

MUCILAGE



- Mucilages are generally normal products of metabolism formed within the cell (intracellular formation).
- Mucilages;
 - Storage material
 - Water storage reservoir
 - Protection for germinating seeds.

Occurrence of mucilage



- Mucilage is often found in;
- Epidermal leaf cells (Senna)
- Seeds coats (linseed, psyllium)
- Roots (marshmallow)
- Barks (Slippery elm)

MUCILAGE



- They are not pathological products.
 - ▶ White colour, amorphous
 - ▶ Used as emollient and laxative
 - ▶ Especially used in pharmaceutical technology
 - ▶ Used in microbiology such as, agar
- Some of them doesn't contain uronic acid (e.g. Tubera Salep, Semen Foenugraci, laminaria, carrageenan)

PHYSILLIUM (Semen Psyllii, Karniyarık Tohumu)



- Psyllium consist of the dried, ripe seeds of *Plantago psyllium* (Plantaginaceae)
- Geographical sources: Mediterranean Europe (France, Spain), Cuba, Turkey (Adana, Gaziantep)



PHYSILLIUM (Semen Psyllii, Karnıyarık)

- Boat-shaped, outline elongated ovate, 2-2.5 mm length, black brown,
- Physillium seeds contain mucilage (12-15%) in the epidermis of the testa.
- On hydrolysis; galacturonic acid, galactose and xylose.
- The seeds also contain fixed oil, sugars, sterols and protein.



PHYSILLIUM (Semen Psyllii, Karnıyarık)



Uses and action;

- Demulcent, emolient
- Used for chronic constipation
- Antiinflammatory in colitis
- Avoid to use in respiratory and gastrointestinally disorders.

SEMEN LINI, LINSEED, KETEN TOHUMU



- Linseed or flaxseed is the dried, ripe seed of *Linum usitatissimum* L. (Linaceae).
- The plant is annual, 30-60 cm length, blue flowers in June-July.
- The plant is cultivated in India, Egypt, Brazil, Canada and Europe.
- West Anatolia, North
- Anatolia and Central Anatolia



SEMEN LINI, LINSEED, KETEN TOHUMU



- The seeds (l=4-6 mm, in epidermis of testa) consist of mucilage (10 %)
- In hydrolysis;
- D-galacturonic acid, arabinose, rhamnose
- Protein 20-25 %
- Fixed oil 30-40 %
- Linamaroside (cyanogen glycoside)



SEMEN LINI, LINSEED, KETEN TOHUMU



- Linseed is known from ancient Egypt
- Laxative (oral use)
- Infusion of the seeds are protective against digestive system inflammation
- Also it has antiinflammatory effects in external use.
- Linseed oil or flaxseed oil (bezir yağı) is the fixed oil of Linseed.



HERBA LINI CATHARTICI, Laxative Linseed, MÜSHİL KETEN



- Aerial parts of *Linum catharticum*
- White flowers
- Traditionally purgative, diuretic and expectorant.



<http://botanika.wendys.cz>



MALLOW, FOLIA MALVAE, FLOS MALVAE



- The drug is obtained from the dried leaves and flowers of *Malva sylvestris* (Malvaceae)
- *Malva neglecta*
- *M. rotundifolia*
- *M. montana*
- Spread in Anatolia
- Flowering time: June-July
- Leaves have long stipulate, rotundate, palmate vein, creanate



MALLOW, FOLIA MALVAE, FLOS MALVAE



- Mallow contains mucilages 15-20% in leaf epidermis
- In hydrolysis;
- D-galacturonic acid
- Galactose
- Ramnose
- Uses of Mallow;
- The mucilages contained in the leaves and flowers is responsible for the herbs emollient and demulcent properties.

The leaves have been used as a laxative and for gut irritation.

MARSHMALLOW, ALTHAE ROOT, RADIX ALTHAE



- The crude drug is obtained from the dried roots of *Althaea officinalis* or *Althaea rosae* (Anatolia) (Malvaceae)
- The leaves of the plant are collected in flowering time.
- The roots of the plant, which are 2 years old, are collected in Autumn
- The leaves of the plant have stellate hairs and glandular hairs (difference from the Mallow).



MARSHMALLOW, ALTHAE ROOT, RADIX ALTHAE



- The roots and the leaves of *Althae officinalis* contains mucilage 20 %.
- In hydrolysis;
- D-galacturonic acid,
- Arabinose
- Ramnose
- Galactose
- Glucose



MARSHMALLOW, ALTHAE ROOT, RADIX ALTHAE



- **Uses of Marshmallow;**
- Marshmallow used as cough suppressant and soothe irritated throats.
- It is also used in intestinal conditions (constipation, gastritis, irritable bowel syndrome, peptic ulcer.
- Applied topically. Marshmallow soothes inflammed skin and helps to heal minor abrasions.



