

# PLANT FIBERS

- Plant fibers are thick walled cells with pointed ends cell walls of which consist of cellulose and may or may not contain lignin.
- In medical practice they are used as surgical dressings made up of natural or artificial materials.
- Apart from 3 natural sources such as plant, animal and mineral fibers they are now synthesized chemically from various materials.
- **Plant fibers** – Jute, flax, hemp, cotton.
- **Animal fibers** – silk, wool.
- **Re generated and synthetic fibers** - Nylon, terylene, orlon.
- **Mineral fibers** - Glass, asbestos.

- **Fibers regenerated from carbohydrate material** – Alginate yarn, Artificial silk or rayon or re generated cellulose.
- **Fibers regenerated from protein materials** – Aridil from ground nut protein and fibrolin from milk casein.
- Various chemical tests can be applied for the identification of fibers.
- The microscopical examination is the main criteria to confirm the identity of fibers.
- Commercially fibers are used in the textile industry for weaving the cloth, as filtering medium and also for insulation purpose.

# COTTON

**Synonyms:** Raw cotton, cotton wool, purified cotton, Absorbent cotton, surgical cotton.

**Biological source:** cotton consists of the epidermal trichomes or hairs of the seeds of the cultivated species of the *Gossypium herbaceum*, *Gossypium barbadense*.

**Family:** *Malvaceae*

Purified cotton or absorbent cotton consists of the trichomes as free from fatty matter and adhering impurities. It is also bleached and sterilized.

**Geographical source:** USA, Egypt, India, Africa and South America.

# Preparation of Absorbent cotton

- Cotton is commonly grown for the purpose of fibers in the tropical countries.
- The plant after flowering bears fruits known as capsules. The fruits are 3 to 5 celled.
- Each capsule contains numerous seeds, the seeds covered with the hairs are known as **bolts**.
- The bolts are collected, dried and taken to the **ginning process**, where the trichomes are separated from the seeds.
- Various devices are used to separate the hairs, the short and long hairs are separated from each other.

- The hairs with short length are known as **linters** and are used for the manufacture of absorbent cotton, while long hairs are used for the preparation of cloth.
- The raw cotton obtained by this process is full of impurities like wax, fat, colouring matter, vegetable debris etc.
- To remove the impurities it is taken to the machine known as **cotton opener** and followed by the treatment **with dilute soda** solution under pressure for about 10 – 15 hours.
- The wax, fatty material and colouring matter are removed by this treatment. It is then washed with water and treated with suitable bleaching agent.
- It is again washed with water and dried and made as flat sheets. Packed in wrappers and sterilized.

# DESCRIPTION

**Colour** - white( due to bleaching)

**Odour** – odourless

**Taste** – Tasteless

**Size** – cotton fibers are 2.5-4.5 cm in length and 25-35 micron in diameter.

It is free from pieces of leaves, seed coat, foreign matter and dust. It may be slightly off white in colour if sterilized.

**STANDARDS:** Length-not less than 15mm.

Water soluble extractive – not more than 0.5%.

Sulphated ash – not more than 0.5%

## **HISTOLOGICAL CHARACTERS**

- The trichomes are uni cellular , flattened and ribbon like with slightly thickened and rounded apex.
- They are tubular and hollow.

## **CHEMICAL CONSTITUENTS**

- **Raw cotton** contains about 90% of cellulose, 7-8% of moisture, wax, fat and remains of protoplasm.
- **Purified cotton** or **absorbent cotton** is entirely cellulose with 6 – 7 % of moisture.

# CHEMICAL TESTS

- Soak cotton fibers in iodine water and dry. Add few ml of 80% sulphuric acid trichomes turns purplish blue or bluish green colour.
- Ammonical copper oxide solution ( cuoxam reagent ) dissolves raw cotton fibers with the formation of balloons while absorbent cotton dissolves completely with uniform swelling.
- Cotton is insoluble in dilute sodium hydroxide solution and hydro chloric acid.it is soluble in 66% of sulphuric acid.

