

5.1.4. Castor Oil

Castor oil is a vegetable oil having anti-inflammatory and antibacterial properties.

Synonyms

Castor bean oil, castor oil seed, ricinus oil, oil of palma, and oleum ricini.

Biological Source

Castor oil is obtained by cold expression from the seeds of *Ricinus communis* Linn.

Family

Euphorbiaceae

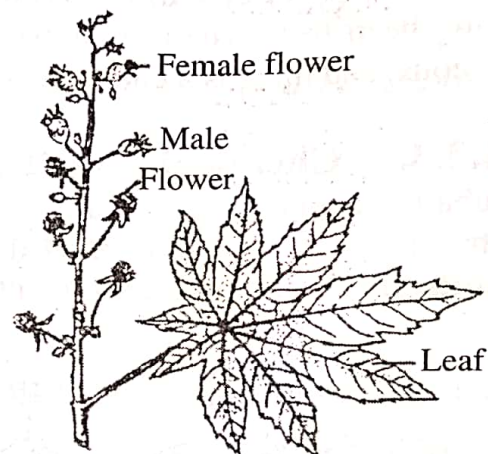


Figure 5.3: *Ricinus Communis*

5.1.4.1. Occurrence and Distribution

Castor plant (**figure 5.3**) is cultivated in Brazil, U.S.S.R., Thailand, U.S.A., and Romania on a large scale. In India, it is widely grown in Andhra Pradesh (produces about 60% of the total crop in India), Gujarat, and Karnataka.

5.1.4.2. Organoleptic Evaluation

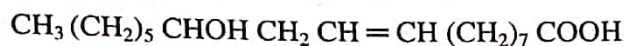
The organoleptic features of castor oil are:

- 1) **Colour:** Pale yellow or almost colourless liquid.
- 2) **Odour:** Slight and characteristic.

- 3) **Taste:** Bland initially and later becomes slightly acrid, and usually nauseating.
- 4) **Nature:** Viscous and transparent liquid.
- 5) **Solubility:** Soluble in alcohol (an exception to the category of fixed oils); miscible in chloroform, solvent ether, glacial acetic acid, and petroleum ether; insoluble in mineral oil.

5.1.4.3. Chemical Constituents

Castor oil contains about 80% of **triglyceride of ricinoleic acid**. The fatty acids present in the drug are isoricinoleic, linoleic, stearic and isostearic acids. Ricinoleic acid is responsible for the viscosity of castor oil.



Ricinoleic Acid

Heptaldehyde (heptanal), undecenoic acid, and sebacic acid are also the chemical constituents of castor oil.

Castor seeds contains **kernel** (75%) and **hull** (25%). The seeds are rich in phosphorus and most of it is in the form of **phytin**. Hull contains excess of minerals and an alkaloid ricinine, resin, pigment, etc. Kernel contains 36-60% of oil. Castor seeds also contain enzymes like lipase, maltase, and invertase. The proteinous constituent of castor seeds is **ricin** (3% of the whole seeds) which is toxic.

5.1.4.4. Chemical Tests

Castor oil gives the following chemical tests:

- 1) The oil mixes with half of its volume of light petroleum ether at 40-60°C.
- 2) A clear liquid is obtained when an equal volume of ethanol is added to the oil.
- 3) The liquid obtained above remains clear when cooled at 0°C and stored for 3 hours.

5.1.4.5. Therapeutic Efficacy

Castor oil has the following therapeutic properties:

- 1) It acts as a cathartic due to the irritant action of ricinoleic acid.
- 2) Commercially, it is used for lubrication.
- 3) Sometimes it is consumed orally as an aromatic castor oil or in the form of capsules.
- 4) It is an ingredient of abortifacient paste, and ricinoleic acid is an ingredient in contraceptive creams and jellies.
- 5) Atropine and cocaine used for ophthalmic purposes are suspended in it.
- 6) Sulphorecinolate is a strong bactericide, thus, used in tooth formulation.
- 7) On a commercial scale, it is used for manufacturing sebacic acid (a raw material for synthesis of resins).
- 8) Undecylenic acid which is a fungicide is prepared from castor oil.
- 9) Castor cake is the source of lipase enzyme.

5.1.5. Ispaghula

Ispaghula is also known as plantago seeds and psyllium husk. The term **plantago** is a Latin term which means **sole of the foot** (it refers to the leaf shape). Isabgol is hygroscopic, and swells and expands to become mucilaginous.

Synonyms

Isabgul, Ispagol, Ishabgula, spongeal seeds, Indian psyllium, and Flea seed.

Biological Source

Ispaghula is the dried ripe seeds of *Plantago psyllium* L., *Plantago arenaria*, *P. ramosa* (Spanish or French psyllium seed), *Plantago ovata* (blond or Indian plantago seed), or *Plantago amplexicaulis*.

Family

Plantaginaceae

5.1.5.1. Occurrence and Distribution

P. amplexicaulis is cultivated on the Punjab plains, Malwa and Sind, and extending to Southern Europe. *P. psyllium* is an annual pubescent herb growing indigenously in the Mediterranean countries. The *P. ovata* is grown in abundance in Pakistan; besides it is found to be native to Mediterranean countries and Asia. It is grown in France and constitutes the main bulk of the American imported psyllium seed.

