Ginning and Spinning Operation

Level II

Based on March 2022, Curriculum Version 1

MODULETITLE: Identifying and Determining Cotton Characteristics

Module Code: IND GSO2 M01 0322

Nominal duration: 70Hour

Prepared by: Ministry of Labour and Skill

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Acronym

INTRODUCTION TO THE MODULE

This Module is developed to provide you the necessary information regarding the following content coverage and topics:

- Identify basic features of local seed cotton
- Recognize parts of cotton bolls
- Recognize key cotton features necessary to achieve optimum classing outcome
- Identify key cotton features that can be varied through ginning process
- Recognize key cotton characteristics necessary to maximize cotton value

Learning Objective of the Module

- Identify basic features of local seed cotton
- Understand parts of cotton bolls
- Determine key cotton features necessary to achieve optimum classing outcome
- Identify key cotton features that can be varied through ginning process
- Recognize key cotton characteristics necessary to maximize cotton value

Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the "LAP test" giver at the end of each unit and
5. Read the identified reference book for Examples and exercise

Unit One :-Identifying Basic Features Of Local Seed Cotton
This unit is developed to provide you the necessary information regarding the following content coverage and topics: • Identifying species of seed cotton • Weather climate impact on growing of cotton • Module controlling system • Typical trashes in modules of seed cotton This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this unit, you will be able to: • Identify species of seed cotton • Understand Weather climate impact on growing of cotton • Access Module control system • Determine trash module of seed cotton

1.1 Identifying species of seed cotton

1.1.1 TYPES OF LINT COLOUR

The lint colour of cotton under commercial cultivation is often white. In the cultivated species, brown and green colours are most common. Some of the genotypes in germplasm collection of USA and Russian Republics are reported to have coloured lint with shades of pink, red, blue, green and also black. Ms.Sally Fox of Vresers Ltd. claimed to have developed multi coloured lint, i.e. development of more than one colour on the same lint strand. However, genotypes with multi coloured lint have not yet been made available to the researches nor produced on large scale. The two commonly occurring lint colours, i.e. brown and green are briefly discussed below:

Brown colour

Among the coloured cottons, brown is the most common colour. The brown colour is found in different shades which ranges from light brown to intense mahogany red. Depending on the intensity of colour, it is named as light brown, khaki / camel colour, brown, dark brown / chocolate colour, dirty grey, tan and red. Brown colour is found in all the four cultivated as well as many of the wild species. Brown colour is more stable than green clour. On continuous exposure to sunlight, brown colour also fades but gradually at a very slow rate. In India, brown linted varieties G.arboreum, namely, Cocanada-1, Cocanada-2 and red Northerns were under commercial cultivation during first half of the 20th century.

Green Colour

Green is the second important commonly occurring lint colour in cotton. Green colour is less common than brown and occurs mainly in two shades i.e. light green and green. Green colour is more prone to fading, fades faster than the brown colour. Prolonged exposure to sunlight during boll opening leads to rapid fading of green colour and the colour turns to white, off-white or brownish. Portion of lint which is not directly exposed to sunlight retains its original lint colour. Green colour is mostly observed in G.hirsutum and probably varieties possessing green lint have not yet been released for commercial cultivation.

1.1.2 Sources Of Lint Colour

There are two important sources of coloured lint in cotton. These are-

(i) germplasm collections, and

(ii) (ii) wild species.

These are briefly discussed below:

Germplasm collection

Genetic resources are most vital for improvement of any crop. In India, about 40 coloured genotypes of upland cotton (G.hirsutum), mostly of various shades of brown and green color are available in the National Gene Bank of Cotton maintained at the Central Institute for Cotton Research, Nagpur. These genetic stocks are indigenous collections as well as exotic accessions from USA, erstwhile USSR, Israel, Peru, Mexico, Egypt etc. In Asiatic diploid cottons (G.arboreum and G.herbaceum) about 10 germplasm lines possessing mostly light brown lint colour are also available. Most of the coloured linted germplasm lines have been evaluated for their economic attributes as well as fibre characteristics.

1.1.3 Advantages Of Coloured Cotton

There are several advantages of naturally coloured over the white cotton varieties. These are briefly discussed below:

Effect on Human Health

Cotton fabrics with artificial dyes have been reported to have adverse effects on the skin and human health. Artificial dyes cause allergy and itching on the skin and sometimes may cause skin cancer. In cotton mills, several labourer come in contact with artificial dyes. Artificial dyes have adverse effect on their health. There is risk of skin cancer among the persons who regularly come in contact with artificial dyes. It is a known fact that most of dyes used in textile industries are carcinogenic. The fabric prepared from naturally colored cotton lint is free from such adverse effects. There is no need of using artificial dyes, when the fabric is manufactured from naturally colored cotton. Such fabric can be safely used even by those having sensitive skin. Thus, fabric manufactured from colored cotton has been found to be the best for human health.

Effect on Environment

Various artificial dyes are being used for dyeing of cloth manufactured from the white lint. After dyeing, the chemical residues in the form of dyeing or finishing affluent are thrown in nearby river contaminating water and soil. This form a major source of environmental pollution. When the fabric is manufactured from naturally colored lint, there is no need of artificial dyes. Hence the residues of artificial dyes will not accumulate in the drains. Thus use of naturally colored cotton helps in reducing environmental pollution caused by artificial dyes.

Effect on cost of fabric production

The dyeing process adds to the cost of production of fabric. The dyeing process is omitted when naturally coloured lint is used for manufacturing of the fabric. Thus the cost of production of fabric can be reduced to some extent through the use of naturally colored cotton. If the coloured cotton is paid higher price than white cotton, then the reduction in the cost of production of fabric caused by omitting dyeing process is compensated by high price of coloured cotton fabric.

Limitations Of Coloured Cotton

Naturally coloured cottons have some inherent drawbacks. These are: low yield potential, poor fiber properties, limited colors, instability of colors, contamination of white cotton, low market demand, and lack of marketing facilities.

What is called cotton seed?

Cotton seed, seed of the cotton plant, important commercially for its oil and other products. Cottonseed oil is used in salad and cooking oils and, after hydrogenation, in shortenings and margarine. The cake, or meal, remaining after the oil is extracted is used in poultry and livestock feeds.

Cotton seed, seed of the cotton plant, important commercially for its oil and other products. Cottonseed oil is used in salad and cooking oils and, after hydrogenation, in shortenings and margarine. The cake, or meal, remaining after the oil is extracted is used in poultry and livestock feeds. Linters, the short cellulose fibres left on the seed after the staple cotton is removed by ginning, are used to make coarse yarns and many cellulose products. The hulls, or outer seed coverings, are used in ruminant animal feed as roughage.

Why cotton is called King of fibre?

Fig 1cotton plant

Cotton is the most important natural textile fiber, as well as cellulosic textile fiber, in the world, used to produce apparel, home furnishings, and industrial products.

How do you identify a cotton plant?

Fig 2 cotton plant

The cotton plant belongs to the genus Gossypium of the family Malvaceae (mallow family); the same family as hollyhock, okra and hibiscus. It is generally a shrubby plant having broad three-lobed leaves and seeds in capsules, or bolls; each seed is surrounded with downy fiber, white or creamy in color and easily spun.

What are the 4 types of cotton?

Fig 3 cotton plant

There are four different types of cotton, each with its own characteristics**.**

1. Pima cotton**.** Pima cotton is the highest quality cotton available, thanks to those long, silky fibers. This means that pima cotton t-shirts, dress shirts, or polo shirts will not only be some of the most comfortable items in your closet, they'll be softer,

Pima cotton considered the finest type of cotton in the world, pima cotton's fibers are extra soft and extra long.

What is pima cotton vs cotton?

Still wondering what is the difference between pima cotton and regular cotton? In addition to being softer than regular cotton, pima cotton is known to be more durable. It is resistant to common issues like fraying, tearing, and general wear and tear, while regular cotton tends to show signs of age sooner is pima cotton the same as 100% cotton?

A. Pima cotton is a higher-end type of cotton with a longer fiber than conventional cotto**n**. It has a reputation for producing a smooth fabric that's soft to the touch, wrinkle-resistant, and ultra-durable.
B. Egyptian cotton. Egyption cotton is very similar to pima cotton. ...
C. .Upland cotton. the United States as "American Upland" cotton and has fibers that range in length from about 7/8 to 15/16 inches. ...
D. .Organic cotton. Organic cotton is grown using methods and materials that have a low impact on the environment. Organic production systems replenish and maintain soil fertility

Compared to other materials on the market, organic cotton is one of the most environmentally friendly options, as it does not have a harsh manufacturing process. The production of organic cotton fabric uses less energy, releases fewer greenhouse gases and due to the improved soil quality, uses significantly less water

What is difference between cotton seed and seed cotton?

Related Definitions

Seed Cotton means cotton as it comes from the field prior to ginning. Seed Cotton means raw cotton containing seed and lint that has been harvested from a field, but has not been ginned. Seed Cotton means the lint and seed derived from the ball of the Gossypium plant.

open Access *Cotton seeds varieties identification* based on shape features ... The **parameters were then used as the index of species identification**

Cotton seeds are the seeds of the cotton plant. Cotton seeds are ovoid, 3.5-10 mm long. They are densely covered with white or rusty, long and woolly hairs, called the lint, which is the main product used to make cotton textiles, and shorter hairs (linters).

Cotton cultivation and organic production

Cotton is natural fiber grown on plant related to the hibiscus. The seeds are planted in spring and cotton plant grows in to green bushy shrubs about a meter in height. The plants briefly grow pink and cream colored flowers that pollinated drop off and are replaced with fruit better known as cotton balls.

Cotton is one of the most important fiber and cash crop of Ethiopia and plays a dominant role in the industrial and agricultural economy of the country. It provides the basic raw material (cotton fiber) to cotton textile industry. Cotton in Ethiopia provides direct livelihood farmers and about millions people are employed in cotton

Trade and its processing

In Ethiopia, there are major cotton growing regions. Afar, Amhara, SNNPR, Gambela

Cotton Species

There are four cultivated species of cotton viz. gossypium arboreum, G.herbaceum, G.hirsutum and G.barbadense. The first two species are diploid (2n=26) and are native to old world. They are also known as Asiatic cottons because they are grown in Asia. The last two species are tetraploid (2n=52) and are also referred to as new world Cottons. G.hirsutum is also known as American cotton or upland cotton and G.barbadense as Egyptian cotton or Sea Island cotton or Peruvian Cotton or Tanguish Cotton or quality cotton. G.hirsutum is the predominant species which alone contributes

1.2 Weather climate impact on growing of cotton

Several questions have come in this week regarding the effect of cold weather and moisture on cotton growth. Cotton is sensitive to cold temperatures as well as excessive soil moisture. Generally speaking, having one of these situations is made worse by having the other as well. In other words, cold temperatures are problematic; however, problems usually worsen when cold temperatures occur in conjunction with excessive soil moisture. This is most true for cotton that has just been planted. Cotton seed that imbibes cold water during the hours after planting is most likely to incur damage. Cotton seeds that have germinated and are subjected to temperatures of 50°F can suffer from root abortion and/or death. Cotton that was planted prior to or during cold temperatures that occurred early this week has been slow to germinate and develop.

Rainfall received late last week was needed in many areas; however, excessive moisture can lead to problems. Heavy rainfall can result in soil crusting as well as increased damage from seedling disease (as above, this situation is compounded by the occurrence of low temperature). As a result, rotary hoes have been running in some fields where crusting is an issue. If a given field became waterlogged following excessive rainfall, problems can occur depending on the length of time soil remained waterlogged. Fields that remained waterlogged for 24 to 36 hours may have increased incidence of seedling death. Saturated conditions prevent oxygen from reaching cotton roots which can ultimately result in seedling death. Roots generally become discoloured which is accompanied by a reduction or stoppage of growth.

Cotton does not grow when temperatures fall below 60°F. A large portion of our cotton crop was planted last weed and as a result, cotton in many fields has emerged but has been very slow to develop. Compounding this problem is the level of thrips that many are experiencing. Dr. Angus Catchot has provided a post in regard to this situation on this blog.

Cotton that has been impacted by environmental conditions has left some weighing replant options. As we all know, the decision to replant can be one of the most difficult decisions to make, especially considering the calendar date. Factors to consider when making replant decisions are stand uniformity and health of existing stand. Generally speaking, cotton planted after May 15th will not yield as well as cotton planted prior to that date. This is a general rule based on past research; however, given the weather conditions so far this year, that date may not apply. As indicated above, some cotton has struggled due to environmental conditions. If you have a uniform population that appears to be healthy you have no major cause for concern as of now. However, if you have stands that have frequent skips larger than 2 â€“ 3 feet, yield reductions will likely occur. Research has indicated that uniform stands in the 15,000 â€“ 20,000 plant per acre range can provide optimum yields. If you have recently planted seedlings that are unhealthy, not growing properly, and may ultimately result in poor stands, replanting may be the best option. Cotton re-planted during optimum conditions will likely germinate and develop quicker than cotton suffering from non-uniform stands, damaged root systems, etc.

