood (source of most of the dyes in the middle– ages). The American Quercitron barks gave the colour yellow. Various shades of the same colour are produced from various barks creating variegated shades. Basically, four colours viz., Red, blue, yellow and brown are in existence. The combination of these four colours create various patterns and shades.

Insect Dyes: These are extracts from insects like Cochneal , Kermes (mostly used in Europe), and also fish dyes used in Byzantine during ancient times.

The earliest known dyeing of flax fibres was discovered in an ancient prehistoric cave in the Republic of Georgia which dates back to 34000 BC. More evidence of textile dyeing in the Neolithic period was discovered in the city of Catalhuyk in Southern Anatolia as traces of red dye (ochre), an iron oxide pigment obtained from clay. In China, dyes extracted from plant parts, barks and insects have been in use for 5000 years. Early evidence from the Sind province in Pakistan - cotton dyed with a vegetable dye - was found in Mohenjo-dharo remains (3rd millenium B.C.). This colour was obtained from madder and in combination with a blue dye obtained from indigo was introduced to other regions through trade.

Cochneal dyes and Kermes from insects and plant dyes like woad and madder were part of the main economies of Asia and Europe until the discovery of synthetic dyes in the mid -19th century.

The first synthetic dye was William Perkin's mauveine in 1856 followed by another important synthetically designed dye duplicating red dye from madder. Alizarin another dye obtained from coal tar was designed in 1869. The advent of these synthetic dyes led to the collapse of the art of dyeing with natural dyes in the textile economy of Britain and Europe in the mediaeval times. With the rising domination of the commercial dyeing processes, began the decline of the art of dyeing and the numbers of skilled artisans practising the ancient art block print also dwindled.

Concept of Dyeing:

Dyeing is the application of colours or pigments to textile fibres, yarns or fabrics, ensuring an element of colour fastness. It is done by using a chemical solution where the fibre expresses affinity depending on the dye and particular chemical material. Dyeing is achieved by absorption, diffusion and bonding of the pigment in the fibre, depending on time and temperature. The bond may be strong or weak depending on the dye or chemical used.

The essential process of dyeing has changed a little over time. The dyeing material is put in a pot of water for extraction. The textile to be coloured is added to it and a slight heat is applied till you get the desired result. Mordants may be added to achieve colour fastness. The dyeing can be achieved depending on the dye in various fibre processing stages. Dyeing can be done before spinning or weaving (dyeing of wool), after spinning ((yarn dyeing) and dyeing in pieces (fabric).

Dyeing may be done to the entire fabric or in patches on the fabric by printing. Printing application is achieved by block printing, an ancient art practised by skilled artisans endowed with a hereditary legacy. It is a process creating patterns on textiles, selective dyeing on textile, not the whole of it. Some of the traditional Navajo printing still exist in USA. Block printing is widely prevalent in various parts of India, like Jaipur in Rajasthan and kalamkari printing in Andhra Pradesh. Few people have come and learnt the art of Jaipur block printing emerging as able textile designers in USA. The few artisans still remaining are dwindling in numbers,

Types of dyes:

These are classified as Natural dyes and Synthetic dyes based on their origin.

Natural dyes:

These are obtained from vegetable and plant parts like roots, berries, barks, leaves and wood; Cochneal insects and Kermes and other biological matter like fungi. Natural mordants ((used as colour fixatives or colour binders to the fibre) like tannins are derived from oak galls, pigments and a wide range of other plant parts; pseudo-tannins like plant-derived oxalic acid and ammonia from stale urine. Plants that bio-accumulate aluminium have been used like club mosses. Symplocus genus used for dyeing are an endangered species in Europe. Plant dye producing plants like woad, indigo, saffron and madder, etc. have been in cultivation since ages in the commercial trade economies of Africa, Europe and Asia and America.

Many available local dyestuffs have been used in different places. Some scarcely available dyes from natural invertebrates, plants (Haematoxylum campachianum.), Tyrian blue and Kermes (crimson red) are valued as luxury ones due to their brilliant colour and permanence.

