

Pharmacognosy

lab exercise 3



Root drugs

Balsams, Tars

Gumms

Tubers



Filicis maris radix (*rhizoma*)



- Mother plant: *Dryopteris filix-mas*, Dryopteridaceae
(male fern)

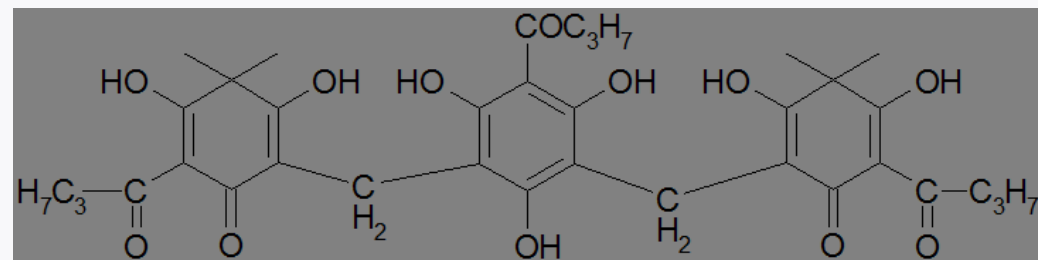




Filicis maris radix (*rhizoma*)



- Macroscopy: unstripped, uncut brown rhizomes, on fractures greenish, without odour, disgusting bitter taste
- Content compounds: **phloroglucinol derivatives** (mixture is called filicin) in form of oleoresin
- Usage: veterinary antihelminthic (obsolete)

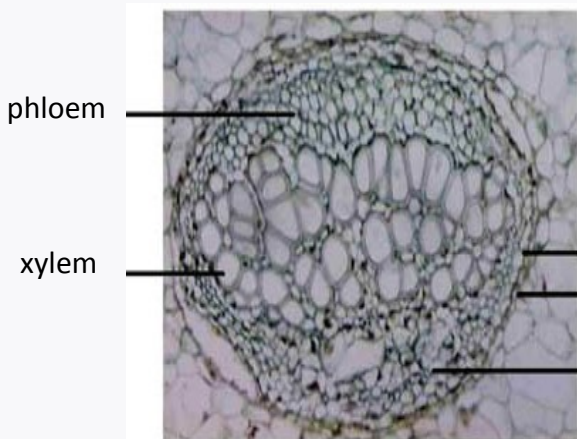


filixic acid

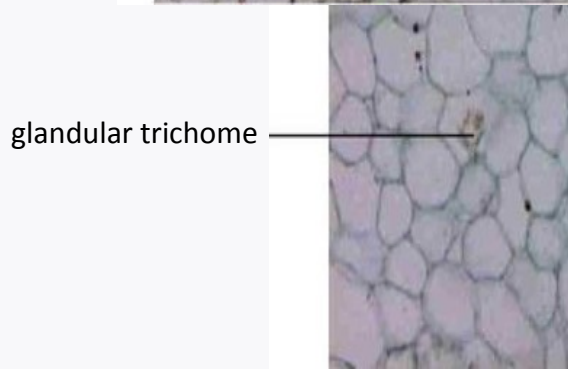
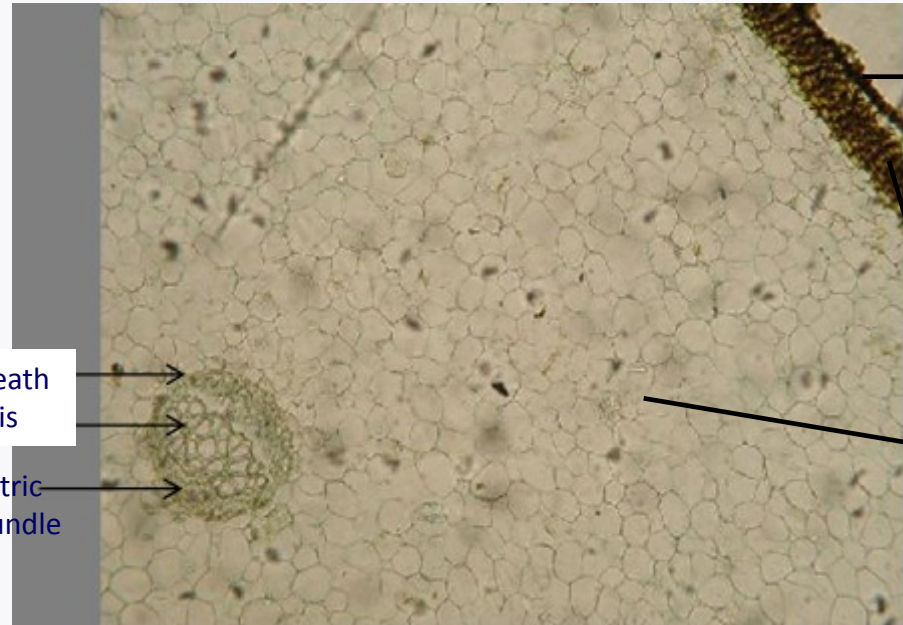
Filicis maris radix (*rhizoma*)



- **Microscopy:** monocotyledonous plant, **hadrocentric** vascular bundles with endodermis and starchy sheath, glandular trichomes in basic parenchyma



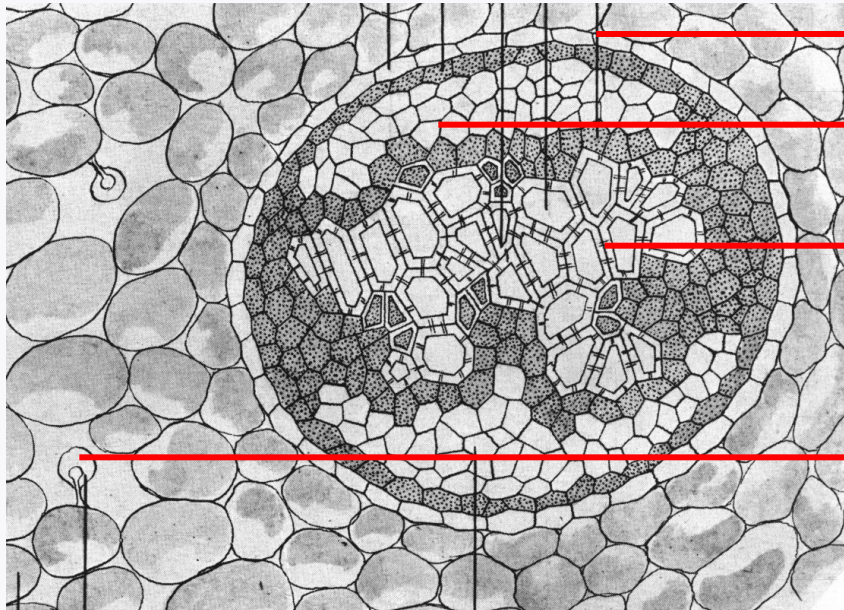
starchy sheath
endodermis
hadrocentric
vascular bundle



