

Pharmacognosy

lab exercise 2



Amorphous drugs

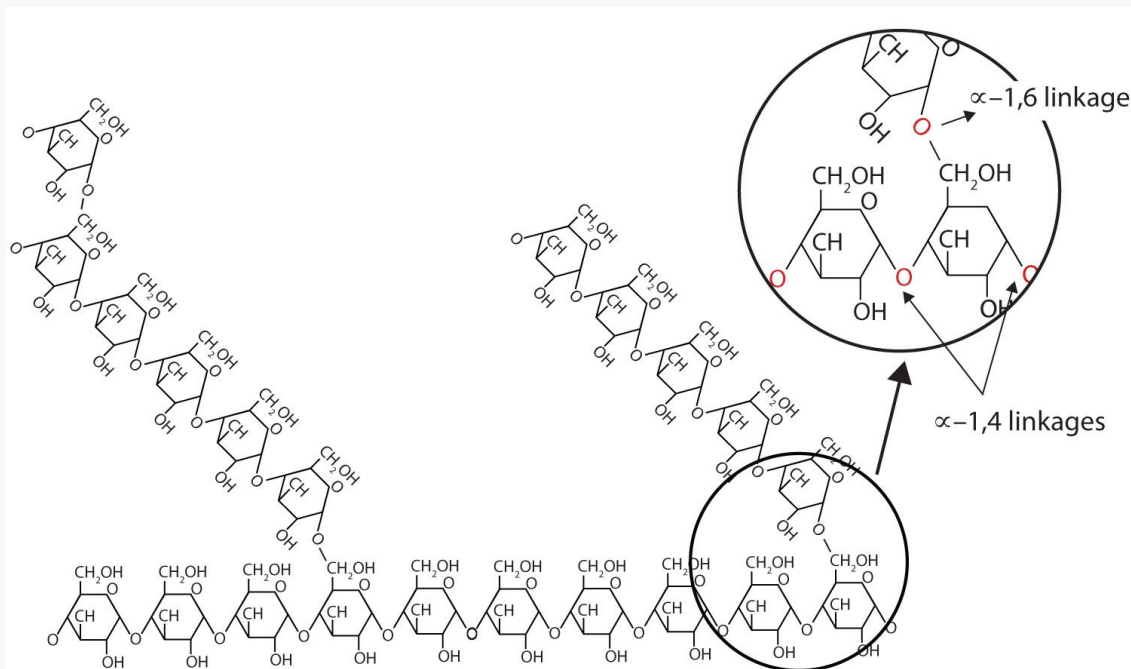
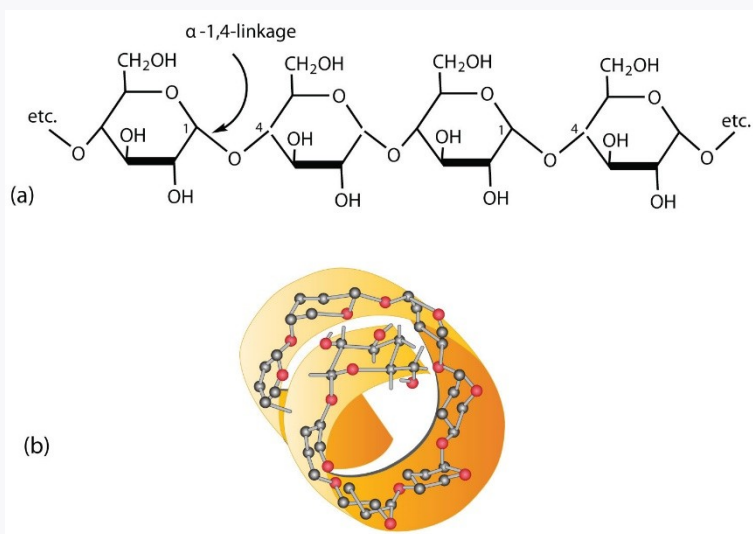
Natural fibers

Natural antidiabetics



Starches - Amyla

- Macromolecules composed from glucose units, consist of water-soluble **amylose** and water-swelling **amylopectine**
- Obtained from crushed plant material by washing with water and consequent chemical adjustment





Starches - Amyla

- Used as additive compounds to manufacture powders, tablets, suppositories and unguents; dietetics;

- Pharmacopoeial starches:

