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Cotton Exchange Building, 2nd Floor, Cotton Green, Mumbai - 400 033
Telephone: 8657442944/45/46/47/48 Email: cai@caionline.in
www.caionline.in

Looms and Textiles - Key Insights

(....Continued from Issue No. 16 dated 16th July 2024)

EXPERT's Column

Dr. T. R. Loknathan has worked in the area of Genetic Enhancement of G.hirsutum cotton. He has also worked in Desi cottons (G.arboreum) in both research and promotional activity amongst tribal farmers of Melghat and Parseoni taluka.

Dr. T. R. Loknathan
Retired Principal Scientist
ICAR -CICR, Nagpur

Er. Gautam Majumdar
Agricultural Engineer

Er. Gautam Majumdar is an Agricultural Engineer by profession. He retired from ICAR-CICR, Nagpur having worked there for more than thirty years. He has been working for cotton picking mechanisation for the past 10 years.

Ribbon, Bands and Inkling Looms

These are narrow looms that are used to make narrow warp -faced strips of small ribbons, bands or tapes. These looms are small in size and can be placed on a table.

Darning Looms

Small- handed looms known as darning looms are made to fit under the fabric to be mended and held by an elastic band on one side and a groove

around the loom's darning egg portion. They may be made of heddles by flip- flopping rotating hooks. Other devices have just a darning egg and a comb - like piece with teeth to hook the warp over, these are used for repairing knitted garments and are like linear knitting spool. Darning looms were sold during World War 2 due to severe clothing rationing in United Kingdom and Canada.

Shedding Methods

It is possible to manually weave weft threads over and under warp threads. Sometimes tapestry techniques use warp threads. Pin looms and peg looms also generally have shedding devices. Pile carpets do use shedding devices, where individual warp thread is knotted to the warps, but weft threads may use shedding devices to hold the carpet together.

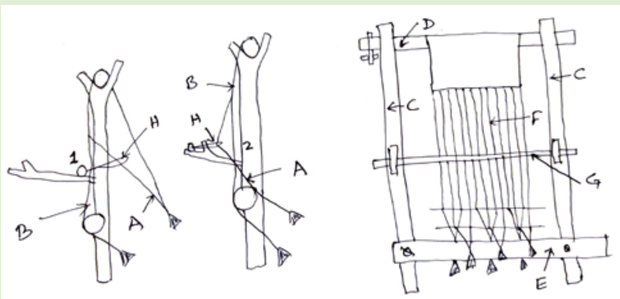
These pull warp threads to each other so a shed is formed and weft thread passes through the shed. There are various methods for forming the shed. At least two sheds may be formed - shed and counter-shed. Simple weave is enough for tabby weave, more complex weaves like twill weave, satin weave, diaper weaves and figure (picture forming) weaves require more sheds.

Shed - Rod

A shed-rod (shedding stick) is simply a stick used to weave through the warp threads. When the threads are pulled perpendicular (or rotated to stand on the edge, for flat sheds), it creates a shed. To create a counter- shed usually a heddle bar is used.

Heddle Bar

This is simply a stick placed across the warp and tied to the individual warp threads. When lifted, the warp threads are pulled to an out of position creating a shed. The warp - weighted loom typically uses a heddle - bar. It has two upright posts (C) supported by a horizontal beam (D) which is cylindrical around which the cloth is rolled over and above the loom so that a long piece of it is woven taller than the loom, to an ergonomic working height. The warp threads (F and A and B) hang from the beam and rest on the shed rod (E). The heddle bar (G) attached to some of the warp threads (A not B) using loops of strings called leashes (H). So when the heddle bar is pulled out and placed in the forked sticks protruding from the posts, the shed 1 is replaced by shed 2. Cloth is woven by passing the warp thread through shed and counter-shed alternately. Heddle bars are used on modern tapestry looms.



Tablet Weaving

Tablet weaving uses cards to punch holes. The warp threads pass through the holes and are twisted and shifted to create various sheds. This technique is used for making narrow work and also used for finishing edge, decorative weaving of selvage bands instead of hemming.