Mordants are often used with Natural dyes. the word mordant originates from the Latin word 'mordere ' meaning to bite and improves colour fastness. Mordants are metal salts which form stable molecular complexes with natural dyes and natural fibres. Most commonly used mordants are alum (a metal salt, potassium aluminium silicate) and iron (ferrous sulphate). But many other metal salts in use earlier have now been abandoned due their toxic nature and ecological health. Many non - metal mordants like pseudo - tannins were also used as apt binders to these dyes.

In natural dyes there are 'fast' dyes which bind very strongly to the molecular structure of mordant and fibre. Another group are the 'fugitive' dyes which do not bind and fade away after being treated with the fibre. Natural dyes are obtained from all berries, beets, cabbage, spinach and most of the flowers (although a few flowers are used as natural dyes).

Common natural dyestuff has been obtained from various dye yielding plants belonging to different genera and species distributed in tropical, sub- tropical and temperate regions in diverse geographical habitats, spread across the continents of both the New and the old words. They have flourished within various tribes in different countries as craft weavers (ancient dyeing art preservers).

The natural dyestuff in existence were red, pink, blue, purple, brown, black, green, yellow, pink, etc. Each of them was characteristic and manifested in diverse plant species. A combination of few produced diverse shades practised since ages.

The various natural colour dyes viz. Red and pink, yellow, orange, blue, purple, green, brown, black are manifested in different plant species and different genera distributed across the world in diverse habitats. These have been utilised by a diverse sect of craft dyers of differing ethnicity in different parts of the world.

Natural dye plants, their geography and the native craft dyers (tribes as stakeholders :

The natural dye colours like red and pink, yellow, blue, purple, violet, green, brown, black are distributed in many diverse species, genera of invertebrates, plants, animals, insects, lichens, etc. These diverse genera are to be found in different ecological regions. The diverse dye producing plant species within a genera are endemic to these regions. Ancient dyeing techniques were practised by the natives inhabiting the region. These native tribes flourished in their art of dyeing and block printing (creating patterns) and the local textile industries developed, taking on the distinctive characteristic of their respective domestic regions. These local textile industries continued to flourish in the mediaeval 18th century till the entry of the synthetic dyes.

Some of the plant species cited here like madder, alkanna, indigo, dyer's broom, Juglans, ochre, logwood , Brazil wood, many more species like lichens, molluscs, snails, lac insects, Cochneal have been explored. Some are widespread and some are endemic. The native tribes, like, Navajo basket and rug weavers, Japanese Shibori printers, European craft dyers, Indonesian batik cloth weavers, native Indian craft dyers (Jaipur block printers, Ponduru craft dyers, Himalayan madder dyers, etc), flourishing in Asia have all put the dyeing industry on the global map.

Different fibres require different mordanting. They are broadly classified into two categories.

1. Cellulose fibres: Cotton, linen, hemp, ramie and rayon.

2. Protein fibres: Angora, wool, mohair, cashmere, silk, soy, leather and suede.

Both the fibres require different mordants for dyeing due to their differing molecular structures, differing in their binding abilities. Cellulose fibres have less affinity for dyes as compared to Protein fibres. The best thing for a cellulose fibre is to first use tannin and then add alum.

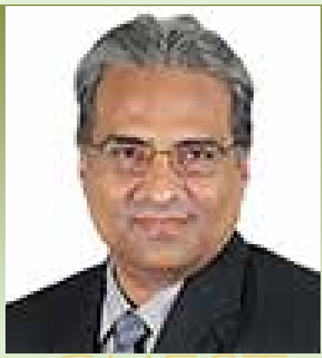
(To be continued...)

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

Fibre Attributes, Their Measurement and Impact - Part 3

Contd. from Issue No. 10 dated 18th August, 2020

GUEST COLUMN



Dr. P.K. Mandhyan
Principal Scientist (Technical Textiles) ICAR-CIRCOT, Mumbai.

