Flavonoids

- Flavonoids are found in all of the Angiosperms and rare in Gymnosperms,
- Polygonaceae, Rutaceae, Leguminosae, Compositae and Umbelliferae are the families rich from flavonoids
- The light increases the amount of flavonoid in the leaves and flowers
- Although, as a general rule, glycosides are water-soluble and soluble in alcohols, a fair number are sparingly soluble (rutin, hesperidin). Aglycones are, for the most part, soluble in apolar organic solvents (ether, chloroform, benzene): when they have at least one free phenolic group, they dissolve in alkaline hydroxide solutions.
- They are yellow pigments mostly in crystal form.

Identification

- **A) Cyanidin (Shinodo) Reaction.**
- **With magnesium powder (for flavanones and dihydroflavonols) or with zinc (for flavonoids in the strict sense) both in the presence of hydrochloric acid;**
- **Flavones-------orange**
- **Flavonols…….red**
- **Flavanones…..violet**
- **Isoflavones and chalcones give no reaction**

Flavonoids

- TLC, Paper chromatography and paper electrophoresis are used
- By examination under UV light before and after spraying with aluminum trichloride or ammonia vapors or alcoholic potas can be used
- Ferric chloride (green-blue)
- Aluminum trichloride (flavonols…. florescent)
- Potassium borohydrate (flavanones….violet-red)

Quantition

- A) Colorimetric method
- B) Spectrometric methods (UV, IR, NMR, MS, HPLC)

Flavonoid extraction

- Glycosides can be extracted with polar solvents
- Aglycones can be extracted with apolar organic solvents
- Lipophilic flavonoids of the superficial leaf (or frond) tissues are directly extracted by solvents of medium polarity (e.g., dichloromethane); next they must be separated from the waxes and fats extracted simultaneously.

- Ethanol stops the enzyme activity in fresh material.
- Tannins removed with Pb(Ac)2

Extraction and separation

- Aglycones can be extracted by benzene, ether, chloroform, ethylacetate, hexane.
- Glycosides can be extracted by acetone, alcohol, water, methanol:water, ethyl alcohol:water.
- If the plant material contain steroids, carotenoids and chlorophyll they can be removed by extraction of petroleum ether or hexane. Diethyl ether extract free aglycones and ethyl acetate dissolves the majority of glycosides.
- Separation and purification of flavonoid extracts can be performed by chromatographic methods on silicagel, sephadex, Al_2O_3, cellulose, polyamide and etc.

Biological Activities of flavonoids

- They attended to oxido-reduction reactions due to their polyphenolic structure. They act as hydrogen donors.
- Fungicide, they protect plants against parasites
- Diuretic, diaphoretic, antispasmodic
- Isoflavonoids have estrogenic activity. Quercetin and kaempferol have weak estrogenic activity.
- Decrease capillary permeability and fragility. Increase capillary resistance.

Flavonoids vitamin P activity

The main property that is recognized for flavonoids is «venoactivity», in other words their ability to decrease capillary permeability and fragility
In animal models, they can decrease the signs of experimental vitamin C deficiency. Because of this property, they were first referred to as «vitamin P factors» or bioflavonoids (citrin, rutin, diosmin, naringenin, hesperetin)

Especially OH containing at 3’ and 4’ positions in free form, they act as hydrogen donors.

Vitamin P activity mechanisms:
1. They insert collagen fibers on vein wall and increase capillary resistance

2. Decrease histamin level by inhibiting histidine decarboxylase

3. Inhibit the accumulation of cholesterol on vein wall by helping vitamin C for transforming to bile acids of cholesterol in liver

Flavonoids activity

- Free radicals play an important role in beginning of the some cancers, as well as they induce neurodegenerative disorders. Flavonoids have antagonistic activity against production of free radicals.
- Free radical scavenging activity.
- Activation of free radicals are inhibited by degredation
- They have enzyme inhibitory activities