Filicis maris radix (*rhizoma*)



- Microscopy: hadrocentric vascular bundle



endodermis

phloem

xylem

internal glandular
trichome



Sarsaparillae radix (sarsaparilla)

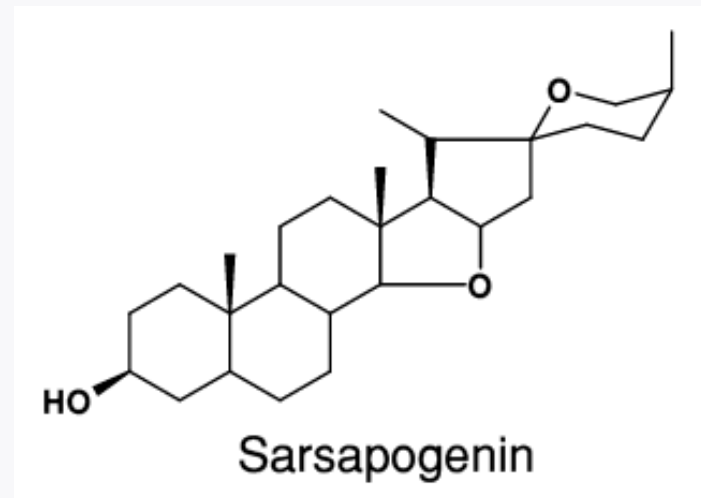
- Mother plant: *Smilax sp.*, Smilacaceae (catbrier, prickly-ivy)





Sarsaparillae radix (sarsaparilla)

- Macroscopy: long, without branches, cylindrical, brown, without odor, slimy taste
- Content compounds: **steroidal saponins**
- Usage: metabolic, therapy of syphilis





Sarsaparillae radix (sarsaparilla)

■ Microscopy:

rhizodermis

primary cortex with raphides and starch

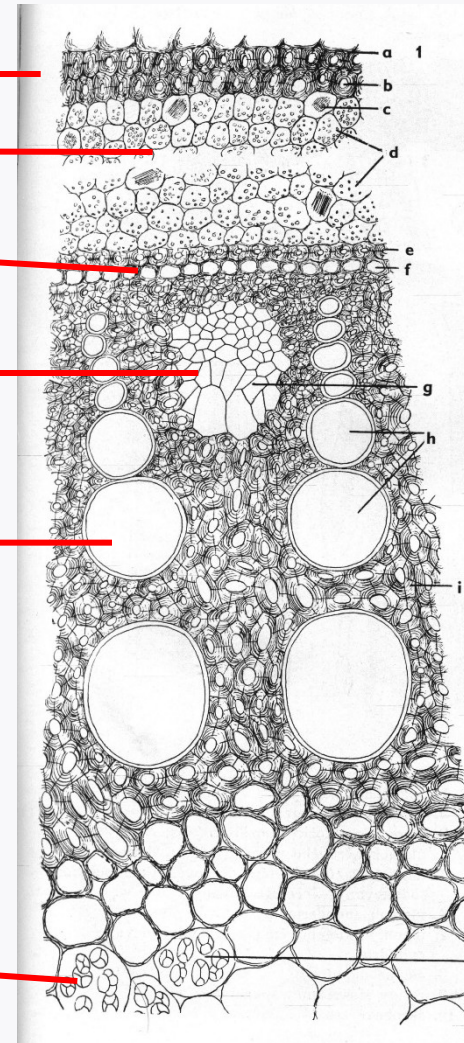
endodermis

sieve-tubes

vessel

Vascular bundle: radial polyarch

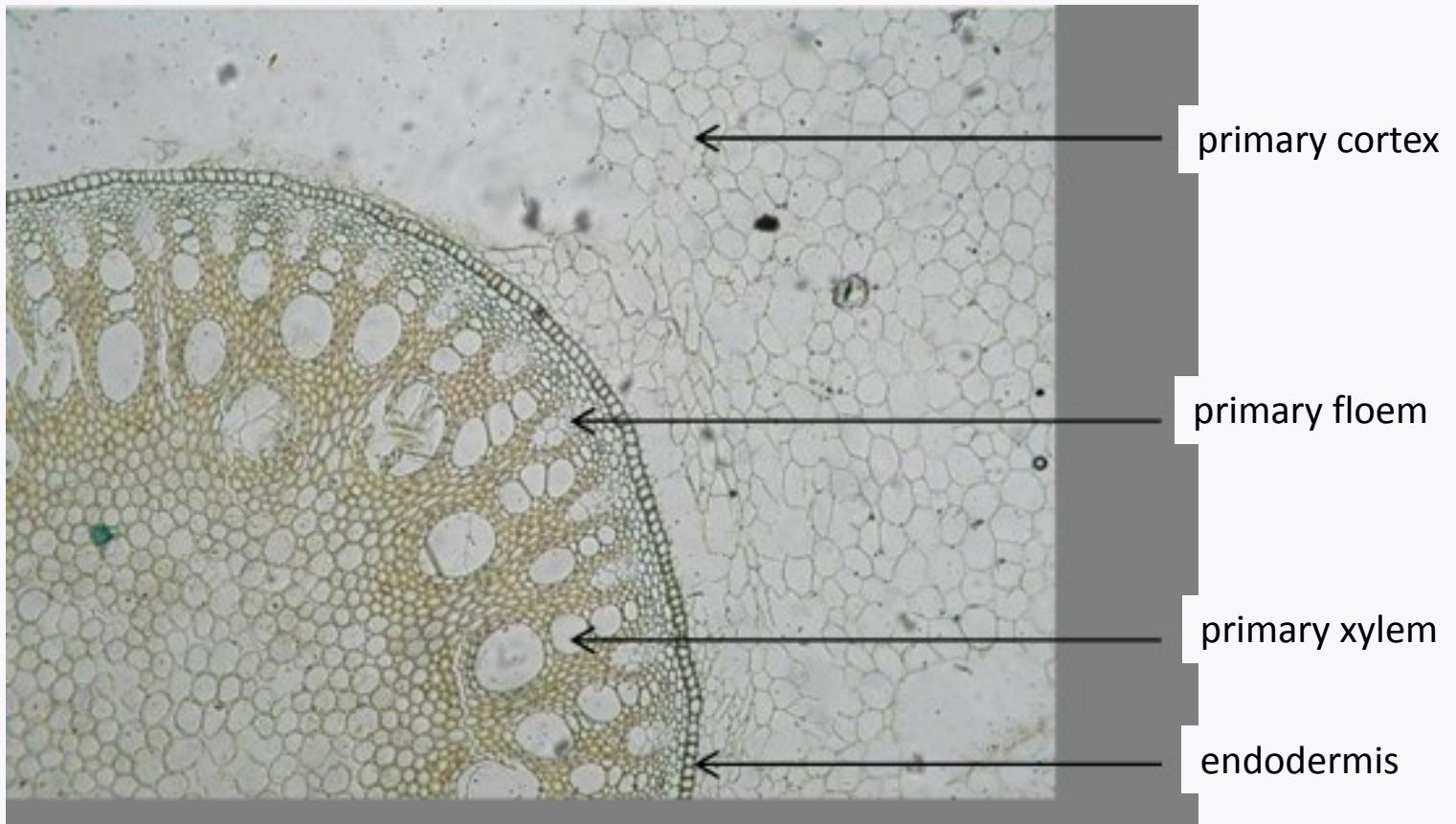
starch





Sarsaparillae radix (sarsaparilla)