# USES

- Used as a filtering medium and in surgical dressings. It is also used as an insulating material.
- Absorbent cotton absorbs blood, mucus, pus and prevents the wounds from infections.

# STORAGE

- Stored in cool place, Bacterial contamination makes the cotton friable and brittle.
- The absorbent cotton should be wrapped in wrappers so as to prevent the dust and microbial contamination.
- Heat and long storage make absorbent cotton non absorbent.

# JUTE

**Synonyms:** Gunny

**Biological source:** it consists of phloem fibers of the stem of various species of the *Corchorus* (*Corchorus olitorius*) and *Corchorus capsularis*.

**Family :** Tiliaceae

## Geographical source

- The plants producing jute are cultivated in west Bengal in the basins of gangas and in Assam.
- The jute plants grow successfully in areas having loamy soil with PH values of 6 to 8.

# METHOD OF PREPARATION

- Jute fibers are prepared generally in the month of July when the plants are in flowering stage.
- The stems are cut and leaves are removed, and sub merged in to a water tank in the form of bundles.
- To protect the bundles they are covered with straw, and kept for 3 weeks. This process is called **RETTING**.
- The fibers are separated from the wood by beating on the end of the stems. Then it is cleaned and dried in sun.
- Depending upon the length of fibers their colour and glossiness different grades of jute are prepared.

## **CHEMICAL CONSTITUENTS**

The fibers are yellowish brown in colour and contain cellulose ( 53%) hemi cellulose ( 20%) and lignin ( 10%).

## **CHARACTERS**

Jute fibers are about 0.8 - 5mm in length and 10 - 25 $\mu$  in diameters. The commercial strands are up to 3m long.

## **CHEMICAL TESTS**

The middle lamella is highly lignified and gives red colour with phloroglucinol and hydro chloric acid.

## **USES**

In the manufacture of tows, padding splints, filtering and straining medium. In the preparation of gunny bags.

# HEMP

**Biological source:** Hemp is prepared from the pericyclic fibers of the stems of *cannabis sativa*.

**Family :** *cannabinaceae*

**Geographical source:** The plant is grown in large quantities for its fibers in Russia. The plant also grows in Italy, France and America.

**Preparation:** The fibers are prepared by **Retting** in the same way as jute.

**Chemical constituents:** The hemp fiber is chiefly composed of cellulose. Lignin is also present to some extent.

# CHARACTERS

- Hemp fibers are 35 – 40 mm long and have an average diameter 22 $\mu$ .
- The fibers end unlike those of flax are bluntly rounded, in some cases the ends are forked.
- The luman of the fiber is flattened or oval.

## USES

- Hemp is used in the manufacture of rope, twine and sail cloth.

# HALLOCIINOGEN – CANNABIS

**Synonyms:** Cannabis indica, Indian hemp, ganja

**Biological source:** cannabis consists of dried flowering tops of the cultivated female plants of *cannabis sativa*.

**Family:** *cannabinaceae* ( *Moraceae* )

**Geographical source:** It is indigenous to india. Cannabis is produced commercially in Mexico and Africa. In india it is cultivated in Maharashtra, west Bengal and Madhya Pradesh. Commercially it is cultivated for various purposes (eg) for fibers, oil and for narcotic substances like charas, bhang, ganja etc. For the production of fibers it is cultivated in Kashmir, Nepal and kerala.

## CULTIVATION AND COLLECTION

- The cultivation of cannabis is under taken only under license from the Government because of its narcotic effects.
- It needs light loamy soil or sandy soil. **It is cultivated by sowing seeds** in the month of June or July.
- The distance between 2 rows is about 1 meter and it needs about 6 to 9 kg of seeds per hectare.
- The plant is kept free of weeds.
- It flowers in the month of November or December and harvesting is done in the month of December or January.
- The average yield of ganja per hectare is 275 kg.