Flavonoids activity

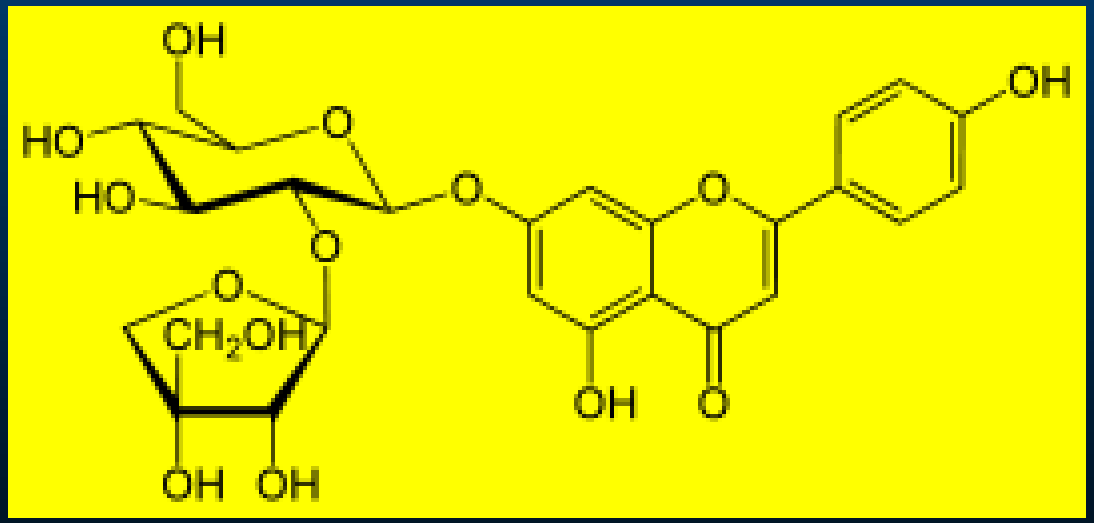
- Anti-inflammatory activity.
- Hepatoprotective activity
- They used for treatment of venous insufficiency, capillary disorders alone or in combination of other drugs

FRUCTUS PETROSELINI
Parsley fruit

- *Petroselinum crispum* (*P.sativum*) (Umbelliferae) fruits
- 50-80 cm, biennial, glabrous
- Contain essential oil
- Flavonoid ------Apioside
- Apioside(apiin)-----Apigenin+Glucose+ Apiose
- Essential oil (%2-7)-----Apiole
- Fixed oil (%20)

