

## Lecture 11

### **Cotton *Gossypium* sp. (2n=26, 52) Malvaceae**

Cotton is the most ancient crop of the tropical and subtropical. It is one of the most important items of export in the developing countries. Cotton fiber is unchallenged natural textile fiber even today. The genus *Gossypium* consists of diploid and tetraploid cultivated cotton.

**Old world cotton or Desi cotton or diploid cotton** 2n=26 are *G. herbaceum* (upam cotton) and *G. arboreum* (Karunkanni cotton)

**New world cotton or American cotton or Tetraploid cotton** 2n=52 are *G. hirsutum*. (Combodia or upland cotton) and *G. barbadense*. (Sea Island cotton)

Cotton fiber is epidermal prolongation of seed coat cells. The longer out growth make **lint** and the shorter one make **fuzz**. In diploid cotton and upland cotton both lint and fuzz are present where as Sea island cotton (*G. barbadense*) only lint are present and such seeds are called **naked seed**.

### **Structure of fiber**

There are five different parts in a mature fiber. 1) The integument or outer layer is also called cuticle or waxy layer .2) Outer cellulose layer which is largely the original cell wall. 3) Layers of secondary deposits. This is nearly pure cellulose. Numerous concentric layers in this portion is recorded. 4) Walls of the lumen, a spiral structure surrounding the central cavity of the fiber and more dense than any other part of the fiber. 5) Substance in lumen is structure less and of a nitrogenous nature.

**Jute - *Corchorus capsularis*, *C. olitorius*.**(2n=14) Tiliaceae.

Jute is a leading crop among all bast fiber. (Stem fiber) plants. It is a typical plant of humid tropics and subtropics. Jute is chiefly raised for the sake of its fiber, which develops in the external part of the stem (in the bark). Individual fibrils are from 5 to 40 mm long. The surface of the jute fiber is smooth and brown in color. Commercial jute fiber is obtained from two species *viz.* *Corchorus capsularis* (white or bitter jute) and *C. olitorius* (Tossa jute). Mainly grown in W. Bengal, Bangladesh.

### **Fiber extraction.**

The ideal phase of harvest is when the plants are in small pods. Harvested plants are bundled and staked for the withering of leaves. After 2 to 4 days the leaves shed and the bundles are then steeped in water.

### **Steeping**

It is a process of immersing the bundles in water. After 2 to 4 days the tissues and cells rupture. This facilitates the entry of micro organism into stem.

### **Retting**

It is a process by which harvested stems are steeped in water so that the fiber in the stem get loosened and separated from the woody stalk due to the removal of protein, gums and other mucilaginous substances by the micro organisms. Fiber yield is 6% of the fresh stem weight.

### **Fiber Quality**

Jute fiber is fine and silky but less stronger than many other fiber.

### **Mesta *Hibiscus cannabinus* (2n = 36 ) Malvaceae**

Mesta fiber is a valuable fiber probably next to jute. This crop is successfully grown throughout tropics and subtropics. Bast fiber is obtained from the stem similar to jute.

### **Sun hemp. *Crotalaria juncea*. 2n=16 Fabaceae**

Sunnhemp is another source of bast fiber, grown in tropical countries. It is also grown as fodder and green manure. The fibers are stronger than jute but lighter in color and more enduring than jute. They are long strands of fiber of about 4 to 5 feet in length and yellow to green in color. Fiber is obtained by retting.

### **Sugars**

#### **(Sugar cane *Saccharum officinarum* (2n=80) Poaceae.)**

Sugar cane is a perennial gigantic grassy plant of Poaceae family. It is extensively grown in India, Cuba, Hawaii W.Indies.

There are 5 species of sugarcane of which three are cultivated and two are wild species.

1. *Saccharum officinarum*. Noble cane (2n=80). Large barreled, low fiber, high sugar content, susceptible to diseases and pests.
2. *S. barberi*. Indian cane (2n=82-124) Intermediate between noble and wild canes. Small barrel, internodes spindle shaped, high fiber content, resistant to diseases.
3. *S. sinense*. Chinese cane (2n=118) Vigorous thin grassy form resistant to drought, pest and diseases. Fair amount of sucrose content.

4. *S. spontaneum*. Wild cane (2n=40-128). Vigorous than grassy form. Virtually no sucrose, resistant to drought, pest and diseases.
5. *S. Robustum*. Wild cane (2n=60-194) Thick stock low sugar content, disease resistant.

The above 5 species are important for the improvement of sugar cane. They all inter cross freely.

**Inflorescence** is panicle. It is also called **Arrow**.

### **Nobilization**

Back crossing of F1 with *S. officinarum* ( noble cane)

### **Forage Crops**

The term **forages** is used broadly to mean all the plant constituents that are eaten by herbivores, including that are grazed (**pastures**) and those that are cut and fed such as **fodder**. Crop residues such as straw and the foliage of trees and shrubs also fall within this broad definition.

**Fodders-** Plants, which are, cultivated as forages crops and they are cut and fed to animals in stalls.

**Pastures-** grasses and legumes are grown in pasture lands where the animals are led to graze.

**Forages** can broadly be classified into three groups. *viz.* **grasses, legumes and non legumes.**

**Grasses.** Annual grass – Maize, sorghum, and cumbu.

**Perennial grass.**—B.N. and N.B, hybrids.

**Legumes** Annual Cowpea, cluster bean.

Perennial Lucerne, Sirato, Desmanthus

**Non legumes.** – Fodder beet, Fodder radish.

### **Grasses**

**Napier grass - *Pennisetum purpureum***

It is a tall perennial grass forming very thick clumps, tillering is heavy. It comes up well in both under tropical and temperate regions. It comes well in any soil condition and also responds to sewage irrigation 6-8 harvests can be taken in a year. The grass withstands drought for short spell and regenerate with rains.

**Pearl millet** Napier (Bajara - Napier)

They are very vigorous in their growth and adopted for varying climatic and soil conditions. They give heavy yield higher than Napier. They are more nutritious, palatable, succulent, juicy and less fibrous. They tiller profusely have luxuriant growth and responds to higher level of nitrogen.

**Guinea grass- *Panicum maximum***

It is the most popular grass with heavy tillering, forming big clumps with long internodes, slender and glabrous. It comes up well in tropical condition with moist climates. Under cultivation it can be grown in any soil. It requires sufficient moisture but cannot withstand water logging. It responds to sewage irrigation. It can be harvested once in 25 to 30 days interval. The crop can be allowed in the field for several years. Dry matter content is 15- 20% Protein 6- 8% free from all toxic principles.

**Buffel grass- *Cenchrus ciliaris***

It is an important perennial pasture grass and grows well in a great variety of soil and climate. It is a perennial grass with underground rhizomes. They are hardy and drought resistant and have quick regeneration capacity. It gives the highest forage yield among the grasses grown under rainfed condition. Aerial branches tufted, leaf sheath compressed with hairs raceme of spikes sessile spikelets, no lodicules.

**Johnson grass- *S. halapense***

It is native of Africa. It was taken by colonel Johnson and hence named after him. In South India it occurs both in  $2n = 20$  &  $40$  forms. Because of rhizomatous condition it will spread easily. Co. 27 fodder cholam (Co 11 x *S. halapense*)

**Legume Fodder**

**Lucerne / Alfalfa (*Medicago sativa*)**

It is also called as **queen of fodder or green gold**. Lucerne is grown for pastuer, hay, dehydrated meal and for medicinal purpose. It is an important leguminaceous fodder grown as a perennial crop in drier regions and as an annual crop in hot humid regions. It is heat and drought resistant.

**Cow pea-*Vigna unguiculata***

It is the most important leguminous fodder crop during summer and rainy seasons mainly due to its quick growing habit, high yielding ability and high protein content.

**Desmodium-** *D. tortuosum* / *intortum* is commonly known as green leaf desmodium, is a large trailing and climbing, perennial rooting at nodes and having a deep tap root. It can be harvested 2-3 times. Shade tolerant green manure cum fodder produces profuse seeds.

Protein 22%. It is a tropical legume. It grows well in acid soils.

### ***Stylosanthus guianensis***

It is a summer growing perennial pasture fodder legume. *S.hamata* found to thrive in alkaline soils. *S.fruiticosa* is from India. It is an herb and small shrub. It thrives in light soils due to its deep rooting system.

### **Tree fodder**

**Subabul-** *Leucaena leucocephala*.

Among the browsing leguminous trees it tops the best. It provides economic nutritious and highly palatable forage to livestock and poultry. It has an amino acid mimosin. Excess feeding leads to fall of hairs, thyroid gland swelling and stunted growth. Pods can be fed to cattle. Protein 29%.

### ***Glyricidia sepium***

It is a medium tall tree grown in tea coffee and coca plantation for shade. It is pruned for green manure purpose.

**Agathi / sithagathi-** *Sesbania gandiflora* and *S. sesban*.

It is a fast growing and leaves are rich in protein and very much relished by all types of livestock.

**Erythin-** *Erythrina indica*

Indian coral leaf is a nitrogen fixing cum fodder green manure tree suited even to high acid soil.

### **Green manure and green leaf manure**

**Green manure** is generally a leguminous crop raised in a field and incorporated in situ.

E.g. Sunnhemp, daincha.

### **Green leaf manure**

It is a practice of cutting and applying them to the fields and ploughing them e.g. Neem, calotropis, glyricidia.

**Sunnhemp.** *Crotalaria juncea*. Erect herbaceous shrub. Cylindrical stem silky appearance pods oblong inflated and hairy.

**Sesbania speciosa.** It was introduced from South Africa. It is a quick growing and attains 3-4m in about 4 months. The crop stands drought and to some extent salinity. The stem is pithy but if allowed To grow for more than 4 or 5 months it becomes woody.

**Daincha.** (*Sesbania aculeata*) It is a quick growing succulent crop which adapts itself to varying conditions of soil and climates. It can be grown even under adverse drought, water logging condition and salinity.

**Tephrosia pururea noctiflora.** It is a perennial undershrub, growing wild in sandy or gravelly waste places. It is also grown as an annual crop for green manure

**Neem.** *Azadirachta indica.* Evergreen tree with plenty of foliage. Loppings once or twice a year.

**Pungam.** *Pongamia glabra.* A leguminous ever green tree. Lopping is done once or twice a year.