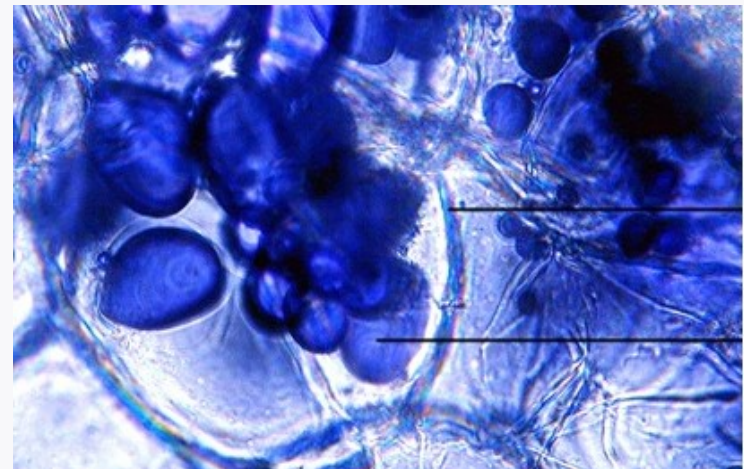
Solani amyllum,

Oryzae amyllum,

Tritici amyllum,

Maydis amyllum

- Important starches: *Marantae amyllum*



Cell wall

Amyloplast

Solani amyllum CzPh 2017



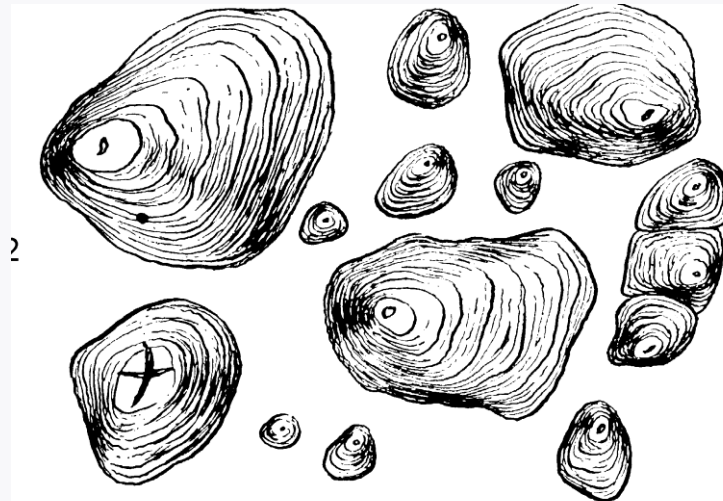
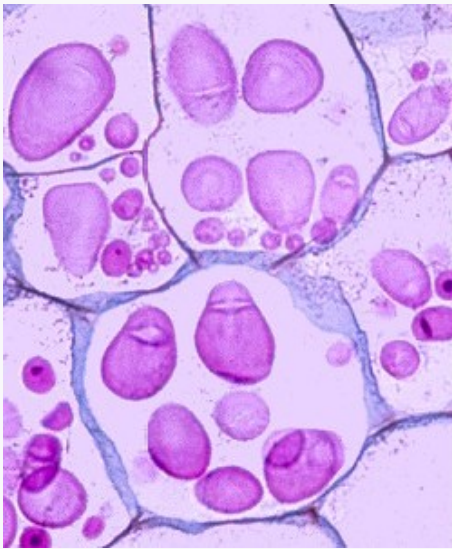
- Mother plant: *Solanum tuberosum*
Solanaceae (potato)
- Macroscopy: very smooth white powder, squeaking when pressed, without taste and smell
- Usage: additive substance for dosage forms, food industry, chemistry, dietetics



Solani amyllum CzPh 2017



- Microscopy: big grains egg or pear shaped with eccentric *hilum*, eccentric embedded, size 30-100 mm



Oryzae amyllum CzPh 2017



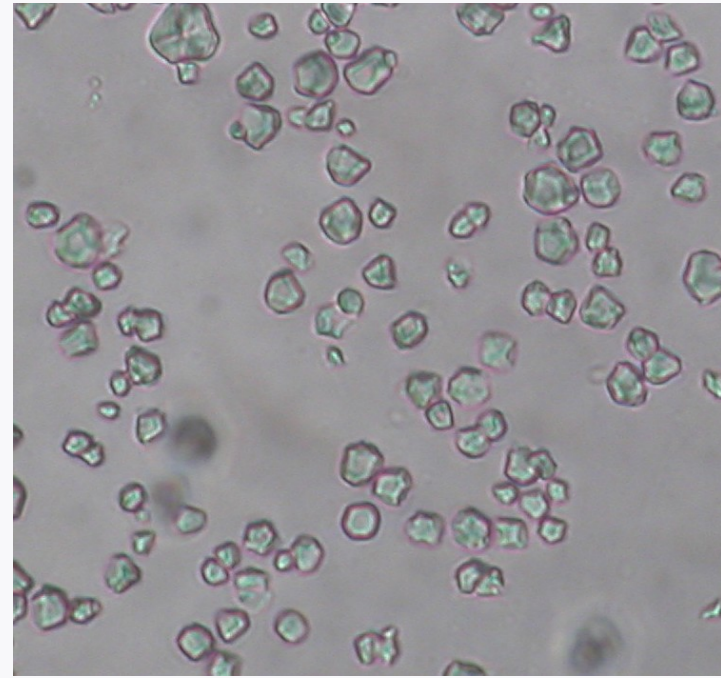
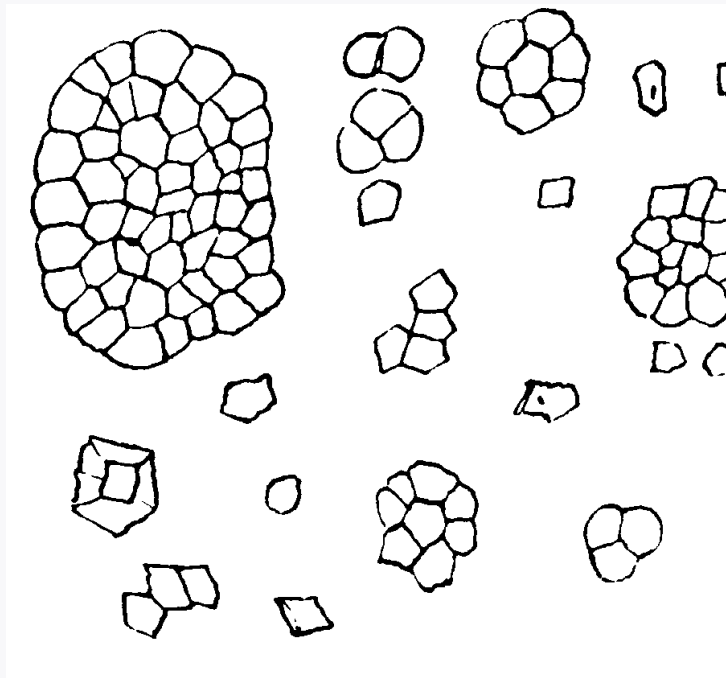
- Mother plant: *Oryza sativa*,
Poaceae (rice)
- Macroscopy: very smooth white powder, squeaking when pressed without taste and smell
- Usage: adjuvant in pharmacy, talcum powders





Oryzae amyllum CzPh 2017

- Microscopy: multi-angular grains without concentric stratification, with vague central disruption, diameter 2-5 mm, usually aggregated into egg-shaped formations