5.1.5.2. Organoleptic Evaluation

The organoleptic features of ispaghula (figure 5.4) are:

- 1) **Colour:** Pinkish-grey to brown.
- 2) **Odour:** Odourless.
- 3) **Taste:** Bland and mucilaginous.
- 4) **Size:** 1.8-3.3mm long and 1-1.75mm broad.
- 5) **Shape:** Boat-shaped.
- 6) **Surface:** Hard, transparent, and smooth; a central, grey or reddish-brown oval spot is present in the centre of the convex surface; hilum on the concave surface is covered with a thin, whitish membrane having two perforations.
- 7) **Extra Features:** On soaking in water, the seed-coat swells (swelling factor is 10.25-13.5); seeds are surrounded with transparent, colourless, tasteless, and odourless mucilage.

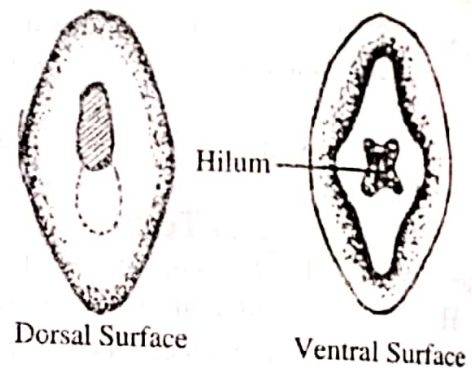


Figure 5.4: Macroscopic Characters of Isabgol Seed

Ispaghula Husk

When isabgol seeds are processed to remove the seed coats, they are termed as isabgol husk which makes about 25-27% of the seed. It is obtained as follows:

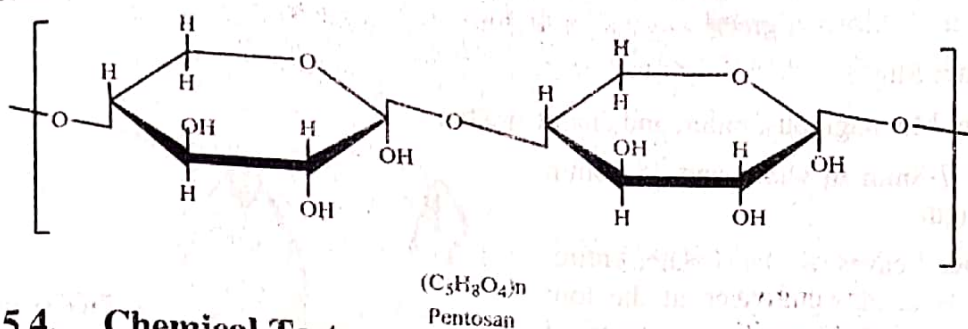
- 1) The seeds are dried properly and sieved to remove the foreign organic matter.
- 2) After sieving they are crushed by passing several times through flat stone grinders, for complete removal of the coating.
- 3) The kernels and husk are separated by winnowing the crushed material.
- 4) Husk is sieved to obtain different grades and sizes. Thus, it consists of the epidermis and its adjacent layers are removed from the dried seeds of *Plantago ovata*.

Morphologically, isabgol husk is available as pale buff ovate flakes (1-2mm in size) of somewhat lanceolate shape.

5.1.5.3. Chemical Constituents

Ispaghula seeds contain 10% mucilage in their epidermis. The principle constituents present in the mucilage are **pentosan** (soluble in cold water) and **aldobionic acid** (soluble in hot water) The former hydrolyses into xylose, arabinose; while the latter

yields galacturonic acid and rhamnose. The endosperm and embryo contains the fixed oil (composed of linolenic, linoleic, oleic, palmitic, stearic, and lignoceric acids) and proteins.



5.1.5.4. Chemical Tests

Ispaghula gives the following chemical tests:

- 1) Swelling factor (the criterion for drug purity) of ispaghula is the quantitative determination of its swelling due to the presence of mucilage. It is determined by dissolving 1ml drug in 20ml water with occasional shaking in a 25ml measuring cylinder. Then the cylinder is allowed to stand for 24 hours and the volume occupied by the seeds after 24 hours of wetting is measured. Swelling factor for ispaghula seeds is 10-14.
- 2) Ispaghula being mucilaginous gives pink colour when treated with ruthenium red solution.
- 3) In aqueous medium, the mucilage swells forming an external surrounding layer on the seed.

5.1.5.5. Therapeutic Efficacy

Ispaghula has the following therapeutic properties:

- 1) The seeds and husk are used as demulcent, laxative, and emollient.
- 2) It is used for treating chronic constipation, amoebic and bacillary dysentery.
- 3) Its mucilage is used in tablet preparation.
- 4) The crushed seeds are used in the form of poultice for relieving rheumatic pain.
- 5) It effectively works as a soothing agent, thus, is used in duodenal ulcers and piles.
- 6) An acid form of polysaccharide is obtained by removing cations from the mucilage. This is done by treating the mucilage with cation-exchange resins and spray drying the resultant products, which are widely used as tablet disintegrators and enteric coating substance. They are also employed in sustained release drug formulations.