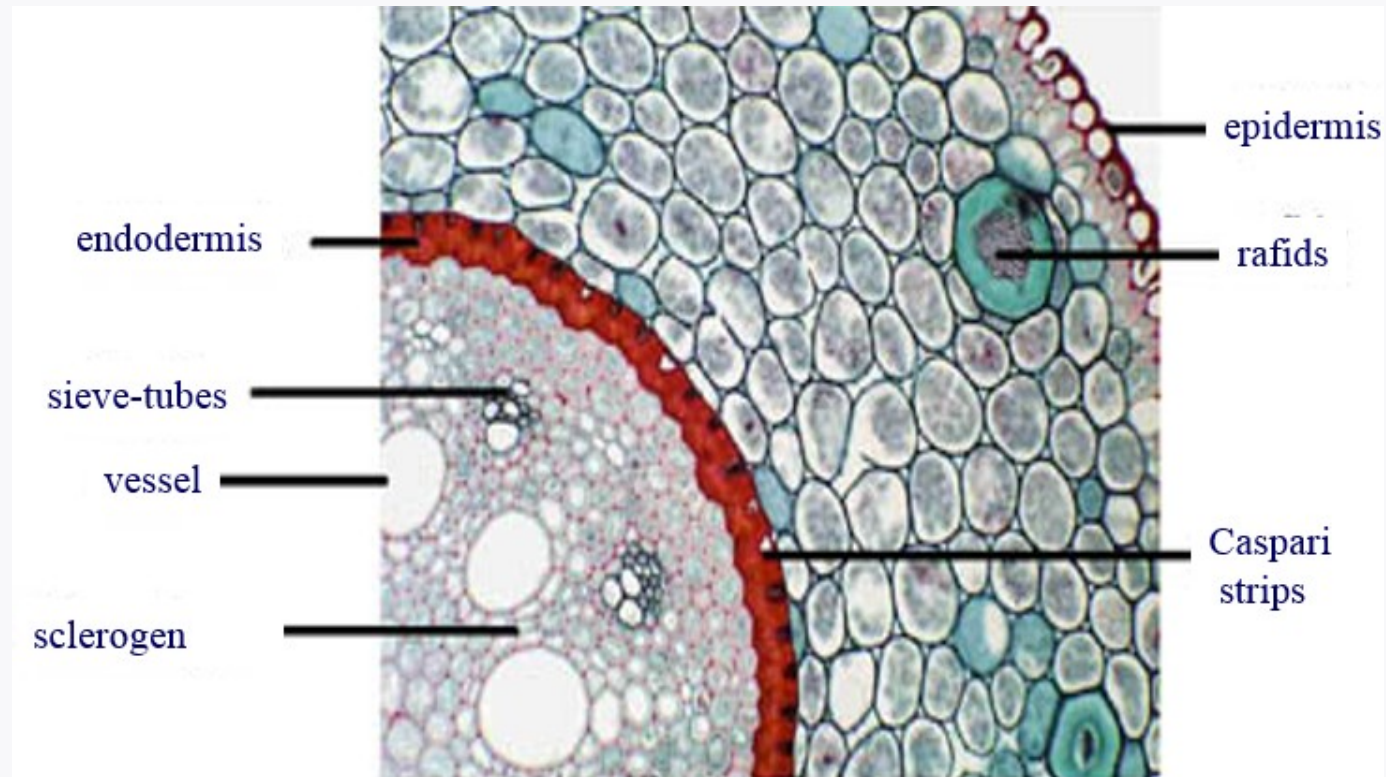
- Microscopy:





Sarsaparillae radix (sarsaparilla)

- Microscopy:





Veratri albi radix CzPh 2017



- Mother plant: *Veratrum album*, Melanthiaceae (white hellebore)

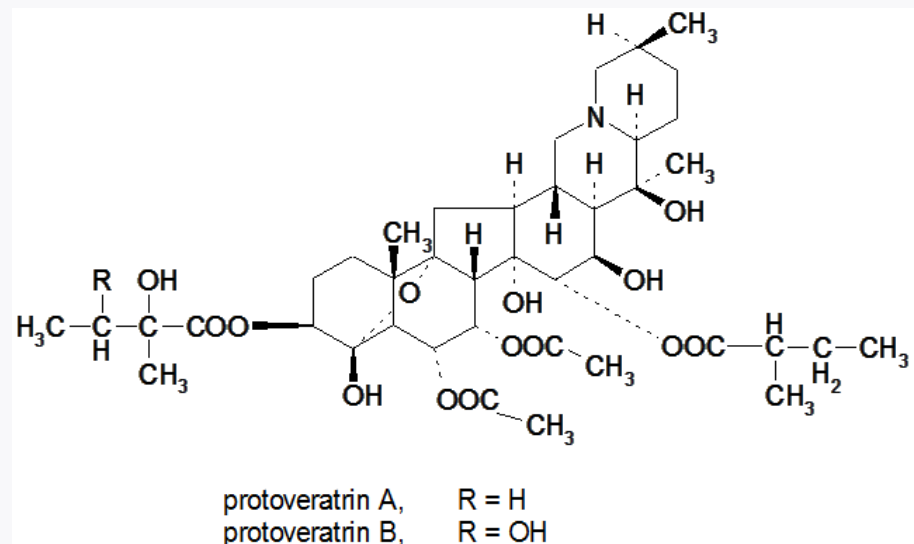




Veratri albi radix CzPh 2017



- Macroscopy: black-brown rhizome obovate shape, with roots surrounding or with scars after roots, fracture is white-grey, without odour, bitter taste
- Content compounds: steroidal alkaloids **protoveratrine A, B**
- Usage: hypotensive, ectoparasitic, isolation of alkaloids





Veratri albi radix CzPh 2017

■ Microscopy:

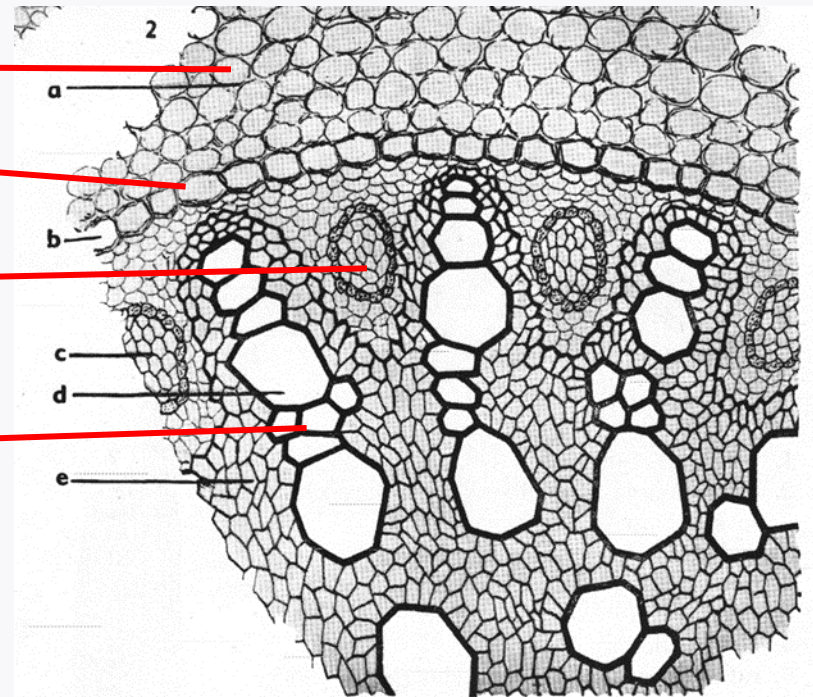
primary cortex

endodermis

(Caspari strips)

sieve-tubes

ducts



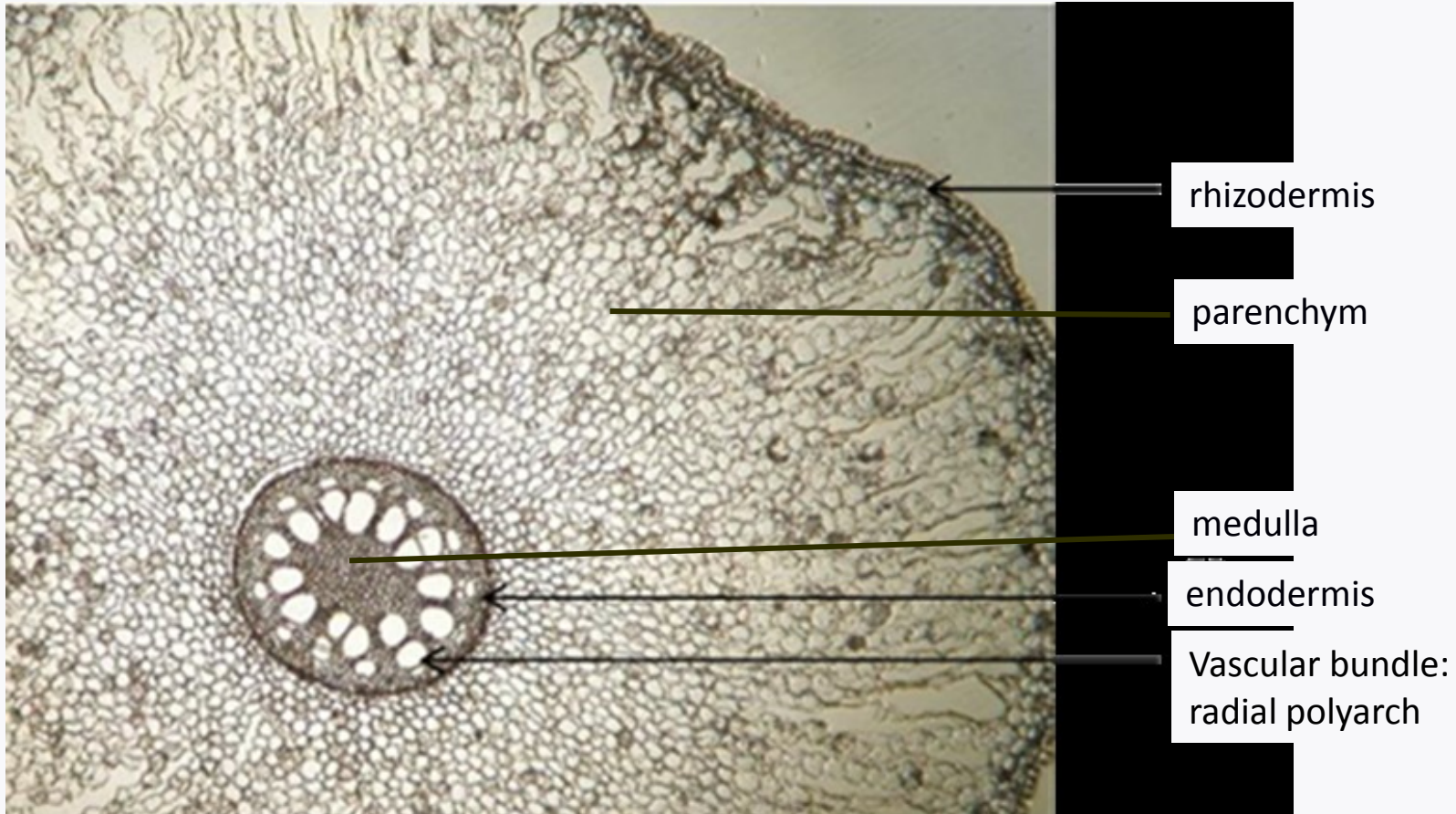
Vascular bundle: radial polyarch



Veratri albi radix CzPh 2017



■ Mikroskopie:





Calami aromatici radix

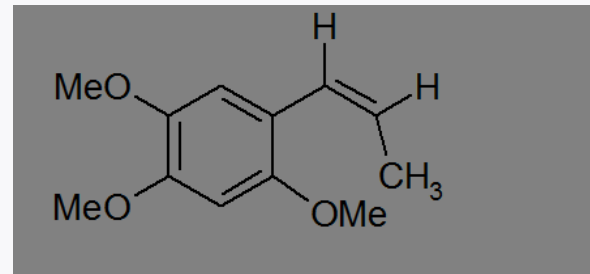
- Mother plant: *Acorus calamus*, **Acoraceae** (sweet flag)





Calami aromatici radix

- Macroscopy: grey-brown wrinkled rhizomes without roots (visible scars), aromatic odor, strong spicy taste
- Content compounds: **volatiles** (β -asaron), **bitter substances**, tannins, cholin, starch and mucilages
- Usage: aromatic amarum, stomachic, spasmolytic