FRUCTUS PETROSELINI

- Furanocoumarin (photosensitisation)
- Apioside (apiin) has diuretic activity
- Apiole emmenagogue
- Leaves of the parsley used due to its diuretic activity as well as against menstruial disorders because of its emmenagogue activity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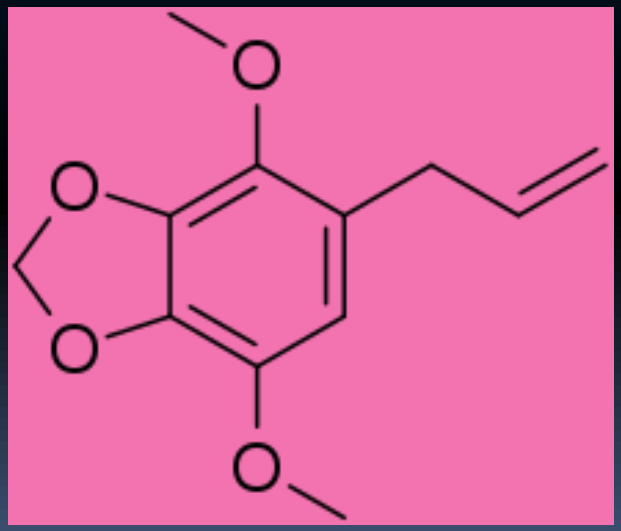
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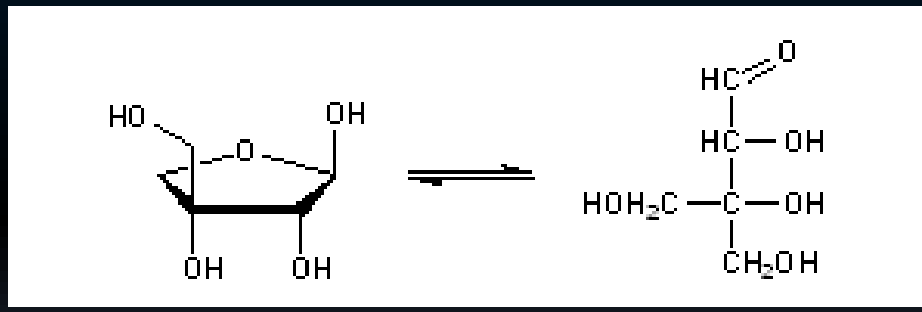
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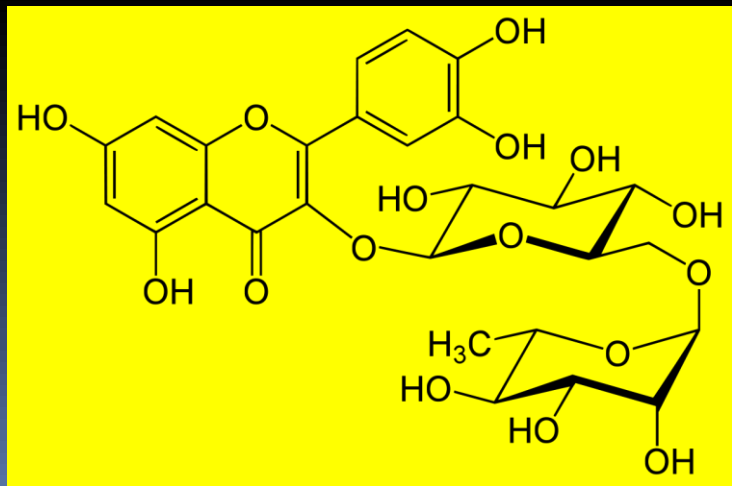
HERBA RUTAE

- *Ruta graveolens* L. (Rutaceae) (Rue/Sedefotu) dried or fresh aerial parts with flowers
- 50 cm, leaves are glabrous, flowers are yellow, has special smell, perennial shrubs
- Cultivated in gardens
- Mediterraneaen plant, grows naturally in Europe, in Turkey an ornamental plant

HERBA RUTAE

- Flavonoid----Rutin (%1-2)---acid hydr.---quercetin+rutinoside
- Essential oil %0.1---%90 methyl nonyl ketone
- Toxic compound



HERBA RUTAE

- Species growing in Turkey;
- *Ruta chalepensis* essential oil---- 47%
- *Ruta montana* essential oil 84% methyl nonyl ketone
- 100 g plant material contains------ 390 mg vitamin C
- Furocoumarins----- Psoralens, bergaptene
- Furoquinolein

HERBA RUTAE

- Infusions------antispasmodic, stomachic,
- Essential oil is used as anti-epileptic and for treatment of hysteria
- Rubefacient----for treatment of rheumatism
- Menstruel disorders as emmenogogue
- Rutin--- Vitamin P-activity (venoactive compound)
- Does not used as source for rutin

- Production of rutin;
- *Fagopyrum esculentum* (Polygonaceae) (Kara buğday-buchwheat)
- European plant cultivated for rutin production
- Annual, 80 cm , leaves contain rutin 2-3 %

- **PRODUCTION:**

- Boiled EtOH or hot air is used for stabilization of the leaves
- EtOH or isopropanol is used for extraction ----- concentrated-----filtered---cooled---RUTIN obtained in crystalline form
- *Sophora japonica* (Leguminosae) flower buds contain 15-20% rutin - also used for rutin production

- *Eucalyptus macrorrhyncha* (Myrtaceae) grows in Australia leaves contain 10 % rutin
- *Ruta chalepensis* flowers contain 10 % rutin grows in Turkey, South and east part of Anatolia.
- Rutin; increase capillary resistance and increase permeability
- Used in hypertension and arteriosclerosis
- Used in circulatory disorders in venous vessel insufficiency.