# MACROSCOPIC CHARACTERS

**Colour** - Dull green

**Odour** – strong, characteristic and narcotic

**Taste** – Acrid and pungent

**Shape** – flattened or cylindrical masses consisting of branches

## **Narcotic products from cannabis**

- **Bhang**, or **hashis** or **siddhi** ,**ganja** and **chara**.
- Only the female plants are used for the preparation.
- Male plants are not selected because the resinous material is formed only in female un fertilized plants.

## 1. Bhang or hashis or siddhi

- It is prepared by cutting the leaves and flowering tops of the plant exposing them in sun it is dried and pressed . This product is stored in earthen vessel . The resinous matter present in glandular trichomes contains hallucinogenic matter.

## 2. Ganja

- It consists of the dried flowering or fruiting tops of the female plants from which no resin has been removed. For the preparation of ganja plants are collected when the flower stalks begin to turn yellow.
- It is collected and crushed to press the floral shoots then it is subjected to pressure under press, after 3 to 4 days ganja is ready for storage. **2 types of ganja** is available, **flat or Bombay ganja** and **round or Bengal ganja** better quality from Bengal.

**3. CHARAS:** It is a resinous exudation collected from the leaves of the hemp plants. The resinous secretion appearing just before flowering of the plant it is collected by rubbing the fresh tops between the hands or by beating them on cloth or carpet. The adhering material is scrapped off to yield charas.

### **CHEMICAL CONSTITUENTS**

- Indian hemp contains 15-20% of resin (present in glandular trichomes) which contains the major active euphoric principle 1,3,4 trans tetra hydro cannabinol.
- It also contains volatile oil, trigonelline and choline. The resin also contains cannabinol, cannabidiol, cannabidiolic acid, cannabichromene and cannabigerol.
- Indian hemp seeds contain about 20% of fixed oils.

## **IDENTIFICATION TEST**

- Shake about 0.1 gm drug with light petroleum ( 60-80) and filter. To 1ml filtrate add 2ml of 15% solution of hydrogen chloride in ethyl alcohol .At the junction of 2 liquids a red colour appears after shaking the upper layer becomes colour less and lower layer acquires pink colour which disappears on addition of water.

## **USES**

- It is a narcotic, sedative and analgesic. It has psychotropic properties due to tetra hydro cannabinol. It causes in toxication, euphoria and lateral mental disturbances.

## **STORAGE**

- It should be stored in a well closed container after thorough drying.

# TERATOGEN – AMINO ALKALOID

## COLCHICUM

**Synonyms:** Meadow saffron seeds , autumn crocus.

**Biological source:** It consists of the dried ripe seeds of *colchicum luteum* and *colchicum autumnale*.

**Family:** *Liliaceae*

Colchicum corm is also used medicinally.

**Geographical source:** It is found and cultivated in various parts of Europe like England, Czechoslovakia, Holland , Poland and Yugoslavia.

It is also cultivated in india in western Himalaya and Kashmir.

# HISTORY

- This seed was known from the time of Dioscorides.
- It was not much used due to its toxic nature.
- Arabian people were using it for the treatment of gout. In 17<sup>th</sup> century, it was re introduced in European countries and first appeared in the London pharmacopoeia in 1616.
- **Pelletier** and **caventon** isolated colchicine from colchicum in 1820.

# **CULTIVATION AND COLLECTION**

- It is a corm which is present as a swollen under ground stem with sheathing leaves.
- Towards the end of summer the fully grown corm develops daughter corms in the axil of scaly leaf near the base and develop a new plants.
- In Jammu and Kashmir and different parts of Europe and Africa the drug is obtained by propagation with seeds.