Australian cotton industry is looking to the future through explicit research focusing on what impact climate change and extreme weather events will have on cotton production, and seeking to understand how we can adapt to environmental changes.

Worldwide cotton production has broadly adapted to growing in temperate, subtropical and tropical environments, but growth and production systems in Australia may be challenged by future climate change. Changes in climate factors such as warmer air temperatures and extreme fluctuations in precipitation as a result of rising carbon dioxide (CO_2) concentration may significantly impact plant growth and crop productivity.

Prior research utilising controlled environment glasshouses and field studies in the US have provided an excellent foundation of understanding potential impacts. However, there has been no specific research into climate change impacts for modern Australian cotton systems, and little research attempted to assess the combined interactive effects (temperature x CO_2 x water) of climate change on cotton productivity; especially in the field.

Over the past several years, a range of research initiatives led by CSIRO and Western Sydney University, and supported by CRDC, have been underway to better understand responses of the Australian cotton system to this changing environment. Research has included simulation modelling, glasshouse and field-based studies, which has revealed some key insights. On-going research requires a multi-faceted approach that incorporates model simulations, glasshouse and field studies to better our understanding and knowledge of cotton system and plant-soil responses to projected environmental conditions for Australian cotton regions.

Climate change will have both positive and negative effects on cotton production. Increased CO_2 may increase yield in well-watered crops and higher temperatures will extend the length of the growing season. However, warmer temperatures also accelerate the rate of crop development and could potentially shorten the time to maturity, which may then impact crop management decisions.

Higher temperatures also have the potential to cause significant fruit loss, reduce water use efficiencies, lower yields and alter fibre quality.

Environmental conditions that encourage excessive shading by the leaves may lead to fruit loss throughout the season. Consequently, fruit loss may exacerbate excessive vegetative growth and further loss of fruit, due to a lower fruit load to restrict vegetative growth.

A prediction of more frequent extreme weather events such as droughts, heat waves and flooding pose significant risks to improvements in cotton productivity. Inter-annual yield variability is likely to be greater, with benefits from increases in yield potential during favourable seasons, but also large reductions in yield during the seasons affected by extreme weather events.

Research into integrated effects of climate change (temperature, humidity, CO_2 and water stress) on cotton growth, yield and quality will be important. This includes the development of cultivars tolerant to a biotic stresses (especially for more frequent hot, water-challenged (deficit and waterlogged) conditions), and better understanding of whole system management strategies to maximise production and minimise losses of cotton grown in variable environments. In a systems context, climate change is a multi-factor complex issue that is likely to require more than one solution to address the multi-dimensional, integrated impacts on Australian cotton production systems.

This overview highlights some of the recent research that outlines legacy effects, climate change across Australian cotton regions, and the impacts of extreme weather events on cotton systems.

Legacy effect

The positive effect of elevated CO_2 on cotton growth and yield is generally consistent across studies, however, single-season experiments do not account for 'legacy effect' on subsequent crops.

Cotton plants under elevated CO_2 produce N-poor litter, which can reduce soil N availability for subsequent crops through reduced decomposition rate. As a third of cotton's N uptake comes from mineralised N, reduction in decomposition can strongly limit the yield response to elevated CO_2 in subsequent seasons.

In glasshouse experiments, elevated CO_2 strongly reduced yield in the second year, particularly at ambient temperature. Conversely, warmer air temperature had a consistent effect and seemed to negate the negative effect of elevated CO_2 on yield.

Assessing the strength of this legacy effect in the field will be critical in developing fertiliser recommendations to mitigate the potential negative impact of elevated CO_2 on cotton yield in the future.

Climate change across cotton regions

There have been substantial increases in atmospheric CO_2 concentration since the beginning of the industrial age. Atmospheric CO_2 during the past 800,000 years ranged between 170 and 300 μmol mol-1 in response to natural transitions between glacial and inter-glacial periods.

However, atmospheric CO_2 has been rapidly increasing over the past 200 years due to world-wide industrial activity from a pre-industrial concentration of about 280 μmol mol-1 to 406 μmol mol-1 in 2017 (Tans and Keeling, 2018), with projections for more rapid increases in the future. It is projected that atmospheric CO_2 concentration will rise to 450 μmol mol-1 by 2030.

As a consequence of rising greenhouse gases in the atmosphere, including CO_2, global air temperatures have also been increasing throughout many regions. Global average air temperature has warmed by more than 1°C since records began in 1850, and each of the last four decades have been warmer than the previous decade (CSIRO and Bureau of Meteorology, 2018). Australia's climate has increased 1°C since 1901 with an increase in the frequency of extreme heat events (CSIRO and Bureau of Meteorology, 2018).

In a recent study, eight locations across Australia's cotton-growing regions have been assessed to explore temperature trends from: (a) 1957 to 2017 (60 years); (b) 1957 to 1996 (39 years); and (c) 1997 to 2017 (20 years). All eight locations exhibited a trend for an increase in the accumulation of the number of day degrees (a measure of heat accumulation throughout a growing season, from September to April) during the period 1957 to 2017 (Figure 1). Furthermore, from 1957 to 1996, there was an increase in the number of day degrees at Emerald, and during the period 1997 to 2017 there was an increase in the number of day degrees at Griffith and More.

Although the slopes of each regression were mostly positive, suggesting a possible increasing trend in day degree accumulation, the variation in the number of day degrees between years was large over a relatively short timeframe. However, the significant increasing trend in the number of day degrees from 1957 to 2017 for all eight locations indicates an increase in the number of hot days and warmer night-time air temperatures.

Current climate projections indicate Australia will exhibit more heat waves (air temperatures greater than 35°C). Recent examples were during the 2016-17 cotton season, where high temperature records were broken across the country. More, in the Gwydir Valley in North West NSW, recorded 54 consecutive days exceeding 35°C. The previous record was 11 days above 35°C. Mungindi, north of more, measured 49 consecutive nights of 20°C or above. The previous record was 27 nights.

Climate projections also indicate that there will be changes in rainfall distribution, including an increase in the intensity of drought and flooding. Drought conditions directly affect dry land crops during the season and reduce water availability for irrigated cotton systems. On the other hand, Australia's cotton is often grown on heavier soil textures (clay soils), so crops may experience yield losses due to water logging during heavy rainfall events.

Crop simulation studies

Crop simulation studies assessed the potential impacts on lint yield, water use, and water use efficiency across nine Australian cotton locations covering diverse irrigated and dryland scenarios at Emerald, Dalby, St George, Goondiwindi, Moree, Bourke, Narrabri, Warren, and Hillston

What is the weather climate in Ethiopia?

The country has a diverse climate and landscape, ranging from equatorial rainforest with high rainfall and humidity in the south and southwest, to the Afro-Alpine on the summits of the Simien and Bale Mountains, to desert-like conditions in the north-east, east and south-east lowlands.

What are the factors affecting cotton?

He found that cultivation cost, sowing cost, seed, fertilizer, pesticide, irrigation and labour are the important variables in production of cotton. Plant protection and irrigation are the most important variables which affect the cost of production.

How does climate change affect Ethiopia?

Climate change is expected to increase heat waves, droughts, flooding, and sea levels around the world, and also cause important health risks in Ethiopia. Ethiopia is vulnerable to many of the effects of climate change, including increases in average temperature and changes in precipitation.

It is estimated that 97% of the water in the Indus River goes towards producing crops like cotton. Cotton's most prominent environmental impacts result from the use of agrochemicals (especially pesticides), the consumption of water, and the conversion of habitat to agricultural use.

How does climate affect cotton?

The results show that climate change has a significant negative impact at 1% level on cotton production observed with an average decrease per farmer of 2330 kg, on the yield efficiency with an average decrease of 515 kg/ha.

What are the climatic conditions for the growth of cotton plant?

Cotton is a tropical crop and it is raised in India as a Kharif crop. Cotton requires uniformly high temperature between 21 degree Celsius and 30 degree Celsius. During October, the day temperature should be above 26 degree Celsius which helps the ripening and bursting of cotton balls under the sunny skies

1.3 Module controlling system

Many years, trailers were the primary method of moving harvested cotton from the field to the cotton gin. Until the mid-1940s, cotton was primarily hand harvested and there was a limited effect of trailer capacity on timeliness of harvesting.

The advent of mechanical harvesting significantly increased the harvesting capacity and made trailers the limiting factor in the harvesting-ginning system. Larger and increased numbers of trailers and the gradual increase in ginning capacity could not keep up with harvesting capacity. Thus harvesters would sit idle until cotton was ginned from trailers and made available to the producer. This extended the harvest season, exposing cotton remaining in the field to undesirable weather conditions that resulted in yield and quality losses.

The need for an improved storing and transporting system led to the development in the early 1970s of the module builder. This was a system in which cotton was dumped from the harvester into the module builder and the cotton compacted into a trapezoidal shape. Initially, modules were built on pallets made of either wood or metal. Further studies found that the cotton modules could be formed and stored directly on the ground without significant loss of cotton quantity or quality, so long as the ground surface was well drained.

A method of hauling the modules from the field to the gin was also developed. Initial haulers used tilting beds with rollers and a winch that pulled the pallets onto the truck. Modules built without pallets allowed the use of systems similar to those for hay bales. This included a series of parallel chains built into the tilting bed. The chains were synchronized to the ground speed of the truck when loading and unloading the module. The module truck provided a method for transporting the modules at higher speeds and longer distances.

When cotton moduling systems were initially adopted, the gins were not adequately equipped to break up the modules. The suction system used to unload trailers was slow and ineffective when feeding compressed seed cotton from modules. Early systems utilized either stationary or moving heads that used several cylinders with lugs to remove the cotton from the compacted module, dropping the seed cotton onto belts or into pneumatic conveying systems.

Taken as a system, the module builder, transporter and feeder represented a revolutionary change in the way cotton was handled between the field and gin. The module system was adopted rapidly wherever cotton was mechanically harvested, because it provided significant operational efficiencies, both for harvesting and ginning operations.

The initial module system concept evolved with many changes and improvements. The module builder used in the United States has kept the standard 7.5-foot wide by 32-foot base dimensions. Module builder height can vary from 9 feet- 6 inches to 11 feet, with the more common height being 11 feet. The choice of heights depends on other equipment used in the harvesting system. The biggest change since the early development of the module builder has been larger capacity cotton harvesters. Harvester operating width gradually increased from 2-row to 4-row and then to 6-row and 8-row. The wider multi-row units cannot dump directly into module builders because of the header width. To accommodate the wider machines and keep the expensive harvesters working, a system of using carts, known as boll buggies, was developed to transport the harvested cotton from the field to the module builders that were typically located at the edge of the field.

. This separation of the harvest and transport functions allows the more expensive harvester to spend more time harvesting. Some harvesters and boll buggies are equipped with live chain drags on the side of the baskets so that, when tilted up for dumping, the cotton can be dumped in a more controlled manner. As more of the cotton crop was stored in modules, the need to maintain the quality of the seed cotton became apparent. Seed cotton modules are protected by placing a water-resistant cover over the top surface of the module

What is a module of cotton?

Once cotton is harvested, it is stored in modules — which hold 13 to 15 bales — for protection against the weather. Modules are stored in the field or on the gin yard until the cotton is ginned.

What is a cotton module builder used for?

The cotton module builder is a machine used in the harvest and processing of cotton. The module builder has helped to solve a logistical bottleneck by allowing cotton to be harvested quickly and compressed into large modules which are then covered and temporarily stored at the edge of the field.

Module records regarding date of receival, moisture content at receival, location of module in module yard and grower details are accessed Moisture: The Roller Gins can take up to 10-11%moisture but above that the drying process should be adopted before feeding the seed cotton to the ginning machines and the moisture contents should be brought down to below 10% before ginning

1.4 Typical trash found in modules of seed cotton is identified

what is trash content in cotton?

Trash is a measure of the amount of non-lint materials in cotton, such as leaf and bark from the cotton plant.

Trash Grade depends on trash, the quantity and appearance of foreign matter remaining in cotton lint after ginning. Foreign matter includes seed, stem, leaf, bract, dirt, grass, bark, and particles introduced by harvesting equipment (oil, rubber) and handling (bagging, rope). Differences in trash content can determine color differences within a given grade Preparation. This is the effect ginning has on smoothness of the cotton lint. Machine harvesting, excessive gin drying and cleaning and high gin production rates can lead to rougher lint. Naps and neps contribute to roughness. Naps are large, tangled masses of fibers that often result from ginning wet cotton. Neps are smaller snarled clusters of fibers that look like dots in the lint and are more difficult to remove.

what is the machine that separates cotton fibres from the seed and trash called?