HERBA RUTAE

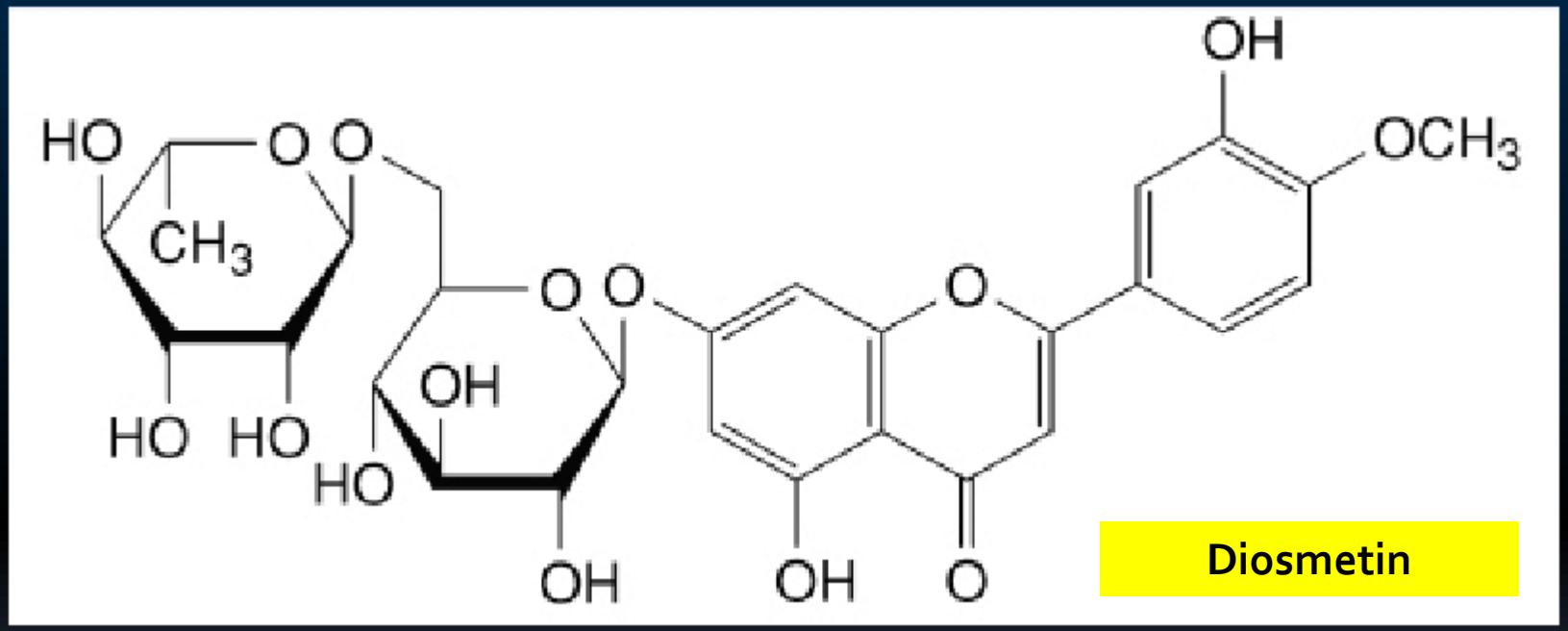
- Herba Rutae, is used for abortifacient in folk medicine, however this plant may induce poisoning and death.
- Used for treatment of rheumatism as poultice. This drug is irritating therefore drug should removed when redness is observed on skin
- This drug is dangerous , it should be used consciously.