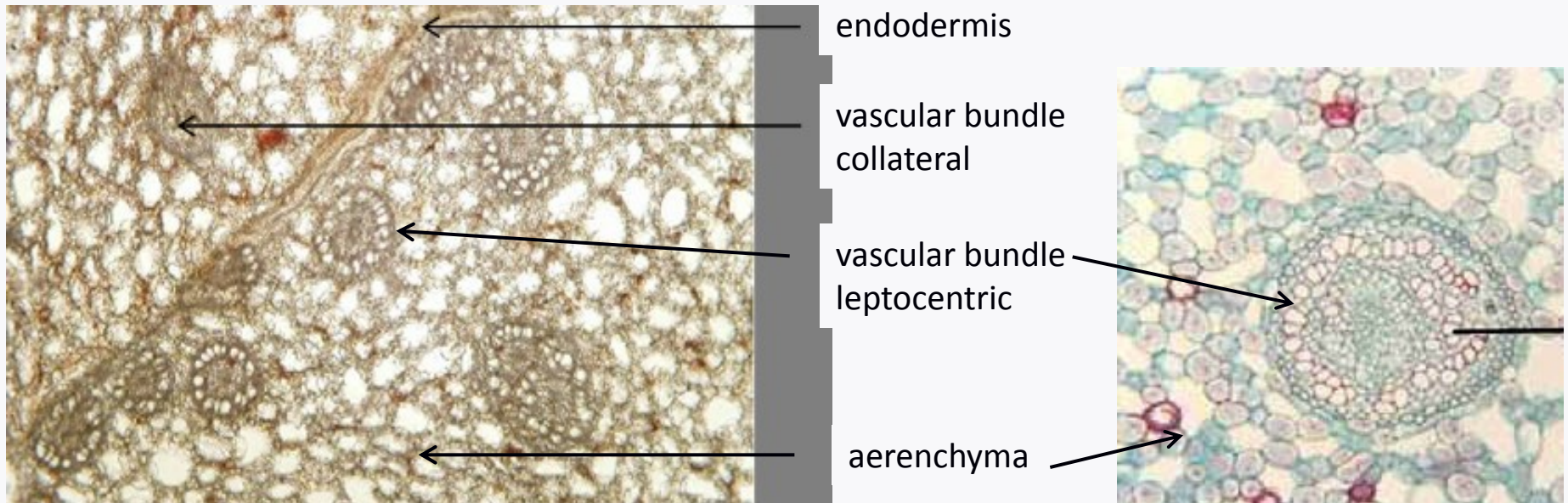


β -asaron



Calami aromatici radix

- Microscopy: rhizodermis, primary cortex with vascular bundles **collateral** in sclerogen sheath, endodermis, central cylinder with **leptocentric** vascular bundles, often volatiles-containing cells, characteristic chain parenchyma - **aerenchyma**





Calami aromatici radix

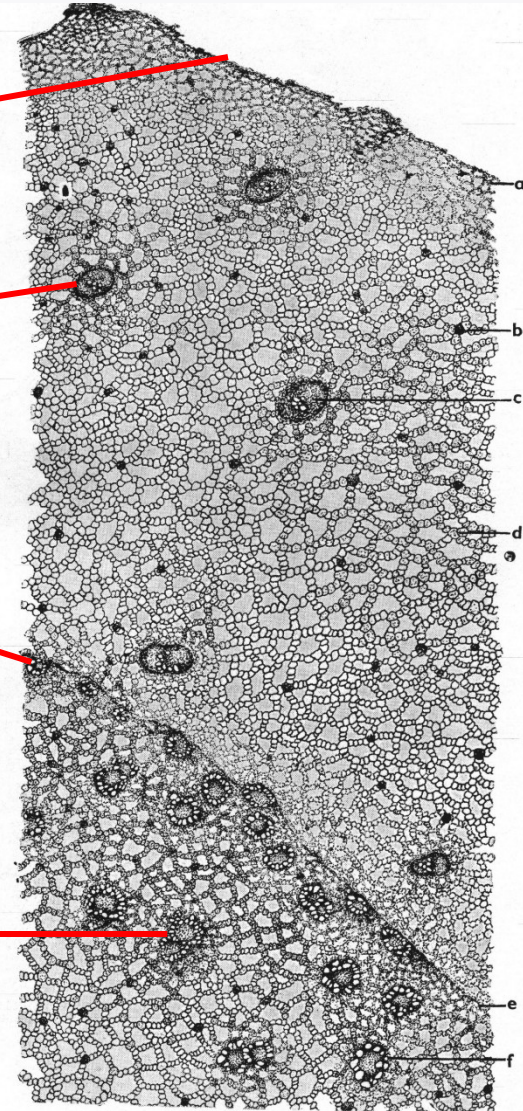
■ Microscopy:

rhizodermis

collateral vascular bundle

endodermis

leptocentric vascular bundle





Lichen islandicus CzPh 2017 (iceland moss)

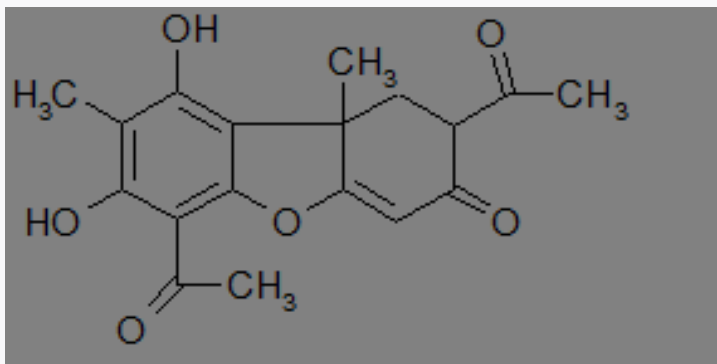
- Mother plant: *Cetraria islandica*, Parmeliaceae



Lichen islandicus CzPh 2017 (iceland moss)



- Macroscopy: thin, branched, fragile thallus, upper side green-brown, under side grey-white with bright spots, weak odour, slimy taste
- Content compounds: **lichenin, isolichenin, lichen acids** (usnic acid, fumarprotocetraric acid), iodine, flavonoids, vitamins A and B₁
- Usage: mucilage, antitussive, amare



Usnic acid





Lichen islandicus CzPh 2017 (iceland moss)

- Microscopy: transversal section

upper cortical part

(stratum corticale superior)

hyphae

medullar part

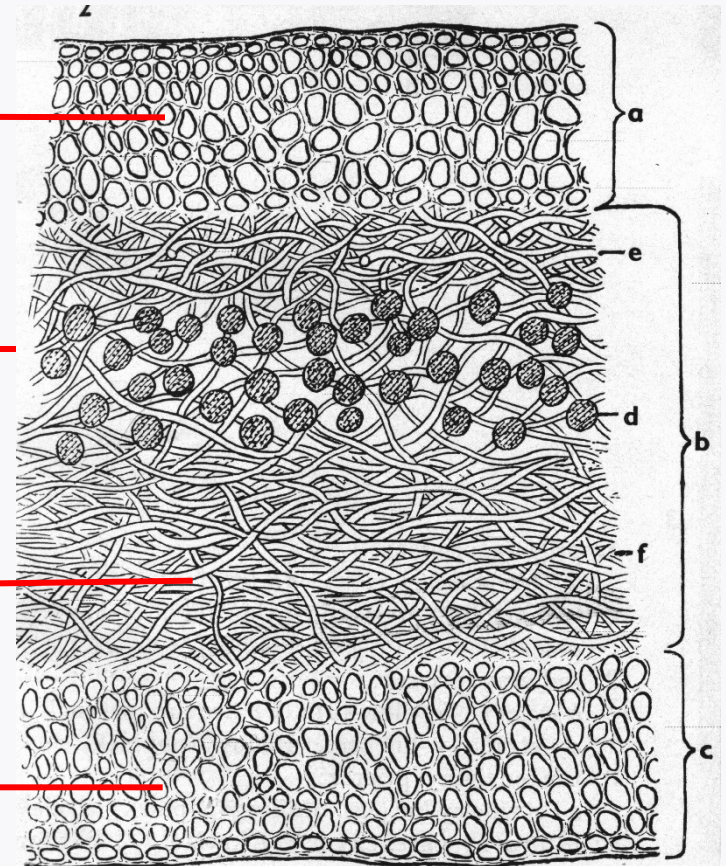
(stratum medulare)