A cotton gin—meaning "cotton engine"—is a machine that quickly and easily separates cotton fibers from their seeds, enabling much greater productivity than manual cotton separation.

How much is the lint percentage in seed cotton?

around 32 to 37%

Presently, the farmers get rates only on the basis of raw cotton which consists of lint and seeds. The lint percentage is around 32 to 37% while the rest is the seed weigh.

How is quality of cotton measured?

Official USDA cotton quality classifications measure three factors: grade, staple**,** and micronaire (10). 1/ Grade depend on the color, trash content, and preparation (smoothness) of the sample. Staple is the average length of the individual fibers. Micronaire is a measure of fiber fineness and maturity.

Self-Check -1

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. The cotton briefly grow pink and cream colored flowers that pollinated drop off and re replaced with fruit better _____________.(2 pts.)

   A) Fiber B. Yarn C. Cotton fiber D. Cotton balls E. planting

Give short answer

1. Define the cotton (2 pts.)
2. What are the four species of cotton? (2 pts.)
3. What is trash content in cotton?
4. What are safety precautions during operating? (3 pts
5. What is a module of cotton?
6. What is difference between cotton seed and seed cotton?

Unit Two: Recognize Parts Of Cotton Bolls
This unit is developed to provide you the necessary information regarding the following content coverage and topics: • Parts of the cotton plant • Components of cotton boll • Maturity of cotton bolls • Identifying fiber length This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Apply Parts of the cotton plant • Understand Components of cotton boll • Determine Maturity of cotton bolls • To Identifying fiber length

2.1 Parts of the cotton plant

The cotton plant is constantly manufacturing new, specialized cells to form the organs that carry out growth and reproduction. The four organs are the roots, stem, leaves, and fruits (squares, flowers, and bolls).

What is a piece of cotton called?

BOLL: the seed-bearing part of the cotton plant in which the. cotton fibers are formed. DYE: a natural substance used to add a color to or change the. color of something. FIBER: a fine, threadlike piece, produced by the cotton plant.

What is the white part of the cotton plant called?

Each plant has different amounts of branches so each plant yields a different number of squares. A mature square becomes the puffy, white **tuft or boll** that is readily visible when picking time nears. Cotton plants planted in the spring will start sprouting bolls in early to mid-fall.

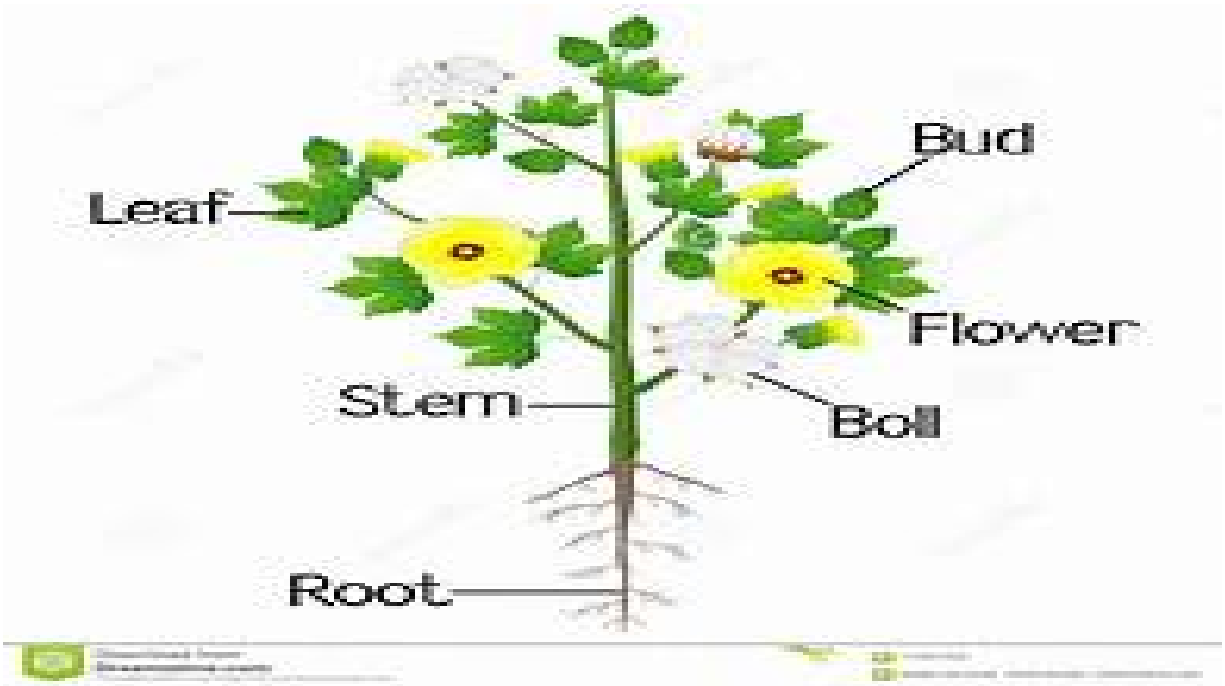

Fig 2.1 cotton plant

The cotton plant belongs to the genus Gossypium of the family Malvaceae (mallow family); the same family as hollyhock, okra and hibiscus. It is generally a shrubby plant having broad three-lobed leaves and seeds in capsules, or bolls; each seed is surrounded with downy fiber, white or creamy in color and easily spun. The fibers flatten and twist naturally as they dry. There are different species of Cotton – Gossypium hirsutum, Gossypium barbadense, Gossypium herbaceum and Gossypium arboreum, the first two species being the most commonly cultivated.

Cotton is of tropical origin but is most successfully cultivated in temperate climates with well-distributed rainfall. All western U.S. cotton and as much as one-third of Southern cotton, however, is grown under irrigation. In the United States, nearly all commercial production comes from varieties of upland cotton (G. hirsutum), but small quantities are obtained from sea-island and American-Egyptian cotton (both belonging to the species G. barbadense). G. arboreum and G. herbaceum are cultivated species in Asia.

Different Parts of the Cotton Plant

Fig2.2 Stem &Branches

Cotton is grown between 37 degrees North at Ukraine and 30 degrees south in Australia in warm, frost-free, sunny climate. Cotton requires a lot of sunshine temperatures between 60 to 95 degrees Fahrenheit (16-35 degrees Celsius). The major cotton producing countries are United States, China, India, Pakistan, Uzbekistan, Brazil, Australia, Egypt, Argentina, Turkey, and Greece.

A cotton plant starts from seeds. The seeds germinate in 5 to 10 days and the cotton plant begins its growth with two cotyledons (the seed leaves that form nodes opposite each other at the base of the main stem) until the plant forms true leaves (leaves produced subsequent to the cotyledons). Cotton has a tap root system and roots go deeper into the soil for search of nutrients. Development of a healthy root system for acquiring soil nutrients is vital to feed the growing plant.

As a cotton plant begins to grow, it develops a series of nodes up the main stem. Beginning with the fifth or sixth node, the plant begins to form fruiting branches, which bear the cotton fruit.

Typically, a cotton plant will continue to add nodes and fruiting branches for a total of 16 to 22 nodes, with 12 to 16 fruiting branches. Leaves:

Leaves provide carbohydrate energy supply for adding nodes and branches and for growing bolls. Photosynthesis converts light energy into chemical energy that is stored as sugars in the plant. All plant metabolic reactions are dependent on this energy source.

What are the parts of a cotton plant

1 What are the parts of a cotton plant?

2 How do you identify a cotton plant?

3 Is cotton a tree or shrub?

4 Are cotton balls real cotton?

5 What is the best fertilizer for cotton?

6 What is the growth pattern of a cotton plant?

7 How long does it take for cotton seed to germinate?

What are the parts of a cotton plant?

The cotton plant is constantly manufacturing new, specialized cells to form the organs that carry out growth and reproduction. The four organs are the roots, stem, leaves, and fruits (squares, flowers, and bolls).

How do you identify a cotton plant?

The leaves of the plant are spirally arranged on the branches, have long petioles and have 3–5 triangular lobes. The plant produces a single flower on each auxiliary branch which can be red-purple, yellow or white in color and forms a leathery, oval seed capsule, or 'boll' which is 2–6 cm (0.8–2.4 in) long.

What are the stages of a cotton plant?

The developmental phases for cotton can be divided into five main growth stages: (1) germination and emergence (2) seedling establishment (3) leaf area and canopy development (4) flowering and boll development and (5) maturation

How long does it take for a cotton plant to produce cotton?

It takes 65 to 75 days of temperatures above 60 degrees Fahrenheit for cotton to go from seed to flower. The plants need an additional 50 days after the flowers bloom for the seed pods to mature.

What is the best fertilizer for cotton?

Fertilizer: Cotton crop should be manured with FYM or compost at least once in 3 years at the rate of 12 to 15 tons/ha. The fertilizer dose of 100:50:50 (NPK) kg/ha for irrigated cotton; 80 :40:40 (NPK) kg/ha for rainfed cotton hybrids and 50:25:25 NPK kg/ha both for desi and hirsutum varieties are recommended.

What are the essential parts of a cotton plant?

If you closely examine the inside of the cottonseed, you will find all of the essential parts that form the mature plant. There are two well developed cotyledons, that will form the seed leaves which manufacture food for the young seedling.

In just the matter of a day, that white flower will become a pink color and will continue to open fully. The end result of this stage is a flower that's generally a vibrant fuchsia color or even a near-purple hue.

A cotton plant starts from seeds.

The seeds germinate in 5 to 10 days and the cotton plant begins its growth with two cotyledons (the seed leaves that form nodes opposite each other at the base of the main stem) until the plant forms true leaves (leaves produced subsequent to the cotyledons).

Roots

Cotton has a tap root system and the roots can be as deep as 10 inches in the first 3 weeks. Roots can grow up to 2 inches per day during the early stages of cotton, making them twice as long as the plant height. When plants begin to set bolls, root growth slows abruptly.

Which part of cotton is used?

All parts of the cotton plant are useful. The most important is the fiber or lint, which is used in making cotton cloth. Linters – the short fuzz on the seed – provide cellulose for making plastics, explosives and other products. each cotton boll usually contains **in** 27-45 seeds, and attached to each seed is between 10,000 – 20,000 tiny fibres about 28mm . Cotton fibre is made from cellulose, has a slim coating of wax and is thin and hollow like a straw.

Fiber length Fiber length is primarily determined by cotton variety, but growing conditions and fertility can affect length as well. Night time temperatures of 60-70ºF are optimum for fibber length development, Temperatures above or below this range result in shorter fibbers. Reduced length can also result from deficit or excess soil moisture levels.

Cotton harvesting**:** is one of the final steps in the production cotton crops, It is one of the most important. The crop must be harvested before weather can damage or completely ruin its quality and reduce yield.

Cotton can be harvested by two ways**;** Machine harvesting and manual harvesting Machine harvesting is harvesting cotton by using machines

Machine harvesting also requires more defoliants and lint cleaners**.** Depending on the differences, between daytime high and nighttime low temperatures, defoliants might be needed to induce. Leaf drop also, as mentioned, machine picking will result in more trash. Therefore, pre-cleaners (sometimes called lint cleaners) are needed at gins, and the weight of seed cotton per ton of lint will increase, resulting in higher costs for transporting seed cotton to gins. Gins will also have more gin trash to dispose of.

Precaution during harvesting

The modern mechanical cotton harvester is a large machine with many fast-moving parts. Skillful operation is necessary for the safety of people on and around the machine and for effective machine operation. Here are some general recommendations for operators of cotton harvesters.

Before starting the mechanical harvester, put the mechanism or transmission in the neutral or park position. Engaging the starter with these systems in gear may result in a sudden, unexpected movement that could injure the operator or others.

Avoid high-speed stops and turns, uneven terrain, and soft ground. Operation under these conditions may result in a roll over.

Keep all safety shields in place when operating the harvester. They keep your hands and clothing out of moving parts.

The harvester should be equipped with an effective fire extinguisher.

Wear close-fitting clothing and stay alert to keep from becoming entangled in moving parts.

Keep hands and feet away from moving parts Reduce travel speed when moving over rough or uneven Terrain.

Cotton harvesters are top heavy even with empty Baskets.

High-speed travel could result in a rollover.

Keep your harvester safely away from ditches, creeks, and other steep, sloping ground.

Keep end rows smooth and firm. Steep slopes and plowed turn rows make turning Difficult, and may cause a rollover.

Reduce engine speed before braking or turning. Quick stops with the high-profile cotton pickers can result in in a serious head injury to anyone standing in the Wrong place on the operator's platform.

