Medicinal plant raw materials and phytopreparations having laxative effect

Various types of plant-derived laxative are used:

-stimulant laxatives (purgatives), which act directly on the mucosa of the GI tract;

- bulk-forming laxatives, which act mainly via physicochemical effects within the bowel lumen;

- osmotic laxatives, which act by drawing water into the gut and thus softening the stool.

Osmotic laxatives may be mineral in origin, for example magnesium salts, or derived from natural products such as milk sugars.

BULK-FORMING LAXATIVES

These are bulking agents with a high percentage of fibre and are often rich in polysaccharides, which swell in the GI tract. They influence the composition of food material in the GI tract, especially via the colonic bacteria, which are thus provided with nutrients for proliferation. This in turn influences the composition of the GI flora and the metabolism of the food in the tract (including an increase in gas, or flatus). Fibre-rich food is part of a healthy diet, but processed food and modern lifestyles have generally reduced fibre intake. Bulk-forming laxatives are generally not digested or absorbed in the GI tract, but pass through it largely unchanged.

Bulking agents can be distinguished from swelling agents in that bulking material contains large amounts of fibre, whereas swelling material is generally composed of plant material (seeds) with a dense cover of polysaccharides on the outside. Both types of medicinal drugs may swell to a certain degree by the uptake of water, but swelling agents in the strict sense include only medicinal plants that form mucilage or gel. The swelling factor (which compares the volume of drug prior to and after soaking it in water) is an indicator of the amount of polysaccharides present in the drug and is generally used as a marker for the quality of bulk-forming laxatives.

Preparations of bulkforming laxatives are always taken with plenty of water. They can, paradoxically, be used to treat diarrhoea if given with very little fluid; they then absorb the fluid from the lumen and increase the consistency of the stool.

-Linseed (flax) (Linum usitatissimum L.) - Lini usitatissimi semina
- Psyllium (Plantago psyllium L.) - Plantaginis psyllii semina (Psyllii semen)

Alginate

Alginate, or alginic acid, is an anionic polysaccharide distributed widely in the cell walls of brown algae including Laminaria. Raw or dried seaweed is washed with acid to remove crosslinking ions that cause the alginate to be insoluble. It is then dissolved in alkali, typically sodium hydroxide, to produce a viscous solution of alginate. The solution is filtered to remove the cell wall debris and leave a clear alginate solution. Alginate binds with water to form a viscous gum and acts as a protective coating over the walls of the stomach and oesophagus.

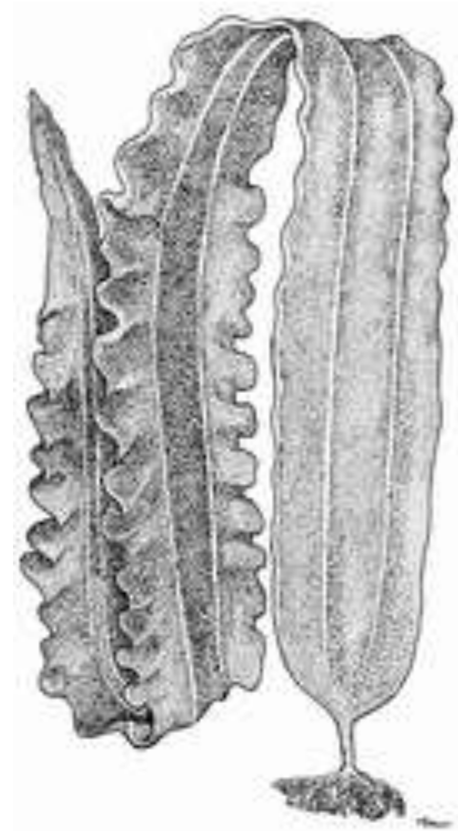
LAMINARIA LAMINAE (SEAWEED) – LAMINARIA THALLI

Laminaria saccharina (L.) Lam.
Laminaria japonica Aresch.
Family *Laminariaceae*

Laminaria japonica. Thallus consisting of root-like holdfast, short stipe and blade. Blade long-belt shaped, up to one meter long, 10-20 cm broad, with margin undulate and overlapping, thick at the middle and thin at the margin. A short and small stipe and holdfast at the base of the blade. Holdfast sturdy (presenting haptera) with which the algae is fixed to rocky substratum. Colour: thick dark green; blade surface brown, occasionally glaucescent.