gonidia

hyphae

lower cortical part

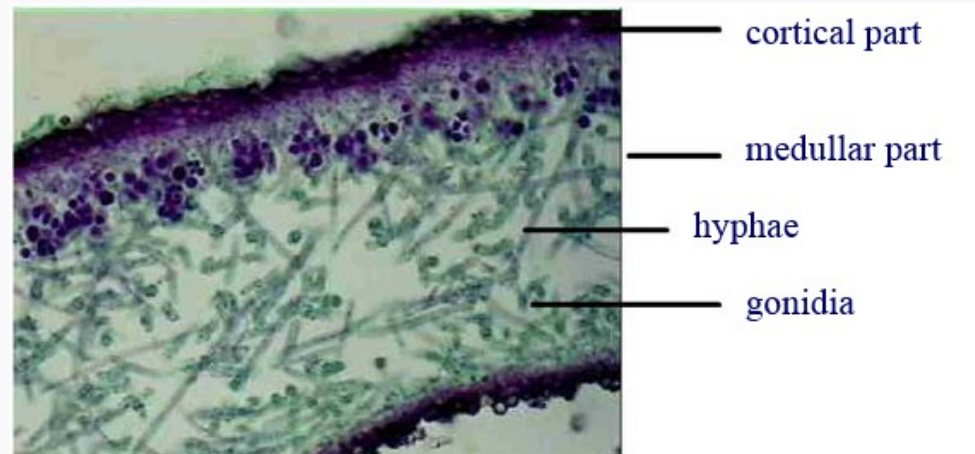
(stratum corticale inferior)





Lichen islandicus CzPh 2017 (iceland moss)

■ Microscopy:





Secale cornutum (rye ergot)



- Mother plant: *Claviceps purpurea*, Clavicipitaceae
(ergot fungus)

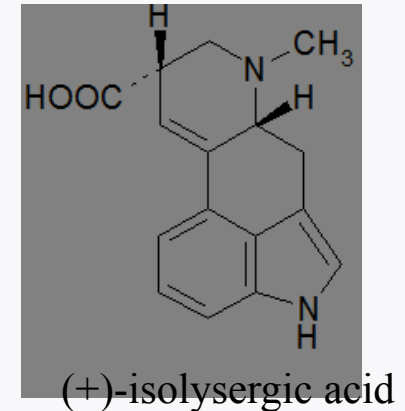
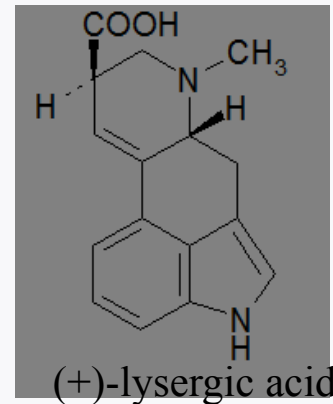
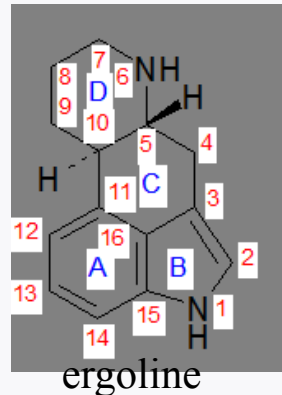




Secale cornutum (rye ergot)



- Macroscopy: drug is a sclerotium of roll-shape, dark purple at the surface, characteristic odour, bitter-sweet taste
- Content compounds: **ergoline alkaloids**: derivatives of lysergic acid
 - **Amino alcohol derivatives**: ergometrine
 - **Peptide derivatives**: ergotamine group (ergotamine)
ergoxine group (ergostine)
ergotoxine group (ergocristine, ergocornine, ergocryptine)





Secale cornutum (rye ergot)



- **Usage:** uterotonic (ergometrin), antimigrenic (ergotamine), spasmolytic, hypotensive, sedative
- Infamous cousin: **LSD – lysergide** (lysergic acid diethylamide)
 - Psychotomimetic, hallucinogen
- **Ergotism:** ergot poisoning
 - Gangrenous ergotism (vasoconstrictor effect in extremities – tissue death – gangrene – shedding of fingers, hands, limbs) known as St. Anthony’s fire
 - Convulsive ergotism (painful convulsions, psychotic disturbances, hallucinations)

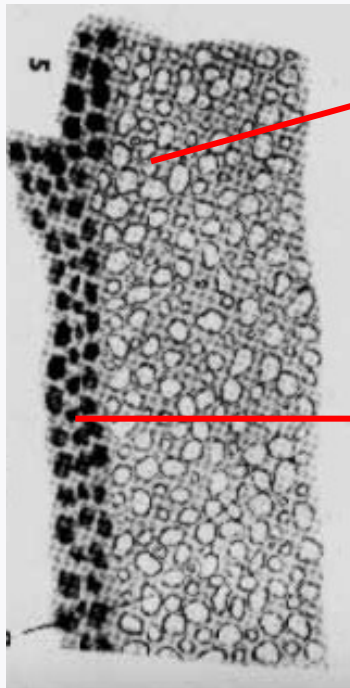


Secale cornutum (rye ergot)



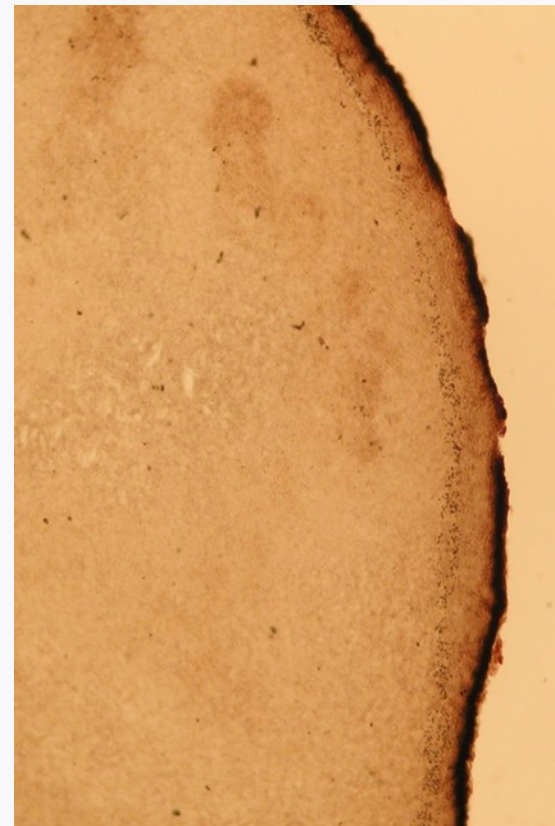
- Microscopy:

Transversal section: surface layer (3-8 layers), containing the purple pigment, plectenchyma with air ruptures



plectenchyma

surface layer





MACROSCOPY



***Camphora racemica* CzPh 2017**

***Camphora D* CzPh 2017**

Mother plant: ***Camphora officinarum (Cinnamomum camphora)***

Lauraceae (camphor tree)

- Natural camphor is dextro-rotary and is obtained by steam distillation from the wood of camphor tree



By Peripitus - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=3288580>

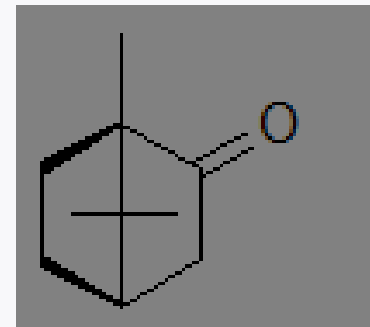
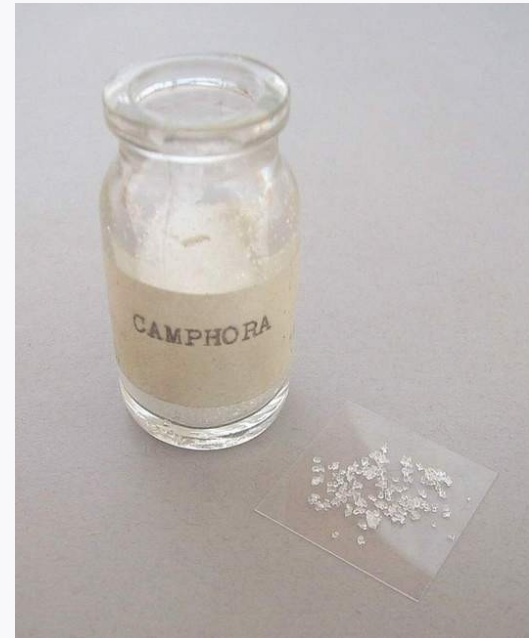




Camphora racemica CzPh 2017

Camphora D CzPh 2017

- Macroscopy: drug consist of white crystalline powder of characteristic odour, hot, later cool taste
- Content compounds: **2-bornanone**
- Usage: antiseptic, derivans (neuralgia, gout pain, rheumatic pain), central analeptic





Carbo activatus CzPh 2017

- Macroscopy: black light powder without lumps, highly adsorbent, without taste and odour
- Content: **80 - 95% carbon**
- Usage: poisonings, gastrointestinal dysfunctions, water purifying, solution bleaching





Chrysarobinum



- Mother plant: *Andira araroba*,
Fabaceae
- Macroscopy: light, microcrystalline,
yellow powder, without odour,
strong irritant
- Content: derivatives of **anthracene**
- Usage: cytostatic effects,
dermatology (keratolytic for therapy
of psoriasis and mycosis)





Balsams (oleoresins)

- Complex mixtures of carbohydrates and resins dissolved in them
- Produced by plants under normal conditions or pathologically after wounding
- *Balsamum peruvianum* CzPh 2017
- *Balsamum toluatanum* CzPh 2017
- *Balsamum canadense*
- *Balsamum copaivae*

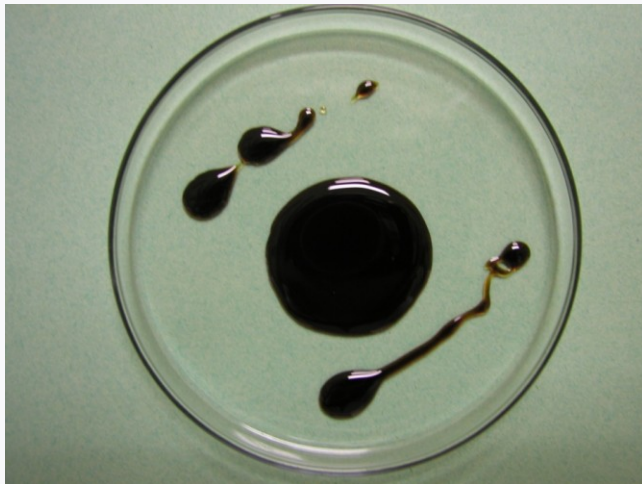




Balsamum peruvianum

CzPh 2017, Balsam of Peru

- Mother plant: *Myroxylon balsamum* var. *pereirae*, Fabaceae
- Macroscopy: transparent syrup-like liquid of dark-red colour, vanilla odour, bitterish taste

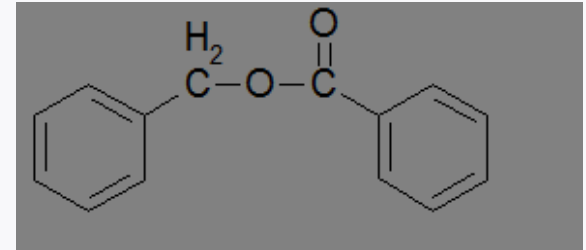




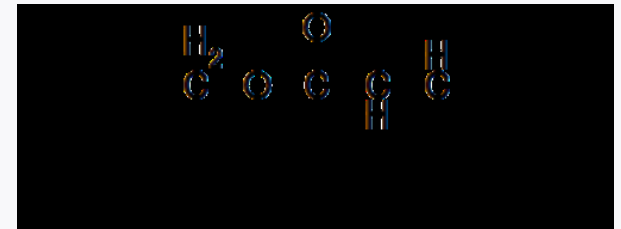
Balsamum peruvianum

CzPh 2017, Balsam of Peru

- Content compounds: **cinnamein**
(mixture of cinnamate and benzoate ester of benzyl alcohol), resinous compounds, free aromatic acids, vanillin
- Usage: desinficiens, slight derivans, support of tissue granulation and healing



benzoate ester of benzyl alcohol



cinnamate ester of benzyl alcohol

Balsamum toluatanum

CzPh 2017, Tolu Balsam



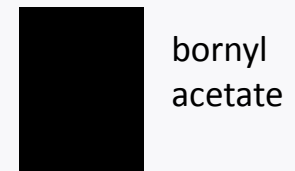
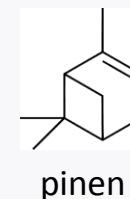
- Mother plant: *Myroxylon balsamum* var. *balsamum*, Fabaceae
- Macroscopy: soft material with dispersed microscopic crystals of yellow-brown colour, vanilla odour, aromatic taste, slight acid
- Content compounds: **cinnamein**, 80 % of resin, vannilin and eugenol
- Usage: expectorans, healing preparation for wounds treatment, cosmetics