Rotating Hook Heddles

There are rotating hook heddles made of flip-flopping hooks, which raise or lower the warp creating a shed. The hooks when vertical, have the weft threads rolled around horizontally. If the hooks are flopped on one side or another, the loop of weft twists, raising one side or other, creating a shed and counter-shed.

Rigid Heddles

These are generally used in single shaft looms. Odd warp threads go through the slots and

through the circular holes, or vice versa. The shed is formed by lifting the heddles and the counter shed by depressing it. The warp threads in the slots stay where they are and the ones in circular holes are pulled back and forth. A single heddle can handle all the warp threads, but sometimes multiple heddles are used.

Multiple Rigid Heddles

Rigid heddles are called 'rigid' to distinguish from wooden and metal heddles, where each warp has its own heddle, which has an eye at the end and one at the middle for the warp thread. The eyes in the ends are attached to the shaft, all in a row. This cannot be done in a single shaft loom and requires multiple shafts. The different shafts (also called harnesses) must be controlled by some mechanism.

While non- rigid heddles generally require two shafts even for tabby weave, twill weaves require more than two or three shafts depending on the twill, while more complex figured weaves require more harnesses.

Treadle Controlled Looms

These looms can control multiple harnesses with multiple treadles. The weaver selects which harnesses to be engaged with feet. One treadle may be connected to more than one harness and any number of treadles can be engaged at once, meaning that the number of sheds selected is two to the power of number of treadles. Eight is a large reasonable number of treadles, giving a maximum of 2 to the power of 8 = 256. The weaver must remember the sequences of treadling required to produce a pattern.

Figure Harness and Draw Loom

The draw loom is for weaving a figured cloth. 'Figure harness' can control individual warp threads separately allowing to make very complex patterns. Draw loom requires two operators, the weaver and one assistant 'draw boy' to manage the figure harness.

The earliest confirmed evidence of draw loom fabrics came from the state of Chu, c 400 BC. Some scholars speculate that there is evidence that draw loom fabrics in Dura Europpas were found before 256 AD. Draw looms were invented during Han dynasty in China. Foot - powered multi - harness looms and jacquard looms were used for weaving silk and embroidery. The draw looms enhanced and sped up the silk production and the silk industry flourished in China. The draw looms were also introduced to Persia, India and Europe.

Dobby Head

The dobby head is a device which replaces the draw boy, the weaver's helper who used to control warp heads by pulling on draw threads. Mechanical dobbies use draw threads with pegs in bars to lift the set of the levers. The placement of pegs determines which levers to be lifted. The sequence of bars effectively remembers the sequence for the weaver. Computer operated Dobby heads which are automatic use solenoids instead of pegs.

Jacquard Loom:

A jacquard loom is a mechanical loom invented by Joseph Marie Jacquard in 1801. It the manufacturing process of figured textiles of complex patterns of brocade, damask, and matalesse. The loom is controlled by punched cards with punched holes, each row corresponding to each row of design. Multiple holes are punched on each card and multiple cards creates a design. This invention is based on other inventions by Frenchmen viz., Basile Buchon (1725), Jean Baptiste Falcon (1728) and Jacques Vaucanson (1740). A Jacquard head can be attached to a power loom or a handloom, controlling which warp thread to be raised during shedding. Multiple shuttles can be used to control the colour of the weft during picking. This loom is the predecessor of the computer- aided punch card system.

Picking (Weft Insertion)

The weft may be passed across the shed as a ball of yarn and it is usually bulky and unergonomic. Shuttles are usually slim enough to pass through the shed and carry a lot of yarn, so the weaver does not have to refill too often, and to be an ergonomic size and shape to the particular weaver yarn. They may also be designed for low friction.

The role of shuttle is important in operating a loom. A shuttle is a tool designed neatly and compactly in a holder which carries the weft yarns with the loom's weaviing. Shuttles are thrown or passed back and forth through the shed, between the yarn threads of the warp into the weft to weave.