Distribution

Laminaria japonica grows along the shores of the Sea of Japan and the Sea of Okhotsk; in the White, Barents and Kara Seas there are Laminaria saccharina and Laminaria digitata.



Laminaria japonica

Laminaria saccharina. Yellow brown, to 3 m in length; with a claw-like holdfast, a small, smooth, flexible stipe, and an undivided laminate blade to 3 m long with parallel, ruffled sides and a elongated, tongue-like appearance. The frond is characterstically dimpled with regular bullations (depressions).

Distribution

It is found in the north Atlantic Ocean, Arctic Ocean and north Pacific Ocean. It is common along the coast of Northern Europe as far south as Galicia Spain. In North America, it is found on the East Coast down to Long Island. On the coast of Asia, it is found south to Korea and Japan.

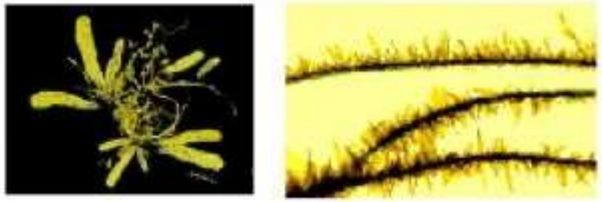
Laminaria saccharina

Harvesting

The best time for harvesting is from June to September. Harvesting is done either from storms or from boats by winding them on special poles. Sometimes special devices are used. Raw material is used fresh and dried in the sun.

Laminaria is cultivated.

Sporeling-curtains in a rearing tank



Young seedlings attached to substrates (palm-fibre ropes)

Farmers are managing the farmed kelp

Sun-drying processing method

Constituents

Laminaria contains polysaccharides (alginic acid, laminarin, mannitol, fucoidin), iodides (2.7-3 %), vitamins (B1, B2, B12, A, C, D, E, carotenoids), salts of potassium, sodium, magnesium, bromine, cobalt, iron, manganese, sulphur and phosphorus compounds, nitrogen-containing substances, proteins (5-10 %), carbohydrates (13-21 %), fats (1-3 %). The main substance is the polysaccharide alginic acid, the content of which reaches 30 % of the dry weight of algae.

Uses

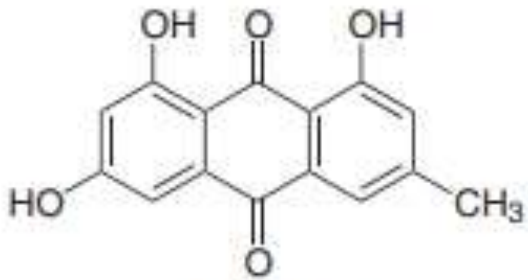
Laminaria contains iodine, an element that the body needs to make thyroid hormones. It's also a rich source of iron and potassium. Laminaria forms a thick, sticky gel when combined with water. This allows it to work as a bulk laxative in the gut.

The brown seaweed Laminaria japonica has anti-inflammatory and antioxidant properties

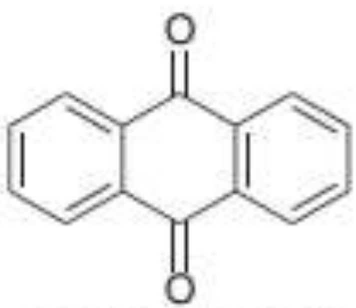
STIMULANT LAXATIVES

Stimulant laxatives are derived from a variety of unrelated plant species, which only have in common the fact that they contain similar chemical constituents. These are anthraquinones such as emodin and aloe-emodin, and related anthrones and anthranols.