Keep everyone away from module builders in the field.

Be sure there is no one in the module builders before dumping.

A load of cotton falling into a module builder could seriously injure or suffocate someone trapped inside.

Be sure you're clear of electrical wires before raising or dumping a basket.

A raised basket may reach a height of 25 feet, and if it makes contact with a power line, you could be electrocuted

Hand picking

Manual harvesting is harvesting cotton by hand

Labor tends to be scarce; there is high demand for agricultural workers to harvest "secondary" crops (Rice, corn, vegetables). As a consequence, cotton pickers were needed from outside the area.

This is particularly the case for the third or even fourth passes, which were said to draw few local pickers because of the low productivity at that point in the harvest.

.

Fig.2.3hand picking

Mechanical harvesting

Cotton is defoliated or desiccated prior to harvest. Defoliants are used on the taller varieties of cotton that are machine picked for lint and seed cotton, and desiccants usually are used on short, storm proof cotton varieties of lower yield that are harvested by mechanical stripper equipment. More than 99 percent of the national cotton area is harvested mechanically. The 2 principal harvest methods are machine picking, with 70 percent of the harvest from 61 percent of the area, and machine stripping, with 29 percent of the harvest from 39 percent of the area. Picking is practiced throughout the cotton and stripping is limited chiefly to the dry plains.

Defoliation may be defined as the process by which leaves are abscised from the plant.

The Process may be initiated by drought stress, low temperatures, or disease or it may be chemically induced by topically applied defoliant agents or by over fertilization. The process helps lodged plants to return to an erect position, removes the leaves that can clog the spindles of the picking machine and stain the fiber, accelerates the opening of mature bolls, and reduces boll rots.

Desiccation by chemicals is the drying or rapid killing of the leaf blades and petioles, with the leaves remaining in a withered state on the plant. Harvest-aid chemicals are applied to cotton as water-based spray, either by aircraft or by a ground machine.

Mechanical cotton pickers, as the name implies, pick locks of seed cotton from open cotton Bolls and leave the empty burs and unopened bolls on the plant. Requiring only 1 operator, typical modern pickers are self-propelled and can simultaneously harvest 2 rows of cotton at a speed of 1.1 to 1.6 meters per second (m/s) (2.5 - 3.6 miles per hour [mph]). When the picker basket gets filled with seed cotton, the machine is driven to a cotton trailer at the edge of the field. As the basket is hydraulically raised and tilted, the top swings open allowing the cotton to fall into the trailer. When the trailer is full, it is pulled from the field, usually by pickup truck, and taken to a cotton gin. Mechanical cotton strippers remove open and unopened bolls, along with burs, leaves, and stems from cotton plants, leaving only bare branches. Tractor-mounted, tractor-pulled, or self-propelled strippers require only 1 operator. They harvest from 1 to 4 rows of cotton at speeds of 1.8 to 2.7 m/s (4.0 - 6.0 mph). After the cotton is stripped, it enters a conveying system that carries it from the stripping unit to an elevator. Most conveyers utilize either augers or a series of rotating spike-toothed cylinders to move the cotton, accomplishing some cleaning by moving the cotton over Perforated, slotted, or wire mesh screen. Dry plant material (burs, stems, and leaves) is crushed and dropped through openings to the ground. Blown air is sometimes used to assist cleaning

Feed products for livestock

Cottonseed is crushed in the mill after removing lint from the cotton boll. The seed is further crushed to remove any remaining linters or strands of minute cotton fibers. The seeds are further hulled and polished to release the soft and high-protein meat. These hulls of the cottonseed are then mixed with other types of grains to make it suitable for the livestock feed. Cottonseed meal and hulls are one of the most abundantly available natural sources of protein and fiber used to feed livestock.

Cottonseed as supplement is marketed primarily towards agricultural sectors that feed dairy cows. Some feedlots use corn to supplement the forage diets of cows; high starch diets, such as those in corn supplemented diets, can lead to liver damage in cows. Cotton seed is considered a safer alternative to corn supplemented diets due to its low starch content. Cottonseed as livestock feed must also be monitored for safety since the foodstuff is high in energy/fat and too much fat content in a cow's diet can disrupt its ability to digest fiber, leading to other complications.

Cotton seed meal

Cotton seed meal is a good source of protein. The two types of meal extraction processes are solvent extraction and mechanical extraction. Most of the meal is extracted mechanically through cottonseed kernels. The flaked cottonseed kernels are put under high pressure through a screw inside a constantly revolving barrel. The screw pushes out the oil through the openings made in the barrel. The dry pieces left in the barrel are preserved and ground into meal. During the solvent extraction process, the cottonseed kernels are subjected to fine grinding by pushing them through an expander and then the solvent is used to extract most of the oil. The solvent-extracted meals have a lower fat content of 0.5% than the mechanically extracted meals with a fat content of 2.0%. Cottonseed meal contains more arginine than soybean meal. Cottonseed meal can be used in multiple ways: either alone or mixed with other plant and animal protein sources.[

Cottonseed hulls

The outer coverings of the cottonseed, known as cottonseed hulls, are removed from the cotton kernels before the oil is extracted. Cottonseed hulls are an excellent source of livestock feed as they contain about 8% cotton linters, which are nearly 100% cellulose. They require no grinding and easily mix with other feed sources. As they are easy to handle, their transportation cost is also fairly low. Whole cottonseed is another feed product of cottonseed used to feed livestock. It is the seed left after the separation of long fibres from cotton, and serves as a good source of cellulose for ruminants. Whole cottonseed leads to high production of milk and fat when fed to a high-producing dairy cow. It can be cost effective and provides nutrients with a high protein value of about 23%, crude fibre value of 25%, and high energy value of 20%. Whole cottonseed serves as a highly digestible feed which also improves the reproductive performance in livestock. Pima cottonseed, which is free of linters by default, and delinted cottonseed are other types of cottonseed feed products.

Consumption by humans

Cottonseeds are toxic to humans and most animals due to the presence of gossypol, though it is tolerated by cows, and cannot be consumed by humans without processing. In order to make cottonseed oil fit for human consumption, it must be processed to remove the gossypol. In October 2018, the United States Department of Agriculture approved for farming a genetically modified version of cottonseed developed by Dr. Keerti Rathore of Texas A&M Agri Life Research that contains ultra-low amounts of gossypol in its seeds. The toxin remains present in other parts of the plant to protect against pests, but is not yet approved by the Food and Drug Administration for human consumption.

Cottonseed oil

Main article: Cottonseed oil.

The refined seed oil extracted from the kernels can be used as a cooking oil or in salad dressings. It is also used in the production of shortening and margarine. Cotton grown for the extraction of cottonseed oil is one of major crops grown around the world for the production of oil, after soy, corn, and canola.

Fertilizer

The cottonseed meal after being dried can be used as a dry organic fertilizer, as it contains 41% protein. It can also be mixed with other natural fertilizers to improve its quality and use. Due to its natural nutrients, cottonseed meal improves soil's texture and helps retain moisture. It serves as a good source of natural fertilizers in dry areas due to its tendency of keeping the soil moist. Cottonseed meal and cottonseed ashes are also sometimes used to supplement organic hydroponic solutions. Cottonseed meal fertilizers can be used for roses, camellias, or vegetable gardens.

Fig.2.4. machine harvesting

2.2 Components of cotton boll

Cotton is a soft, fluffy staple fiber that grows in a boll, or protective case, around the seeds of the cotton plants of the genus Gossypium in the mallow family Malvaceae. The fiber is almost pure cellulose, and can contain minor percentages of **waxes, fats,** pectins, and water.

- ✓ Density: 1.54-1.56 g/cm^3
    - **Luster:** High

- ✓ Resiliency: Low
- ✓ Tenacity (strength)DryWet**:** 3.0-5.0 g/d3.3-6.0 g/

Cotton Fiber

Cotton is a natural cellulosic fiber.

Cotton fibers are seed hairs from plants. Cotton is a soft fiber that grows around the seeds of the cotton plant and is the purest form of cellulose available in nature. It is widely used natural fiber. It is a soft, fluffy staple fiber that grows in a boll, or protective capsule. The fiber is almost pure cellulose. It has 8% moisture regain. (Raw conditioned 8.5%, saturation 20–25%, mercerized cotton 8.5–10.3%.) The fiber contains 90% cellulose and it is arranged in a way that gives cotton unique properties of strength, durability and absorbency. It is fresh, crisp, comfortable, absorbent and flexible, and it has no pilling problems and has good resistance to alkalis

Fig 2.5 Cotton

But cotton has poor wrinkle resistance, shrinkage, poor acid resistance, less abrasion resistance, susceptible to damage by moths and mildew, needs lots of maintenance and stains are difficult to remove. Its fiber length ranges from 1/2 to 2 in. It has 10% increase in strength when wet. It has a density of 1.54–1.56 g/cm3. It has a twisted tube shape. In order to understand the scouring and bleaching process it is necessary to know the constituents of cotton. As scouring and bleaching were done on cotton it will be an advantage to throw light on chemical composition of cotton fiber

Chemical Composition of Cotton Fiber

Table 2.1

Component	Amount	Main location	Primary

	(dry basis)%		wall (%)
Cellulose	94	Secondary wall	48
Protein	1.3	Lumen	12
Pectin substance	0.9	Primary wall	12
Oil, fat & wax	0.6	Cuticle	7
Ash	1.2		3
Malic, citric and other organic acids	0.8	Lumen	14
Total sugar	0.3	Primary wall	
Pigment	Trace		
Others	0.9		

Major chemical compositions of cotton fiber are briefly described below**:**

Cellulose:

Cellulose content of the raw cotton fiber ranges from 88 to 96 %. Cellulose is a polymer of ß-D-glucose with a specific configuration shown in figure. The cellobiose, repeating unit of cellulose, consist of two beta glucose molecules linked together at the 1:4 carbon atoms. Each successive glucose unit is rotated 1800 around the molecular axis. This gives a linear polymer chain that is almost flat therefore suitable for fiber formation.

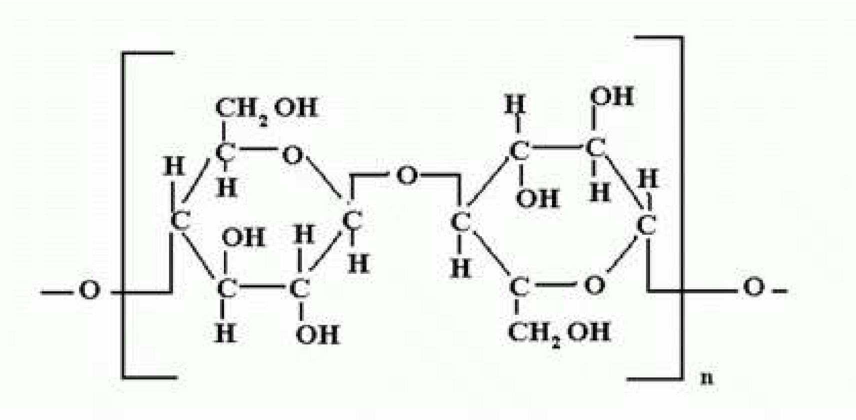

Fig: Chemical Structure of Cotton

About 5000 cellobiose units are present in cotton that is degree of polymerization of cotton is 5000.

Protein:

These areas are derived from the protoplasm of living cell. Fiber contains a small percentage of nitrogen but not all of the nitrogen is present as protein. It is believed that nitrogen-containing compounds may be associated with the natural coloring matter.

Pectic substance:

Natural cotton contains derivatives of pectic acid. They appear as mainly calcium and methyl pectates. But free pectic acid and methyl pectate are also present.

Oil, fat and wax:

Oils and fats are esters of glycerol (glycerides) with higher saturated and unsaturated fatty acids. Waxes are esters of complex monohydric alcohol with fatty acid.

Oils, fats and waxes are all insoluble in water, oils and waxes of cotton consists of:

- Glycerides which are readily saponifiable oils and fats
- Waxes which are saponifiable with difficulties
- Unsaponifiable oils
- Free fatty acids and
- Traces of soaps

each cotton boll usually contains 27-45 seeds, and attached to each seed is between 10,000 – 20,000 tiny fibres about 28mm in length. Cotton fibre is made from cellulose, has a slim coating of wax and is thin and hollow like a straw. hat does a cotton boll contain?

The fruit, called bolls, then begin to develop. These green, immature bolls are a segmented pod containing approximately 32 immature seeds from which the cotton fibres will grow. The boll is considered a fruit because it contains seeds.

