

Pharmacognosy

lab exercise 10

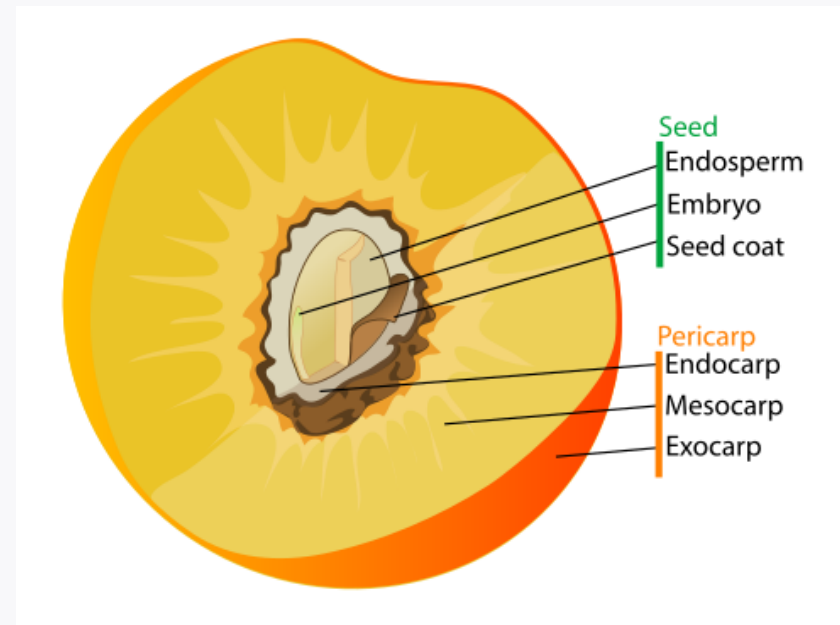


Drugs - fruits



Fructus - fruit

- Generative organ of flowering plants, contains one or several seeds. Its function is to disperse seeds.
- Fruit is composed of outer layer (pericarp, pericarpium) and seed (semen)
- **Pericarpium** is further divided into:
 - exocarp (epicarp), mesocarp, endocarp
- **Seed** consists of:
 - Seed coat (testa), endosperm, embryo





Apiaceae fruits

- Diachenium
- Anatomy of diachenium:
 - Exocarp with prominent ribs (ridges), vascular bundles in ridges
 - Mesocarp contains essential oil channels
 - Endocarp intergrown with testa
 - Endosperm composed of parenchyma, contains oil drops, starch, aleurone grain



Anisi fructus CzPh 2017

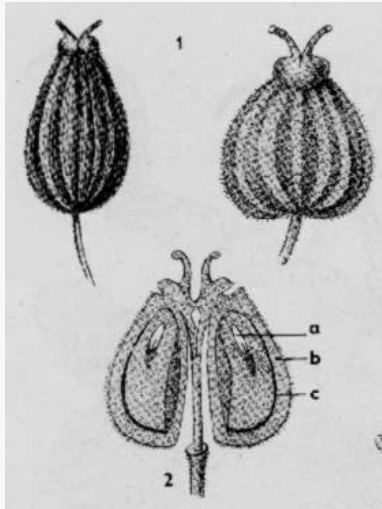
- Mother plant: *Pimpinella anisum*, **Apiaceae**, anise
 - *Anisi etheroleum* CzPh 2017





Anisi fructus CzPh 2017

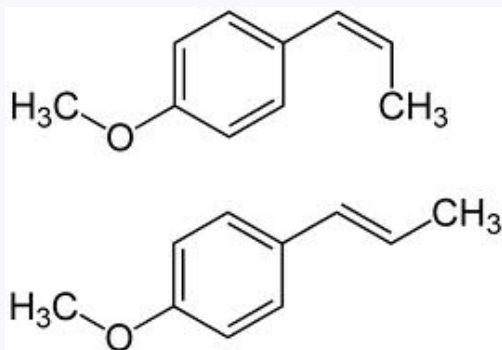
- Macroscopy: *diachenium* of obovate shape, grey-brown, softly hairy, fruit connected by short stalk, each achene has 5 bright ribs, strong spicy odour, sweet aromatic taste



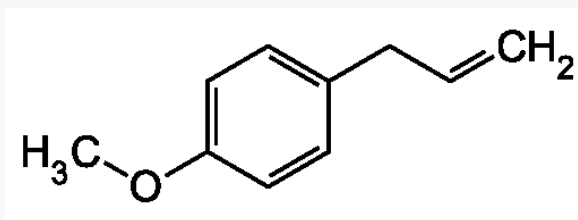


Anisi fructus CzPh 2017

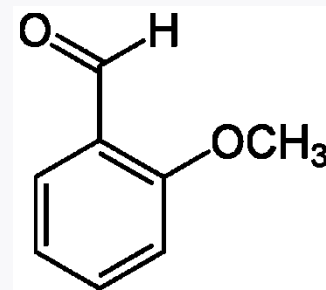
- Content compounds: essential oil (trans-anethol, methylchavikol, anisaldehyd), oil, proteins, sugars



cis, trans-anethol

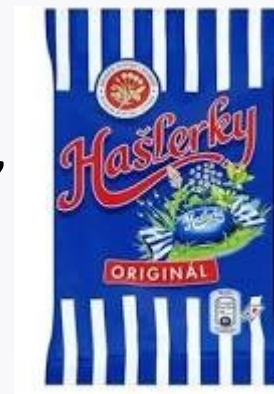


methylchavikol



anisaldehyd

- Usage: expectorant, carminative, stomachic, spasmolytic, flavoring for ouzo, raki, Czech candy called Hašlerky





Anisi fructus CzPh 2017

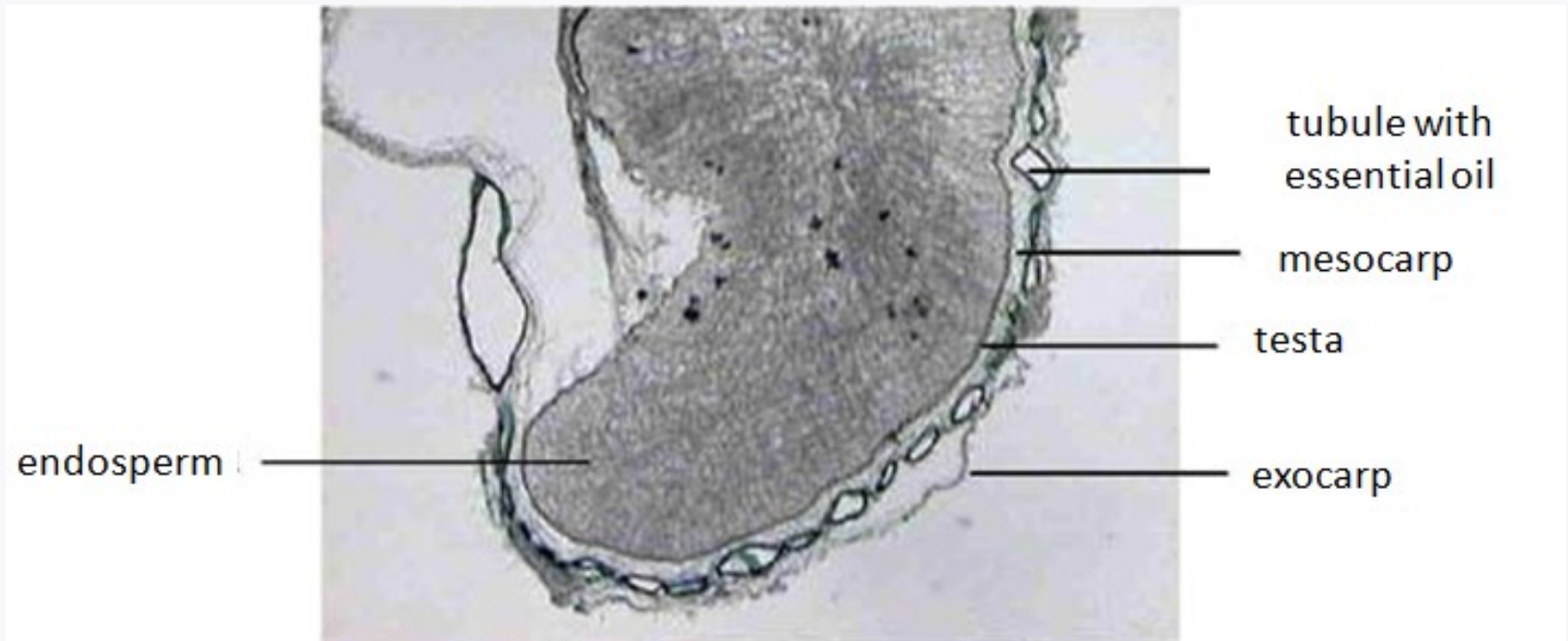
- Different names of anise alcohols across the Mediterranean region