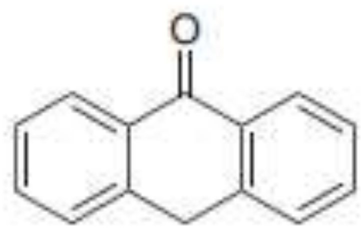
Anthraquinones are commonly found as glycosides in the living plant. Several groups are distinguished, based on the degree of oxidation of the nucleus and whether one or two units make up the core of the molecule. The anthrones are less oxygenated than the anthraquinones and the dianthrones are formed from two anthrone units. Studies using dianthrone glycosides such as sennosides A and B suggest that most of these compounds pass through the upper GI tract without any change; however, they are subsequently metabolized to rhein anthrone in the colon and caecum by the natural flora (mainly bacteria) of the GI tract. Anthranoid drugs act directly on the intestinal mucosa, influencing several pharmacological targets, and the laxative effect is due to increased peristalsis of the colon, reducing transit time and, consequently, the re-absorption of water from the colon. Additionally, the stimulation of active chloride secretion results in an inversion of normal physiological conditions and a subsequent increased excretion of water. Overall, this results in an increase of the faecal volume with an increase in the GI pressure. These actions are based on the well-understood effects of chemically defined constituents; consequently, phytomedicines containing them are usually standardized to specified anthranoid content.



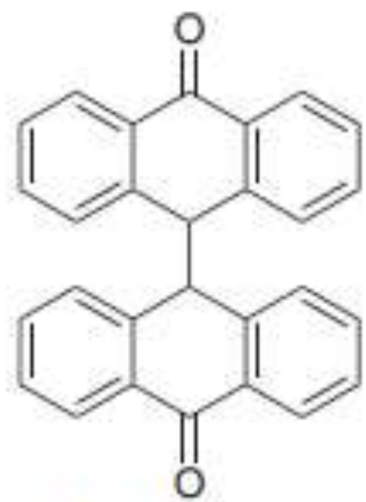
Emodin



Anthraquinone



Anthrone



Dianthrone

SENNA LEAVES - SENNAE FOLIA

Cassia acutifolia (*Alexandrian Senna, Cassia senna*)
Cassia angustifolia
Family *Fabaceae*

The genus *Cassia* (*Fabaceae*) is very large, with about 550 species, mostly occurring in warm temperate and tropical climates. The species are not native to Europe and were an important drug of early trading; the name ‘senna’ is of Arabic origin and was recorded as early as the 12th century. *Cassia senna* L. is today named *Senna alexandrina* Mill. and yields the drugs senna leaves and senna fruit. The species was previously split into two species based on their origin: *Alexandrian senna* (*Cassia senna* L. also known as *C. acutifolia* L.) and Tinnevelly senna (*C. angustifolia* Vahl). The common names were derived from their original trade sources and are only applied to the fruits (pods). The second origin is considered to be the milder in activity.

Senna is a shrubby plant that reaches 0.5–1 metres, rarely two metres in height with a branched, pale-green erect stem and long spreading branches bearing four or five pairs of leaves. These leaves form complex, feathery, mutual pairs. The leaflets vary from 4 to 6 pairs, fully edged, with a sharp top. The midribs are equally divided at the base of the leaflets.

The flowers are in a raceme interior blossoms, big in size, coloured yellow that tends to brown. Its legume fruit are horned, broadly oblong, compressed and flat and contain about six seeds.

Alexandrian senna is indigenous to South Africa. It widely grows and sometimes is cultivated in Egypt and in the middle upper territories of Nile river. It is also cultivated in Kordofan and Sennar regions of Sudan. Indian or Tinnevelly senna is indigenous to southern Arabia and cultivated largely in Tinnevelly and Ramnathpuram districts of Tamilnadu. It also grows in Somaliland, Sindh and Punjab region.