5.1.6. Senna

Senna is a herb used as a laxative. It is also known as **wild senna**, *Cassia marilandica*, or **locust plant**. In the ancient times, the Arabian physicians used senna as cathartics.

Synonyms

Cassia senna, *Folia senna*, and *Tinnevelles senna*.

Biological Source

Senna is the dried leaflets of *Cassia angustifolia*.

Family

Leguminosae

5.1.6.1. Occurrence and Distribution

Cassia senna is found to be grown in tropical Africa and Sudan, while *Cassia angustifolia* is native to Arabia, Somalia, Sind, and the Punjab (parts of India).

5.1.6.2. Organoleptic Evaluation

The organoleptic features of senna are:

- 1) **Colour:** Yellowish-green.
- 2) **Odour:** Slight.
- 3) **Taste:** Mucilaginous, bitter, and characteristic.
- 4) **Size:** 7-8mm in width and 25-60mm in length.
- 5) **Shape:** Leaves are lanceolate, entire; apex is acute with spine at the top; base of the leaflets are asymmetrical with transverse lines, more prominent on lower surface (figure 5.5); trichomes are present on both the surfaces.

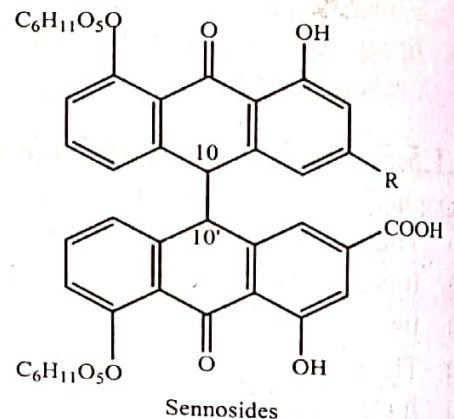


Figure 5.5: Indian Senna Leaflets

5.1.6.3. Chemical Constituents

Senna contains mainly two **anthraquinone glycosides** called as **sennoside A** and **sennoside B** (not less than 2.5%) which account for its purgative property. **Tutin** in 1913 isolated **rhein** and **aloe-emodin**. **Stoll** and his colleagues in 1941 reported isolation of crystalline sennosides A and B.

Sennosides A and B are stereoisomers of each other. They are dimeric glycosides with rhein dianthrone as aglycone, i.e., 10,10' bis (9,10-dihydro-1-8-dihydroxy-9-oxoanthracene-3-carboxylic acid). In sennoside B, the aglycone is in meso form; and in sennoside A, it is dextro-rotatory. They also differ by the way of linkage of glucose to the aglycone fraction. The purgative activity of sennosides A and B, accounts up to 40-60% activity of crude drug.



It is also reported that sugar part of these glycosides has transporting function for the aglycone up to large intestine and also protective action so that oxidation of aglycone to other very less active anthraquinones is prevented.

R	Configuration	Glycosides
COOH	<i>Trans</i>	Sennoside A
COOH	<i>Meso</i>	Sennoside B
CH ₂ OH	<i>Trans</i>	Sennoside C
CH ₂ OH	<i>Meso</i>	Sennoside D

Senna leaf also contains other anthraquinone glycosides in small amounts. They are **sennosides C and D**, rhein 8-glucoside, rhein 8-diglucoside, aloe-emodin, 8-glucoside, also contains phytosterol, mucilage, resin, myricyl alcohol, salicylic acid, chrysophanic acid, and calcium oxalate.

5.1.6.4. Chemical Tests

Senna gives the following chemical tests:

- 1) **Borntrager Test:** The senna leaves are boiled with dilute sulphuric acid and filtered. To the filtrate organic solvent like benzene, ether, or chloroform is added and shaken. The organic layers are separated and to it ammonia solution is added. The

ammoniacal layer produces pink to red colour indicating the presence of anthraquinone glycoside.

- 2) Little amount of senna leaves is extracted with water by boiling and the resultant is filtered. The filtrate is treated with 5N NaOH and sodium hyposulphite. On heating a mixture of red colour develops.

5.1.6.5. Therapeutic Efficacy

Senna has the following therapeutic properties:

- 1) It is mainly used as a purgative. Its branded preparations, e.g., Glaxenna^R (Glaxo), Pursennid^(R) (Sandoz), and Helmacid with senna^(R) (Allenburrys), are used as purgatives in habitual constipation. It contains glycosides which get absorbed in the small intestinal canal, and then its aglycone part gets separated and ultimately excretes in the large intestine (colon). The released anthraquinones irritate and stimulate the colon to enhance its peristaltic movements, thus causing bulky and soft excretion of faeces.
- 2) It is used as a stimulant cathartic.
- 3) Its inherent action is associated with griping; thus it is dispensed with the carminatives to counteract the undesired effect. (6)