There are different types of shuttles which find their selective use adhering to their working mechanism of the loom.

Various Types Stick Shuttles

Unnotched stick shuttles are the simplest of the shuttles. These are just yard sticks wrapped with yarns, and come in various shapes as with the use of bobbins and bones in tapestry making. Bobbins are used in vertical warps while bones are used in horizontal ones. Shuttles are passed not thrown through warp- weighted looms.

Stick Shutte, Rag Shuttles and Ski Shuttles

Stick shuttles are wound in a figure of eight. Stick shuttle must be passed through not thrown as it would be inconvenient for wide warps. Belt or band shuttle is a short, and sturdy shuttle used for weaving as well as a batten, to beat the new woven weft against the previously woven fell.

Net shuttles are used for netting, ski shuttle has its own use and identity. A rag shuttle has two skis; it uses strips of rags to weave carpets and hence the name.

Boat Shuttles

Boat shuttles may be closed (hollow at the bottom) or open. Yarn may be side feed or end feed. They are commonly added to 10 cm (4 inch) or 15 cm (6 inch) bobbins lengths. There are various examples of historical importance depicting their use. One or any shuttles are used in weaving as per the needs.

Flying Shuttle

Hand weavers who threw a shuttle could weave a cloth as wide as arm's span length. If wider cloth is to be woven then one requires two people. John Kay patented the flying shuttle in 1733. The weaver held a picking stick with two chords to a device at both ends of the shed. With a flick on the wrist, one chord was pulled and the shuttle was propelled through the shed to the other end with considerable force, speed and efficiency. A flick in the opposite direction and the shuttle was pulled back. A single weaver could control this weaving motion, but the flying shuttle could weave much wider cloth than arm's length and much greater speed was achieved by hand - thrown shuttles.

The flying shuttle was one of the key developments which enhanced the Industrial Revolution. The whole picking motion did not rely on manual operation and it would be a matter of time before the shuttle would be powered by machine rather than man.

Weft Insertion in Powerlooms

Different types of powerlooms are determined by the pick or weft inserted in the warp. Weft insertion has been a limiting factor in production. So to make it cost effective in manufacturing of cloth, many advances have been made and by 2010, weft insertion speed had reached a speed of 2000 wefts per minute.

Five Main Types of Weft Insertion

Shuttle type: The first powered looms were of shuttle types. Spools of weft unravel the shuttle which travels across the shuttle to the shed. These are similar to projectile method of weaving except that the spool is stored on the shuttle. These shuttles have become obsolete in modern fabric manufacturing since it could work upto a speed of only 300 wefts per minute.

Air Jet Looms: An air-jet uses short bursts of compressed air to propel the shuttle through the shed to complete the weave. Air jets are the fastest of the shuttles because they can weave at an insertion speed of weft at 1500 wefts per minute. However, the amounts of compressed air required to run the looms and the complexity in which air jets are positioned makes them costlier than other looms.

Water Jet Looms: Water jet looms use the same principle as air jet looms but they take advantage of pressurised water to propel the weave. The advantage of this type of weaving is that water

power is cheaply available at the site. Picks per minute can reach as high as 1000 picks per minute.

Rapier Looms: Rapier looms are versatile looms which can weave using large variety of threads. They have many types of rapiers but they also use the. hook system attached to a metal band across which the shed is passed. These machines usually reach a speed of 700 picks per minute.

Projectile Looms: Projectile looms use an object which is propelled across the shed usually by spring power, and is transported across the width of the cloth by a series of reeds. The projectile is then removed from the weft fibre and returned to the opposite side of the machine so that it can be reused. Maximum speed can be attained by these machines up to 1050 picks per minute.

Circular Looms: Circular looms are used to create seamless tubes of products like hosiery, sacks, clothing, fabric hoses (such as fire hoses) and the like. These looms can use ten shuttles in a circular motion driven by electromagnets for the weft threads and cams to control the warp threads. The warps rise and fall with each shuttle's passage, unlike in other looms where all the threads are lifted at the same time.

