



SUBSTANCES USED FOR LOCAL EFFECTS

ASTRINGENTS (tannins)

- External usage
- Internal usage

EPITHELISANTS, GRANULANTS → DERMATOLOGICS

- External usage



TANNINS

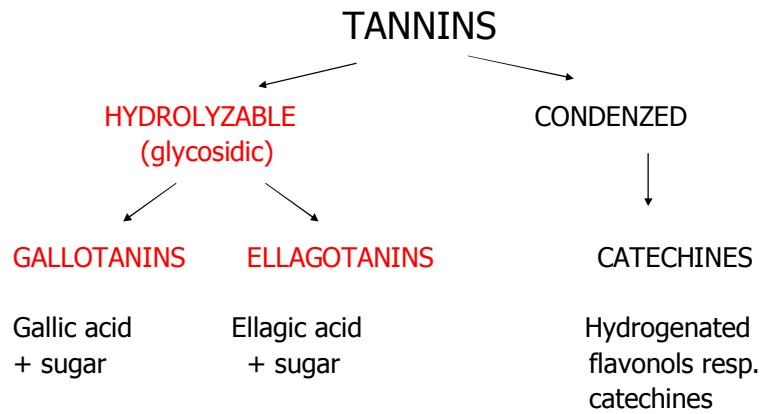
Characteristics

- Heterogeneous organic polyphenols with relatively high molecular weight
- Amorphous compounds forming in water acidic colloid solution with astringent taste
- After reaction with proteins produce insoluble substances → limited therapeutical usage; leather industry – change skin to leather
- With heavy metals and alkaloids (with exception of morphine, atropine, cocaine) form almost insoluble precipitates, with iron salts form inks
- They possess ability to agglutinate erythrocytes
- Oxidize, condensate and polymerize to non-active phlobaphenes
- In certain period of plant development as a defense against microorganisms

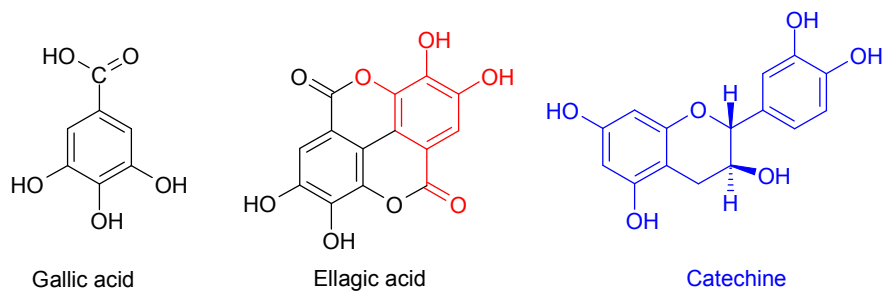
Occurrence:

Dicotyledonous plants with exception of Papaveraceae and Brassicaceae
Rarely monocotyledonous plants

CLASSIFICATION ACCORDING TO THE STRUCTURE



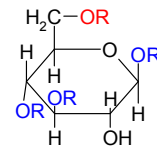
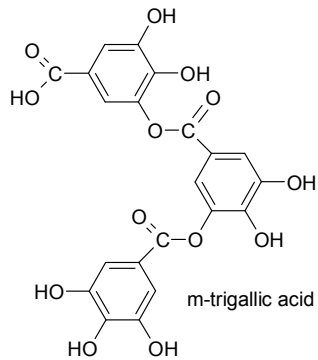
BULDING BLOCKS OF TANNINS