Anisi fructus CzPh 2017

- Microscopy: exocarp, on epidermis located small, soft fine papilla-like trichomes with grainy cuticle, mesocarp – numerous tubules with essential oil, endocarp (fused with testa), in ribs located collateral vascular bundles, endosperm





Anisi fructus CzPh 2017

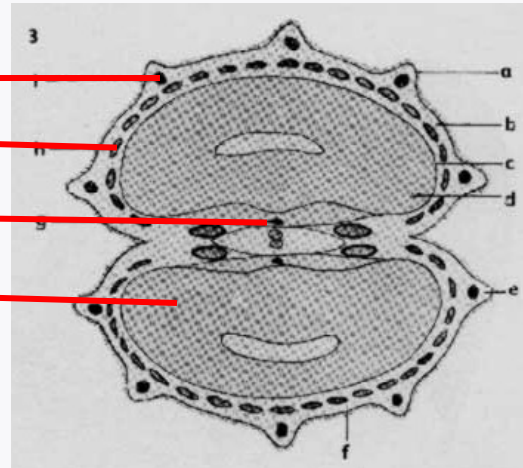
■ Microscopy:

vascular bundle

tubule with essential oil

rafe

endosperm



trichomes

exocarp

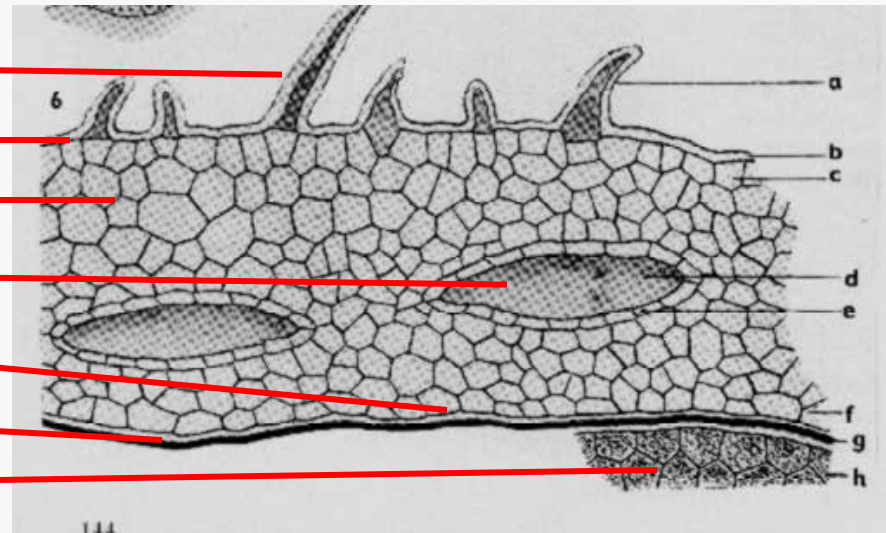
mesocarp

tubule with essential oil

endocarp

testa

endosperm





Coriandri fructus CzPh 2017

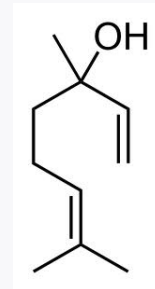
- Mother plant: *Coriandrum sativum*, **Apiaceae**, Coriander, κορίαννον
 - *Coriandri etheroleum* CzPh 2017



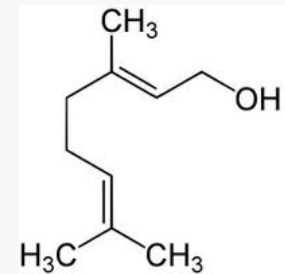
Coriandri fructus CzPh 2017



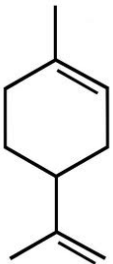
- Macroscopy: spherical *diachenium* yellow-brown, 12 main and 10 side ribs, pleasant aromatic taste and odour
- Content compounds: **essential oil** (linalol, geraniole, limonene, camphora), oil, tannins
- Usage: stomachic, carminative, mild spasmolytic; externally to treat neuralgia. Corrigens of taste and smell, ingredient of curry powder



linalol



geraniole

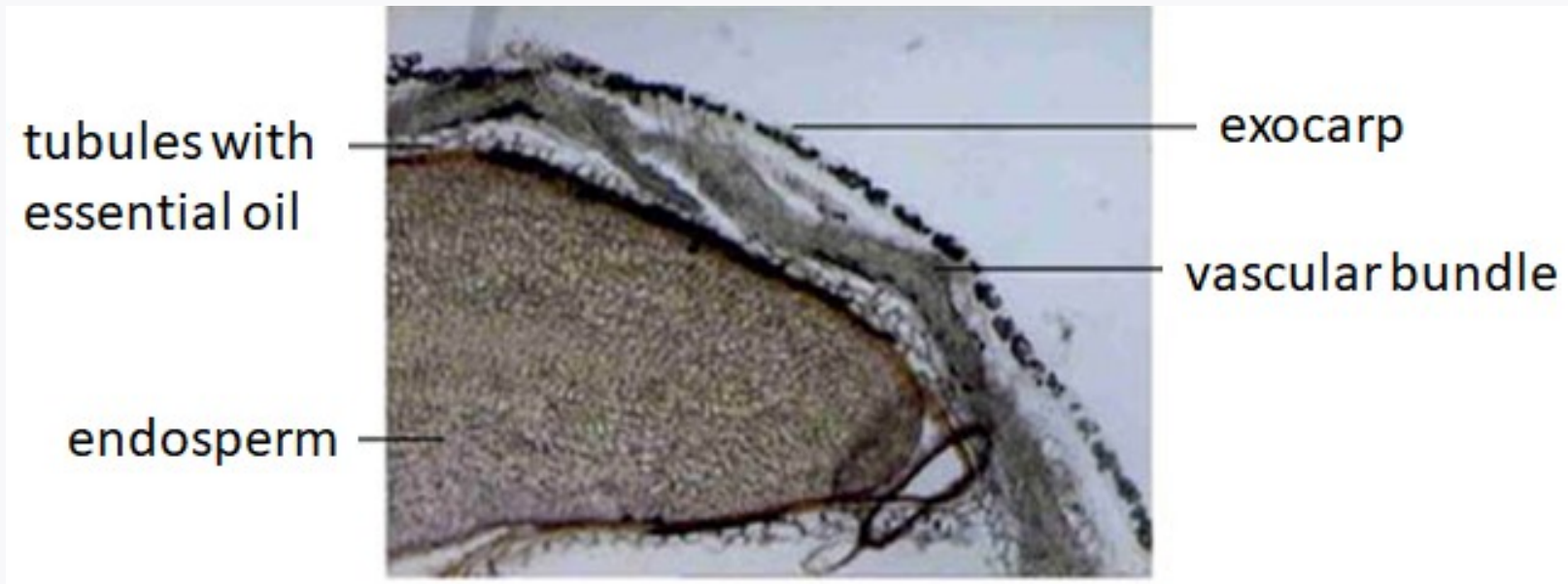


limonene

Coriandri fructus CzPh 2017



- Microscopy: exocarp, mesokarp, endocarp fused with testa, in main ribs located tubules with essential oil and small vascular bundles, strip of sclerenchyma - stereome layer, at carpophore two big tubules with essential oil with epithelial lining, endosperm