Secondary Motions

Dandy Mechanism: It was patented in 1802. Dandy always automatically rolls the finished cloth, keeping the fell in the same place. They speeded the weaving process.

Temples: These act to avoid shrinking of cloth sideways while the cloth is woven. The warp -weighted looms have temples made of loom weights, so that they are suspended by strings so that they can be pulled breadthwise. Other temples may be tied to the frame or temples that are hooks to an adjustable shaft between them. Power looms may have temple cylinders. Pins can leave a series of holes in the selvages.

Handlooms to Powerlooms

A powerloom is a loom powered by a source other than weaver's muscles. When powerlooms were developed, other looms were referred to as handlooms. Most of the cloth today is woven in powerloom.The development of powerloom was gradual. Edmund Cartwright built and patented a powerloom in 1845, which was first adopted by the nascent cotton industry in England.

The silk loom made by Jacques Voucanson in 1745, was based on the same principle but did not develop further. The invention of flying shuttle by John Kay allowed the hand weaver to weave a broadcloth without an assistant. This machine has been a key to successful commercial development of the powerloom. Cartwright's model was impractical but many of the previous inventors designed powerlooms in the city of Manchester in England and by 1818, powerlooms usage rose to 32 factories and 5732 looms.

Then the Horocks loom appeared but it was the Robert loom in 1830 that marked the turning point. Incremental changes to the three motions were made. The problems of sizing, stop motion, consistent take off and temples which maintain width of the cloth continue to exist.

In 1841 Kenworthy and Bullough developed the Lancashire loom which was semi-automatic. A youngster could operate six looms at the same time. Thus the powerloom could make calicos which was difficult in handloom and it was economical as well.

Incremental changes were made in the Dickinson loom culminating in the Northrop loom invented by Northtrop This was a fully automatic loom. By 1942, faster, efficient and easier Sulzer and shuttleless rapier looms were introduced.

Many of the mechanisms like Dandy mechanism were first perfected in a handloom and later on integrated into a powerloom.

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

Supply and Distribution of Cotton

02 July 2024

Million Metric Tonnes

	2018/19	2019/20	2020/21	2021/22	2022/23 proj.	2023/24 proj.
BEGINNING STOCKS						
WORLD TOTAL	**18.66**	**17.92**	**20.57**	**19.38**	**18.59**	**19.38**
China	9.03	8.88	9.02	9.37	8.60	8.44
USA	0.91	1.06	1.58	0.69	0.88	0.93
PRODUCTION						
WORLD TOTAL	**25.21**	**26.04**	**24.61**	**25.06**	**24.39**	**24.09**
China	6.04	5.80	5.91	5.73	5.98	5.60
India	5.66	6.20	5.99	5.29	5.72	5.49
USA	4.00	4.34	3.18	3.82	3.15	2.63
Brazil	2.01	2.78	3.00	2.36	2.55	3.20
Pakistan	1.67	1.46	0.96	1.27	0.84	1.42
Uzbekistan	0.64	0.53	0.70	0.59	0.59	0.59
Others	5.20	4.93	4.87	6.01	5.56	5.16
CONSUMPTION						
WORLD TOTAL	**26.03**	**23.05**	**25.71**	**25.84**	**23.66**	**25.00**
China	8.25	7.23	8.40	8.31	7.50	8.30
India	5.40	4.45	5.70	5.30	5.20	5.39
Pakistan	2.36	2.34	2.15	2.45	1.90	2.30
Europe & Turkey	1.82	1.60	1.79	2.01	1.82	1.82
Bangladesh	1.58	1.50	1.64	1.73	1.60	1.60
Vietnam	1.51	1.45	1.52	1.46	1.30	1.42
Brazil	0.73	0.57	0.69	0.70	0.70	0.70
USA	0.65	0.47	0.52	0.56	0.45	0.40
Others	3.73	3.44	3.30	3.32	3.20	3.07
EXPORTS						
WORLD TOTAL	**9.15**	**9.12**	**10.76**	**9.70**	**8.28**	**9.82**
USA	3.23	3.38	3.56	3.15	2.78	2.57
Brazil	1.31	1.95	2.42	1.74	1.45	2.70
Australia	0.79	0.30	0.35	0.79	1.36	1.19
CFA Zone	1.16	1.07	1.19	1.31	0.88	1.04
India	0.76	0.70	1.36	0.87	0.25	0.46
Uzbekistan	0.16	0.10	0.10	0.03	0.01	0.02
IMPORTS						
WORLD TOTAL	**9.22**	**8.78**	**10.66**	**9.61**	**8.23**	**9.82**
Bangladesh	1.54	1.50	1.69	1.70	1.40	1.55
China	2.10	1.60	2.84	1.85	1.38	3.00
Vietnam	1.51	1.41	1.55	1.36	1.35	1.47
Turkey	0.79	1.02	1.19	1.24	0.95	0.64
Indonesia	0.66	0.55	0.55	0.58	0.38	0.50
TRADE IMBALANCE †	0.07	-0.34	-0.10	-0.09	-0.05	0.00
STOCKS ADJUSTMENT ‡	0.01	0.00	0.01	0.09	0.12	0.04
ENDING STOCKS						
WORLD TOTAL	**17.92**	**20.57**	**19.38**	**18.59**	**19.38**	**18.51**
China	8.88	9.02	9.37	8.60	8.44	8.71
USA	1.06	1.58	0.69	0.88	0.93	0.62
ENDING STOCKS/MILL USE (%)						
WORLD-LESS-CHINA *	**50.84**	**73.11**	**57.82**	**56.99**	**67.74**	**58.68**
CHINA **	**107.69**	**124.82**	**111.51**	**103.46**	**112.48**	**130.00**
COTLOOK A INDEX***	**84.35**	**71.33**	**84.96**	**131.68**	**101.62**	**92.97**