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FLOS TILIAE, LINDEN



- Linden are the blossoms of *Tilia cordata* and *T.platypyhyllus* species which is growing in the forests of Europe.
- *T.rubra*-----in the Northern Anatolia
- *T.tomentosa (T.argentea)*-----West part of Turkey.



FLOS TILIAE, LINDEN



- Chemical components:
- Major active components of the Linden;
- 1) Mucilage (6-8%)

Galacturonic acid+ramnose+xylose+galactose



FLOS TILIAE, LINDEN



- **2) Flavonoids (1%)** (glycosides, kaempferol, quercetin)
- **3) Essential oils (%0.05)**
 - **Geraniol**
 - **Eugenol**
 - **Farnesol**



FLOS TILIAE

- ▶ Linalol + Geranyl acetate+ hydroxy citronellal in low amount
- ▶ 4) Tannins –2% proanthocyanidin dimers
- ▶ 3 species growing in Turkey:
- ▶ *T.tomentosa*---% 7.2 muc.-----%0.66 flav.
- ▶ *T.rubra*-----% 6.2 muc. -----%0.85 flav.
- ▶ *T.platyphyllos* -----% 6.5 muc.-----%1.13 flav.

FLOS TILIAE

- ▶ Essential oil 0.044-0.055 % in all tested species but the contents are different
- ▶ *T.tomentosa*----tricosane+fenylethylalcohol and esthers.
- ▶ *T.rubra* ve *T.platyphyllos*-----
tricosane+heneicosane (in high amount)
+eicosane+
fenylethylalcohol and esthers. (in low amount)

FLOS TILIAE, LINDEN



- Traditionally, linden blossoms have been used as an anxiolytic (volatile oil)
- It has also been used in the treatment of cold. Linden flowers when consumed as hot tea, have diaphoretic and diuretic activities (flavonoids).
- Expectorant (mucilage)
- The German Commission E has approved use of linden flower for the treatment of cold and cold-related coughs.



Cortex Tiliae



- **Choleretic**
- **Vasodilatator**
- **Antispasmodic**
- **Migraine and liver diseases**

Carbo Ligni Tiliae



- Herbal coal
- Stomach and gut diseases

STIPITES LAMINARIAE, LAMINARIA



- **Brown sea weeds ;**
 - ***Laminaria cloustoni***
 - ***L. digitata***
 - ***L. saccharina* stalk**
-
- **Found in Norhtern Sea**
 - **It is used in medical operations due to its absorbent activity.**
 - **Laxative as a bulk**
 - **Isolation of alginic acid and its salts**