HERBA BURSAE PASTORIS
Çoban çantası/
shepherd's purse

- *Capsella bursa pastoris* (Cruciferae)
- 50 cm, grows naturally in Europe and in Turkey
- Flavonoid Diosmetin
- Glycosylflavonoid Diosmin---acid hydr.----Diosmetin+gl+rh
- 0.2 % contain cholin

HERBA BURSAE PASTORIS , Çoban çantası

- Against kidney stones,
- Haemorrhage and metrorrhagia
- Tonic for uterine and control of bleeding
- Haemorrhoid and varicosis treatment
- Hypotensive agent



Diosmetin

Ginkgo biloba
maidenhair tree, ginkgo

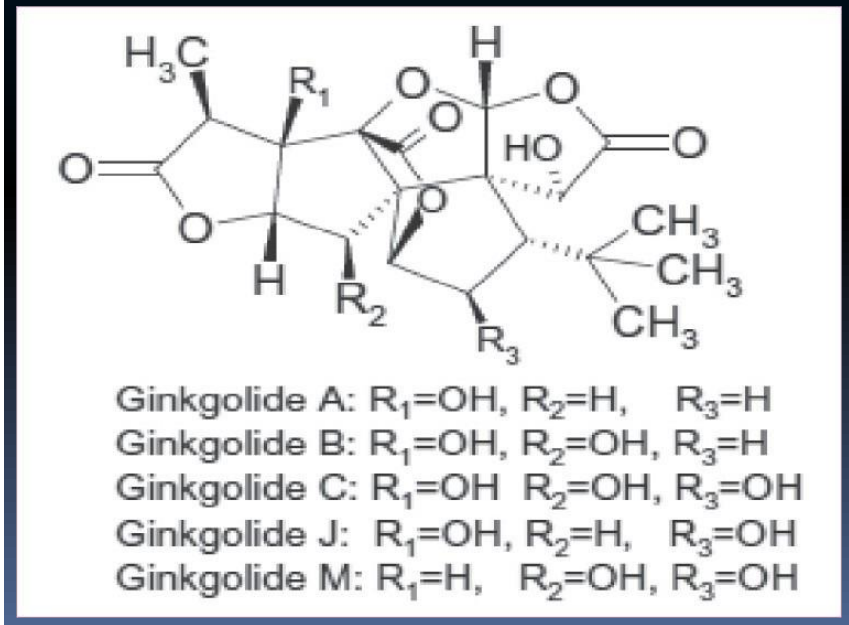
- Ginkgoaceae family
- 200 million years before grows naturally
- 30 m, deciduous plant
- East part of Asia (China, Japan)
- Ornamental plant in Europe and Turkey

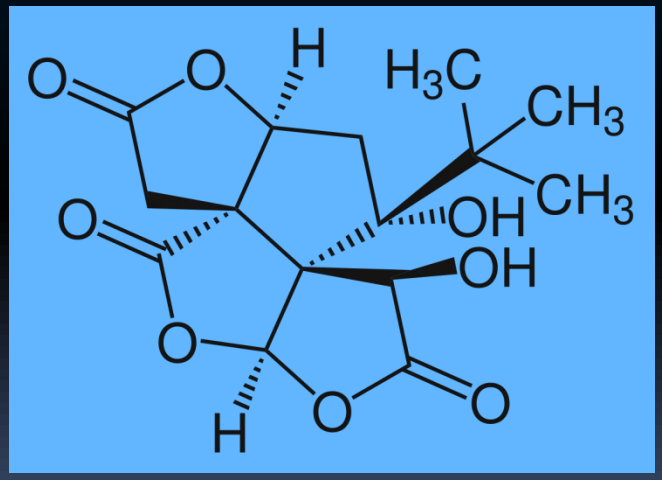
Ginkgo biloba

- Used in folk medicine in ancient times in China
- Preparations in pharmacy contain this plant

Ginkgo biloba

- Chemistry;
- Diterpenes; contain 20 C Ginkgolides (A,B,C,J,M)
- Sesquiterpene lactone Bilabolide





Ginkgo biloba

- Kaempferol, quercetin, luteolin and their mono, di and tri heterosides (commonly gl and rh)
- Biflavonoids; amentoflavone, ginkgetin, bilobetol (dimers of apigenin)
- Proanthocyanidins---catechin derivatives (flavan 3 ol derivatives)

Standardized extract

- **Terpenic structures should be 5-7%**
  Diterpenes, Ginkgolides (A,B,C,J,M)
- **Sesquiterpene lactone Bilabolide**

- **Flavonoid glycosides should be 22-27%**

- The content of ginkgolic acids are limited with max. 5 ppm

- Single dose: 120-240 mg
- Daily dose: 240 mg
- There is no relevant indication for children and adolescents.