Tritici amyllum CzPh 2017



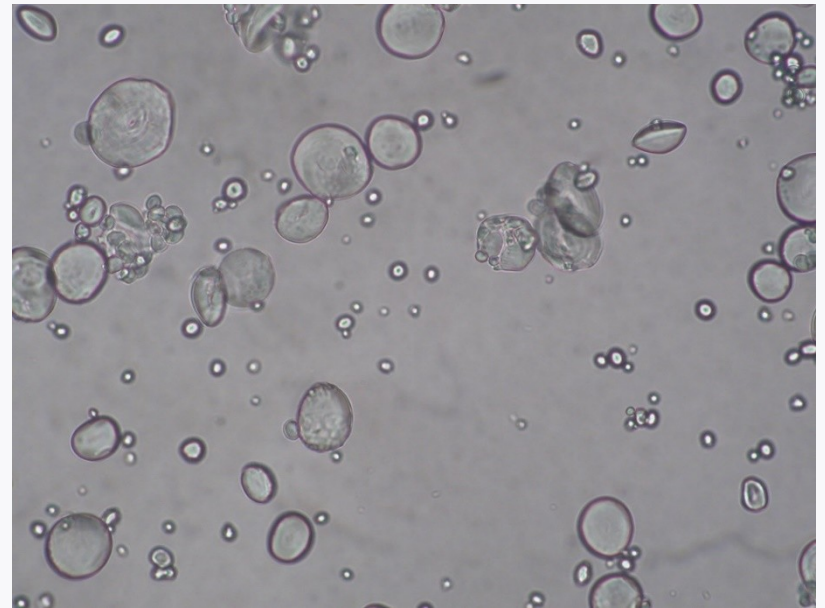
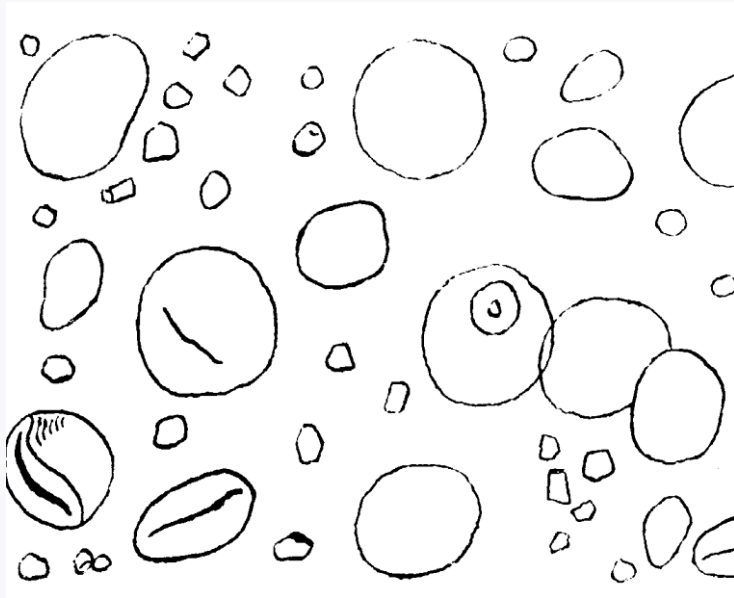
- Mother plant: *Triticum aestivum*
Poaceae (wheat)
- Macroscopy: very soft smooth white powder, squeaking between fingers, without taste and odour
- Usage: adjuvants in pharmacy





Tritici amyllum CzPh 2017

- Microscopy: big grains of lentiform shape, without stratification, size 10-45 mm; or small round grains, size 2-10 mm



Maydis amyllum CzPh 2017



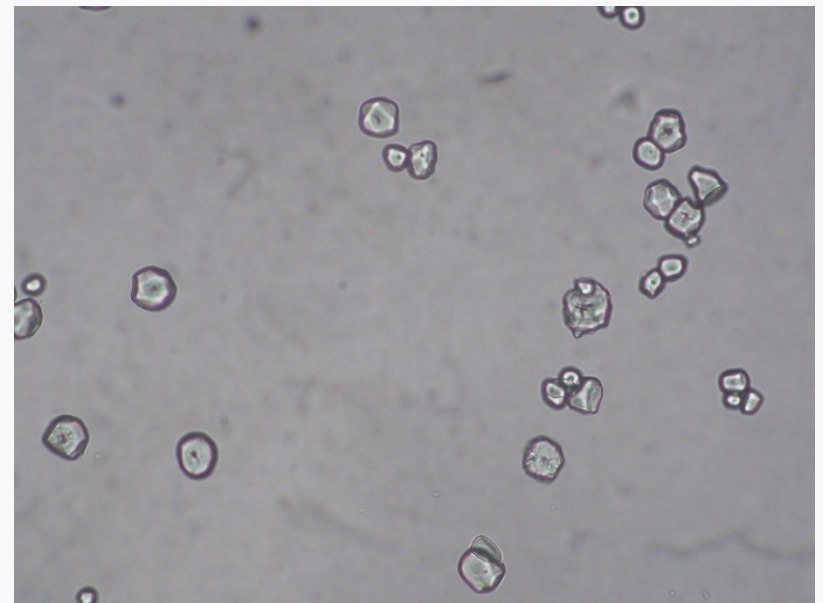
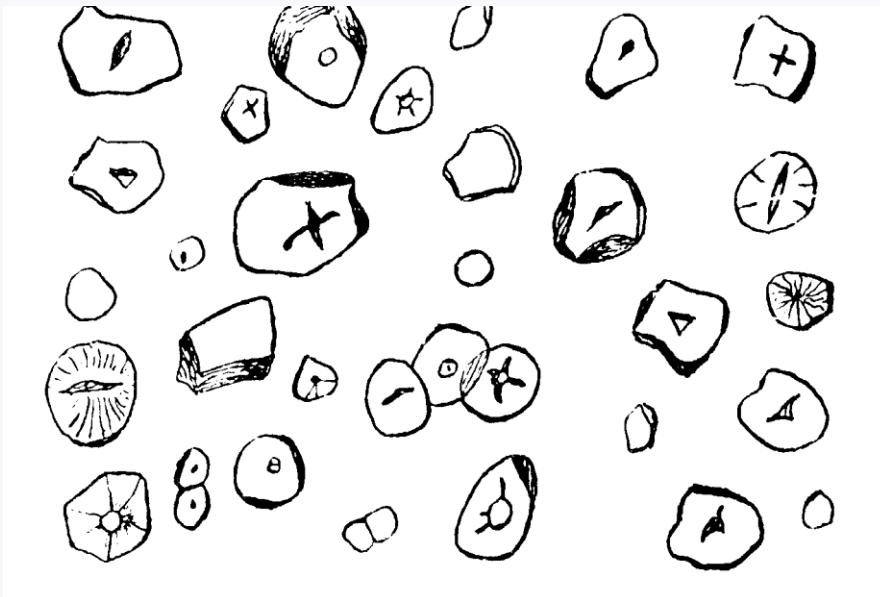
- Mother plant: *Zea mays*
Poaceae (corn)
- Macroscopy: very smooth white to yellowish powder, squeaking when pressed, without taste and smell
- Usage: adjuvant in pharmacy





Maydis amylum CzPh 2017

- Microscopy: multi-angular cornered grains with diameter 2-23 mm, or rounded grains with size 25-32 mm, with distinct central two to five **star shaped disruptions**





Marantae amyllum

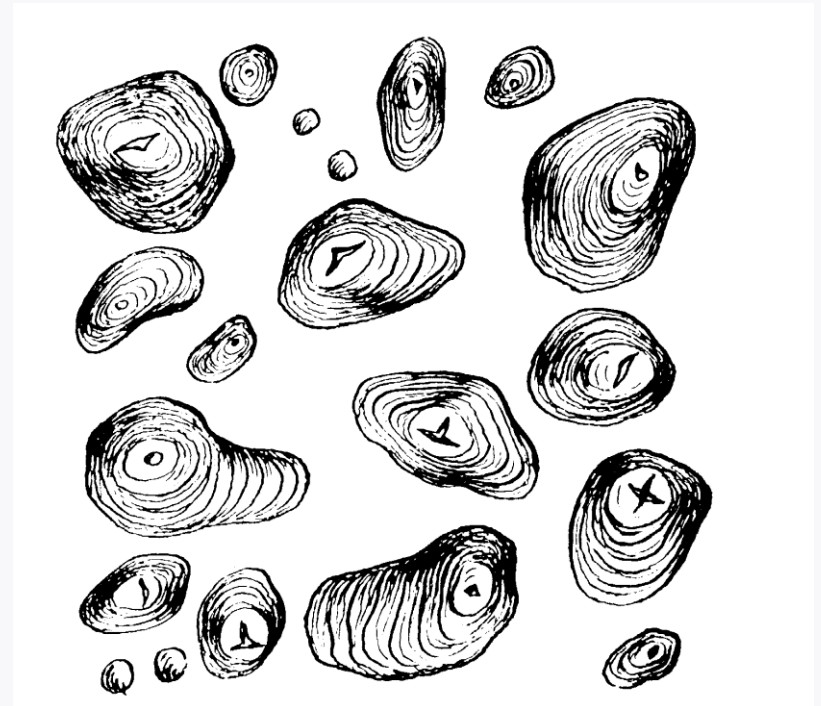
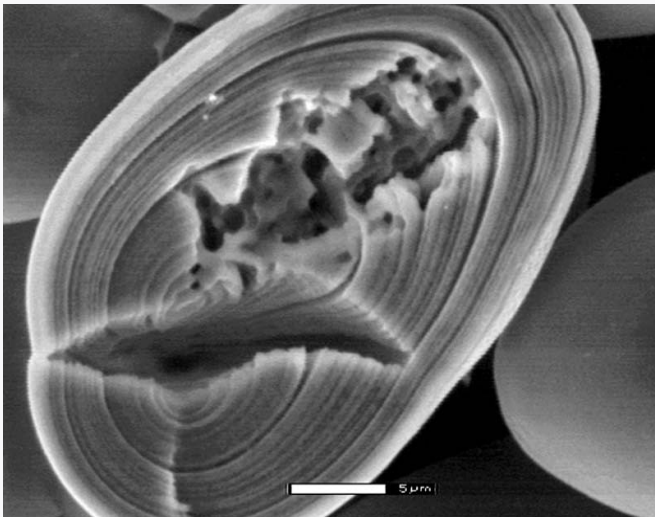
- Mother plant: *Maranta arundinacea*
Marantaceae
(arrowroot)
- Macroscopy: very smooth soft white powder, squeaking when pressed, without taste and smell
- Usage: starch, dietetics





Marantae amyllum

- Microscopy: starch grains egg-shaped, ellipsoid, pear-shaped, or spindle-like with a central disruptions with a **shape of flying bird**, concentric or eccentric, size 10 - 60 μm





Lycopodium

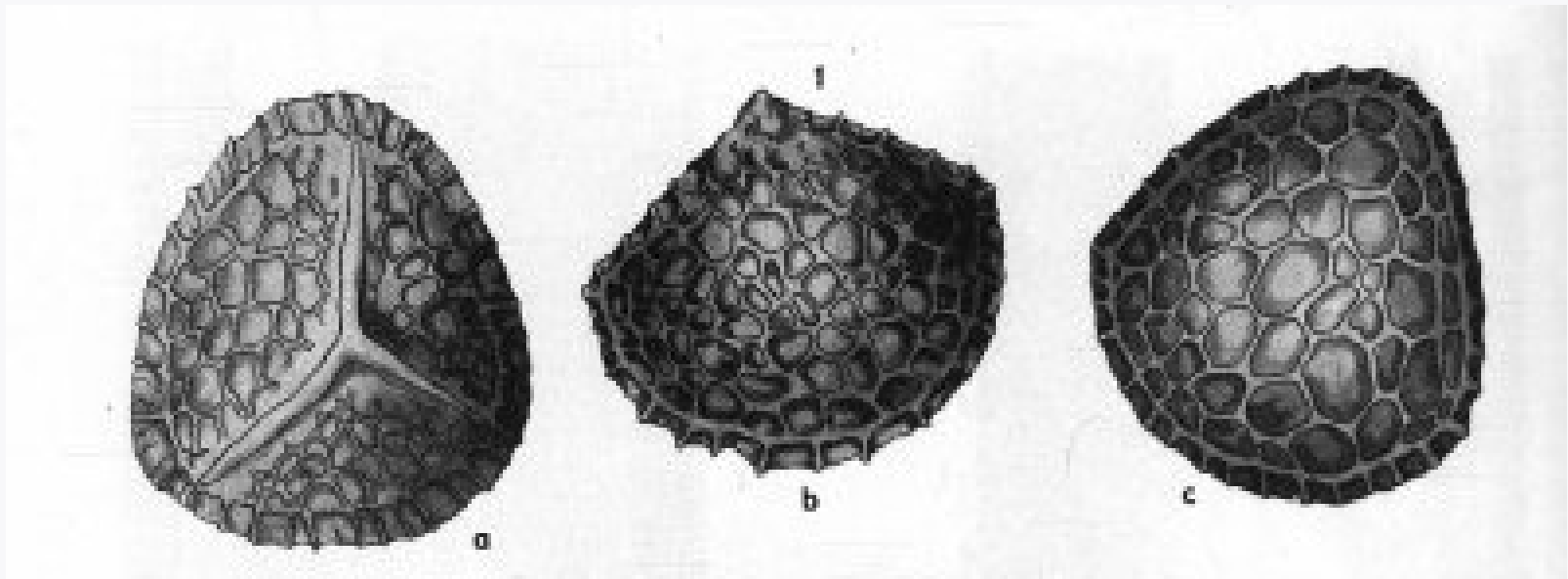
- Mother plant: *Lycopodium clavatum*
Lycopodiaceae
(common club moss)
- Macroscopy: smooth soft yellow powder floating on the water, adhesive, without taste and smell
- Usage: component of wound powders, adjuvant for pills manufacturing, special effects, fireworks





Lycopodium

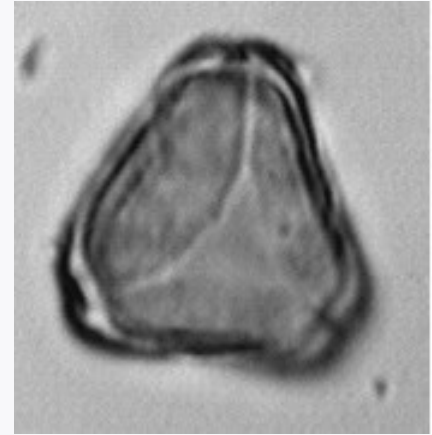
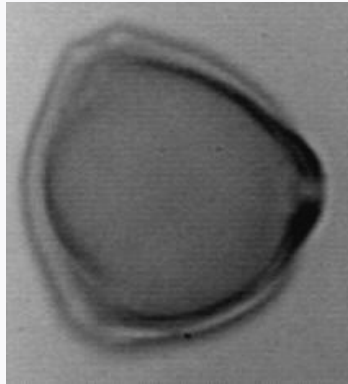
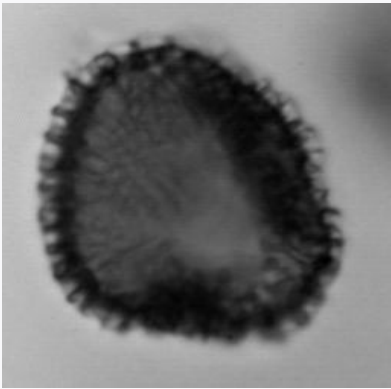
- Constituents: **fatty oils**, resin, malic acid, citric acid
- Microscopy: quadrilateral spores – three flat sides, one strongly concave, with a reticular surface structure and dentated margins, size 30 mm





Lycopodium

- **Attention** do not confuse with pollen





Faex medicinalis

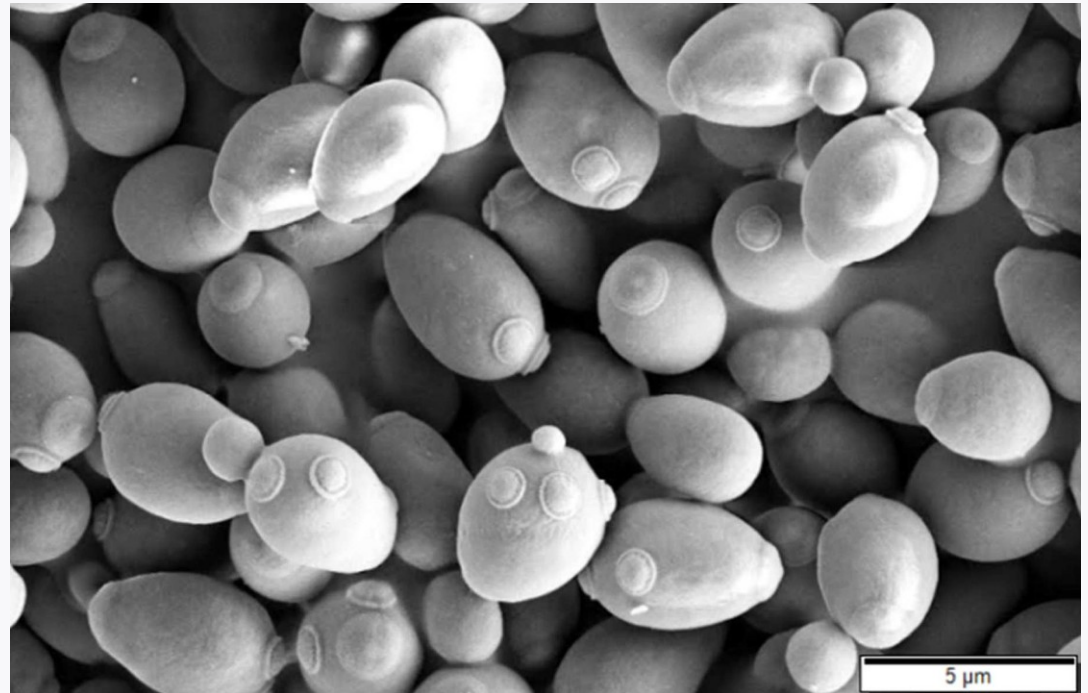
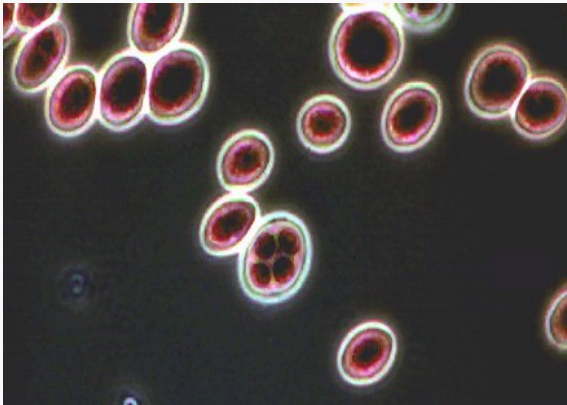
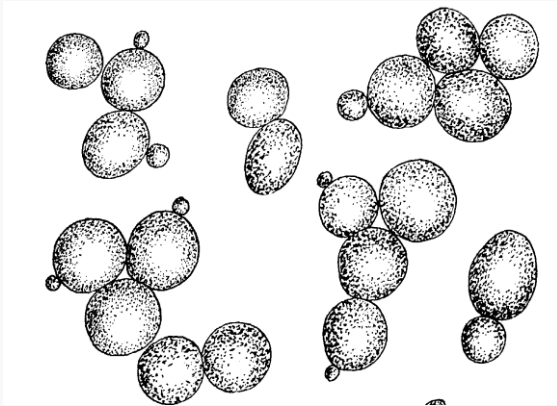
- Washed, devoid of bitter substances
beer yeast *Saccharomyces cerevisiae*
Saccharomycetaceae
- Macroscopy: bright yellow powder of
characteristic taste and odour
- Content compounds: polysaccharides,
fats, proteins, NK, vitamins
- Usage: source of vitamin B, dietetic,
tonic, roborant, dried yeast as filling
agent for pills





Faex medicinalis

- Microscopy: round to oval cells with diameter 8-10 μm , sometimes it is possible to see cell division, cytoplasm is granulated



<https://www.intechopen.com/books/modern-electron-microscopy-in-physical-and-life-sciences/sample-preparations-for-scanning-electron-microscopy-life-sciences>



Natural fibers

- Fibers from seed (cotton wool)



- Fibers from stem (tow - flax, hemp, jute)



- Fibers from leaves (sisal)



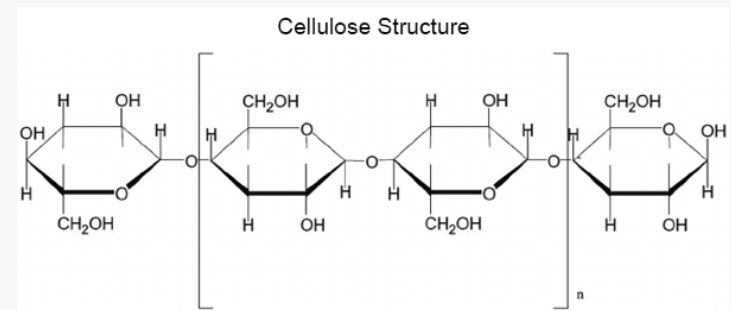
- Fibers from fruits (cocos)





Lana gossypii depurata CzPh 2017

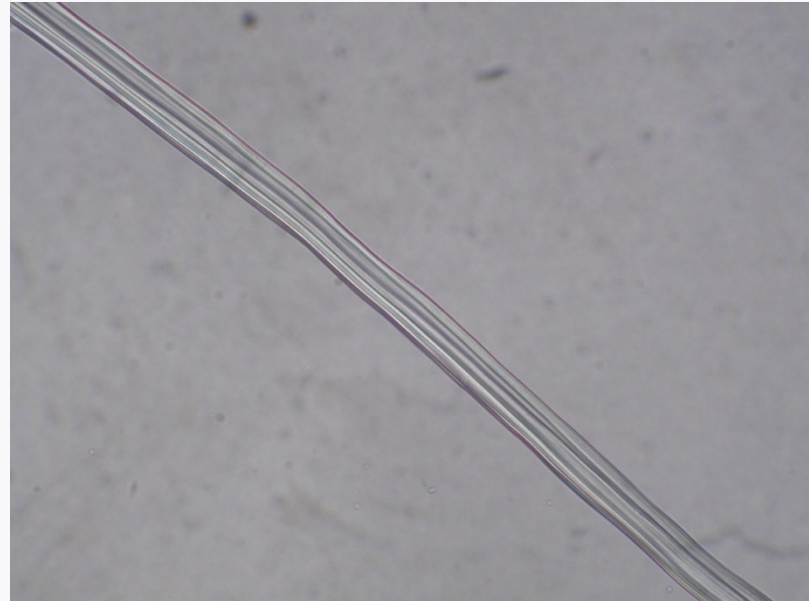
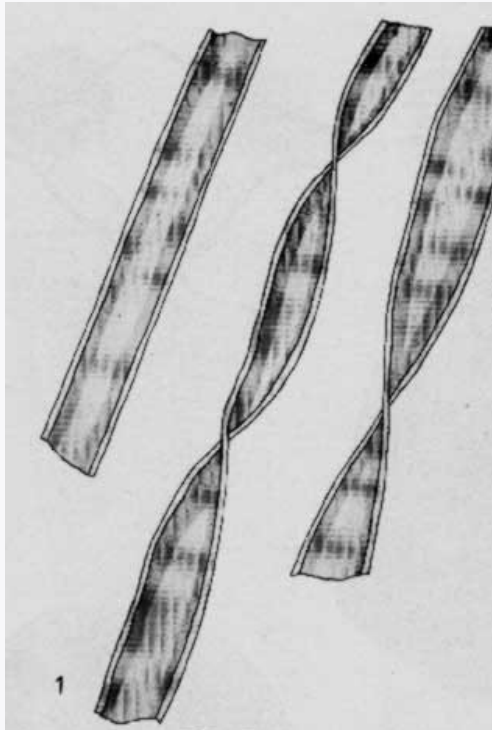
- Mother plant: *Gossypium spp.*
Malvaceae
(cotton plant)
- Macroscopy: purified (pinned), defatted and bleached fibrous trichomes from seed
- Content compounds: pure **cellulose**
- Usage: high suction ability – dressing material





Lana gossypii depurata CzPh 2017

- Microscopy: unicellular trichomes covered with cuticula



Cellulosum ligni CzPh 2017



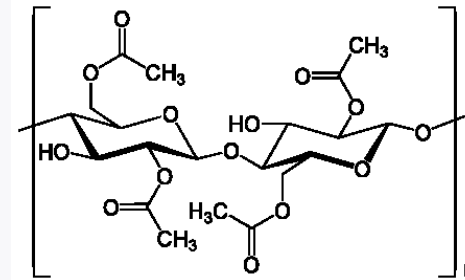
- Mother plant: coniferous species
e.g. *Pinus*
Pinaceae (pine)
- Macroscopy: very short fibers
obtained from wood-pulp
- Content compounds: **cellulose**
- Usage: dressing material



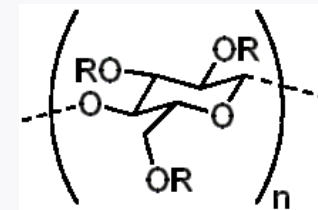


Examples of cellulose in CzPh 2009

- *Cellulosi pulvis*
- *Cellulosum microcrystallinum*
- *Cellulosi acetas*
- *Ethylcellulosum*
- *Hydroxyethylcellulosum*