What are the properties of cotton

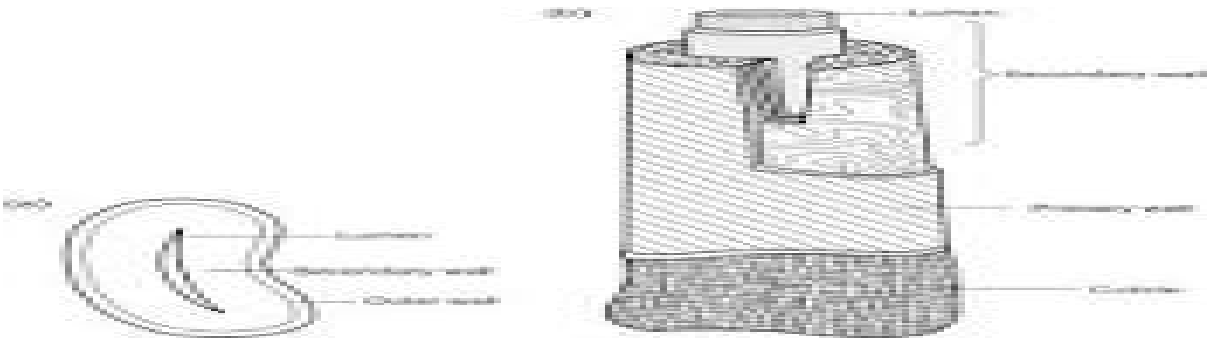

Fig2.6

fibers are natural hollow fibers; they are soft, cool, known as breathable fibers and absorbent. Cotton fibers can hold water 24–27 times their own weight. They are strong, dye absorbent and can stand up against abrasion wear and high temperature. In one word, cotton is comfortable.

what are 10 uses of cotton?

Cotton can be easily processed into a number of products that we use on a daily basis, like coffee filters, book binding, paper, and bandages. Cottonseed oil, which is made from crushed seeds of cotton plants, is used in a multitude of products including soap, cosmetics, and margarine

27-45 seeds

Each cotton boll usually contains 27-45 seeds, and attached to each seed is between 10,000 – 20,000 tiny fibres about 28mm in length.

2.3 Maturity of cotton bolls

the mature seeds are brown ovoid's weighing about a tenth of a gram. By weight, they are 60% cotyledon, 32% coat and 8% embryonic root and shoot. These are 20% protein, 20% oil and 3.5% starch. Fibers grow from the seed coat to form a boll of cotton lint. The boll is a protective fruit and when the plant is grown commercially, it is stripped from the seed by ginning and the lint is then processed into cotton fibre. For unit weight of fiber, about 1.6 units of seeds are produced. The seeds are about 15% of the value of the crop and are pressed to make oil and used as ruminant animal feed. About 5% of the seeds are used for sowing the next crop.

Cotton maturity Whereas the mean perimeter of a raw cotton is mainly a hereditary characteristic, the degree of development of the cell wall is very largely determined by environment. If a fiber has a thick and well-developed wall, it is said to be mature. If, on the other hand, its wall is thin and poorly developed, it is said to be immature. Correspondingly, if a cotton, because of un favorable growing conditions, contains a considerable proportion of immature fibers, it is referred to as an immature cotton. As stated in Section 3.2.5, the degree of thickening, which is a measure of maturity, is given by the ratio of wall area Aw to total fibre area, which equals 4π Aw/P2, where P is the fiber perimeter. For a solid fiber, $\theta = 1$. A maturity ratio is defined as the ratio of the actual degree of thickening to a standard degree of thickening equal to 0.577. Mature cottons have average values of θ greater than this, but immature cottons may have average values below 0.3. In any given sample of cotton, there will be a range of maturities, which, for a mature cotton might go from 0.15 to 0.96 . There is an optimum degree of maturity for a cotton fiber, above which it tends to be too stiff and bristly for ease of processing, and below which it tends to be too flabby and unresilient. It is not very certain just where this optimum lies, though it is probably somewhere between $\theta = 0.8$ and 0.9. Spinners, however, are not usually worried about fibers that have abnormal wall thickening: they are much more concerned about those that have little or none. Cottons that are classed as immature are objectionable mainly because of their liability to the formation of neps, which are small, tightly rolled-up entanglements of fiber and which, unless removed by combing, survive all processes through to the yarn, when they appear as unsightly specks. Neps are not of natural occurrence: they are artifacts produced by excessive rubbing against or between surfaces, which tends to roll the fibers into minute knots, and they have been repeatedly shown to consist mainly of very thin-walled, or so-called 'dead', fibers . In the spinning of fine yarns from fine cottons, nep formation is at once both more frequent and more deleterious in its consequences. With fine cottons, even the fully matured fibers are more delicate than with coarse cottons, and dead fibres are more delicate still so that neppiness is less easily avoided; the neps that are formed are much more noticeable because in fine yarns their size is comparable to the yarn diameter. On account of the very poor wall thickening of the fibers involved, neps when dyed appear much lighter in shade than a normal sample of fibers given the same treatment, and hence appear as light, or even almost white, specks on the surface of the fabric. Calendaring increases their prominence because the knot of flabby fibres is easily flattened and given a bright, glazed appearance. In printed fabrics, somewhat similar faults are produced. If surface neps are removed or dislodged, the underlying normal yarn is relatively unstained over the small area that has been covered by the nep. From the same argument, it will be evident that similar yarns

Measured maturity.

The degree of thickening θ can be directly measured on fiber cross-sections, now made much easier by digital processing. Alternatively, as shown in equation (3., θ can be calculated from the mean specific surface S and the mean linear density of a sample of cotton. In accepting such calculated values, however, while a considerable amount of labour may be saved, it must be remembered that the results are subject to two independent sources of experimental and sampling error. In particular, it should be noted that errors in S are squared in the evaluation of θ. The value of such a procedure therefore depends largely on the reliance that can be placed on the data. Experience suggests that, if the linear density is determined by duplicate tests on each of 500 well-sampled fibres and the specific surface from four air-flow tests, then the calculated maturity is as accurate as is needed for practical purposes and no less reliable than if obtained directly by other means.

Micronaire, fineness and maturity As already indicated, the micronaire value depends on specific surface and is therefore

To be consistent, of course, the linear density should be measured by a whole fiber method.

Relations between micronaire, fineness (linear density) and maturity ratio. Diameter values are for an equivalent circular fiber

Fineness (mtex)

Maturity counts For all except highly specialized research purposes, micrometric methods of measuring maturity are unsuitable, not only because of the technical difficulties referred to but also because of the amount of time consumed by comparison with other methods that are available. Among these, by far the most commonly used is that in which the fibres are examined in longitudinal view under the microscope and classified according to the apparent thickness of the cell wall relative to the width of the fibre. In the U.S.S.R., the observations were made on untreated fibres , but in most other countries the fibres are first swollen in caustic soda. How thin the wall has to be before it is regarded as potentially nep-forming or otherwise undesirable is impossible to define precisely: hence the criteria by which the fibres are classified are decided to some extent arbitrarily. In the British version of the maturity count, the test is carried out on the five tufts of fibre that are left from the Baer diagram after the fibre linear density has been determined. Each tuft is laid on a microscope slide so that the fibres are parallel but separated, a cover-slip is placed over the middle of the fibres, and they are then irrigated with an 18% solution of caustic soda until swelling is complete. The dangerous fibres are considered to be those in which, after this treatment, the wall thickness is one-third or less of the apparent lumen width: these are called ‘dead’ fibres. ‘Normal’ fibres are considered to be those which have become deconvoluted and rod-like and in which swelling of the wall has virtually obliterated the lumen. Between these two is the third class of fibres, referred to as ‘thin-walled’. Classification is carried out with the microscope condenser so adjusted as to give maximum definition of the boundaries of the wall. Observations are made at one place only on each fibre, somewhere about its middle and, where convolutions are still perceptible, at a point where the width is a maximum between two reversals. The slide is first traversed to count the total number of fibres in the mount. It is then traversed again to count the rod-like normal fibres. Finally, it is traversed a third time to count the number of dead fibres. The number of thin-walled fibres, if required, may be obtained by subtraction. The percentage occurrences of normal N and dead D fibres are calculated, and the means for all the slides are obtained.

the boll develops rapidly after fertilization and reaches its full size within three weeks . An additional four to five weeks are required for boll maturation. Seeds attain their full size about three weeks after fertilization, but do not reach maturity until shortly before the boll opens.

How long does it take for a cotton boll to open?

After pollination occurs the boll begins to develop. Under optimum conditions it requires approximately 50 days for a boll to “open” after pollination occurs.

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What happens after cotton bolls are plucked from the field?

These cotton pickers pull the cotton from the open bolls using revolving barbed spindles that entwine the fiber and release it after it has separated from the boll. Once harvested, seed cotton must be removed from the harvester and stored before it is delivered to the gin.

How long does it take a cotton plant to produce cotton?

approximately160daysWith Cotton Harvesting ,Timing Is Everything

Cotton is fully mature and ready for harvesting approximately 160 days after being planted.

Once the bolls have burst open, the farmers can prepare the cotton plants for harvesting

what are the steps involved in process of cotton**?**

Fig 2.7

Cotton Processing

- Step One: Mechanical Cleaning (EVŌC) and Cake Formation. The first step in our process is to run it through a processing machine that opens the dense tufts of fiber from the ginned cotton bales. ...
- Step Two: Scouring. ...
- Step Three: Purifying. ...
- Step Four: Fiber Finishing. ...
- Step Five: Opening and Drying.

2.4 Identifying fiber length

In general, a longer fiber length is preferred. Textile fibers are either staple or filament length. Staple fibers range from 2 to 46 cm; filament fibers are of infinite length. All natural fibers except silk are of staple length.

define the critical fibre length as the length of the smallest fibre segment which can still be broken during the fragmentation test, at a given value of the strain imposed on the specimen

Fibre length: Fibre length is primarily determined by cotton variety, but growing conditions and fertility can affect length as well. Night time temperatures of 60-70ºF are optimum for fibber length development**.** Temperatures above or below this range result in shorter fibbers**.** Reduced length can also result from deficit or excess soil moisture levels**.**

Self-Check -2

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. A form of harvesting which is done by hand is___________(2pts.)
   A) Machine picking
   B) Mechanical harvesting
   C) Hand picking
   D) None
2. Write at least four precautions during harvesting. (4 pts.)
3. What are the stages of a cotton plant?

Unit Three:- Key Cotton Features Necessary To Achieve Optimum Classing Outcome
This unit to provide you the necessary information regarding the following content coverage and topics: This unit to provide you the necessary information regarding the following content coverage and topics: • Importance of cotton colour on classing outcome is understood • Importance of leaf grade**,** other trash and stickines**s** on classing outcome is understood • Influence of micronire**,** fiber length and length uniformity on classing outcome is understood • Importance of maintaining fibre length and minimizing *short fiber content* through the ginning process is understood This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Importance of cotton *colour* on classing outcome is understood • Importance of *leaf grade***,** other trash and *stickiness* on classing outcome is understood • Influence of *micron ire***,** *fiber length* and *length uniformity* on classing outcome is understood • maintain Importance of fibre length and minimizing ***short fiber content*** through the ginning process is understood

3.1 Cotton colour classing

Cotton color is an important measurement in judging fiber's spinning quality in the current cotton classing system. This chapter first briefly reviews the history and major factors of cotton color grading, and then discusses the instrumental methods, including HVI colorimeter and color imaging system, that has been developed for objective and reliable grading of cotton color.

3.1.1Cotton classing

Classification refers to the application of official standards and standardized procedures developed by for measuring the physical attributes of raw cotton that affect the quality of the finished product and/or manufacturing efficiency.

The classing methodology is based on grade and instrument standards, and it's used hand in hand with state-of-the-art methods and equipment. The resulting information provides the cotton industry with the best possible data on cotton quality for the purposes of accurate marketing and processing. USDA classification currently consists of determinations of fiber length, length uniformity, fiber strength, micronaire, color, trash, leaf, and extraneous matter.

Today, precision instruments are used to perform quality measurements, and they're able to do so in a matter of seconds, whereas original classification methodology systems were inefficient and relied on human senses. The classifications still done manually are for special conditions and extraneous matter. The USDA is in the process of transitioning to all-instrument classification as quickly as the technology can be developed, refined, and prove reliable results.

- Classification Structure
- Standards
- Classification of Upland & Pima Cotton
- Quality & Reliability of Classification Data
- Dissemination of Data

Classification Structure

provides cotton classification services under the direction of the Agricultural Marketing Service (AMS) Cotton and Tobacco Program, which has eight main areas of operation. Each division plays an integral role in maintaining a reliable, efficient, and effective classification system and delivery of services.

Process

After cotton fibers are separated from the seed at the gin, cleaned to remove plant residue and foreign material, and pressed into bales, a sample is taken. A licensed sampling agent takes a sample of at least 4 oz. from each side of every 500 lb.