Dr. P.G. Patil
Director, ICAR-CIRCOT, Mumbai.

Dr. Pradeep Kumar Mandhyan, Principal Scientist (Technical Textiles) and Head Quality Evaluation and Improvement Division, ICAR-Central Institute for Research on Cotton Technology, Mumbai. He is Ph.D (Textiile Physics) from the Mumbai University, Mumbai. He is also Associate of Textile Association. Presently he is working as Principal Scientist (Technical Textiles) and Head Quality Evaluation and Improvement Division, ICAR-Central Institute for Research on Cotton Technology, Mumbai. He has more than 35 years of experience in evaluation of textile fibres, yarns and fabrics and development of various value-added products from various natural fibres. He has contributed many research articles in national and international journals, popular articles, training manuals, reports, etc. He is also the Principal Investigator (Quality Research) of All India Co-ordinated Research Project – on Cotton of Ministry of Agriculture and Farmer's welfare. He is member of Central Variety Identification Committee for cotton. He is also member of Board of Studies of DKTE Institute of Engineering and Textiles, Ichalkarnji. He is member of various Sectional Committees of Bureau of Indian Standards.

Dr. P.G. Patil is the Director of ICAR-CIRCOT, Mumbai. He holds B.Tech., M.Tech. and Ph.D. degrees and has more than 25 years of professional experience in Management of programmes in post-harvest processing of cotton, value addition to cotton by-products, quality standards of seed cotton, lint, yarn, fabric etc. He has also worked as Cotton Consultant on deputation to The Cotton Corporation of India for modernisation of cotton ginning industry in India. He has handled about 20 national and international projects including the projects funded by Common Fund for Commodities and United Nations Conference on Trade and Development. He is a member of Cotton Advisory Board, Cotton Variety Identification Committee and the Chairman of Sectional Committee, Textiles Division Council and Bureau of Indian Standards. He was the Chairman, Asian Cotton Research and Development Network of International Cotton Advisory Committee (ICAC). He is also the Independent Director of Agricultural Finance Corporation. He is the fellow of Textile Association of India, Indian Society of Agricultural Engineers and Vice-Chairman of Indian Society for Cotton Improvement.

The trash causes a deteriorated appearance of the yarn if present in baled lint. More often higher amount of trash in baled cotton is due to lack of attention while picking and ginning. The excessive trash is removed by pre-cleaning process before ginning. The level of cleaning also has to be optimised because extensive cleaning for removal of trash can cause more fibre breakages thereby higher SFC and nep content. The installed line of cleaning and opening in a spinning can cope up with the optimum level of trash in the baled cotton. Extensive cleaning can cause deterioration of quality of fibres and yarn produced thereof. Therefore, it is imperative for a mill to know the extent to which its line is capable of removing the trash cost effectively keeping the quality of fibres intact especially for rotor and air-jet spinning.

The stickiness poses a major problem for spinning units. The reason for stickiness in cotton is due to physiological plant sugars in immature fibres, contaminants from crushed seed and seed coat fragments, grease, oil and pesticide residues. Apart from these, the major cause of stickiness is due to contamination of cotton from the exudates of silverleaf whitefly and cotton aphid. The sugar exudates from these insects leads to significant problem while spinning such cottons. The build-up of residues on textile machinery results in higher imperfections and stoppages in sliver and yarn production. The residue builds-up even at low to moderate contamination which results in reduced productivity and quality. This also hampers the reputation with a negative impact on sales, exports and price of cotton from regions prone to stickiness.

The subjective assessment of quality of cotton is governed by the different grades assigned to it. The colour is a primary indicator of grade. The discolouration in cotton is due to various reasons out of which some are due to natural cause and rest are because of negligence. Trash and dust content, rain damage, insect secretions, UV radiation exposure, heat and microbial decay are some of the causes of discoloration.