Laminaria digitata (Hudson) J.V. Lamouroux

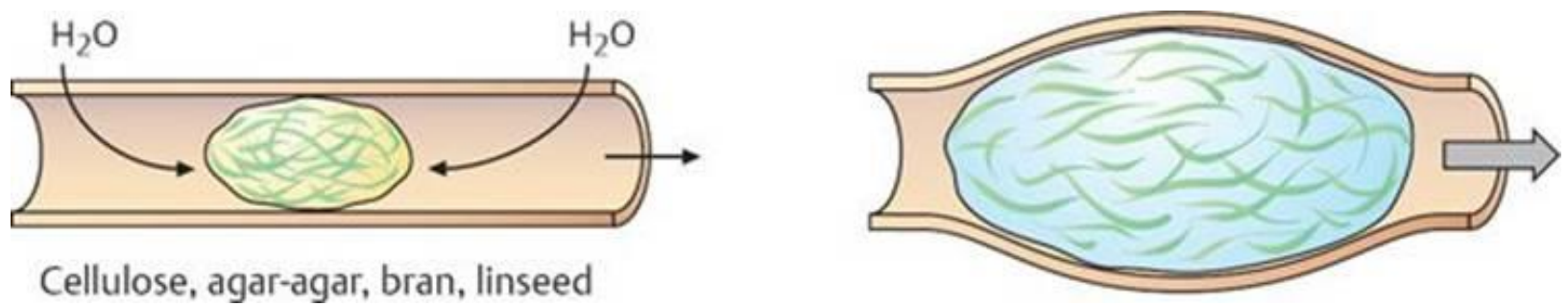


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E. Nic Dhonncha, 2001. AlgaeBase. World
electronic publication www.algaebase.org
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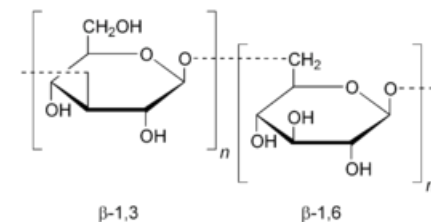
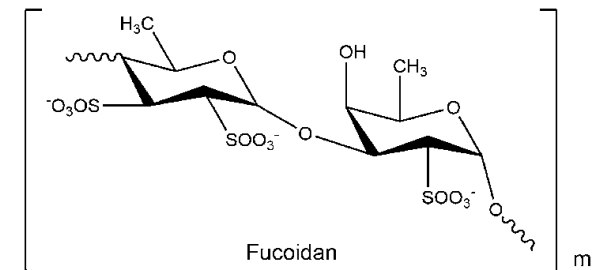
- Bulk-forming laxatives are not digested but absorb liquid in the intestines and swell to form a soft, bulky stool.
- **The increased size of the water-laden laxative stretches the bowel, thus stimulating intestinal movement (peristalsis).**
- The bowel is then stimulated normally by the presence of the bulky mass.



STIPITES LAMINARIAE, LAMINARIA



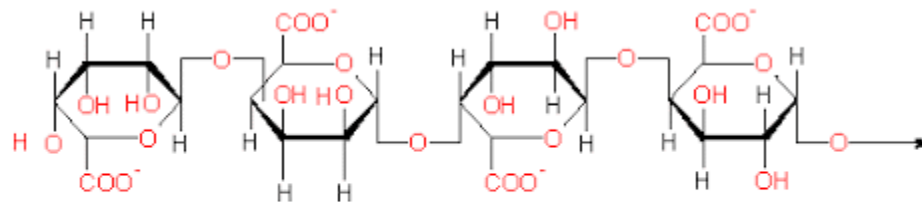
- Contains mucilage (50%) and has 3 different mucilage:
- 1) **ALGIN**---polymers of alginic acids –mannuronic acids
- 2) **FUCOIDAN**---esters of methyl pentose ---fucose sulphate
- 3) **LAMINARINE**---1-3 and 1-6 linked glucose chain.
- Sulphated-dervatives have anticoagulant and antilipidemic activity



ALGINIC ACID and its SALTS

- *Laminaria* ssp.
- *Fucus vesiculosus*
- *F. serratus*
- *Macrocystis pyrifera*

**Brown seaweeds, California, Sweden,
Norway**

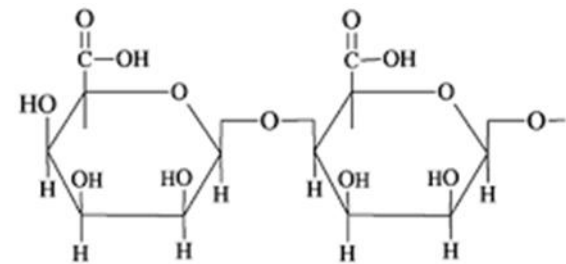


alginic acid

ALGINIC ACID AND SALTS

(Acidum alginicum----Ph. Eur.)

- ▶ Production:
- ▶ Brown seaweeds +dil.acidic water---washed (fucoidin/laminarin/mannitol/mineral salts are removed)+Na₂CO₃ solution.----extraction-----Alginate acid Na⁺ salt (in water)---centrifuged---(impurities are removed)---+dil.H₂SO₄-----ALGINIC ACID precipitate
- ▶ **Constituents D-mannuronic acid (1-4 bonded)**
- ▶ Na⁺, Ca⁺⁺, Al⁺⁺⁺ salts are used.



Structure of Alginic acid: D-mannuronic acid linked by $\beta(1,4)$ linkage

SODIUM ALGINATE (Ph.Eur.)



- **Suspending agent**
- **Emulsifying agent**
- **Disintegrant in tablets**
- **Antiacids against reflux**
- **(Gaviscon--- alginic acid+Na alginate).**
- **Food industry (ice cream, chocolate, jam)**
- **It is used in cosmetics (tooth paste)**



ALGINATES



- Al- Alginate
- **Used in ulceration of Stomach**
- Ca- Alginate
- **Hemostatic**
- **Application for a number of gelation purposes, including the formation of a firm gel for preparing dental impressions.**
- **All alginates used for wound discharge, **in dry wounds they should not be used.****
- **Hemostatic stype and bandage production**

AGAR AGAR, AGAR, JELOZ



- Agar is the dried, hydrophylic, colloidal substance extracted from red algae;
- *Gracilaria lichenoides*---Ceylan
- *Eucheuma spinosum*-----Java
- *Gelidium amansii*----Japan
- *Gelidium cartilagineum*--- Eastern coast of America



AGAR AGAR (TK) (Ph.E.)



AGAR, JELOZ

- Agar is prepared in California as follows;
- The fresh seaweed is washed 24 hours in running water, extracted in steam-heated digesters with dilute acid solution and then with water for a total period of about 30 hours. Then, cooled, evaporated, crushed and filtered.
- Agar usually occurs as bundels consisting of thin, membranous, agglutinated strips or in cut, flaked or granulated forms.