Upon arrival at the classing office, cotton samples are placed into a climate-controlled room where the moisture content of samples is brought into a specified range. This process ensures that the variability of samples is reduced and the classification process fair and equal. After samples are equalized, they're transported to the instrument-testing and manual-classing stations where classification is performed. Once classification is complete, results are immediately imported into the classing facility's database and made available to the customer. Then, at the gin, each bale is labeled with a PBI tag, which includes a twelve-digit number and barcode identifying the classing office, gin, and bale. Each ID number is logged into a database

Standards

Official standards and standardized procedures have been developed to maintain the integrity of the USDA classification system. Official standards are maintained and provided by the Cotton and Tobacco Program's Standardization and Engineering Division. The USDA maintains two basic types of standards—grade standards and instrument standards.

Grade Standards

Grade standards, used for manual classification, specify levels of color and leaf for various grade designations. The USDA maintains two types of grade standards—Universal Upland Grade Standards (referred to as "Universal" standards) and American Pima Grade Standards.

Both Universal Upland and American Pima Grade Standards are only valid for one year because of the gradual changes in color as cotton ages. Grade standards for both American Upland and American Pima Cotton are reviewed periodically to ensure they are still representative of the U.S. crop.

Instrument Standards

Cotton instrument standards are used for instrument calibration and verification. These standards include Universal HVI Calibration cotton, Extra-Long Staple (ELS) Calibration cotton, Universal HVI Micronaire Calibration cotton, Universal HVI Cotton Color, and Cotton Trash Standards.

Establishing Values for Calibration Cotton

In addition to bale uniformity requirements, each bale must meet the length and strength criteria for its intended use. Currently, seven laboratories work together to establish values for calibration cottons, including five USDA facilities, one independent laboratory in the

U.S., and one in the international community. Cumulatively, the labs perform at least 120 tests per bale over a two-day testing period, and the results are used to further evaluate uniformity and to determine the values assigned to the calibration cottons.

For reference purposes, samples of previously established ("benchmark") calibration cottons provide reference points to assure the continuity of testing levels over time.

Classification of upland and pima cotton

The classification of Upland cotton includes measurements for fiber length, length uniformity, fiber strength, micronaire, color grade, trash, and leaf grade. They are performed by precise High Volume Instruments, in a process commonly referred to as "high volume instrument classification." Only extraneous matter and special conditions are still officially classified by the traditional method of classer determination.

Classification procedures for American Pima cotton are similar, including the use of high-volume instrument measurements. The most significant distinction is the difference in color charts. Different grade standards are used because American Pima cotton is naturally a deeper yellow than American Upland cotton.

Pima cotton is roller ginned and Upland cotton is saw ginned. .

Laboratory Conditioning

In order to ensure atmospheric conditions don't influence the measurement of cotton fiber properties, the temperature and humidity of the classing laboratory are tightly controlled.

Sample Conditioning

Samples are conditioned to bring the moisture content into equilibrium with the approved atmospheric conditions. The conditioned samples are randomly checked to verify that the appropriate moisture content has been reached. Samples may be conditioned passively or actively

In passive conditioning, the samples are placed in single layers in trays with perforated bottoms to allow the free circulation of air. In active conditioning, a Rapid Conditioning unit is used to draw air (set at the approved atmospheric conditions) through the sample until the required moisture content for high volume instrument testing is attained.

Equipment Performance Specifications

It's essential to verify that classing equipment meets minimum performance specifications for precision and accuracy. Newly purchased equipment must pass a series of thorough tests before being accepted and put into operation. Additionally, all instruments are evaluated annually, typically before the beginning of each cotton season. Testing is done to verify both the precision and the accuracy of instrument measurements.

Calibration of Instruments

Instrument calibration is performed at regular intervals for each quality—fiber length, length uniformity, micronaire, and fiber strength—through the use of calibration cottons. Tiles are used to calibrate color and trash measurements.

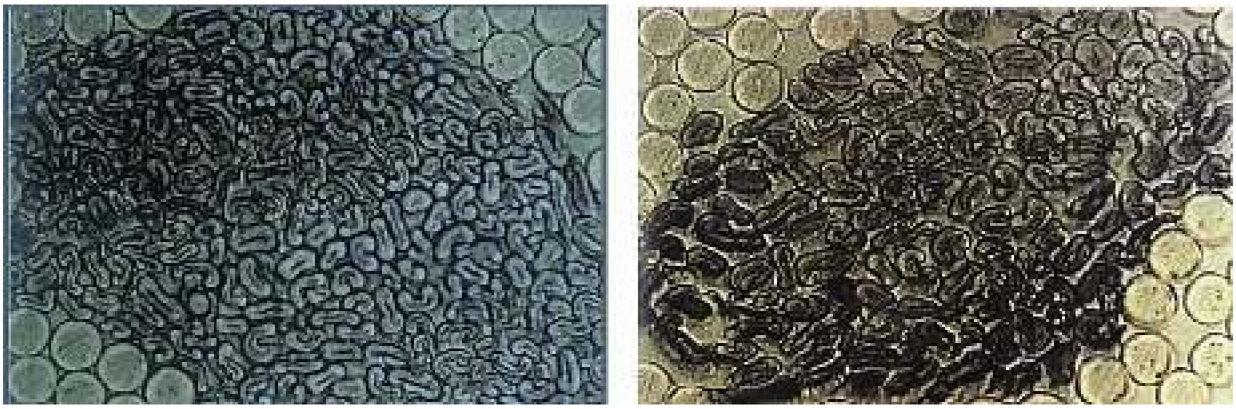

Fig 3.1 Upland cotton with micronaire of 3.8 (left) and 5.2 (right).

Colour Grade*;*The colour of cotton is graded by the high volume instrument.

Color grade is determined by the degree of reflectance (Rd) and yellowness (+b) as established by official standards and measured by the high volume instrument. Reflectance indicates how bright or dull a sample is, and yellowness indicates the degree of pigmentation. A three-digit color code is determined by locating the point at which the Rd and +b values intersect on the color chart for American Upland cotton.

The color of cotton fibers can be affected by rainfall, freezes, insects, fungi, and staining through contact with soil, grass, or cotton-plant leaf. Color can also be affected by excessive moisture and temperature levels during storage, both before and after ginning. Color deterioration because of environmental conditions affects the fibers' ability to absorb and hold dyes and finishes and is likely to reduce processing efficiency.

Trash

Trash is a measure of the amount of non-lint materials in cotton, such as leaf and bark from the cotton plant. The surface of the cotton sample is scanned by a digital camera, and the digital image is analyzed. The percentage of the surface area occupied by trash particles (percent area) and the number of trash particles visible (particle count) are calculated and reported.

The ratio between percent area of trash and trash particle count is a good indicator of the average particle size in a cotton sample. For instance, a low percent area combined with a high particle count indicates a smaller average particle size than does a high percent area with a low particle count.

A high percent area of trash results in greater textile mill processing waste and lower yarn quality. Small trash particles, or “pepper trash,” are highly undesirable, because they are more difficult for the mill to remove from the cotton lint than are larger trash particles

3.2 Cotton impurity classing

Impurities in Raw Cotton: the types of impurity found in raw cotton are: Seed: this is the largest type of impurity found in raw cotton. It may consist of un-ginned seeds. The impurities of Cotton Fiber: Cotton is a uni-cellulose fiber. Cellulose is the use able and main part of the cotton fiber. 94% cellulose and 6%

3.3 Seed cotton fiber grading

Leaf grade is a measure of the leaf content in cotton. Recent extensive research and development work has resulted in acceptance of instrument leaf grade. Leaf grade is now determined by high volume instrument trash meter percent area and particle count (described above for trash). The leaf grade is calculated from these parameters based on the Universal Upland Grade Standards and American Pima Grade Standards.

Leaf content is affected by plant variety, harvesting methods, and harvesting conditions. The amount of leaf remaining in the lint after ginning depends on the amount present in the cotton before ginning, the amount of cleaning, and the type of cleaning and drying equipment used. Even with the most careful harvesting and ginning methods, a small amount of leaf remains in the cotton lint. From the manufacturing standpoint, leaf content is all waste, and there is a cost factor associated with its removal. Also, small particles cannot always be successfully removed, and these particles may detract from the quality of the finished product.

Extraneous Matter

Extraneous matter is any substance in the cotton other than fiber or leaf. Examples of extraneous matter are bark, grass, spindle twist, seed coat fragments, dust, oil, and plastic. Unlike plant-based extraneous matter (such as bark, grass, or seedcoat fragments), plastic extraneous matter generally is not uniformly distributed throughout a plastic-contaminated bale. Therefore, a classing sample from a plastic-contaminated bale may or may not have plastic extraneous matter present. The kind of extraneous matter and an indication of the amount (light or heavy) are noted by the classer as a remark on the classification document. Another factor noted on the classification record under "extraneous matter" is abnormal preparation. "Preparation," or "prep," describes the degree of smoothness or roughness of the ginned cotton lint. Various methods of harvesting, handling, and ginning cotton produce differences in roughness or smoothness of preparation that sometimes are quite apparent. Abnormal preparation of Upland cotton has greatly decreased in recent years as a result of improved harvesting and ginning practices, and now occurs in less than half of one percent of the crop.

3.4 Maintaining fiber length

3.4.1The Classification of Cotton

Measurements for fiber length, length uniformity, fiber strength, micronaire, color grade, trash, and leaf grade are performed by precise High Volume Instruments, in a process commonly referred to as "high volume instrument classification." Only extraneous matter and special conditions are still officially classified by the traditional method of classer determination.

table 3.1 Fiber Length

Inches	32nds	Inches	32nds
0.79 and shorter	24	1.11-1.13	36
0.80-0.85	26	1.14-1.17	37
0.86-0.89	28	1.18-1.20	38
0.90-0.92	29	1.21-123	39
0.93-0.95	30	1.24-126	40
0.96-0.98	31	1.27-1.29	41
0.99-1.01	32	1.30-1.32	42
1.02-1.04	33	1.33-1.35	43
1.05-1.07	34	1.36 and longer	44and longer
1.08-1.10	35		

Fiber length is the average length of the longer half of the fibers (upper half mean length). It is reported in both 100ths and 32nds of an inch (see the conversion chart below). Fiber length is measured by passing a "beard" of parallel fibers through an optical sensing point. The beard is formed when fibers from a sample of cotton are automatically grasped by a clamp, then combed and brushed into parallel orientation.

Fiber length is largely influenced by variety, but the cotton plant's exposure to extreme temperatures, water stress, or nutrient deficiencies may result in shorter fibers. Excessive cleaning or drying at the gin may also result in shorter fibers. Fiber length affects yarn strength, yarn evenness, and the efficiency of the spinning process. The fineness of the yarn that can be successfully produced from given fibers also is influenced by fiber length.

Length Uniformity

Length uniformity is the ratio between the mean length and the upper half mean length of the fibers, expressed as a percentage. If all of the fibers in the bale were the same length, the mean length and the upper half mean length would be the same, and the uniformity would be 100 percent. However, because of natural variation in the length of cotton fibers, length uniformity will always be less than 100 percent. The table below is a guide to interpreting length uniformity measurements.

Length uniformity affects yarn evenness and strength and the efficiency of the spinning process. It is also related to short fiber content (content of fibers shorter than 1/2 inch). Cotton with a low uniformity index is likely to have a high percentage of short fibers. Such cotton may be difficult to process and is likely to produce low-quality yarn.

Fibre Strength

Table 3.2 interpreting fibre strength

interpreting fibre strength	
Description of degree of strength	Strength gr/tex
Very strong	31and aove
strong	29-30
Average	26-28
intermediate	24-25
weak	23and below

Strength measurements are reported in grams per tex. A tex unit is equal to the weight in grams of 1,000 meters of fiber. Therefore, the strength reported is the force in grams required to break a bundle of fibers one tex unit in size. Strength measurements are made on the same beards of cotton that are used for measuring fiber length. The beard is clamped in two sets of jaws, 1/8 inch apart, and the amount of force required to break the fibers is determined. The table below is a guide to interpreting fiber strength measurements.

Fiber strength is largely determined by variety. However, it may be affected by plant nutrient deficiencies and weather. Fiber strength and yarn strength are highly correlated. Also, cotton with high fiber strength is more likely to withstand breakage during the manufacturing process.

Fig3.3 Fiber length and strength measurements are made on the same "beard" of cotton.

Micronaire

Micronaire is a measure of fiber fineness and maturity. An airflow instrument is used to measure the air permeability of a constant mass of cotton fibers compressed to a fixed volume. The chart below is a guide to interpreting micronaire measurements.