Note :
Seasons begin on August 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.*
‡ *Difference between calculated stocks and actual; amounts for forward seasons are anticipated.*
* *World-less-China's ending stocks divided by World-less-China's mill use, multiplied by 100.*
** *China's ending stocks divided by China's mill use, multiplied by 100.*
*** *U.S. Cents per pound. Average price for a given season, August 1 to July 31 or average-to-date.*
Source: ICAC Cotton This Month, 02 July 2024


COTTON ASSOCIATION OF INDIA
A CHILD'S CHILDHOOD IS FOR LEARNING
DON'T USE THEIR CHILDHOOD FOR EARNING
SAY NO TO CHILD LABOUR
COTTON ASSOCIATION OF INDIA
Established 1921
ISO 9001:2015

UPCOUNTRY SPOT RATES

(Rs./Qtl)

Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length As per CAI By- laws								Spot Rate (Upcountry) 2023-24 Crop July 2024					
Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Gravimetric Trash	Strength /GPT	15th	16th	17th	18th	19th	20th
1	P/H/R	ICS-101	Fine	Below 22mm	5.0 – 7.0	4%	15	14285 (50800)	14426 (51300)	14426 (51300)	14426 (51300)	14426 (51300)	14369 (51100)
2	P/H/R (SG)	ICS-201	Fine	Below 22mm	5.0 – 7.0	4.5%	15	14454 (51400)	14594 (51900)	14594 (51900)	14594 (51900)	14594 (51900)	14538 (51700)
3	GUJ	ICS-102	Fine	22mm	4.0 – 6.0	13%	20	11473 (40800)	11529 (41000)	11529 (41000)	11585 (41200)	11529 (41000)	11501 (40900)
4	KAR	ICS-103	Fine	22mm	4.5 – 6.0	6%	21	12710 (45200)	12766 (45400)	12766 (45400)	12766 (45400)	12738 (45300)	12738 (45300)
5	M/M (P)	ICS-104	Fine	23mm	4.5 – 7.0	4%	22	15157 (53900)	15213 (54100)	15213 (54100)	15213 (54100)	15185 (54000)	15185 (54000)
6	P/H/R (U) (SG)	ICS-202	Fine	27mm	3.5 – 4.9	4.5%	26	15747 (56000)	15803 (56200)	15803 (56200)	15860 (56400)	15860 (56400)	15775 (56100)
7	M/M(P)/ SA/TL	ICS-105	Fine	26mm	3.0 – 3.4	4%	25	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)
8	P/H/R(U)	ICS-105	Fine	27mm	3.5 – 4.9	4%	26	15888 (56500)	15944 (56700)	15944 (56700)	16000 (56900)	16000 (56900)	15916 (56600)
9	M/M(P)/ SA/TL/G	ICS-105	Fine	27mm	3.0 – 3.4	4%	25	14397 (51200)	14397 (51200)	14397 (51200)	14397 (51200)	14369 (51100)	14313 (50900)