The contamination of cotton by non-cotton materials creates inconvenience in subsequent mechanical processing. Most of the contaminants such as woven plastic, jute/ hessian fibres, leaves, feathers, paper, leather pieces, sand, dust, rust, metal, grease, oil, rubber, tar, etc. are added due to shear negligence. Several programmes for farmers and ginners are being organised by State and Central Government bodies to create awareness about the hazards of contaminants for the industry. The contaminants can degrade the yarn, fabric and garments to lower quality and attract penalties from discounts to total rejection of the lot. Presently these contaminants are removed by hand at spinning mills which involves extra labour cost.

6. Objective Classing of Cotton

India has an array of production practices that range from completely organic to commercially chemical intensive. The pricing of cotton presently is not completely based on the instrumental grading of cotton. In order to help the small farmers to assess his produce and to negotiate for better price, a suitable mechanism to assess the quality of produce at farm level is missing. There are various channels exists for cotton marketing viz – farmer-ginner-consumer, farmer-trader-ginner-consumer, farmer-village merchant-commission agent-consumer. One way of measuring market efficiency is measuring the farmer's share in the consumer's price. Currently farmers share in consumer price is in the range of 85% and this comes down if the marketing channel is lengthy.

Private traders, state level co-operatives and CCI are the three groups involved in the marketing of cotton. In India, the sale of cotton is carried out by cotton brokers and mill representatives. Spinning mills are facing problem to maintain the quality from lot to lot due to non-classification of lint by the ginners. In US and China, all the bales produced in their countries are tagged with quality data by the classing centre. A national data base has been maintained by US classing centre and provides data to traders and consuming industry and it helps the industry to get cotton of assured quality.

Cotton is classed by gins in many cases in China. Gin classing is subject to spot checks by China's Fiber Inspection Bureau (CFIB). When cotton is delivered to a textile mill, CFIB classes 10 percent of the bales, and the CFIB results become the basis for payment. Quality problems with Indian cotton are evident in surveys of international textile mills and the discount Indian cotton receives on world markets. Though India produce world-class quality cotton like Sankar-6, Bunny Brahmma, etc., value addition is seriously affected due to cotton quality problems. There is high probability for delivery of poor quality of cotton against commitment of good quality cotton. Hence, it is pertinent to establish a model classing centre at textile clusters in the country which would cater to the needs of both the industry and cotton growers. The cotton classing centre would have latest HVIs for the evaluation of fibre properties, which may be used for classification of cotton using objective and subjective methods. As a modus operandi, the cotton samples may be collected by the collection agent from the ginnery and submitted to the classing centre. The measurement data obtained at this centre would be uploaded to a common server, maintained at classing centres. The above data can be utilized for marketing and price fixation by the stake holders.

Establishing a Model Cotton Classing Centre will enable the farmers to get remunerative price to their produce and textile industry to get quality raw material for their factory. Ultimately good quality fibre translates to good quality yarn.

At the end it could be concluded in short, the kind of cotton the spinners need is "cotton of better grade at a reasonable price, with longer staple length, suitable fineness, stronger fibre strength and higher length uniformity index without honeydew and foreign matter contamination."