Coriandri fructus CzPh 2017

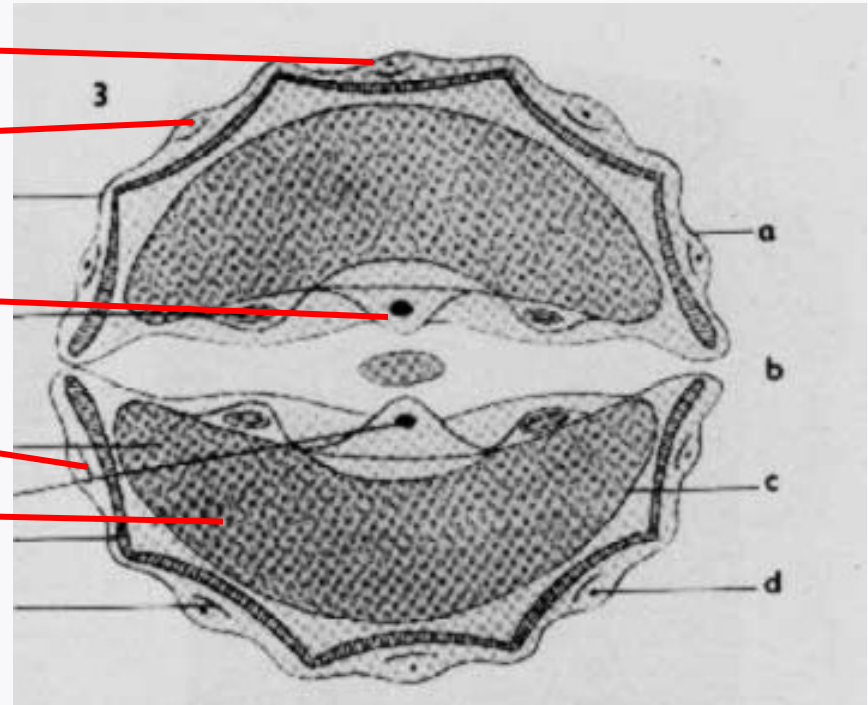


■ Microscopy:

vascular bundle
cell with essential oil

rafe

strip of stereom
endosperm



Coriandri fructus CzPh 2017



■ Microscopy:

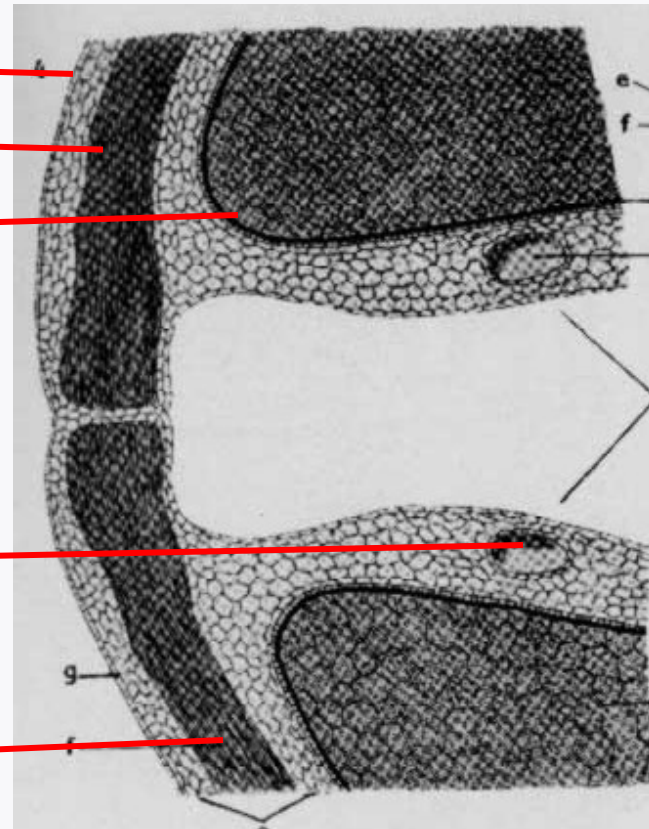
exocarp

mesocarp

endocarp

tubule with
essential oil

strip of stereom





Conii fructus



- Mother plant: *Conium maculatum*, *Apiaceae*, Poison Hemlock

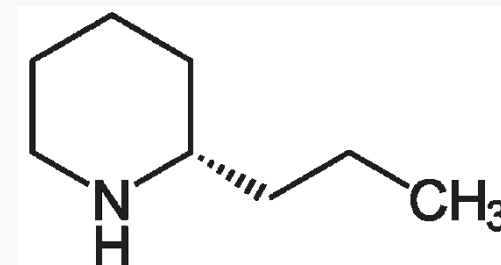




Conii fructus



- Macroscopy: bald, oval-spherical, grey-green *diachenium*, strongly rib-like, ribs deformed, smells after mice, acrid oily taste. **Do not confuse with anise/coriander.**
- Content compounds: piperidine alkaloid **coniine**, oil, proteins
- Usage: poisonous, obsolete analgesic (neuralgia)
- Coniine inhibits nicotinic acetylcholine receptors – paralysis of muscles



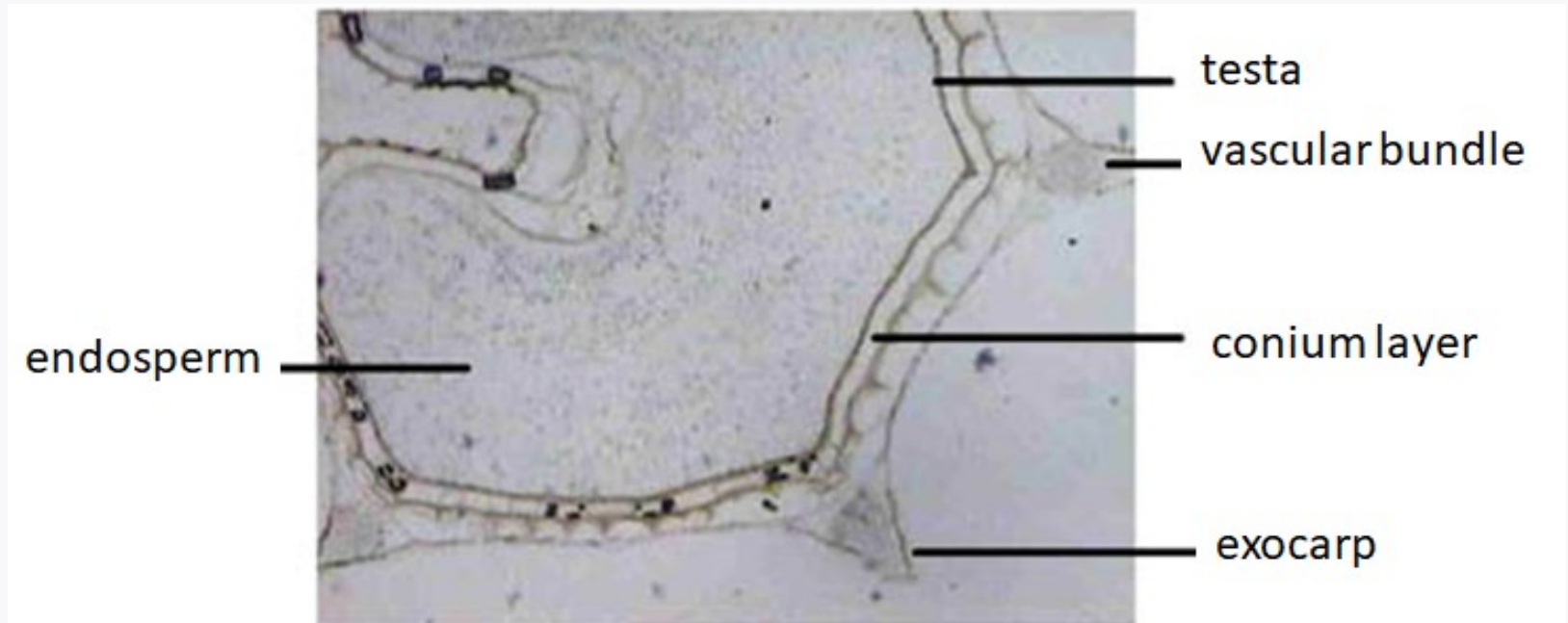
coniine



Conii fructus



- Microscopy: exocarp, mesocarp, endocarp fused with testa creating conium layer, 5 pronounced ribs with vascular bundles and small cells with essential oil, endosperm, aleuronic grains and droplets of oil