Micronaire can be influenced during the growing period by environmental conditions such as moisture, temperature, sunlight, plant nutrients, and extremes in plant or boll population. Fiber fineness affects processing performance and the quality of the end product in several ways. In the opening, cleaning, and carding processes, low-micronaire or fine-fiber cottons require slower processing speeds to prevent damage to the fibers. Yarns made from finer fiber have more fibers per cross-section, which results in stronger yarns.

Self-Check –3

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Which of the following is the measure of grayness and yellowness of the lint ? (1 pts.)
   A) Maturity
   B) Fiber length
   C) Color
   D) Strength
   E) none
2. __________________ is a measure of the fineness of the cotton fiber. (1 pts.)
   A) Color
   B) Trash content
   C) Macronaire
   D) Strength
   E) all
3. ___is measured by clamping and breaking the beard of fibers with an 1/8-inch gage spacing between the clamp jaws. (1 pts.)
   A) Strength
   B) Trash
   C) Color
   D) All of the above
4. List down the quality parameters of cotton fiber. (4 pts.)

Matching

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question carries 2 Point.

A	B
---------1. Fiber length	A. a measure of fiber fineness and maturity
---------2. Micronaire	B. upper half mean length
---------3. Length uniformity	C. Strength
---------4. grams per tex	D. expressed as a percentage

---------5 Leaf grade E. a measure of the leaf content in cotton

Test II: short Answer writing

Instruction: write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

What is the purpose Instrument Standards

1. What is purpose instrument standard?
2. Write down at least two classification cotton of upland cotton?
3. What is the difference between fiber length and length uniformity?

Part III: Short answer writing

Direction: Give short answer to the following questions. Time allotted for each item is 2mniut and each question carry 4 point.

1. Leaf grade
2. micronaire
3. color
4. maturity
5. trash

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers

Unit Four:- Cotton Features That Can Be Varied Through Ginning Process

This unit to provide you the necessary information regarding the following content coverage and topics:

This unit to provide you the necessary information regarding the following content coverage and topics:

- Seed cotton moisture content
- Effect of temperature and speed settings on cotton fiber properties
- Effect of lint cleaners on fiber length and color

This module will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this module , you will be able to:

- identify Moisture content target seed cotton
- Identify the Effect of temperature and speed settings on fiber length, moisture content and trash removal effectiveness is understand

- understand of lint cleaners on fiber length and color

4.1 Seed cotton moisture content

4.1.1 What is seed moisture content?

The moisture content is the amount of water in the seed and is usually expressed as a percentage. It can he expressed on either a wet weight basis (where it is expressed as a percentage of the fresh weight of the seed) or on a dry weight basis (where it is expressed as a percentage of the dry weight of the seed). For genebank work it is usually expressed on a wet weight basis and all determinations and calculations should follow this rule.

The seed moisture content can either be accurately determined experimentally by scientific techniques, or it can be predicted approximately from the information available. The determination is destructive to the seeds used and since in many cases a prediction is sufficient, determination should only be carried out where essential.

Why is it important to determine moisture content?

A small change in seed moisture content has a large effect on the storage life of the seeds. Therefore it is important to know the moisture content in order to make a reasonably accurate prediction of the possible storage life of each accession.

When should moisture content be determined and when should it be predicted?

Accurate determinations should be kept to a minimum because for many activities a prediction is sufficient. In most cases this means one accurate determination after the drying period, so that the moisture content of the stored seeds is known and can be used to make better predictions of storage life.

How should moisture content be determined and how should it be predicted?

The methods outlined in the following pages can be used as a guide to prediction but experience in dealing with a crop in your own genebank will be necessary for reasonable predictions to be made. The methods for determination are modified from those of the International Seed Testing Association (ISTA) as recommended by the IBPGR Advisory Committee on Seed Storage. Other methods are available and can also be used provided that the results give an accurate determination of moisture content and are calculated on a wet weight basis, to enable comparisons to be made between materials and between gene banks.

Prediction of seed moisture content

The possibility of making reasonably accurate predictions of moisture content will improve as you gain experience with seeds of different species and use your knowledge of the origin of the seeds and the conditions in which they have been stored. The moisture content of a seed will equilibrate with the relative humidity of the air surrounding it. This moisture content is called the equilibrium moisture content and because it is constant for any species at known temperature and relative humidity, it can be used as an approximation of the actual seed moisture content.

Moisture contents will differ from seed to seed within the same accession, but should not be sufficiently different to make more than about 1% difference in moisture contents between seeds of the same accession and different accessions of the same species. This is sufficiently close for a prediction.

Determination of seed equilibrium moisture content

1. Do not waste seeds of germplasm for this, but use either excess seeds or those which are being discarded because they have lost viability.
2. Take two lots of seeds of the species of known weight and leave them in open containers in the environment of your genebank to equilibrate. This may be several days for small seeds and longer for large seeds. Seeds will have reached equilibrium with the moisture content of the air when there is no change in weight on different days.
3. Measure the relative humidity of the atmosphere where the seeds have been held for the past few days by using an aspirated hygrometer.
4. Measure the mean temperature.
5. Remove a sample of seeds and do an accurate determination of moisture content for each seed lot.
6. The mean of the two tests can be used as a guide because other seed lots of the same species should equilibrate at similar moisture content under these conditions.
7. Repeat the determination the following day to make sure that the moisture content is stable and that the equilibrium has been reached,
8. The work can be repeated using a number of species which are of interest at a range of relative humidities that are common in your country at different times of the year.
9. Make a table of the equilibrium moisture contents at different temperatures and relative humidities and use this to refer to in the future

The Weighing To Calculate Moisture Content

1. Moisture content is calculated on a wet weight basis and expressed to one decimal place.
2. Replicates should not differ by more than 0.2%.

3. For samples tested without pre-drying use the following formula:

$$\%\text{ Moisture Content} = \frac{\text{Weight of fresh seeds - Weight of dry seeds}}{\text{Weight of fresh seeds}} \times 100\%$$

4. For samples which have been pre-dried, use the following formula:

$$\text{Final \% moisture content} = S1 + S2 - \frac{S1 \times S2}{100}\%$$

where S1 = Percentage moisture content from first stage of drying

and S2 = Percentage moisture content from second stage of drying

Enter The Data Into The Data Files

1. If the standard method was used, enter the percentage moisture content of each accession into the data file for that accession.

2. If the standard method was not used, also enter a note of the method used to determine it.

Example 1. One stage drying

Material	Dish number	Wt. of dish (g)	Wt. of dish and fresh seed (g)	Wt. of dish and dry seed (g)
C124 rep. 1	35	10.3245	14.8668	14.6356
C124 rep. 2	29	10.1442	14.9948	14.7485

Calculation:

Rep. 1:

$$\%\text{ moisture content} = \frac{14.8668 - 14.6356}{14.8668 - 10.3245} \times 100 = 5.1\%$$

Rep. 2:

$$\%\text{ moisture content} = \frac{14.9948 - 14.7485}{14.9948 - 10.1442} \times 100 = 5.1\%$$

Example *2.* Two Stage Drying (Pre-drying)

Material	Dish number	Wt. of dish (g)	Wt. of dish and fresh seed (g)	Wt. of dish and dry seed (g)
First stage of drying (pre-drying)				
Z099 rep. 1	07	20.4112	35.6615	33.2419
Z099 rep. 2	08	21.3121	36.7446	34.2689

Second stage of drying				
Z099 rep. 1	61	10.2323	14.8839	14.6532
Z099 rep. 2	62	10.4132	14.9647	14.7475

Calculation:

Rep. 1

$$\%\text{ moisture content from pre-drying (S1)} = \frac{35.6615 - 33.2419}{35.6615 - 20.4112} \times 100 = 15.9\%$$

$$\%\text{ moisture content from second drying (S2)} = \frac{14.8839 - 14.6532}{14.9647 - 10.4132} \times 100 = 5.0\%$$

$$\text{Final \% moisture content} = 15.9 + 5.0 - \frac{15.9 \times 5}{100} = 20.0\%$$

Rep. 2

$$\%\text{ moisture content from pre-drying (S1)} = \frac{36.7446 - 34.2689}{36.7446 - 21.3121} \times 100 = 16.0\%$$

$$\%\text{ moisture content from second drying (S2)} = \frac{14.9647 - 14.7475}{14.9647 - 10.4132} \times 100 = 4.8\%$$

$$\text{Final \% moisture content} = 16.0 + 4.8 - \frac{16.0 \times 4.8}{100} = 20.0\%$$

The moisture content of seed cotton is a significant attribute in the ginning process. It has a direct impact on fiber quality, clean ability and consistency which in turn reflects in quality of yarn and fabrics produced from cotton. In each gin process, there is requirement of optimum fiber moisture content. The effort required to control moisture pay dividends in gin operating efficiency and market value of the baled cotton. Many approaches are being used to restore moisture in seed cotton in the ginneries. Among these the latest development is the sensor controlled on-line hot air humidification system for uniform application of moisture when the cotton is dry. The optimum cleaning efficiency is achieved only when the moisture contents in the seed cotton are around 6%. In the early cotton season the moisture contents in seed cotton are observed to be around 10 -15 % which makes it difficult to clean the cotton and also affects the ginning efficiency. Efficient ginning can be achieved only when the moisture content in the seed cotton is around 8%. Moisture content much below or above the recommended levels reduces the ginning capacities significantly as well as damages the quality of cotton. In view of this it was felt necessary that the drying process should be done for moist cotton to bring down the moisture content to the desired levels. Therefore the vertical tower dryers of different capacities are introduced. Seed cotton is dried to the recommended moisture level before feeding into gin machine when the incoming seed cotton is having excessive moisture

The moisture content of seed cotton is 7-8%.But cotton must be ginned with moisture content of 5% but for most condition cotton should be ginned at 6-71/2% of lint moisture. Moisture is the most important single factor affecting fiber quality during ginning. When ginning at higher moisture contents, the average length of cotton fiber will be greater than if the same cotton was ginned at low moisture contents. However trash is easier to remove from drier cotton. Consequently, determining ginning moisture content is a compromise between good trash removal with some fiber length damage and length preservation with less lint cleaning. The ideal ginning moisture content is 7%, but moisture b/n 6-7 1/2 % are acceptable. Ginning at moisture outside this range can cause machinery operation and fiber quality problems

4.2 Effect of temperature and speed settings on cotton fiber properties

Industrial settings, including machine speed, machine width and temperature had some direct effects on the shrinkage properties of cotton spandex fabric.

Thermometer Initial Cotton Pollution Level before Experimentation it is defined on the basis of State standard O'z DSt 592. After setting the required regime, 300 g of cotton samples were obtained using the method described in the state standard O'z DSt 643 on the scales with a accuracy of 0.01 g. After the sample was supplied to the LKM device, the heat was transferred and the release time was recorded. After the required time, the cap of fine dirt from the cotton was opened and placed in a polythene sack, and immediately the temperature of the cotton fiber was measured on the contact thermometer. Then the moisture content of the cotton was determined on the VXS-M1 using the method described in the State Standard O'z DSt 644. During the experiment weighed the separated impurities, and the efficiency of the sample and device purification was determined. The experiments were conducted in three repetitions to avoid possible errors

4.3 Effect of lint cleaners on fiber length and color

- Lint grade foreign matter content.
- Specially the saw type lint cleaner was more effective.
- Trash content but more create short fiber
- improved color grades
- reduced Foreign materials ,fiber length

Self-Check –4

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Which of the following is the measure of grayness and yellowness of the lint ? (1 pts.)
   F) Maturity
   G) Fiber length
   H) Color
   I) Strength
   J) none
2. Which of the following is the measure of fineness of the cotton fiber? (1 pts.)
   F) Color
   G) Trash content
   H) Macronaire
   I) Strength
   J) all
3. ___is measured by clamping and breaking the beard of fibers with an 1/8-inch gage spacing between the clamp jaws. (1 pts.)
   E) Strength
   F) Trash
   G) Color

H) All of the above

4. List down the quality parameters of cotton fiber. (4 pts.)

Matching

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question carries 2 Point.

A	B
---------1. Fiber length	A. measure of fiber fineness and maturity
---------2. Micronaire	B. upper half mean length
---------3. Length uniformity	C. Strength
---------4. grams per tex	D. expressed as a percentage
---------5 Leaf grade	E. measure of the leaf content in cotton

Test II: short Answer writing

Instruction: write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

1. Write down at least two classification cotton of upland cotton?
2. What is the difference between fiber length and length uniformity?

Part III: Short answer writing

Direction: Give short answer to the following questions. Time allotted for each item is 2mniut and each question carry 4 point.