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

Glimpses of Independence Day Celebrations

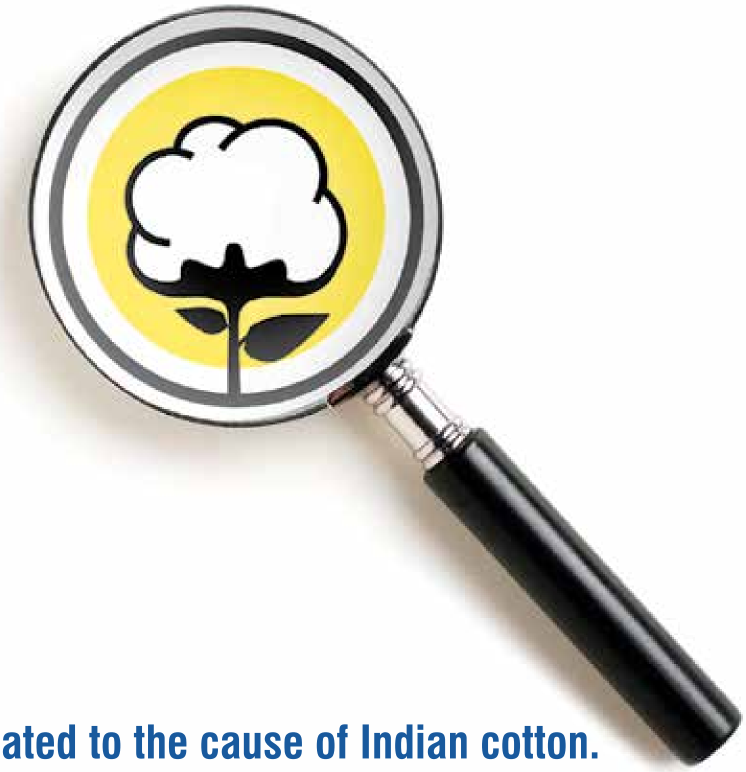
The Cotton Association of India has a venerable tradition of celebrating Independence Day with great fervour, every year, with many people in attendance. This year too, the 74th Independence Day of our country was celebrated on Saturday August 15, on the premises of the CAI. However due to the Corona pandemic, this year witnessed a low- key celebration, with flag hoisting ceremony performed by Shri. Amrendra Singh, Secretary of the Association in the presence of a few staff members.

Update on Cotton Acreage (As on 20.08.2020)

(Area in Lakh Ha)

Sr. No.	State	Normal Area (DES)*	Normal Area as on Date (2015-2019)	Area Covered (SDA)					
				2020-21	2019-20	2018-19	2017-18	2016-17	2015-16
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Andhra Pradesh	6.56	6.450	5.240	5.450	4.730	5.320	3.778	4.890
2	Telangana	17.01	17.262	23.727	17.616	17.606	18.240	12.500	16.330
3	Gujarat	26.04	26.322	22.734	26.287	26.908	26.580	23.654	27.300
4	Haryana	6.07	6.412	7.370	7.010	6.650	6.560	4.980	5.810
5	Karnataka	6.47	6.584	6.630	4.947	3.840	4.500	4.640	4.840
6	Madhya Pradesh	5.65	5.852	6.440	6.100	6.880	5.990	5.990	5.470
7	Maharashtra	41.48	41.532	41.844	43.636	40.623	41.700	39.000	38.020
8	Odisha	1.31	1.380	1.678	1.695	1.578	1.450	1.360	1.250
9	Punjab	3.56	3.206	5.010	4.020	2.840	3.850	2.560	4.400
10	Rajasthan	4.77	5.238	6.721	6.445	4.961	5.031	3.847	4.060
11	Tamil Nadu	1.61	1.574	0.083	0.065	0.058	0.167	0.056	0.103
12	Others	0.43	0.462	0.216	0.271	0.172	0.286	0.170	0.210
All India		**120.967**	**122.274**	**127.693**	**123.542**	**116.846**	**119.674**	**102.535**	**112.683**

** Directorate of Economics & Statistics, Ministry of Agriculture and Farmers Welfare, Krishi Bhavan, New Delhi*
Source : Directorate of Cotton Development, Nagpur