10	M/M(P)/ SA/TL	ICS-105	Fine	27mm	3.5 – 4.9	3.5%	26	15522 (55200)	15578 (55400)	15578 (55400)	15578 (55400)	15550 (55300)	15550 (55300)
11	P/H/R(U)	ICS-105	Fine	28mm	3.5 – 4.9	4%	27	16056 (57100)	16113 (57300)	16113 (57300)	16169 (57500)	16169 (57500)	16085 (57200)
12	M/M(P)	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	16028 (57000)	16085 (57200)	16085 (57200)	16085 (57200)	16056 (57100)	16056 (57100)
13	SA/TL/K	ICS-105	Fine	28mm	3.7 – 4.5	3.5%	27	16141 (57400)	16197 (57600)	16197 (57600)	16197 (57600)	16169 (57500)	16169 (57500)
14	GUJ	ICS-105	Fine	28mm	3.7 – 4.5	3%	27	16085 (57200)	16141 (57400)	16141 (57400)	16141 (57400)	16113 (57300)	16085 (57200)
15	R(L)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)
16	M/M(P)	ICS-105	Fine	29mm	3.7 – 4.5	3.5%	28	16310 (58000)	16366 (58200)	16366 (58200)	16366 (58200)	16338 (58100)	16338 (58100)
17	SA/TL/K	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	16422 (58400)	16478 (58600)	16478 (58600)	16478 (58600)	16450 (58500)	16450 (58500)
18	GUJ	ICS-105	Fine	29mm	3.7 – 4.5	3%	28	16338 (58100)	16394 (58300)	16394 (58300)	16394 (58300)	16366 (58200)	16338 (58100)
19	M/M(P)	ICS-105	Fine	30mm	3.7 – 4.5	3%	29	16647 (59200)	16703 (59400)	16703 (59400)	16703 (59400)	16703 (59400)	16703 (59400)
20	SA/TL/K/O	ICS-105	Fine	30mm	3.7 – 4.5	3%	29	16703 (59400)	16759 (59600)	16759 (59600)	16759 (59600)	16759 (59600)	16759 (59600)
21	M/M(P)	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)
22	SA/TL/ K / TN/O	ICS-105	Fine	31mm	3.7 – 4.5	3%	30	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)
23	SA/TL/K/ TN/O	ICS-106	Fine	32mm	3.5 – 4.2	3%	31	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)	N.A. (N.A.)
24	M/M(P)	ICS-107	Fine	34mm	2.8 - 3.7	4%	33	23199 (82500)	23199 (82500)	23199 (82500)	23199 (82500)	23199 (82500)	23199 (82500)
25	K/TN	ICS-107	Fine	34mm	2.8 - 3.7	3.5%	34	23761 (84500)	23761 (84500)	23761 (84500)	23761 (84500)	23761 (84500)	23761 (84500)
26	M/M(P)	ICS-107	Fine	35mm	2.8 - 3.7	4%	35	23621 (84000)	23621 (84000)	23621 (84000)	23621 (84000)	23621 (84000)	23621 (84000)
27	K/TN	ICS-107	Fine	35mm	2.8 - 3.7	3.5%	35	24324 (86500)	24324 (86500)	24324 (86500)	24324 (86500)	24324 (86500)	24324 (86500)

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