1. Leaf grade
2. Micronaire
3. Color
4. Maturity
5. trash

Note: Satisfactory rating – above 60%   Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers

Unit Five:- Cotton Characteristics Necessary To Maximize Value
This unit to provide you the necessary information regarding the following content coverage and topics: This unit to provide you the necessary information regarding the following content coverage and topics: • Impact of ginning process impurities • Methods of protecting ginned and seed cotton from contamination • Maintaining fiber properties This module will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this module , you will be able to: • Improve Impact of ginning process impurities • protect gin and seed cotton from contamination Maintain fiber properties

5.1 Impact of ginning process impurities

Ginning treatments the effect of combing the stock before ring spinning results in increases in the corresponding yarn breaking strengths and elongations, while lowering while significantly lowering the irregularity number of defects and yarn hairiness.

Fiber length can also be affected by the ginning process. If cotton moisture is low during ginning, fiber length can be compromised due to breakage. The ideal ginning moisture range is 6 to 8%. 5 When lint moisture is below 5%, each percentage lower is equivalent to 1/100 of an inch reduction in length.

5.2 Methods of protecting ginned and seed cotton from contamination

Keeping area/machine clean

- ✓ Area around the machine is kept clean during setting and loading as per standard and safety procedures.
- ✓ This includes

- ✓ Cleaning dust from machine
- ✓ Checking and lubricating moving parts
- ✓ Removing cotton and other process remains
- ✓ Applying kaizen principle to the working area

Preventive maintenance and good housekeeping are essential to an effective loss control program because they increase production and help reduce the chance of fires, property loss, and injuries due to accidents. In addition to cleanliness, good housekeeping also means an orderly flow and arrangement of all materials.

The following is an example of gin housekeeping procedures that include some preventive maintenance:

a. Clean floor and coffee area daily.
b. Empty trash cans.
c. Clean heater screens.
d. Clean restrooms each shift.
e. Check magnets when gin is shut down.
f. Clean air compressor air filters.
g. Empty barrels under rock catcher.
h. Blow out all motors at least every other day.
i. Blow down gin each shift, including all catwalks.
j. Clean the following daily: battery condenser, lint flue, lint cleaners, extractor feeders (back and front), incline cleaners, conveyor distributor, V-trench and seed conveyors, field control paddles, oil chains (when needed), and air conditioner filters.
k. During downtime, clean the following: all pits, seed cotton separators, airline separators, lint cleaner fans, humid air units, and the seed blower filter.
l. Also during downtime, do the following: Check for wads in tower dryers, blow down gin, blow out motor brakes, clean counter flow belly and check vacuum, and oil chains in seed pit.

5.3 Maintaining fiber properties

- ✓ Cotton Fibers and its Properties
- ✓ Properties, classification, and methods to identify the attributes of cotton fibers
- ✓ USTER® HVI is used for measurement of the most important cotton fiber properties of micronaire, fiber length (UHML), uniformity, short fiber index, strength, elongation, color, trash content, and degree of maturity.

- ✓ Microscopic Appearance of Cotton Fiber

  Different kinds of fibers can be identified by their microscopic appearance better, than their physical appearance. When cotton is viewed under a microscopic lens; In longitudinal view, it appears as a flat tube with spiral twists or a twisted ribbon. Under the cross-section view, it is bean-shaped.

- ✓ Properties & Uses of Cotton Fiber

The fibers are sent to a textile mill where carding machines turn the fibers into cotton yarn. The yarns are woven into cloth that is comfortable and easy to wash but does wrinkle easily. Cotton fabric will shrink about 3% when washed unless pre-treated to resist shrinking.

Cotton is prized for its comfort, easy-care, and affordability and is ideal for clothing, bedding, towels, and furnishings.

❖ **Properties of Cotton by Physical Structure**

✓ **Color**

The color of cotton fiber is instrumental in fiber identification. The usual color of cotton fiber ranges from white to creamy white. The color of fiber depends upon the conditions under which cotton is produced e.g., time of picking, the soil of growth, exposure of the plant to sunlight, climatic conditions, impact of insects and fungi, etc. The cotton produced normally has a cream-white color. If fiber is not picked at the right time, its color may vary. If fiber is left for an extended period of time in the boll, it may turn bluish-white. There are five recognized groups of color: white, gray, spotted, tinged, and yellow stained. As the color of cotton deteriorates the process ability of the fibers decreases.

✓ **Fiber Strength**

Fiber strength is measured in grams per denier (gm/den). Cotton is a moderately strong fiber. It has a tenacity of 3.0 – 4.9 gm/den. The strength of the cotton fiber is directly affected with the moisture regain and higher length. Wet cotton fiber is 20% stronger than dry cotton fiber. Similarly, long cotton fibers are stronger than short fibers.

✓ **Elastic Property**

The elasticity of cotton fiber is very low. Recovery from the deformation of cotton fiber from the applied load is very low as cotton fiber is a rigid fiber and inelastic. At 2% extension, it has an elastic recovery (ER) of 74%. At 5% extension, it has an elastic recovery (ER) of 45%. Elastic property can be achieved by; Chemical treatments for the purpose of improvement increase recovery but fibers become harsher due to chemical treatment. Blending or mixing of cotton with elastic fiber, e.g. polyester.

✓ **Length**

Physically the individual cotton fibers consist of a single long tubular cell. Its length is about 1200-1500 times its breadth. The length of cotton fiber varies from 16mm to 52 mm or ½ to 2½ inches depending upon the type of cotton. The width varies between 12 to 20 microns, e.g. Indian cotton- 16-25 mm American cotton- 20-30 mm Sea Island- 38-52 mm Egyptian cotton- 30-38 mm

- ✓ **Fineness**

The fineness of the fiber depends upon the length of the fiber. As cotton fibers are longer in length, they have high fineness. Fineness is expressed in terms of decitex and it varies from 1.1 – 2.3 decitex in cotton fibers. Shorter cotton fibers have low fineness.

- ✓ **Length Uniformity**

Length uniformity or uniformity ratio is determined as "a ratio between the mean length and the upper half mean length of the fibers and is expressed as a percentage". A low uniformity index shows that there might be a high content of short fibers, which lowers the quality of the future textile product. Hence, fibers with high length uniformity produce good quality products.

The typical length uniformity of cotton fibers is shown as below

Table 5.1

length Uniformity	Uniformity Index [%]
Very High	>85
High	83-85
Intermediate	80-82
Low	77-79
Very Low	<77

- ✓ **Crimp**

Cotton fiber is more or less twisted on its longitudinal axis which can't be seen from outside. This is called fiber crimp. The twist in the fiber doesn't tend to be continuous in one direction i.e. if the first director of the fiber is right, and then the direction of the fiber is left. This property of cotton fiber helps in spinning.

- ✓ **Specific gravity**

The specific gravity of cotton fiber is 1.54.

- ✓ **Effect of Sun-light**

When cotton is exposed to sunlight, there is a gradual but consistent loss of strength of cotton fibers and they turned yellowish due to sunlight. When heat is promoted and brought to cotton fibers by sunlight, degradation of cotton is done by oxidation. From sunlight, much of the damage is caused by ultraviolet light.

- ✓ **Effect of Heat**

Cotton is very resistant to degradation by heat. It begins to turn yellow after being burnt at 120° C for several hours. Decomposition of cotton fiber occurs at 150° C due to the process of oxidation. Cotton is severely damaged after a few minutes after at 240° C. Cotton burns readily in the air.

- ✓ **Luster**

Cotton fiber has a very low luster naturally just like low elasticity.

- ✓ **Effect of Moisture**

The tensile strength of the cotton fiber is increased with the absorption of moisture. Under normal humidity conditions, cotton takes up about 6 – 8% moisture. Cotton fiber has a moisture regain of 8.5%. Wet cotton fiber is 20–25 % stronger than dry cotton fiber as hydrogen bonding is produced between molecules of water and cellulose present in cotton. Hydrogen bonding becomes the cause of strength in wet cotton fiber.

- ✓ **Effect of Age**

A small loss of strength is shown by cotton when stored carefully. After 50 years of storage, cotton may differ only a little from new fibers.

- ✓ **Smell**

Cotton fiber burns rapidly in the air. Cotton burns instantaneously when it comes in contact with flame. Cotton burns quickly and readily with the smell of burning paper.

Conductor Related Posts

Fiber Cotton Fibers – the king of fibers

Cellulose-seed fiber from the nature

Cotton is a very good conductor of heat and air. Cotton is a good conductor of electricity.

- ❖ **Properties of Cotton by Usage**
- ✓ **Comfort**

Cotton fiber has a large amorphous portion and this is why the air can be in and out through cotton fiber. So, the fabric made of cotton fiber is quite comfortable to use.

- ✓ **Soft Handle**

Cotton fiber, if properly ginned, gives the best soft handle feeling among all other fibers. This property is instrumental in fiber identification.

- ✓ **Absorbent**

Cotton fiber has high absorbency power and this is why this fiber can be died properly and without any problem or difficulty. It absorbs perspiration quickly which is its highly esteemed property. As the body perspires, cotton fibers absorb the moisture and release it on the surface of the fabric, so it evaporates.

- ✓ **Printing**

The printing efficiency of cotton fiber is good. If the printing is applied on cotton fiber, it seems it doesn't spread the color outside the design.

- ✓ **Good Color Retention**

Cotton fibers have very good color retention. Fabrics made by it can retain their color in harsh conditions and in washing.

- ✓ **Machine Washable & Dry Cleanable**

Cotton fiber has very good fatness and is easily washable. It is seen that some fibers can't be dried or washed due to their sensitivity to water and weak fastness properties. You can easily wash the cotton-made fabric by machines and even you will be able to dry this fiber by using an electronic drier. Cotton fabric is very easy to launder.

- ✓ **Good Strength**

Cotton fiber is a moderately strong fiber. Its strength along with its other properties makes it ideal for wear. Cotton fiber is also very durable.

- ✓ **Draping:**

The drape-ability of cotton fiber is quite good. You can use the cotton fiber-made fabric in any kind of wear that needs more flexibility and drapes.

- ✓ **Sewing & Handling Is Easy:**

The sewing efficiency on Cotton made fabric is easier and more comfortable than other fibers. Cotton is very easy in handling.

- ✓ **Breathability:**

Fabric made from cotton fiber has very high air permeability which makes it highly breathable fabric. It has a distinctive feature that it adjusts easily with climatic requirements. That is why it is called all-Season fabric. In the summer season, the cotton fabric keeps the body cool and absorbs sweat easily. As the body perspires, cotton fibers absorb the moisture and release it on the surface of the fabric, so it evaporates.

- ❖ **Chemical Properties of Cotton**
- ✓ **Effect of Acids**

Cotton is damaged by dilute acids and cold concentrated acids which causes disintegration.

- ✓ **Effect of Alkalis**

Cotton has excellent resistance to alkalis. It swells in caustic alkalis like NaOH but it doesn't damage by alkali. It can be washed repeatedly in soap solution without any problem.

- ✓ **Effect of Organic Solvent:**

Cotton has a high resistance to normal cleaning solvents. Cotton is dissolved by copper complexes such as copper ammonium hydroxide etc.

- ✓ **Effect of Insects**

Cotton is not attacked or damaged by moths or beetles.

- ✓ **Effect of Micro-Organism:**

Cotton is attacked by fungi and bacteria. Mildews feed on cotton fiber, rotting and weakening the material. Mildews and bacteria will flourish on cotton under hot and humid conditions.

- ✓ Use of Cotton Fiber

Cotton fiber can be woven or knitted into fabrics such as velvet, corduroy, chambray, velour, jersey, and flannel.

It is used to make breathable textile products like underwear, socks, and T-shirts.

Cotton is also used in fishnets, coffee filters, bookbinding, and archival paper.

Linters are the very short fibers that remain on the cottonseed after ginning. They are used to produce goods such as bandages, swabs, banknotes, cotton buds, and x-rays.

Bed sheets are usually made of cotton because of their soft feel.

Cotton fiber is also used to create tents and cotton paper. Cotton paper is used to create banknotes and high-quality art paper.

Cotton is used in apparel; blouses, skirts, pants, shirts, children's wear active wear, etc.

Cotton is used in home upholstery; draperies, curtains, bed sheets, towels, table cloths, table mats, napkins.

Cotton is used to make medical textile-like bandages and wound plasters.

Self-Check –5

Matching

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question carries 2 Point.

A	B
---------1. Effect of Alkalis	A. the king of fibers
---------2. drape-ability	B/.cotton fiber is very good
---------3. Good Strength	C. cotton fiber is quite good
---------4. Cotton Fibers	D. Cotton has excellent resistance to alkalis
---------5 smell	E. Cotton fiber burns rapidly in the air

Test II: short Answer writing

Instruction: write short answer for the given question. You are provided 3 minute for each question and each point has 5Points.

1) What is purpose of Cotton Fiber?
2) State Chemical Properties of Cotton?

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers