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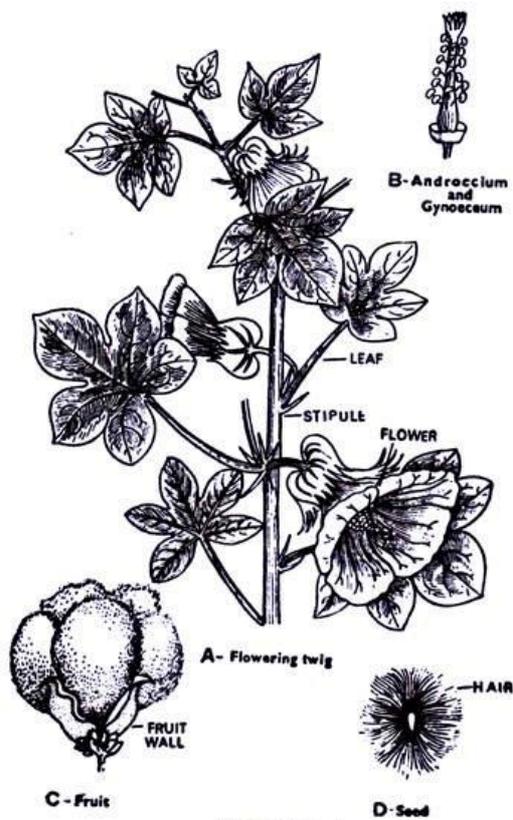
Practical: (Batch-1)

Aim: To study economically Important Plant: Cotton

Botanical name: *Gossypium spp.* (*Gossypium hirsutum*)

Family: Malvaceae

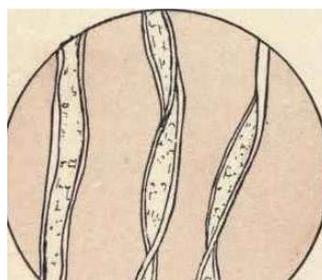
Economically Important part: Surface Fibres (seed fibres)



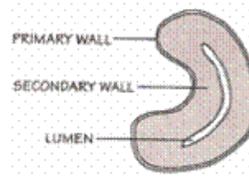
Flowering twig of *Gossypium spp*



Cotton Seed with fibres.



Morphology of fibre.



Cross Section of single fibres

Morphology:

Cotton plant is annual to perennial small shrub or tree with few vegetative branches. Main stem is monopodial in growth and bears spirally arranged branches and leaves. Stem with Dimorphic branching – a. Vegetative branches are monopodial and developed from axillary buds of lower nodes b. Fruiting branches are sympodial and developed from extra-axillary buds of upper nodes. Vegetative branches are similar to main stem which do not bear flowers and give rise to sympodial fruiting branches which bears flowers at the tip. These sympodial branches forms a zig-zag pattern. Leaves are large, blade 4-10 cm, cordate, palmately lobed with three, five or seven lobes and covered with multicellular hairs. Flowers are large surrounded by involucre of leafy bract. Numerous stamen surrounding the style. Cotton fruit is 2 to 4 cm in size and known as cotton boll.

Economically Important part: Fibres

Each cotton boll is spherical leathery capsule consisting of three to five chambers (similar to the number of carpels) and known as locules. In each locule six to nine seeds are present. Each seed is of 8 to 10 mm. The surface of each seed is covered with hairs where long hairs are known as lint, floss or staple and short hairs are known as fuzz or linter. These hairs are fibres and are the epidermal prolongation of with the length from 25 to 60 mm and diameters varying between 12 and 45 μm .

Fibre structure and characteristics:

Cotton fibres have a pronounced three-wall structure. The cuticle layer consists of wax and pectin materials. This outer wax layer protects the primary wall, which is composed of cellulose crystalline fibrils. The secondary wall of the fibres consists of three distinct layers, which include closely packed parallel fibrils with spiral winding of $25-30^\circ$ and represent the majority of cellulose within the fibres. Lumen is surrounded by the tertiary wall.

Longitudinal view: Mature cotton looks like a flat, twisted, ribbon or a collapsed twisted tube. Cotton fibre consists of characteristic convolutions or twists along its length that are randomly left handed or right handed and number 40 – 65/cm.

Cross sectional view: Mature cotton has been or kidney – shaped cross section, and a small lumen. However, by swelling it is almost round when moisture absorption takes place. Immature cotton also has a bean – shaped cross section

but a larger lumen. Mercerised cotton looks almost round to oval, a small point at or near the centre representing the lumen.

Properties and Chemical composition of raw cotton :

Cotton is hydrophilic and the fibres swell considerably in water. Fibres are stable in water. The toughness and initial modulus of cotton are lower compared to hemp fibres, whereas its elongation at break (5-10%) and its elastic recovery are higher. The fibres are resistant to alkali but degraded by acids. The microbial resistance of cotton is low, it burns readily and quickly, can be boiled and sterilized.

Chemical composition of raw cotton :

a) Cellulose	=88 -97 %
b) Protein	= 1 – 2%
c) Oil and wax	= 0.4 – 1.5 %
d) Hemicellulose and Pectin	= 0.4 – 1.5 %
e) Minerals	= 0.7 – 1.6 %
f) Others	= 0.5 – 0.6%

Polymer (or) Fibre forming Substance:

Linear cellulose polymer $-(C_6H_{10}O_5)_n = 10000$

Fine Structure :

Crystalline region=65 to 70%, Amorphous region =35 to 30%

Economic Importance of Cotton

- Cotton can be woven or knitted into velvet, corduroy, denim, jersey, flannel, velour, and chambray and basically used for every type of clothing
- Cotton fibres are also used to make curtains, bed linens, comforters, and blankets.
- Fibre waste of spinning is used in coarser yarns and waste fibre is a filling material in quilts and pillows.
- 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.