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) 2019-20 Crop August 2020					
Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Gravimetric Trash	Strength /GPT	17th	18th	19th	20th	21st	22nd
1	P/H/R	ICS-101	Fine	Below 22mm	5.0 – 7.0	4%	15	10179 (36200)	10179 (36200)	10179 (36200)	10179 (36200)	10179 (36200)	
2	P/H/R (SG)	ICS-201	Fine	Below 22mm	5.0 – 7.0	4.5%	15	10348 (36800)	10348 (36800)	10348 (36800)	10348 (36800)	10348 (36800)	H
3	GUJ	ICS-102	Fine	22mm	4.0 – 6.0	13%	20	5877 (20900)	5905 (21000)	5905 (21000)	5905 (21000)	6018 (21400)	
4	KAR	ICS-103	Fine	23mm	4.0 – 5.5	4.5%	21	6974 (24800)	6974 (24800)	6974 (24800)	6974 (24800)	6974 (24800)	
5	M/M (P)	ICS-104	Fine	24mm	4.0 – 5.5	4%	23	8633 (30700)	8689 (30900)	8689 (30900)	8689 (30900)	8689 (30900)	O
6	P/H/ R (U) (SG)	ICS-202	Fine	27mm	3.5 – 4.9	4.5%	26	9673 (34400)	9701 (34500)	9701 (34500)	9701 (34500)	9729 (34600)	
7	M/M(P)/ SA/TL	ICS-105	Fine	26mm	3.0 – 3.4	4%	25	7283 (25900)	7311 (26000)	7311 (26000)	7311 (26000)	7424 (26400)	
8	P/H/R(U)	ICS-105	Fine	27mm	3.5 – 4.9	4%	26	9814 (34900)	9842 (35000)	9842 (35000)	9870 (35100)	9926 (35300)	L
9	M/M(P)/ SA/TL/G	ICS-105	Fine	27mm	3.0 – 3.4	4%	25	7677 (27300)	7705 (27400)	7733 (27500)	7733 (27500)	7733 (27500)	
10	M/M(P)/ SA/TL	ICS-105	Fine	27mm	3.5 – 4.9	3.5%	26	8858 (31500)	8914 (31700)	8942 (31800)	8970 (31900)	9026 (32100)	
11	P/H/R(U)	ICS-105	Fine	28mm	3.5 – 4.9	4%	27	9870 (35100)	9926 (35300)	9954 (35400)	9983 (35500)	10011 (35600)	I
12	M/M(P)	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	9561 (34000)	9589 (34100)	9617 (34200)	9645 (34300)	9701 (34500)	
13	SA/TL/K	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	9673 (34400)	9701 (34500)	9701 (34500)	9729 (34600)	9786 (34800)	
14	GUJ	ICS-105	Fine	28mm	3.7 – 4.5	3%	27	9617 (34200)	9645 (34300)	9673 (34400)	9701 (34500)	9729 (34600)	D
15	R(L)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	9954 (35400)	9983 (35500)	9983 (35500)	10011 (35600)	10039 (35700)	
16	M/M(P)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	9870 (35100)	9898 (35200)	9898 (35200)	9926 (35300)	9983 (35500)	
17	SA/TL/K	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	9926 35300	9954 35400	9954 35400	9983 35500	10039 35700	A
18	GUJ	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	9926 (35300)	9954 (35400)	9954 (35400)	9983 (35500)	10011 (35600)	
19	M/M(P)	ICS-105	Fine	30mm	3.7 – 4.5	3.5%	29	10067 (35800)	10123 (36000)	10123 (36000)	10151 (36100)	10208 (36300)	
20	SA/TL/K/O	ICS-105	Fine	30mm	3.7 – 4.5	3%	29	10151 (36100)	10208 (36300)	10208 (36300)	10236 (36400)	10292 (36600)	Y
21	M/M(P)	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	10292 (36600)	10320 (36700)	10320 (36700)	10348 (36800)	10376 (36900)	
22	SA/TL/ K / TN/O	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	10320 (36700)	10376 (36900)	10376 (36900)	10404 (37000)	10432 (37100)	
23	SA/TL/K/ TN/O	ICS-106	Fine	32mm	3.5 – 4.2	3%	31	10601 (37700)	10601 (37700)	10601 (37700)	10601 (37700)	10601 (37700)	
24	M/M(P)	ICS-107	Fine	34mm	3.0 - 3.8	4%	33	14819 (52700)	14819 (52700)	14819 (52700)	14819 (52700)	14819 (52700)	
25	K/TN	ICS-107	Fine	34mm	3.0 - 3.8	3.5%	34	15100 (53700)	15100 (53700)	15100 (53700)	15100 (53700)	15100 (53700)	

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