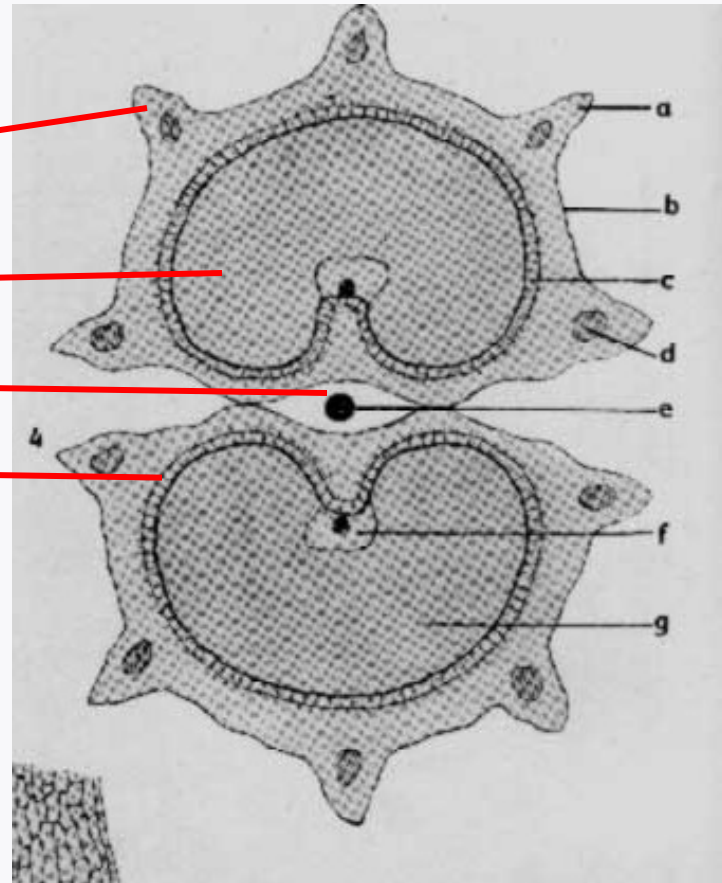


Conii fructus



■ Microscopy:

rib with vascular bundle
and cell with essential oil
endosperm
rafe
conium layer





Conii fructus



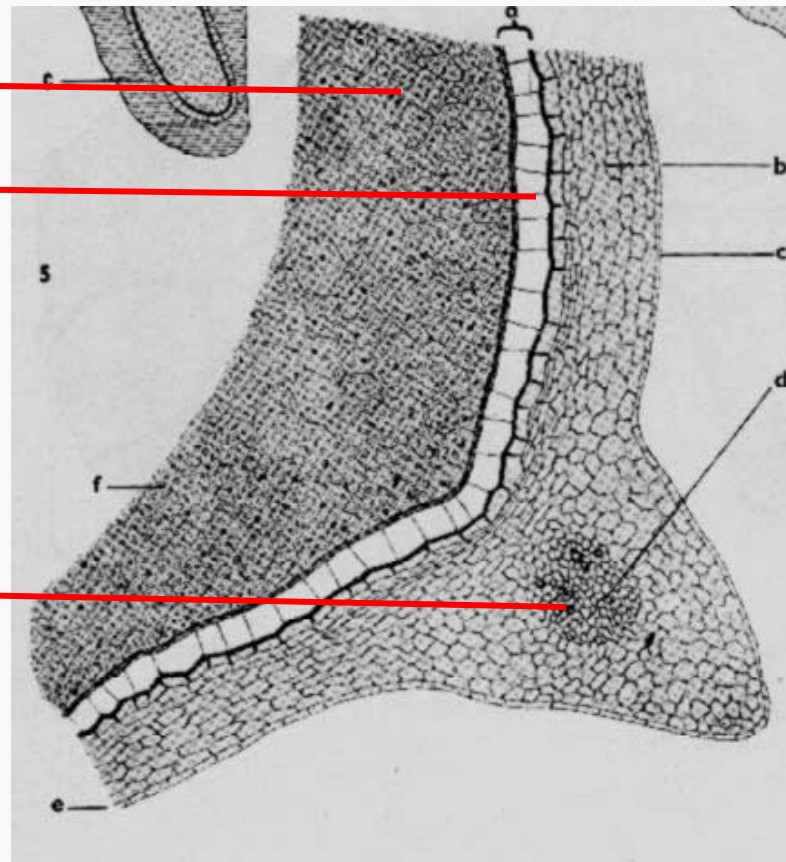
■ Microscopy:

endosperm

conium layer

collateral

vascular bundle





***Foeniculi amari fructus* CzPh 2017**

***Foeniculi dulci fructus* CzPh 2017**

Mother plant: ***Foeniculum vulgare* subsp. *vulgare* var. *vulgare*,
or var. *dulce*, Apiaceae, Fennel**

Foeniculi amari fructus etheroleum CzPh 2017

Foeniculi amari herbae etheroleum CzPh 2017

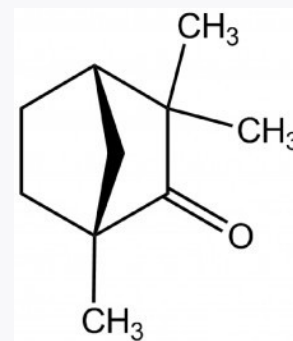




Foeniculi amari fructus CzPh 2017

Foeniculi dulci fructus CzPh 2017

- Macroscopy: *diachenium* of cylindric shape, flattened, smooth, bald, brown-green to yellow, 5 ribs of straw-like yellow colour, aromatic odour, *F. amari* of sharp taste, *F. dulci* of sweet taste
- Content compounds: **essential oil** (trans-anethol, methylchavikol, fenchone), sugars, oil, proteins
- Usage: expectorant, spasmolytic, carminative, taste and smell corrigens