Balsamum canadense, Canada balsam



- Mother plant: *Abies balsamea*,
Pinaceae (balsam fir)
- Macroscopy: syrup-like liquid of light to green-yellow colour, weak fluorescence, balsamic odour and taste
- Content compounds: **volatiles** with pinene and bornyl acetate
- Usage: closure of microscopic slides, cement for optics, rarely for therapy of bronchial diseases



Balsamum copaivae



- Mother plant: tree *Copaifera*, Fabaceae
- Macroscopy: syrup-like yellow liquid, aromatic odour, spicy bitter taste
- Content compounds: volatiles
- Usage: desinfiens in veterinary medicine





Pixes (tars)

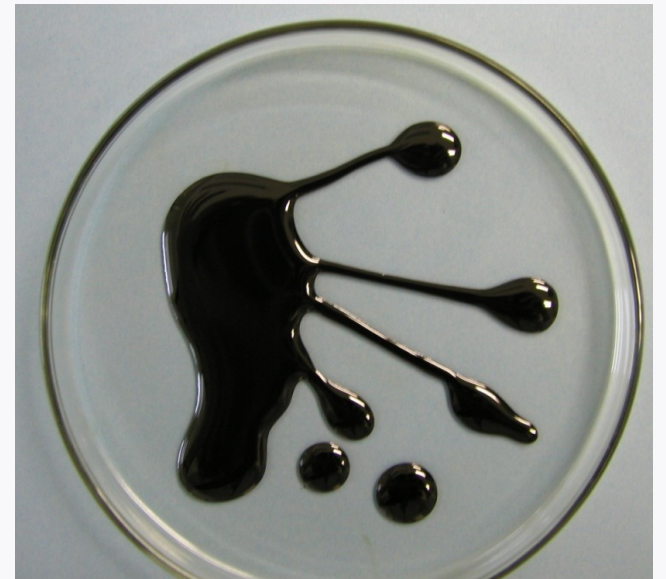
- Variable mixtures of aromatic hydrocarbons and other compounds, produced by dry distillation of coal, woods, and slates
- Content compounds: **polycyclic aromatic hydrocarbons**, heterocycles, aliphatic hydrocarbons
- *Lithantracis pix* CzPh 2009
- *Fagi pix* CzPh 2009
- *Betulae pix*





Lithantracis pix CzPh 2009

- Obtained by dry distillation of black coal
- Macroscopy: black shiny viscous liquid of characteristic odour, soluble only in organic solvents
- Usage: dermatologic





Fagi pix CzPh 2009

- Mother plant: tree *Fagus sylvatica*, **Fagaceae** (European beech)
- Macroscopy: black-brown viscous liquid of characteristic odour
- Content compounds: creosot
- Usage: dermatologic





Betulae pix

- Mother plant: *Betula pendula*, **Betulaceae** (silver birch)
- Macroscopy: yellowish liquid of pleasant odour
- Usage: rarely used in cosmetics or dermatology





Gumms and mucilages

- Amorphous substances, optically active, they form colloidal solutions in water
- Content compounds: strings of pentoses and hexoses (arabinose, rhamnose, galactose)
- *Acaciae gummi* CzPh 2017
- *Gummiresina myrha* CzPh 2017
- *Tragacantha* CzPh 2017



Acaciae gummi CzPh 2017



- Mother plant: *Acacia senegal*, Fabaceae (gum acacia)

Alternatively other species of African *Acacia* species or *A. seyal*

- Macroscopy: irregular round-shaped peaces, white to yellow, transparent, fragile with ruptures and breaks, without odour, mucous taste, adhesive
- Content compounds: polysaccharides
- Usage: mucilaginosum, more often as excipient in pharmacy





Gummiresina myrrha CzPh 2017

- Mother plant: *Commiphora myrrha*, **Burseraceae** (African myrrh)
- Macroscopy: yellow-brown mass, which solidifies on air, characteristic odour and taste
- Content compounds: 50-60 % **slimy compounds**, resins, volatiles oils, bitter compounds
- Usage: deodorant of oral cavity, desinfiens, astringents





Tragacantha = *Traganth* CzPh 2009

- Mother plant: *Astragalus gummifer* or other species from West Asia, Fabaceae
- Macroscopy: foliate, white to yellow flat peaces of hornlike consistence, translucent, without odour, slimy taste
- Content compounds: polysaccharides, 3 % of starch
- Usage: mucilaginous, mild laxative, excipient - binder, emulsifier, ointment base, cement, lubricant



<http://www.biolib.cz/cz/taxonimage/id76775/?taxonid=196259>





Tubers

- Underground formations, they do not replace roots
- *Aconiti radix*
- *Colchici radix*



Aconiti radix (tuber)



Mother plant: *Aconitum napellus*, Ranunculaceae

(monk's-hood, wolfsbane)

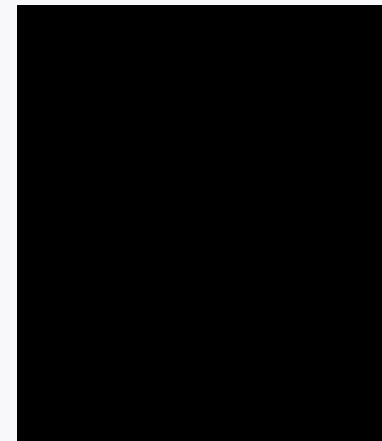




Aconiti radix (tuber)



- Macroscopy: heavy hard turnip-shaped tubers, wrinkled, dark brown, with residues of side roots, without odour, bitter taste, irritant to vomit
- Content compounds: : diterpenic alkaloids - aconitine, napelline, atisine; tannins, starch
- Usage: formerly as analgesic and antipyretic for gout, neuralgia and migraine
- **Danger - aconitine belongs to very poisonous compounds!**



aconitine

Colchici radix



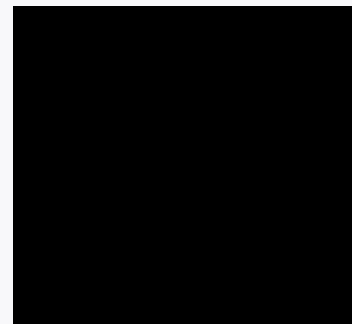
- Mother plant: *Colchicum autumnale*, Colchicaceae (autumn crocus)



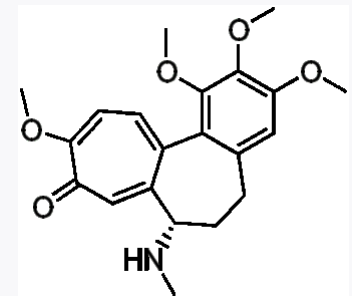
Colchici radix



- Macroscopy: subsidiary full tubers of brown colour, without odour, sharp bitter taste
- Content compounds: highly toxic alkaloids **colchicine** and **demecolcine**
- Usage: cytostatic, antimitotic, antiuratic



colchicine



demecolcine