EXAMPLE OF DEPSIDIC BOND

ESTER BOND BETWEEN CARBOXYLIC GROUP OF ONE MOLECULE AND HYDROXYL GROUP OF ANOTHER MOLECULE OF THE SAME COMPOUND



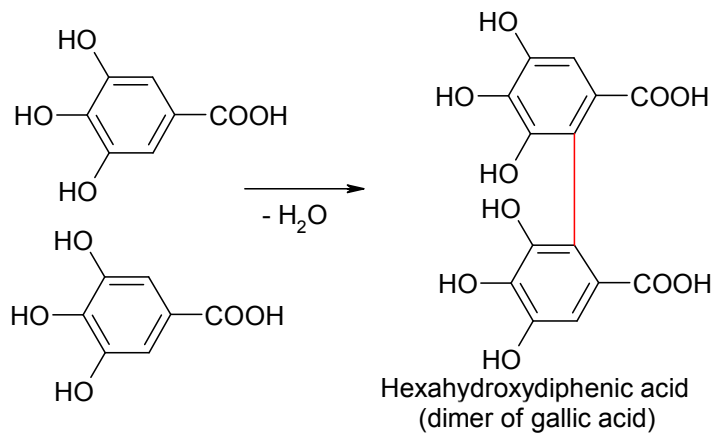
Tannin

R = gallic acid

R = m-trigallic acid

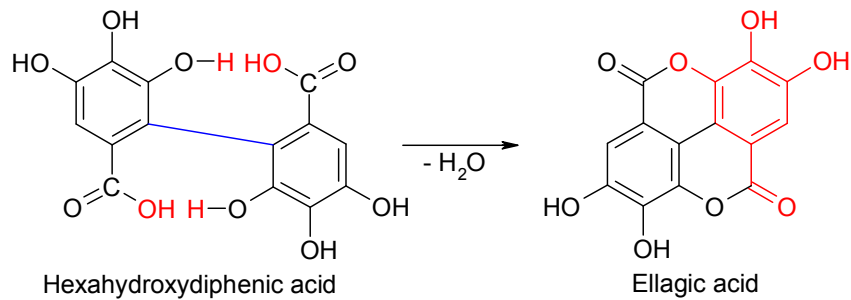


CONNECTION OF GALLIC ACID VIA C-C BOND





ELLAGIC ACID FORMATION



CONDENSED TANNINS (CATECHINES)

Basic building block is catechine and its isomers, furthermore hydroxyflavandiols (leucoanthocyanidins), hydroxyderivatives of cinnamic acid.

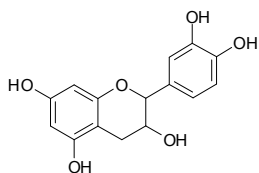
Majority of condensed tannins is created in postmortal condensation process without effect of enzymes.

Catechins condense in weakly acidic environment of cell liquid to true water soluble amorphous tannins. This process is present also during „postmortal“ wood storage. Condensation can take place also into dark water-insoluble phlobaphenes.

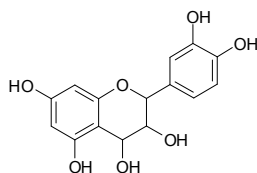
Enzymatic change of catechines via polyphenoloxidases (for example red pigmentation of cacao beans)

Some catechine tannins are in form of esters of catechine with gallic acid (for example epicatechine-3-gallate in *Theae folium*).

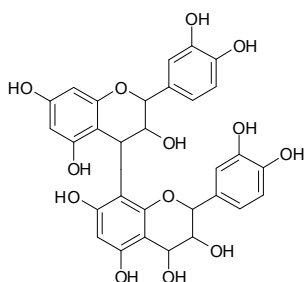
CONDENSED TANNINS (CATECHINES)



Catechine (3-flavanol)



Leukoanthocyanidine (3,4-flavandioli)



Dimeric condensation product as a first level of tannin formation from flavandioli and catechin

TANNINUM – TANNIN ČL 2005

Quercus infectoria – gall oak (Fagaceae)

Mixture of esters of glucose with gallic acid and 3-galloylgallic acid

Sources: tree widespread in Europe, Asia Minor, Iran

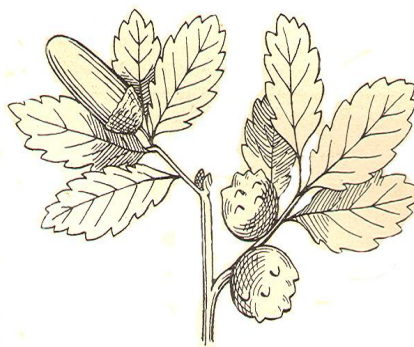
Drug: Gallae – oak apples; galls produced after laying of eggs by gall wasp (*Cynips gallae tinctoriae*) into young of developing leaves.

Instead of the shoot the rounded gall is formed, in which the larvae of wasp is living. Tannin is accumulated inside galls.

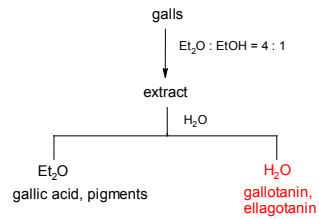
Pharmacopeia accepts especially galls of so called Turkish (Alepo) type. Rounded formations with diameter 1,5 to 2 cm, hard, grey-brown, glabrous, irregularly rough.

Usage: internal: antidiarrhoic

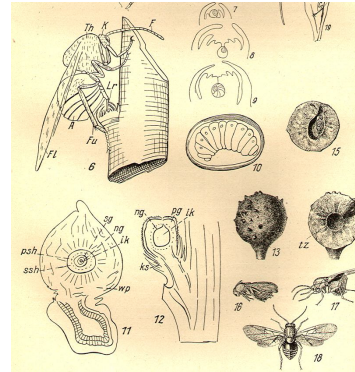
external: burns, frostbites, UV filter



ISOLATION OF TANNIN FROM GALLS



Tannin possesses astringent taste. Storage in well closed vessels protected from light. Solutions are prepared in time of need "ex tempore".



Hamamelidis folium – Witch hazel leaves (ČL 2005)

Hamamelis virginiana – witch hazel (Hamamelidaceae)


Source: Shrub or tree, native in eastern part of North America; it is cultivated as ornamental. Flowering in autumn, parallel with ripening of last year fruits.

Drug: In summer harvested and dried leaves.