AGAR AGAR, AGAR, JELOZ

- Agar is insoluble in cold water (swell up), dissolve in hot water, but if one part of agar is boiled for 10 minutes with 65 times its weight of water, it yields a firm gel when cooled.
- 0.2 % agar solution+tannic acid---no precipitate (difference from gelatin)

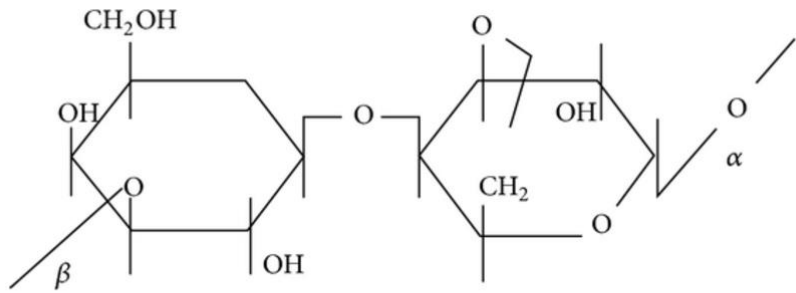


AGAR AGAR, AGAR, JELOZ

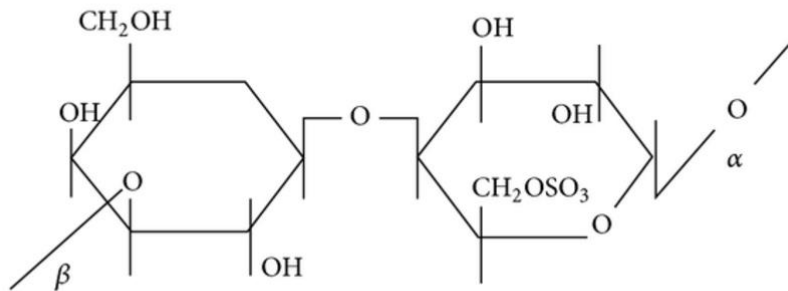


- Agar ----dil. acid hydrolysis--
Galactose+SO₄+BaCl₂----precipitate
- Contains 20% water in dry form
- Agar contain mucilage(65%). It can be resolved into 2 fractions;
- **AGAROSE**----β-gal.+anhydrogalactose (1-4 linked D-galactopyranosyl)
- **AGAROPECTIN**-----
galactose+anhydrogalactose+uronic acid

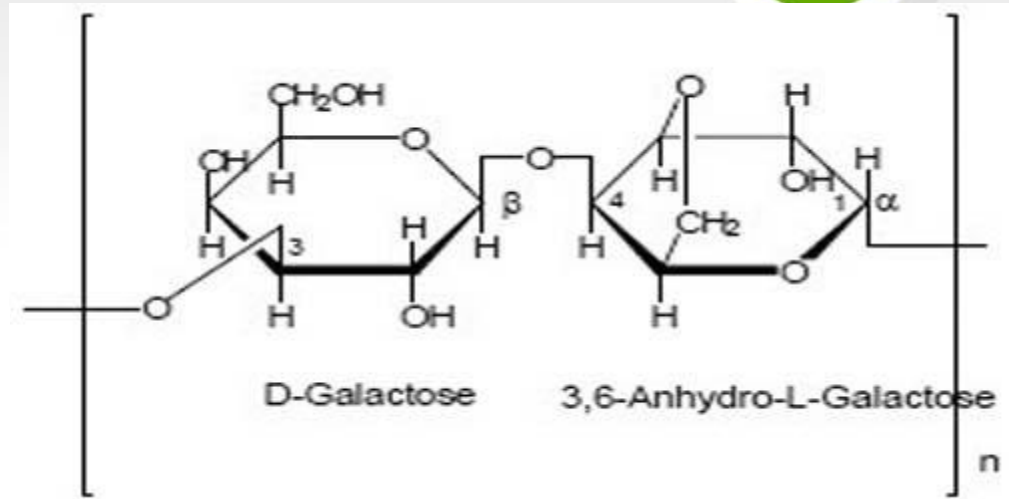
AGAR AGAR, AGAR, JELOZ



Agarose



Agaropectin



AGAR, JELOZ



- Agar hydrates to form a smooth, nonirritating bulk that favors normal peristalsis and is used as a laxative.
- Agar is also used as a suspending agent, an emulsifier, a gelating agent for suppositories and surgical lubricants, and a tablet expipient and disintegrant.
- It is extensively used as a gel in bacteriologic culture media. Because it still in gel form in 40°C (difference from gelatine)
- It is used in food and beer processing and chromatography.