- Treatment should last for at least 8 weeks.
- If there is no symptomatic improvement after 3 months, or if pathological symptoms intensify, the doctor should check whether continuation of treatment is still justified.

Ginkgo biloba

- **EFFECTS**
- Antiinflammatory in joints
- Quercetin showed Antithrombotic activity
- Vasoregulator
- Antioxidants (flavonoids)

Ginkgo biloba

- Antispasmodic
- Antimicrobial against
- *Mycobacterium smegmatis*,
- *Bacillus subtilis* and
- *Staphylococcus aereus*

Ginkgo biloba

- Decrease glucose level
- For treatment of diabetes and myocardial infarction
- Increase learning, memory, concentration
- Used for treatment of cerebral insufficiency, some types of vertigo, or tinnitus, for some types of loss hearing, loss of visual acuity (based on ischemic insufficiency)
- peripheral blood circulation and microcirculation disorders: peripheral arterial obstructive disease
- PAF inhibitor (Platelet activating factor inhibition) (especially ginkgolides)

Ginkgo biloba

- **Preparations:**

- BILOKAN (TB./Drop)---9.6 MG
- GINGOBIL (FILM TB.)------40 MG
- GINKGO (TB.)----------60 MG
- SEREMAKS (FILM TB./Drop)-9.6MG
- TEBOKAN (TB./Drop)-----9.6 MG

Interaction

- with anticoagulants (e.g. phenprocoumon and warfarin) or antiplatelet drugs (e.g. clopidogrel, acetylsalicylic acid and other non-steroidal antiinflammatory drugs), their effect may be influenced.
- warfarin do not indicate that there is an interaction between warfarin and G. biloba products, but adequate monitoring is advised when starting, when changing G. biloba dose, when ending G. biloba intake or if changing product.
- Preparations containing Ginkgo might increase susceptibility to bleeding, the medicinal product should be discontinued as a precaution 3 to 4 days prior to surgery.

undesirable effects

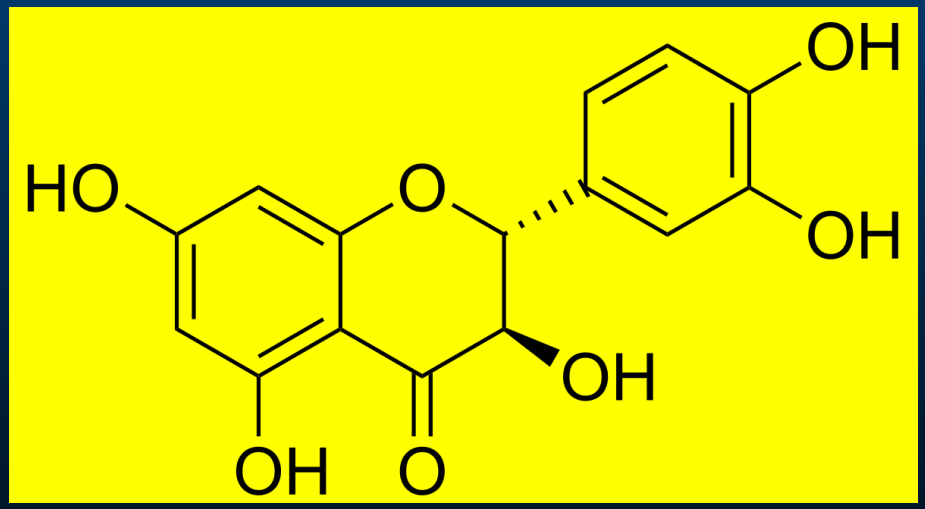
- Blood and lymphatic system disorders Bleeding of individual organs has been reported (eye, nose, cerebral and gastrointestinal haemorrhage). The frequency is not known.
- Nervous system disorders Very common: headache Common: dizziness
- Gastrointestinal disorders Common: diarrhoea, abdominal pain, nausea, vomiting
- Immune system disorders Hypersensitivity reactions (allergic shock) may occur. The frequency is not known.
- Skin and subcutaneous tissue disorders Allergic skin reactions (erythema, oedema, itching and rash) may also occur. The frequencies are not known.
- If other adverse reactions not mentioned above occur, a doctor or a pharmacist should be consulted.