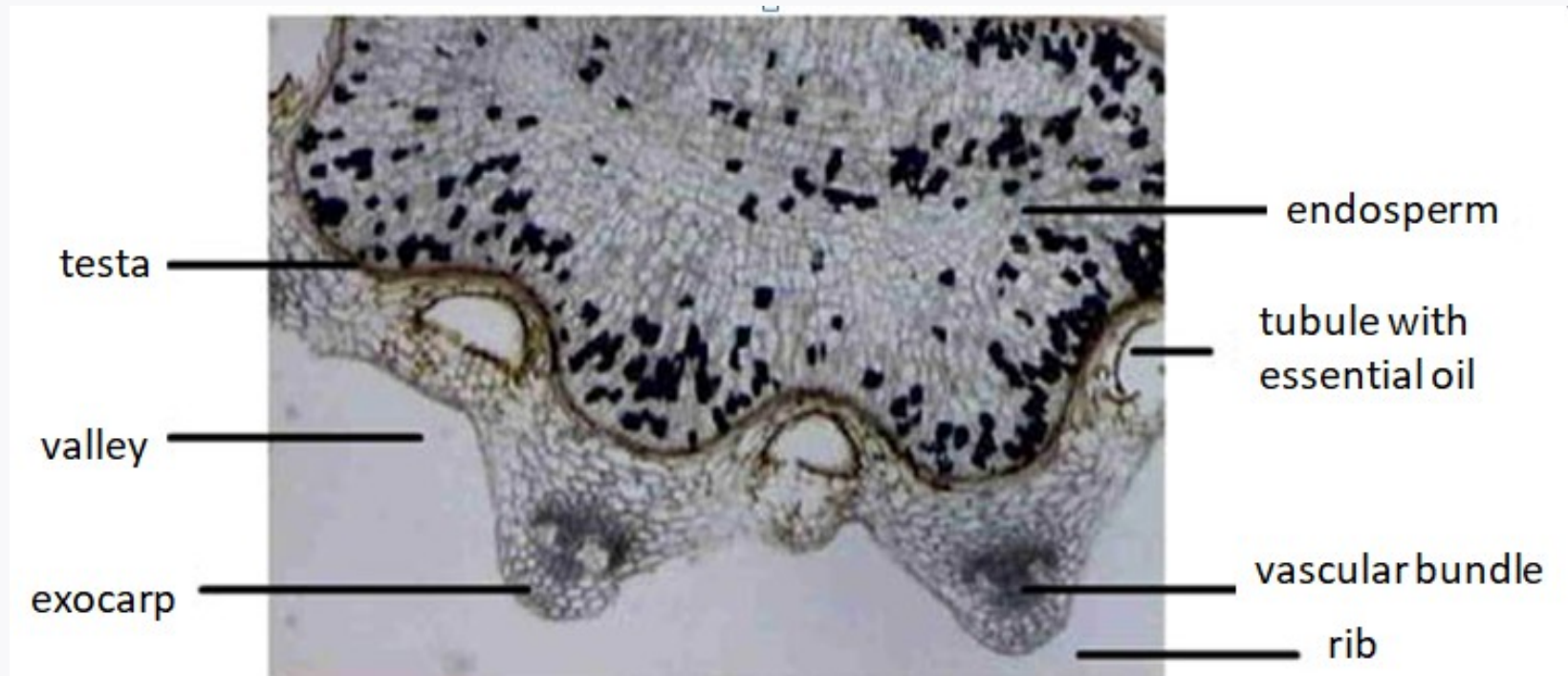
fenchone

Foeniculi amari fructus CzPh 2017

Foeniculi dulci fructus CzPh 2017

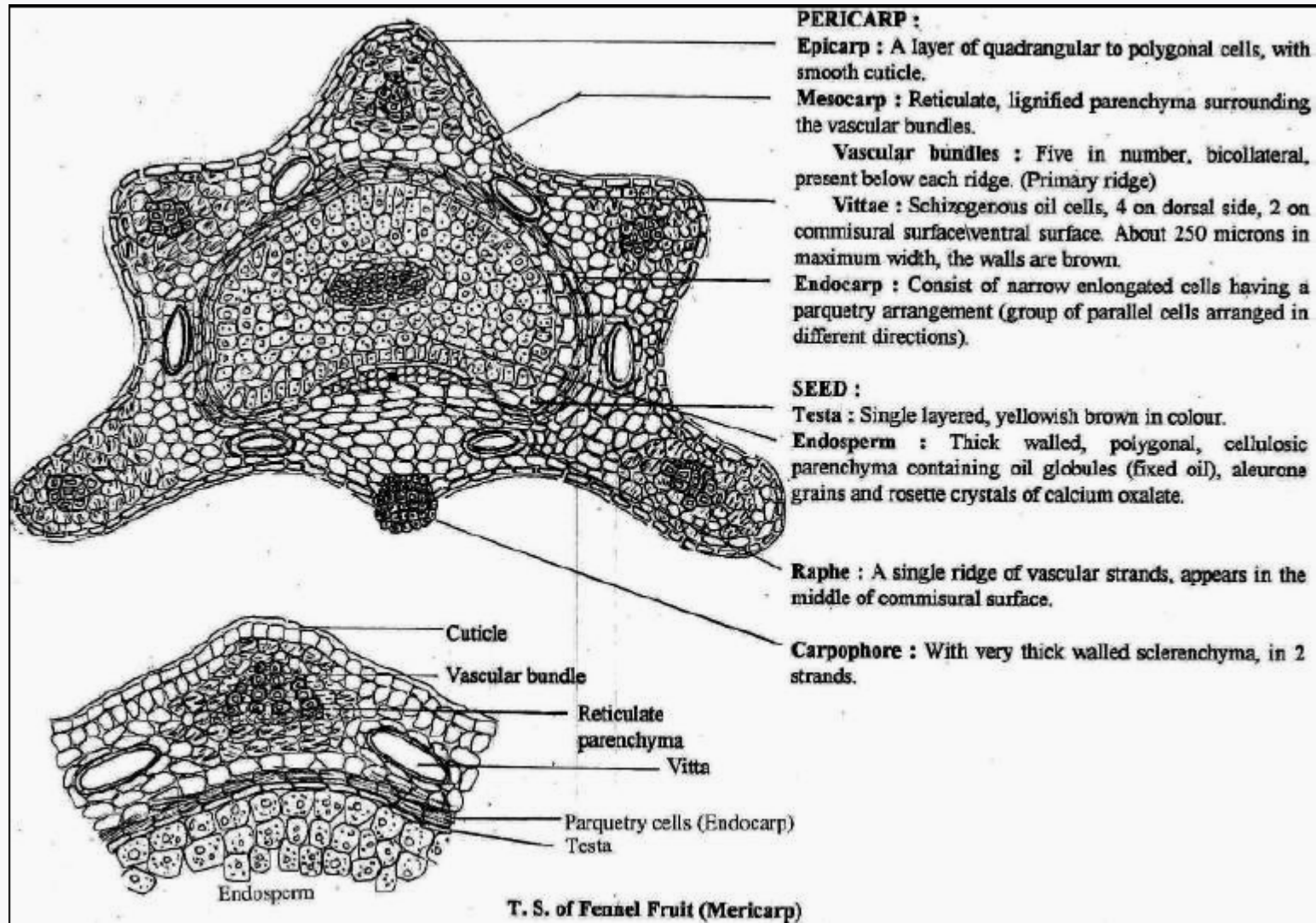


- **Microscopy:** exocarp, mesocarp, endocarp, 5 ribs, in carpophore area two bigger tubules with essential oil, in ribs located vascular bundles, in their surrounding septular cells, in valley tubules with essential oil, tubules with essential oil, endosperm (droplets of oil, and aggregates of calcium oxalate crystals), endocarp fused with testa (parquetry block cells)



Foeniculi amari fructus CzPh 2017

Foeniculi dulci fructus CzPh 2017



Foeniculi amari fructus CzPh 2017

Foeniculi dulci fructus CzPh 2017



■ Microscopy:

endosperm

cell with essential oil

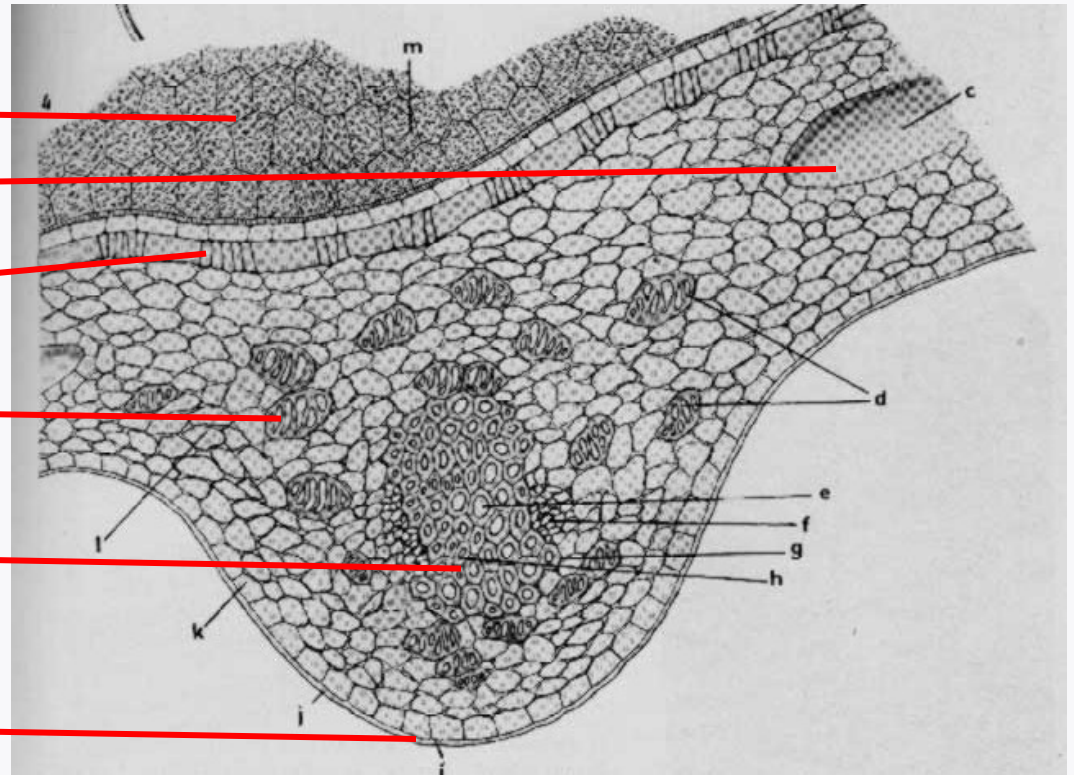
parquetry block

cells of testa

septular cells

vascular bundle collateral

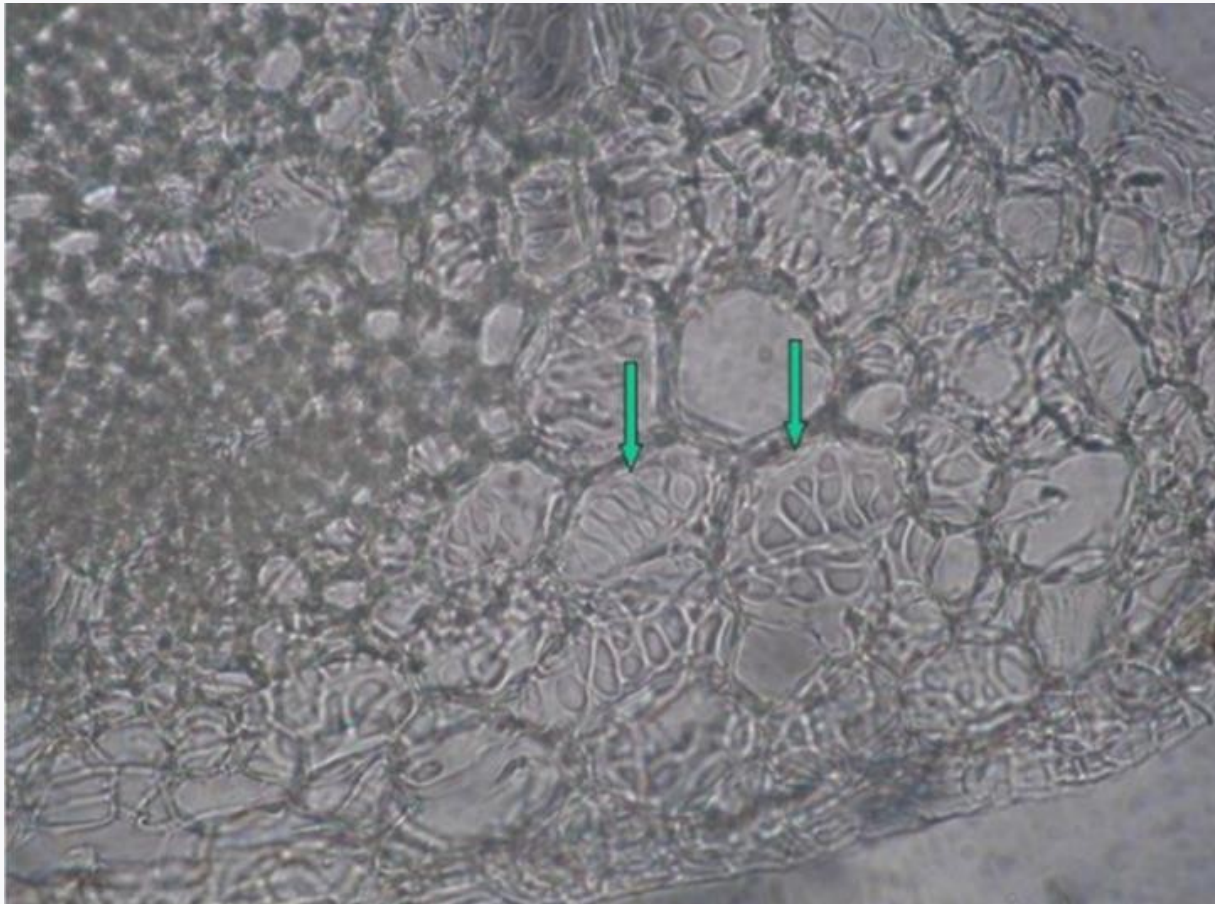
exocarp



***Foeniculi amari fructus* CzPh 2017**
***Foeniculi dulci fructus* CzPh 2017**



septular cells





Aurantii dulce pericarpium CzPh 2017 *Aurantii amari pericarpium* CzPh 2017

- Mother plant: *Citrus aurantium* subsp. *aurantium*, or var. *dulcis*, Rutaceae, Orange
 - Aurantii amari pericarpii tinctura CzPh 2017
 - Aurantii dulcis pericarpii etheroleum CzPh 2017

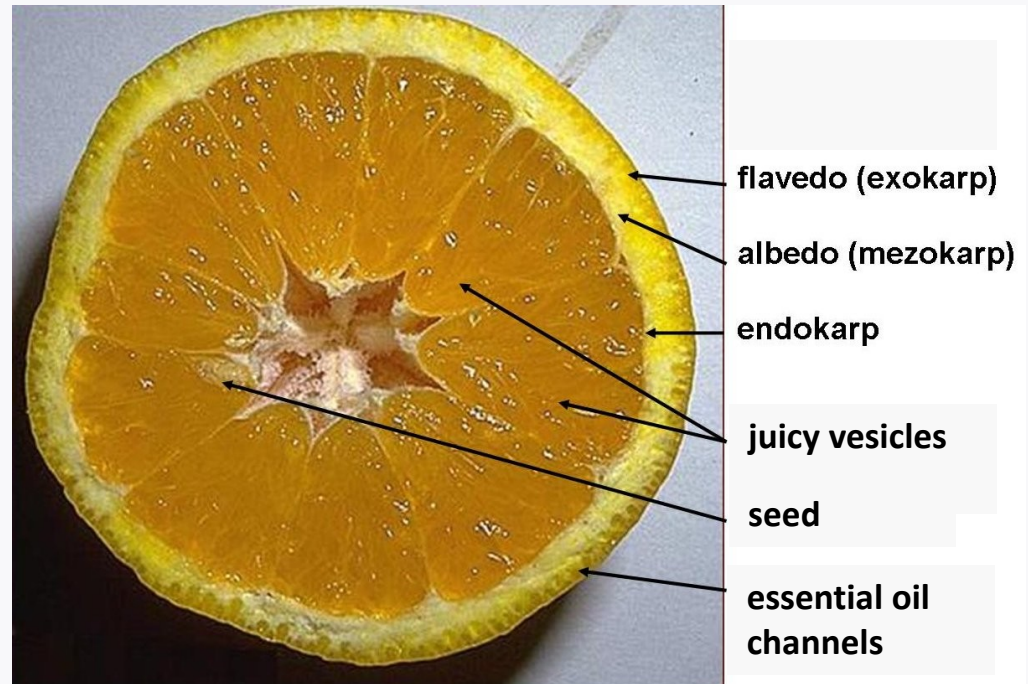




Aurantii dulce pericarpium CzPh 2017

Aurantii amari pericarpium CzPh 2017

- **Macroscopy:** irregular circular pieces, at the end sharpened, externally orange, glandularly pointed from tubules with essential oil, internal side yellowish

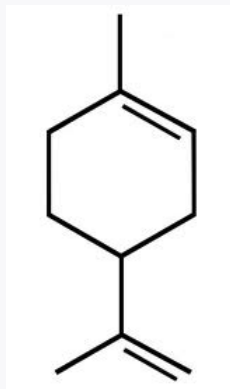




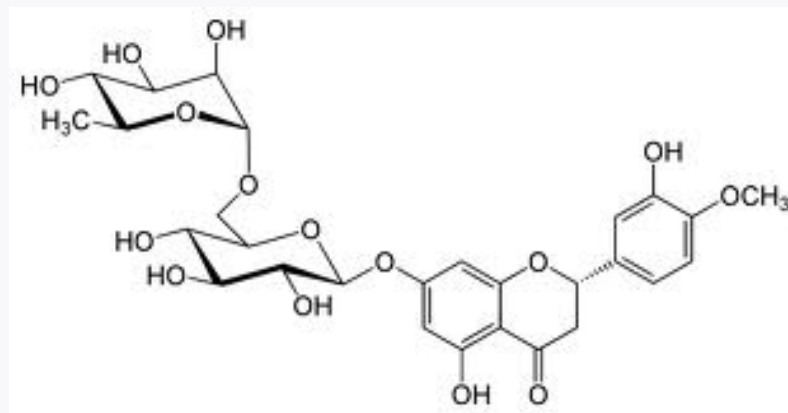
Aurantii dulce pericarpium CzPh 2017

Aurantii amari pericarpium CzPh 2017

- Content compounds: essential oil, (limonen, linalol), flavonoids (rutin, hesperidin, naringin) carotenoids, xantophylls, bitter substances