Senna Species

Constituents

Leaf. Sennosides A and B, which are based on the aglycones sennidin A and sennidin B; sennosides C and D, which are glycosides of heterodianthrones of aloe-emodin and rhein; palmidin A, rhein anthrone and aloe-emodin glycosides and some free anthraquinones. *C. senna* usually contains greater amounts of the sennosides.

Fruit. Sennosides A and B and a related glycoside sennoside A1. The sennosides, which are dianthrones, differ in their stereochemistry at C10 and C10′, as well as in their substitution pattern. *C. senna* usually contains greater amounts of the sennosides.

Other secondary metabolites such as flavonoids, tannins and bitter compounds are also present but not defined in the standard. The way in which the plant material is dried has a strong influence on the amount of glycosides remaining and accordingly on the quality of the product

Uses

Senna leaves are used as laxative. It causes irritation of large intestine and have some griping effect. Thus they are prescribed along with carminatives. Senna is stimulant cathartic and exerts its action by increasing the tone of the smooth muscles in large intestine.

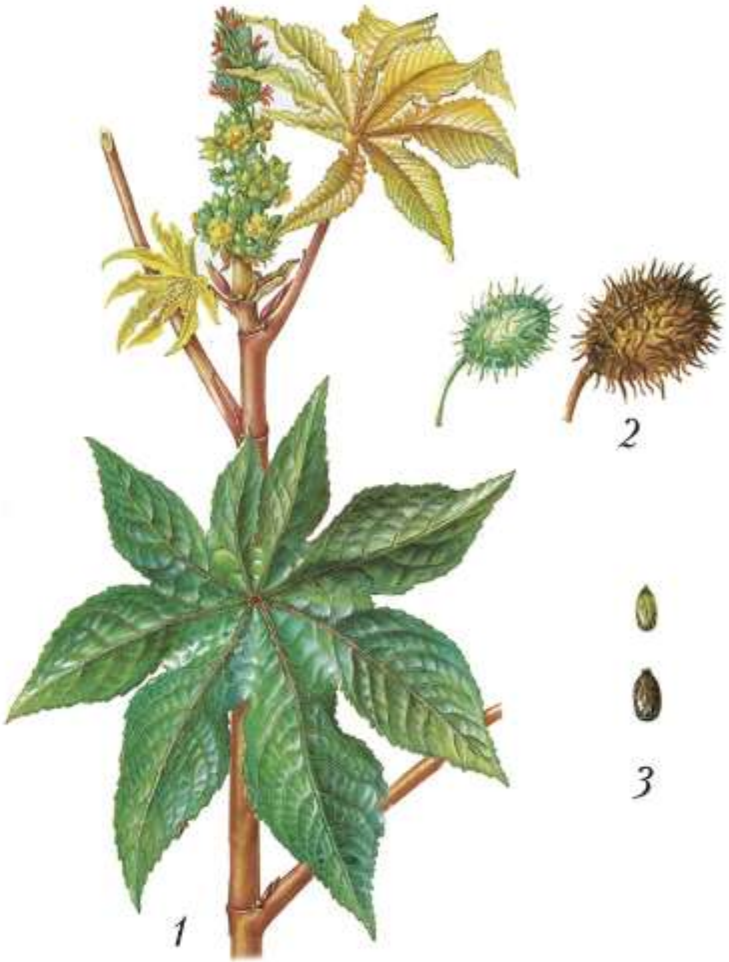
CASTOR OIL
CASTOR BEAN SEEDS – RICINI COMMUNIS SEMINA
Castor bean – *Ricinus communis*
Family *Euphorbiaceae*

Castor bean is an evergreen herbaceous or semi-woody large shrub or small tree. This robust tender perennial can grow to 12 m tall, developing woody stems over a few years in frost-free climates. Because of its rapid, vigorous growth, it is easily grown as a warm season annual in temperate climates, but it rarely exceeds 2.5-4 m in a single growing season.