SEMEN CARDUI MARIAE (Blessed Milk thistle)

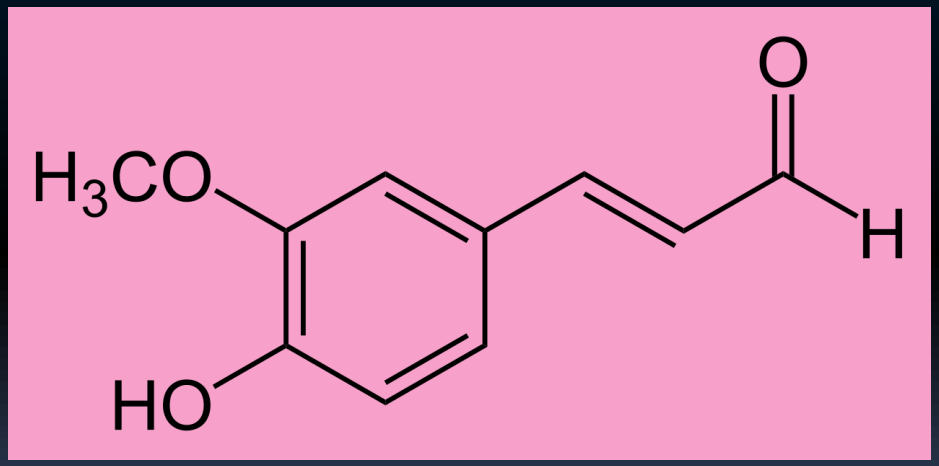
- *Silybum marianum*
- (*Carduus marianus*) (Compositae)
- Milk thistle (Deve dikeni, Meryemana dikeni)
- Fruits are achene and black colour
- 40-150 cm, biennial
- Grows naturally in west Europe, north Africa and east Asia
- In Turkey west and south Anatolia widely distributed, especially in İzmir, Aydın, Denizli, Mersin, Adana, Antakya

SEMEN CARDUI MARIAE

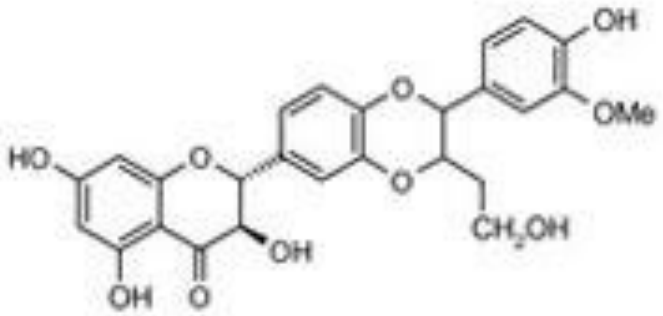
- Flavonolignans;
- Taxifolin (dihydroflavonol structure) + coniferyl alcohol combination found as flavonolignans
- Flavonolignans are found as a mixture and this mixture is known as silymarin
- The flavonolignans found in this mixture are ; Silybin,Silychristin, isomer of silybin (silandrin) and silydianin.