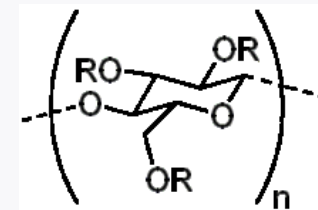


Cellulose acetate



Ethyl cellulose

R = H or CH₂CH₃



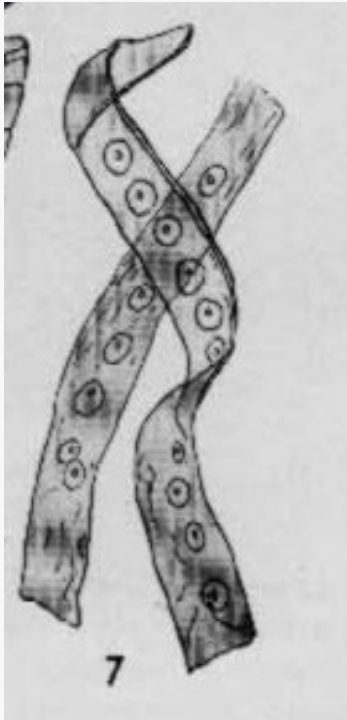
Hydroxyethyl cellulose

R = H or CH₂CH₂OH



Cellulosum ligni CzPh 2017

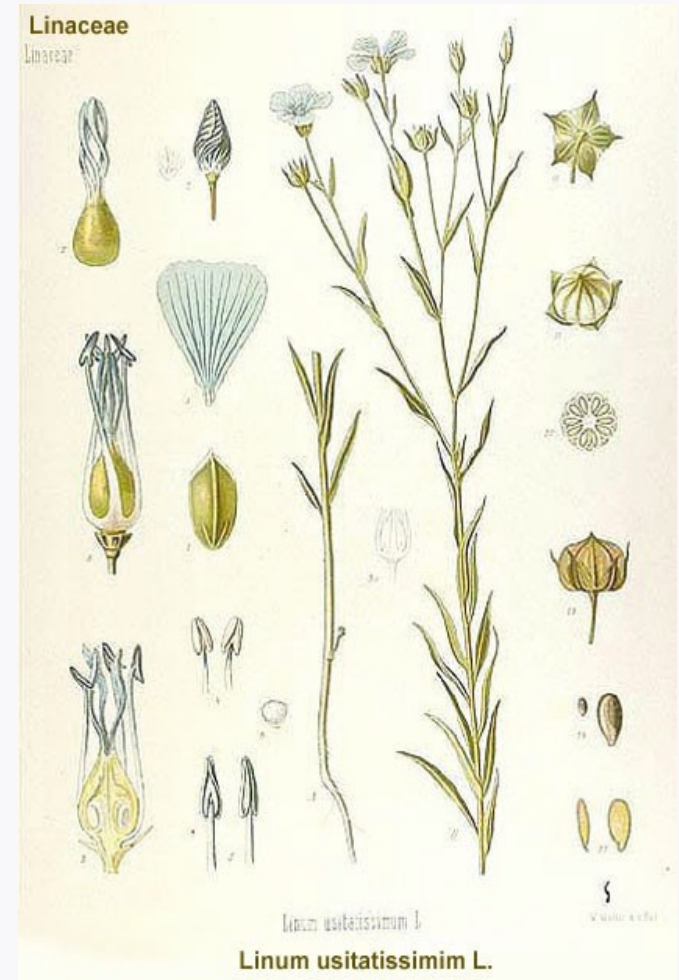
- Microscopy: short fibers of cellulose with fascicular formations



Other natural fibers



- **Flax fibers** *Linum usitatissimum*
Linaceae (flax, linseed)
- obtained from seed-removed, grassed or steeped stems of flax
- Sclerenchyma fibres from wedge-shaped cells
- markedly solid, heat-stable, weak acid resistant, rottenness resistant
- *CzPh 2017 Fila non resorbilia sterilia*





Other natural fibers

- Hemp fibers *Cannabis sativa*
Cannabaceae
- Sclerogenic stem fiber spindle-shaped, at the end sharpened
- Usage: manufacturing of durable textiles (working cloths)





Other natural fibers

- Jute fibre *Corchorus capsularis*
Malvaceae
- very solid phloemic fibers
- Usage: manufacturing of jute bags, sails, or carpets of durable textiles (working clothes)



Other natural fibers



- Sisal *Agave sisalana*
Asparagaceae
- Sclerenchyma stem fiber spindle-shaped, at the end sharpened
- Usage: ropes, twines, cat scratching posts
- Fun fact: can be distilled to make a tequilla-like liquor





Other natural fibers

- Coconut fibers, Coir

Cocos nucifera (coconut tree)

Areaceae

- cavernous, very light fibers, resistant to sea water
- Usage: floormats, ropes, fishing nets



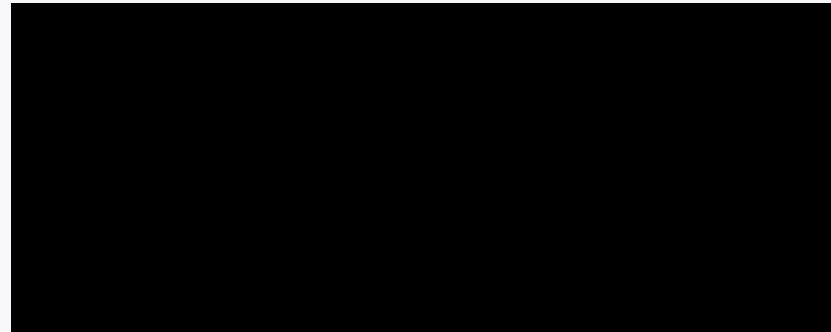
Agar CzPh 2017



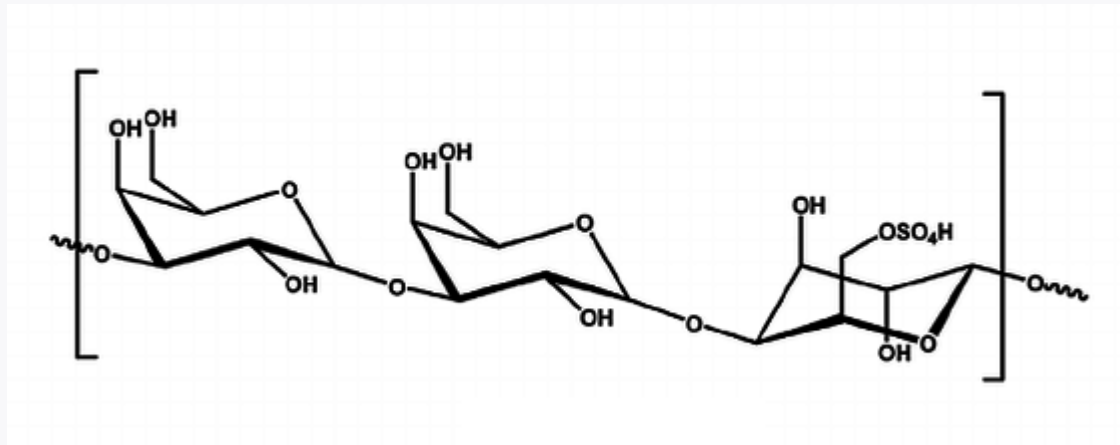
- Source: Dried mucilage obtained from red algae ***Gelidium spp.***, **Gelidiaceae** (class Rhodophyceae)
- Macroscopy: transparent cca 30 cm long strips, or flakes or white powder, without odour, slimy texture
- Content compounds: agarose, agaropectin
- Usage: mild laxative, dietetics, adjuvant



Agar CzPh 2017



Agarose



Agarpectin

Gelatina CzPh 2017, Gelatin



- Denatured, partially hydrolyzed collagen from cartilages, bones and skin of cattle



- Macroscopy: flakes or powder of bright yellow colour, without odour and taste
- Content compounds: AMA: glycine, proline, alanine
- Usage: gelatine capsules, base of suppositories, resorbable sponges, substitute of blood plasma