The species has glossy green leaves, but cultivated selections may have black-purplish, dark red-metallic, bronze-green, or maroon leaves, or bright green leaves with white veins.

The flowers lack petals and are unisexual (male and female) where both types are borne on the same plant (monoecious) in terminal panicle-like inflorescences of green or, in some varieties, shades of red. The male flowers are numerous, yellowish-green with prominent creamy stamens; the female flowers, borne at the tips of the spikes, lie within the immature spiny capsules, are relatively few in number and have prominent red stigmas.

The fruit is a spiny, greenish (to reddish-purple) capsule containing large, oval, shiny, bean-like, highly poisonous seeds with variable brownish mottling.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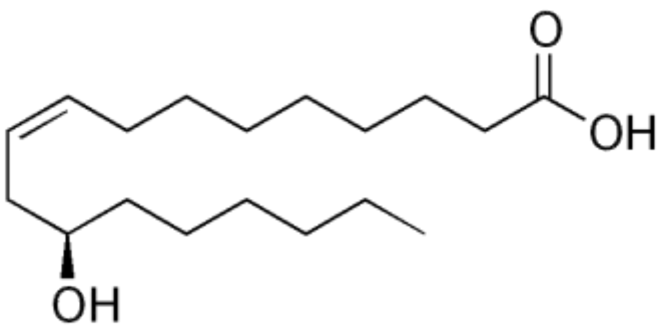
Castor bean is native to tropical east Africa around Ethiopia, but has naturalized in tropical and subtropical areas around the world to become a weed in many places.

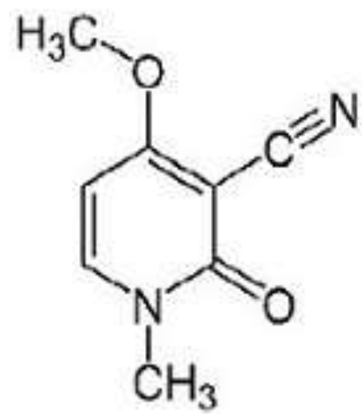
The plants are chiefly cultivated in India, China, and Brazil, largely as the source of castor oil.

Constituents

Seeds of commercial cultivars contain 40–55% of non-drying oil. Large-seeded cultivars have less oil than smaller-seeded ones. The oil contains 80–90% of ricinoleic acid, which is unique among vegetable oils in having a hydroxyl group near a double bond. On dehydration a drying oil is produced, which does not turn yellow on drying or baking; hence its value in paints and varnishes. The seeds contain a toxic protein, ricin, which acts as a blood coagulant.



ricinoleic acid



ricin

The seeds are extremely poisonous, so keep plants out of reach of children (or trim off flowering spike if this is a concern). The toxin in castor seeds is ricin, one of the deadliest natural poisons, estimated as 6,000 times more poisonous than cyanide and 12,000 times more poisonous than rattlesnake venom. As few as four seeds can kill an average-sized adult, while ingestion of lesser amounts will result in vomiting, severe abdominal pain, diarrhea, and convulsions. Livestock and poultry can also be affected if they consume seeds or meal from the seeds.

Although it is a very potent poison, ricin has been investigated as an anti-cancer agent. Ricin is water soluble, not lipid (oil) soluble, so it is not released during the pressing process, remaining in the leftover “seed cake.” This residue is used as a high-nitrogen fertilizer, or after detoxicating, the meal can be used as livestock feed.

Uses

Castor oil is obtained from castor beans either by pressing or by solvent extraction.

Since the toxin does not occur in the pure oil, castor oil can be consumed and has been used medicinally as a remedy for everything from constipation to heartburn. It is an effective cathartic or purgative (laxative) (internally) and can be used externally as an emollient for dry skin.

In addition to the uses mentioned previously, castor oil and its derivatives are used in cosmetics, hair oils, fungistatic (fungus-growth-inhibiting) compounds, embalming fluid, printing inks, soap, lubricants, greases and hydraulic fluids, dyeing aids, and textile finishing materials.