- The propagation is done by sowing seeds in boxes.
- The seedlings are transplanted in open fields at a distance of 1 meter.
- The plants bear the capsular fruits after 1 year of vegetative growth.
- The fruits are collected and dark seeds are separated, processed and graded, the corms are isolated and the adhering scales and coats are removed .
- The corms are sliced transversely and dried below 65C

# **MACROSCOPIC CHARACTERS**

## **COLCHICUM SEEDS**

Very hard in nature and show a reddish brown testa. The seeds have a projection at the hilum and develops strophiole which is an out growth of testa. The seeds are 2 to 3mm in diameter having bitter and acrid taste and no odour.

## **COLCHICUM CORMS**

**Colour** – yellowish brown

**Odour** – no odour

**Taste** – bitter and acrid

**Size** – slices are about 2 – 5 mm in thickness

**Shape** – sub reniform or oval in out line

## **MICROSCOPIC CHARACTERS**

- The section of seeds shows parenchyma and endosperm.
- The parenchymatous cells are reddish brown with thick walls.
- The endospermic cells show pitted walls and contain aleurone grains and fixed oil.
- The strophiole portion of seeds contains starch.
- The corm has epidermis, parenchyma and vascular tissue.
- The parenchymatous cells have abundant starch grains .
- The epidermis has circular stomata, in vascular part the xylem vessels are spiral or annular.

# CHEMICAL CONSTITUENTS

- Colchicum seed contains 0.2-1% of amino alkaloids of which **colchicine** is the main constituent.
- The seeds contain up to 0.8% of colchicine and in corms, it is up to 0.6% colchicum also contains **demecolcine**.
- Both the alkaloids contain tropolone or cyclo heptatrein-01-one ring structure.
- Colchicine (  $C_{22}H_{25}O_6N$  ) is obtained as pale yellow crystals amorphous or in powder form.
- It has a bitter taste and is odourless .It darkens on exposure to air.
- Colchicine is freely soluble in alcohol and chloroform.

## CHEMICAL TESTS

- Colchicine gives yellow colour with 70% sulphuric acid.
- Alcoholic solution of colchicine with ferric chloride gives red colour.

## USES

- Used in the treatment of Gout and Rheumatism.
- It also possesses Anti tumour activity.
- Used in polyploidy  
( for increasing the number of chromosomes) .

Hence it is used in horticulture and cultivation of medicinal plants.

# TERATOGEN

## VERATRUM

- Two important species of genus *veratrum viride* and *veratrum album*.
- Both contain proto veratrine as active principle veratrum contains 2 groups of alkaloids called **je veratrum** and **ce veratrum** alkaloids.
- The alkamine part of both these groups is poly hydroxylated C<sub>27</sub> N fused poly cyclic.
- The members containing **ce veratrum** alkaloids are only therapeutically active and their examples are **cevadine**, **germerine**, **veratridine**, **proto veratrine A** and **proto veratrine B**.

# VERATRUM VIRIDE

**Synonyms:** American or Green hellebore

**Biological source:** It consists of dried rhizome and roots of *veratrum viride*.

**Family:** Liliaceae

**Geographical source:** The drug is obtained from wild growing plants in many parts of united states like states of new York, North california, Georgia, Tennessee etc, it is also found in some parts of Canada.

# MACROSCOPIC CHARACTERS

**Colour** – Brown

**Odour** – un pleasant

**Taste** – Acrid

**Size** – Rhizomes are 5 to 8 cm in length 2-3.5 cm in diameter

**Shape** – Sub cylindrical with numerous yellowish brown roots.

It is a perennial herb about 1-2 m in height, large leaves, which are oval and strongly ribbed , star shaped many flowers in panicle.

**USES:** The medicinal action is due to its alkaloidal constituents. It lowers blood pressure and decreases heart rate, it is used as a liquid extract or tincture in pregnancy associated hyper tension.

# VERATRUM ALBUM

**Synonym:** White hellebore, European hellebore

**Biological source:** it is the dried rhizome of *veratrum album*.

**Family:** Liliaceae

**Geographical source:** it is native to central and southern Europe, china and Japan.

**Habitat:** It is a deciduous hardy perennial herb, flowers in June-July bears white flowers.

Stem is hairy and 50-125 cm.