limonen



hesperidin

- Usage: amare, cholagogue, taste corrigent

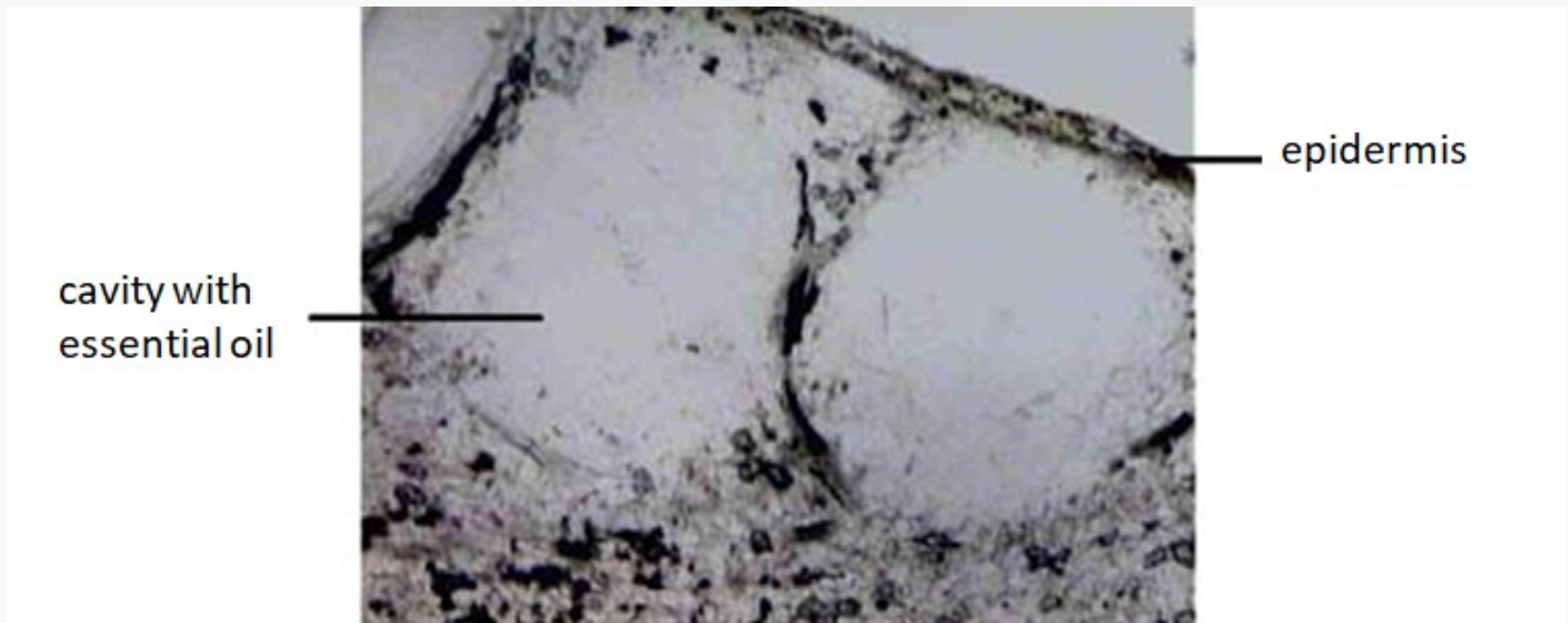


Aurantii dulce pericarpium CzPh 2017

Aurantii amari pericarpium CzPh 2017



- Microscopy: epidermis with stomata, in parenchyma crystals of calcium oxalate and hesperidin, 1-2 lines of schiso-lyzigenic tubules with essential oil, rarely vascular bundles





MACROSCOPY



Avenae fructus

- Mother plant: *Avena sativa*, Poaceae, Oat





Avenae fructus

- Macroscopy: longer and slimmer caryopsis of yellowish colour, without odour, taste mucilaginous floury
- Content compounds: proteins, oils, mineral compounds, vitamins, amino acids, saponins, sugars, glucokinins
- Usage: dietetic, metabolic, sedative, hypotensive, antidiabetic



Capsici fructus CzPh 2017



- Mother plant: *Capsicum anuum* var. *minimum*, *C. frutescens*
Solanaceae Pepper
- *Capsici oleoresina raffinata et quantificata* CzPh 2017
- *Capsici tinctura normata* CzPh 2017
- *Capsici acris extractum spissum normatum* CzPh 2017





Capsici fructus CzPh 2017

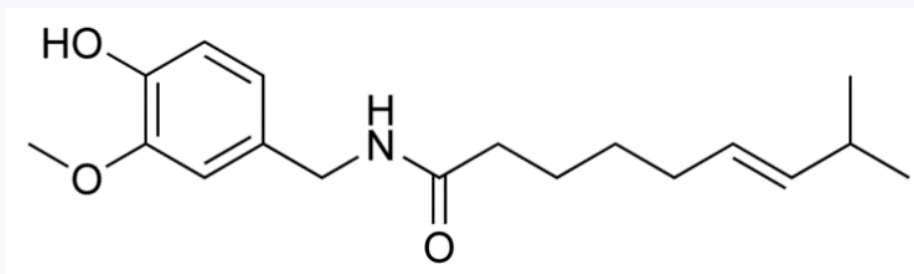
- Macroscopy: spindle like berry, hollow, numerous yellow kidney-shaped seeds, leatherlike pericarp is externally shiny, smoothly stripped, internally wrinkled, weak spicy odour, spicy later hot taste





Capsici fructus CzPh 2017

- Content compounds: alkaloid capsaicin, carotenoids (capsanthin), vitamins B₂, C, flavonoids, essential oil, sugars



kapsaicin

- Usage: stomachic, external derivans, rubefacient for rheumatism treatment
- Spiciness is measured in Scoville Heat Units



Capsici fructus CzPh 2017

Scoville heat units

Example peppers

800,000 to 3,200,000	Pepper X , Carolina Reaper , Dragon's Breath
350,000 to 800,000	Red savina , Chocolate habanero
100,000 to 350,000	Habanero , Scotch Bonnet
10,000 to 100,000	Malagueta pepper , Cayenne pepper , Tabasco pepper
1,000 to 10,000	Guajillo pepper , Jalapeño
100 to 1,000	Banana pepper , Cubanelle
0 to 100	Bell pepper , Pimento

Pungency

SHU

Very highly pungent

Above 80,000

Highly pungent

25,000 to 70,000

Moderately pungent

3,000 to 25,000

Pungency

SHU

Mildly pungent

700 to 3,000

Non pungent

0 to 700

Carvi fructus CzPh 2017



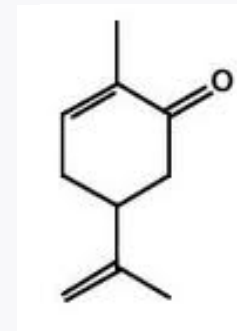
- Mother plant: *Carum carvi*, Apiaceae, Caraway, Persian cumin
- Carvi etheroleum ČL 2009



Carvi fructus CzPh 2017



- Macroscopy: *diachenium* flattened from sides, brown, 5 ribs, bald rough surface, odour and taste typical aromatic
- Content compounds: **essential oil** (carvone, limonene), oil, proteins, sugars, flavonoids
- Usage: carminative, spasmolytic, stomachic, digestive, bacteriostatic



karvon

Crataegi fructus CzPh 2017



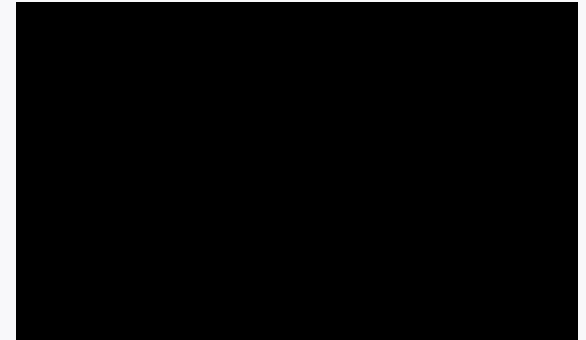
- Mother plant: *Crataegus laevigata* syn. *C. oxyacantha*, *Crataegus monogyna*, Rosaceae, Hawthorn



Crataegi fructus CzPh 2017



- Macroscopy: without odour, acidic taste
 - *C. oxyacantha*- fruits oval to spherical shape, calyx has got the scarification after stalk, 2-3 seedless
 - *C. monogyna*- fruits barrel-like shape, one seedless
- Content compounds: **flavonoids** (hyperoside, rutin), aminopurines, saponins, catechine tannins, vitamins, triterpenic acids (ursolic acid, crataegic acid)
- Usage: antisclerotic, hypotensive, sedative, venoprotective effect



hyperoside

Cynosbati fructus CzPh 2017



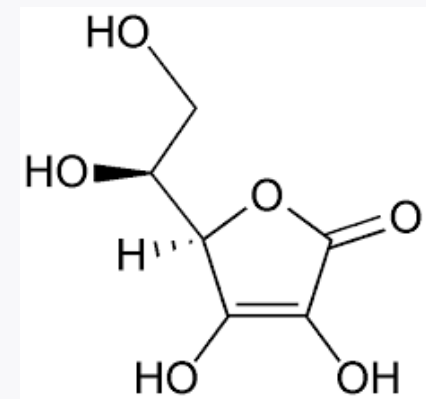
- Mother plant: *Rosa canina*, *Rosa pendulina* Rosaceae, Dog Rose