Gelatina CzPh 2017, Gelatin



Synthesis of collagen

Chains



Procollagen



Tropocollagen



Fibril



Fibre



Cera flava CzPh 2017, *Bee Wax*



- Beeswax made by bee workers (*Apis mellifera* *syn. mellifica*, *Apidae*) when building honeycombs
- Macroscopy: pieces of waxy yellowish mass, without taste and odor
- Content compounds: esters of higher fatty acids and higher aliphatic alcohols
- Usage: ointment base



Cera alba CzPh 2017

Adeps lanae CzPh 2017

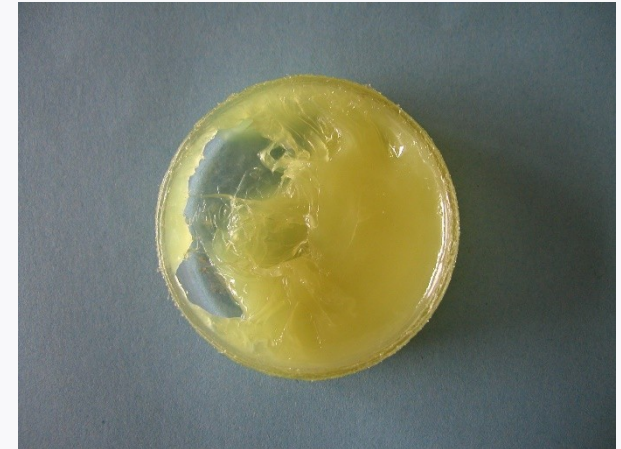


- Obtained by isolation from sheep wool (*Ovis aries*, **Bovidae**)
- Macroscopy: substance of unguent consistence, very viscous, yellow to brown-yellow, weak characteristic odour
- Usage: emulgator



A. lanae cum aqua (Lanolin) CzPh 2017(75:25)

A. lanae hydrogenatus CzPh 2017
(hydrogenation)



Cetaceum (Spermaceti)



- Purified solid portion of fatty-waxy mixture found in cranial cavities of Sperm whale (**Physeter macrocephalus, Physeteridae**)
- Macroscopy: white substance, pearly glossy, on touch oily, weak characteristic odour and pale taste
- Usage: cosmetics, isolation of cetylalcohol



Cera carnauba CzPh 2017 (*Carnauba*)



- Mother plant: *Copernicia cerifera*, *Arecaceae* (*Palmae*)
- Macroscopy: bright brown or bright yellow powder or flakes of characteristic odour
- Content compounds: esters of fatty acids, higher alcohols
- Usage: cosmetics



Guttapercha (gutta-percha)



- Mother plant: different species of genus *Palaquium*, Sapotaceae
- Macroscopy: yellow-brown mass, soft in warm water, solid at room temperature





Guttapercha (gutta-percha)

- Content compounds: up to 75 % of polyterpenic hydrocarbon (**gutta**), resin, salts, nitrogen compounds


- Usage: in stomatology as a dental cement, manufacturing of plasters, dressing material

Gummi elasticum (rubber, caoutchouc)



- Mother plant: Mother plant: different species of **Euphorbiaceae**, genus *Hevea*





Gummi elasticum (rubber, caoutchouc)

- Macroscopy: thin elastic slides or mass
- Content compounds: up to 60 % of water, emulsified rubber, proteins, saccharides
- Usage: rubber industry





Propolis

- Propolis is obtained by bees during harvest of resinous substances from different deciduous and coniferous trees
- Macroscopy: resinous mass, green-brown to dark brown color, characteristic pleasant odor, bitter taste
- Content compounds: resins, waxes, volatiles, flavonoids, alcohols, aromatic aldehydes
- Usage: bactericidal, fungicidal, antiviral, local anesthetic, stomatologic, antiphlogistic, dermatic



Mel CzPh 2017 (honey)



- Obtained by bees when processing and transformation of sweet juice (nectar) from different plants in the honey stomach
- Macroscopy: mass of soft consistence, colour, odour and taste depend on honey type
- Content compounds: glucose, fructose, saccharose, nitrogen compounds, vitamins, mineral compounds
- Usage: dietetic, energetic, local antiseptic effect





Natural antidiabetics

- *Stevia rebaudiana*, Asteraceae



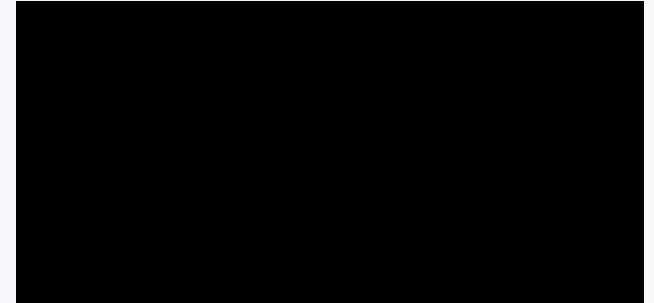
Natural antidiabetics



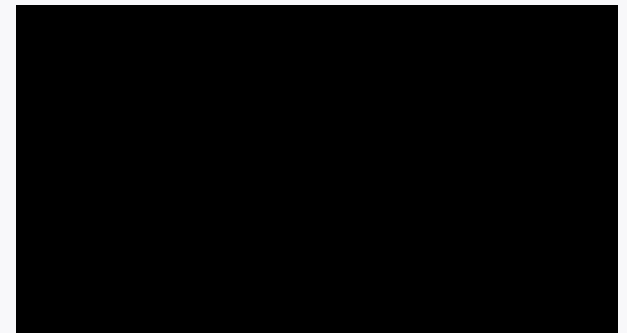
- *Stevia rebaudiana, Asteraceae*

- Content compounds: diterpenic glycoside **stevioside, rebaudiosides A-E** (20-120x higher sweeter than saccharose)

- Usage: sweetener (diet foods), additive to toothpaste (steviosid – destroys pathogenic bacterial of oral micro flora)



Stevioside

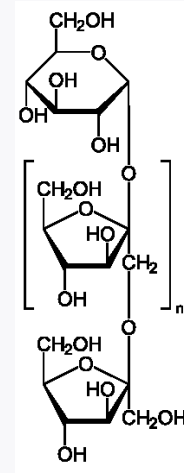


Rebaudioside A

Natural antidiabetics



- **Polymnia sonchifolia, Asteraceae (yacon)**
- Content compounds: monosaccharides and disaccharides, inuline
- Usage: vegetables, juice from tubers as a sweetener



Inulin