CC: At least 3 % of tannins expressed as pyrogallol in dried drugs; (hamamelitannin, elagotannin, flavonoids, leucoanthocyanidins).

Usage: Maceration or extract – astringent and hemostyptic. Component of ointments and suppositories during hemorrhoids. Large consumption in cosmetic industry.





Juglandis folium – walnut leaves
Juglans regia - walnut (Juglandaceae)

Source: tree with huge crown and large impaired-pinnated leaf. Fruit is a **drupe** green, later turning black dried. In Europe cultivated.

Drug: In June harvested, dried, integerrime leaves without black spots.

CC: 3 % of hydrolysable ellagotannins, bitter substances, essential oil; 5-hydroxynaftochinon-1,4 = juglon, in fresh leaves in form of glycoside.

Usage: astringent, externally for baths during skin defects and diseases. Cosmetics –hair pigmentation.

Internally do not use – juglon shows weak mutagennic effect.



Quercus cortex – Oak bark ČL 2005
Quercus robur, *Q. petraea* – oak (Fagaceae)

Source: huge trees, rarely shrubs. Fruit is acorn, sitting in cup-shaped cupules.

Drug: cut dried bark of fresh young branches (mirror bark), harvested in spring.

CC: At least 3,0 % of condensed catechine tannins expressed as pyrogallol / dried drug.

Usage: preferentially external – astringent in form of digestion, for baths, to prevent perspiration of feed, hemorrhoids



Agrimoniae herba – agrimony herb ČL 2005

Agrimonia eupatoria - agrimony (Rosaceae)

Source: perennial herb of mild climate of northern hemisphere

Drug: dried flowering tops of herb

CC: At least 2 % of tannins prevalently of catechine type, quercitrin, choline, citric acid, essential oil

Usage:

Internally astringent, stomachic, cholagogue. Support for liver diseases therapy, during icterus.

Externally as gargle during oral inflammations, additive to baths.



Myrtilli fructus recens – blueberry fruit fresh ČL 2005

Myrtilli fructus siccus – blueberry fruit dried ČL 2005

Vaccinium myrtillus - blueberry (Ericaceae prev. Vacciniaceae)

Source: Approx. 30 cm tall little shrub in Europe, Asia and North America

Drug:

1. Fresh or frozen (-18 °C) fruit (berry) containing at least 0,30 % of anthocyanins, pectin, organic acids, sugar

Usage: vascular diseases; hemeralopia, diabetic retinopathy

2. Dried ripen fruit containing at least 1,0 % of tannins, expressed as pyrogallol

Usage: astringent and antidiarrhoic during catarrhs of GIT, inflammations of oral cavity



Ratanhiae radix – Ratany root ČL 2005
Krameria triandra - ratany (Krameriaceae)

Source: xeric, approx. 1 m tall semi-shrub native on the slopes of Cordillera in Chile, Peru and Bolivia in attitude 1000-2500 m.

Drug: dried, mostly broken roots with red-brown color – „Peru-ratany“; 1/3 of bark, 2/3 of wood

CC: at least 5,0 % of tannins, expressed as pyrogallol / dried drug; tannins present mainly in bark

Usage:

Digestion or powdered root internally as antidiarrhoic

Extract: for treatment in oral cavity, against frostbites, component of preparations used against hemorrhoides.



Tormentillae rhizoma – potentilla rhizome ČL 2005
Potentilla erecta (*P. tormentilla*) - potentilla (Rosaceae)

Source: perennial herb of Europe and north Asia

Drug: Whole or cut dried rhizome with removed roots, red-brown color

CC: At least 7 % of tannins of catechine type, expressed as pyrogallol / dried drug

Usage:

Astringent, antidiarrhoic in form of digestion or extract



Bistortae rhizoma – bistort rhizome

Polygonum bistorta - bistort (Polygonaceae)

Source: perennial herb of Europe and Asia

Drug: dried cut rhizome without roots,
inside pinkish color

CC: At least 5 % of tannins of catechine
type

Usage:

Astringent, antidiarrhoic in form of digestion
or extract.



Rubi fruticosi folium – blackberry leaves

Rubus fruticosus - blackberry (Rosaceae)

Source: thorny shrub native in Europe,
Asia, America

Drug: dried leaves of chosen forms of
species with less thorns

CC: gallotanins, inositol, organic acids

Usage: infusion as antidiarrhoic, during
oral inflammations, for baths.

Fermented leaves are tea substitute





FURTHER DRUGS WITH TANNIN CONTENT

CATECHU (*Acacia catechu* – *mimosa catechu*, Mimosaceae)

Solidified macerate from internal wood of Indian and African tree, containing approx. 50 % of catechine tannins. Powerful astringent – ethanol solutions used for treatment in oral cavity. Used in leather and color industry.

KINO (*Pterocarpus marsupium* – indian kino tree, Fabaceae)

Solidified juice flowing from stem of tree after wounding. Native to east India and Ceylon. Contains up to 85 % of catechine tannins. Astringent.