# MACROSCOPIC CHARACTERS

**Colour** – brown

**Odour** – un pleasant, characteristic when fresh on drying no odour.

**Taste** – burning. Acrid and bitterish.

**Size** – 5 to 15 cm in length and 2 to 3 cm in diameter

**Shape** – Tuberosus , fleshy with number of long white fibers at the end of the roots.

# CHEMICAL CONSTITUENTS

- It contains mainly veratrine and also germidine, germitrine, proto veratrine, cevadine, veratrine pseudo jervijine, veratrosine etc.
- Both proto veratrine A and B are soluble in chloroform but in soluble in water and light petroleum.

## USES

- ***Veratrum album*** is mainly used as a source of proto veratrine A and B.
- Among these proto veratrine A is medicinally more potent.
- They are used for the management of hypertension in pregnancy, especially in preclampsia and eclampsia conditions.

# TERATOGEN-TOBACCO

**Biological source:** This consists of dried leaves of *Nicotiana tobacum*.

**Family:** Solanaceae

**Geographical source:**

- Tobacco is cultivated on a commercial scale to a very large extent in china, united states and india.
- China produces annually 22 lakhs metric tonnes ,while india produces about 5 lakh metric tonnes of tobacco in a year.
- The other tobacco producing countries are Brazil, Russia, Turkey and Italy.
- In india it is produced mainly in Andhra Pradesh, Gujarath, Karnataka, Orissa and Bihar.

# DESCRIPTION

- It is a ever green annual herb 1 – 3 meters in height
- It has a thick erect stem and few branches
- It bears about 20 leaves approximately 80 cm in length
- **Flowers** are light red, white or pink in colour.
- **Fruits** are capsules, elliptic, ovoid 1.5 to 2.0 cm in size.
- **Seeds** are spherical and 0.5 mm in diameter and brown in colour.
- **Varieties of tobacco:** Bidi tobacco, cigar tobacco, chewing and hookah tobacco.

# CULTIVATION AND COLLECTION

- It needs warm climate, well drained fertile land.
- Seeds are used for cultivation.
- The seeds are sown on the seed beds in winter or early spring.
- When the seedlings are about 12 weeks old, they are transplanted.
- In the flowering season, the flowering tops are cut.
- Harvesting is done after 70 to 90 days of transplantation.
- The leaves are then subjected to processing by **air curing, fire curing or fuel curing**.
- During this process the chemical changes occur and lead to development of flavour and aroma.

## **MACROSCOPIC CHARACTERS**

**Colour** – Green or slightly brown

**Odour** – Characteristic to Nicotine

**Taste** – Bitter

**Size** – 60 – 80 cm in length, 35 – 45 cm in width

**Shape** – Ovate, elliptic or lanceolate

The leaves are usually sessile, some times petiolate and with frilled wing.

## **CHEMICAL CONSTITUENTS**

- The tobacco contains pyridine –piperidine type of alkaloids among which the most prominent is nicotine.
- The other alkaloids are nor nicotine and anabasine.

# USES

- Nicotine exerts stimulant effects on heart and nervous system.
- It is not used medicinally. It is powerful quick acting poison. Even 40 mg dose orally is fatal to humans. Rectified tobacco seed oil is used as edible oil in European countries.
- Nicotine is used in the manufacture of nicotinic acid and nicotinamide. Tobacco and nicotine are known insecticides for last 3 centuries. Nicotine controls a wide range of insects. It acts as a contact poison.

- It is also effective against white flies, moths, termites, butterfly larvae, red spider mites etc.
- Nicotine is sprayed on crops in the form of nicotine sulphate.
- It has certain advantages over synthetic insecticides that it is safer, easier to handle and much less toxic to warm blooded animals.
- Because of its volatility it evaporates earlier and leaves no harmful residue on the marketable products