Cynosbati fructus

- Macroscopy: *hypanthium* oval, fleshy, shiny, dark red, inside hard achenes placed in small sharply hispid trichomes, honey-like odour, taste sweet-acid, mild astringent
- Content compounds: **vitamins C, B, K**, sugars, pectins, carotenoids, tannins
- Usage: vitaminiferic, diuretic, mild laxative, tonic



ascorbic acid



Juniperi fructus

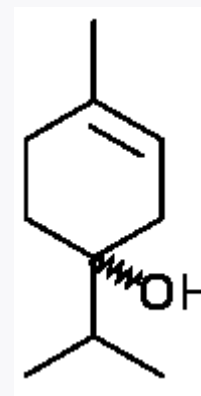
- Mother plant: *Juniperus communis*, Cupressaceae Juniper
 - Juniperi etheroleum ČL 2009





Juniperi fructus

- Macroscopy: spherical fruit, bald, shiny, frosted-like, on the top three-rayed joint, brown-green pulp with three hard 3-edged seeds, resinous odour, taste sweet than aromatic
- Content compounds: **essential oil** (terpinen-4-ol, pinens, sabinene), sugars, bitter substances, ascorbic acid, tannins, leucoanthocyanins
- Usage: diuretic, stomachic, urinary desinfectant, cholagogue, spices, liqueurs



terpinen-4-ol



Myrtilli fructus recens CzPh 2017

Myrtilli fructus siccus CzPh 2017

- Mother plant: *Vaccinium myrtillus*, Ericaceae, Blueberry
 - Myrtilli fructus recentis extractum siccum raffinatum et normatum CzPh 2017





Myrtilli fructus recens CzPh 2017

Myrtilli fructus siccus CzPh 2017

- Macroscopy: shrivelled berries with small stalk, on the top residues of calyx with deeper place, blue-purple pulp with numerous seeds, without odour, sweet-acid acrid taste
- Content compounds: catechine tannins, anthocyanins, organic acids (caffeic, cinnamic acid), pectine, sugars
- Usage: antidiarrhoic, desinficient, dietetic, astringent





Papaveris fructus

- Mother plant: *Papaverum somniferum*, Papaveraceae, Poppy





Papaveris fructus CzPh 2017

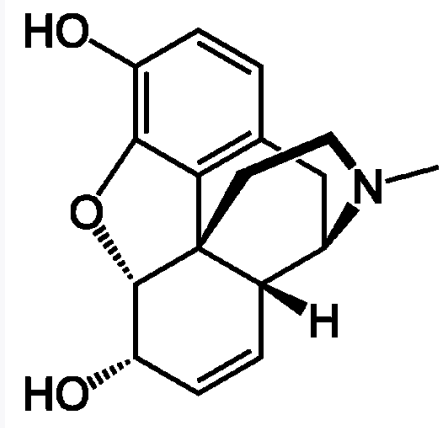
- Macroscopy: capsules, perfectly ripen poppy heads of spherical shape, matte bright brown, ovary terminated by imperfect segmented radial stigma, narcotic odour, bitter taste



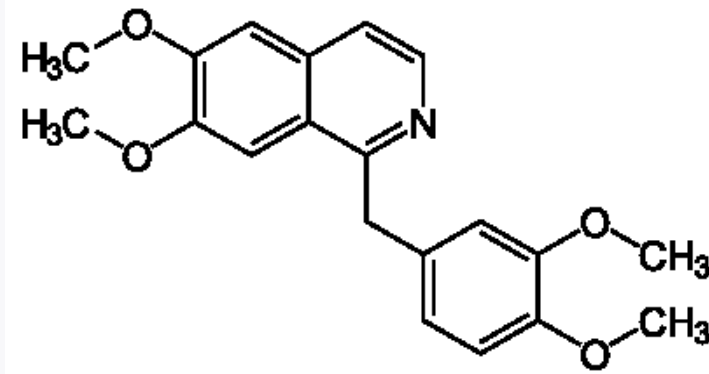


Papaveris fructus CzPh 2017

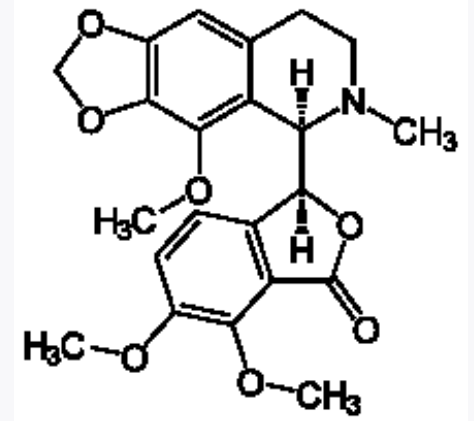
- Content compounds: opium alkaloids (15-25% of latex) - **morphine, codeine, thebaine, noscapine, papaverine**, in form of different salts, meconic acid



morfin



papaverin



noscapin

- Usage: isolation of alkaloids.



Phaseoli fructus sine semine CzPh 2017



- Mother plant: *Phaseolus vulgaris*, Fabaceae, Common Bean





Phaseoli fructus sine semine CzPh 2017

- Macroscopy: legumes, on the surface matte yellowish, without seeds, at the end sharpened, screwed, without odour, mucilaginous taste



- Content compounds: **amino acids** (arginine), triterpens, organic acids, allantoin, choline, mineral compounds (chromium salts), hemicelluloses, glucokinins
- Usage: antidiabetic, metabolic, dermatologic



Sennae acutifoliae fructus CzPh 2017

Sennae angustifoliae fructus CzPh 2017

- Mother plant: *Cassia senna (acutifolia)*, *Cassia angustifolia*,
Fabaceae





Sennae acutifoliae fructus CzPh 2017

Sennae angustifoliae fructus CzPh 2017

- **Macroscopy:** without odour, bitter mucilaginous taste
 - *C. senna* – flat kidney-shaped legumes up to 3.5 cm long, with brown spots corresponding to seeds positions, translucent, markedly sharpened, shortly stalked, 6-7 seeds
 - *C. angustifolia* – legumes insignificantly kidney-shaped, yellow-brown to yellow with brown spots, 5-8 seeds



Cassia Senna:
A, leaflets; B, legumes.



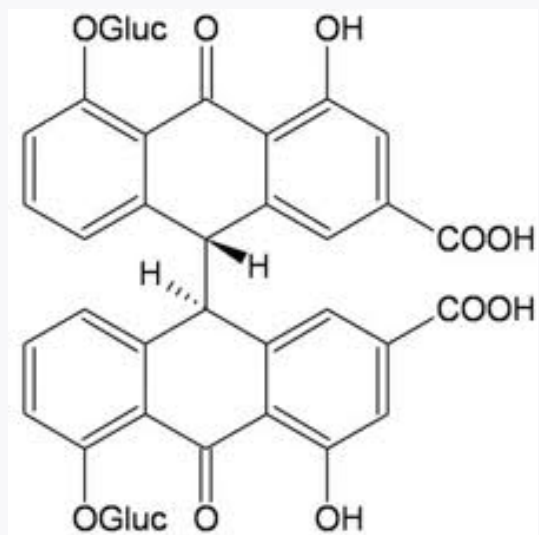
Cassia angustifolia: half natural size; A, leaflets; B, legumes.



Sennae acutifoliae fructus CzPh 2017

Sennae angustifoliae fructus CzPh 2017

- Content compounds: dianthrone derivatives – sennosides A, B, C, D, mucilage, flavone glucosides, bitter substances, tannins



sennoside A

- Usage: irritant laxative



Some interesting tips

- List of crude drugs assorted according to their main effect and usage:
<http://awmkhan.blogspot.com/p/blog-page.html>
- Portal about medicines for patients and healthcare professionals:
<https://www.drugs.com/>
- Bioinformatics and cheminformatics portal with detailed drug data:
<https://www.drugbank.ca/>