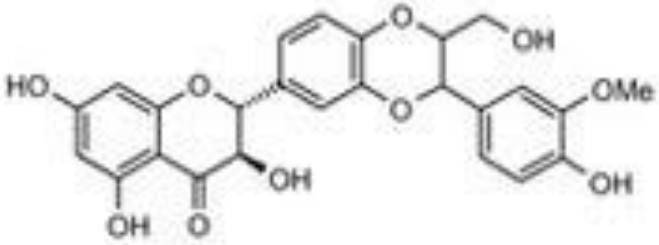
Taxifolin



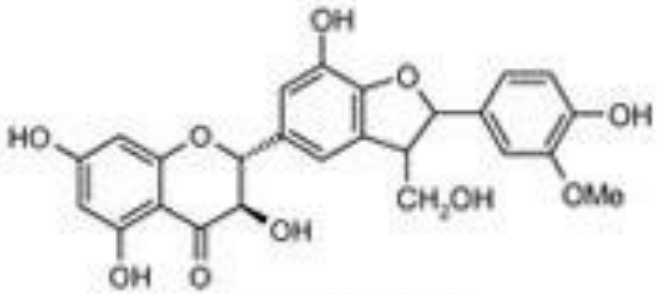
Coniferyl alcohol



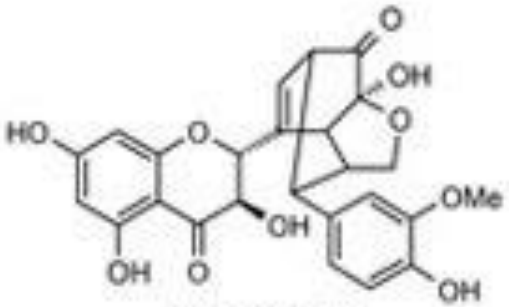
Isosilybin



Silybin



Silychristin



Silydianin

SEMEN CARDUI MARIAE

- **Effect and usage**
- Fruits and seeds used as hepatoprotective
- Silymarin hepatoprotective, especially against fungi intoxication (phalloidin and amanitin poisoning)
- Against toxicity of alcohol
- Preparations are used which contains silymarin in 80% for antioxidant, cirrhosis, hepatitis.
- Aerial parts are diuretic, antipyretic and used for treatment of rheumatism pain.

SEMEN CARDUI MARIAE

- Silymarin protects liver and originated new liver cells which are replaced with the damaged cells
- Drug has already been approved by Commision E as preparations in pharmaceutical dosage forms including tablets, capsule and others.
- Legalon-----Preparations in Germany and England, Turkey
- MILK THISTLE , a preparation

SEMEN CARDUI MARIAE

- 70-80% silymarin standardized extract should be used
- 6-8 week 3 daily in 420 mg dosage.
- After recovery dosage decreased to 280 mg

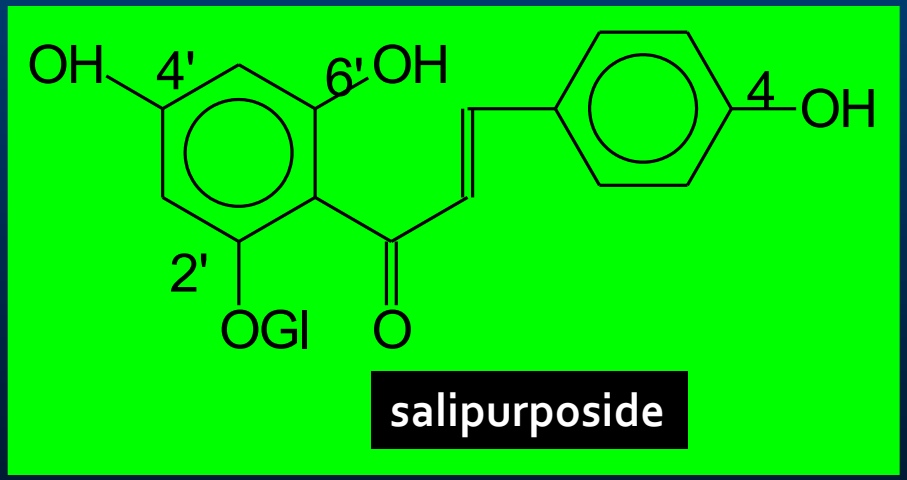
FLOS HELICHRYSI, Altın Çiçeği, Gudema Otu, Ölmez Çiçek, Helichrysi flowers

- *Helichrysum* (Compositae) sp. flowers
- Widely distributed in Europe and in Turkey
- 50 cm, perennial and herbaceous
- Flowers in capitulum and golden yellow, simple and hairy leaves
- In Europe *H. stoechas*, *H.arenarium*, *H.italicum*
- In Turkey *H.graveolens*,
- *H.orientalis*, *H.plicatum*

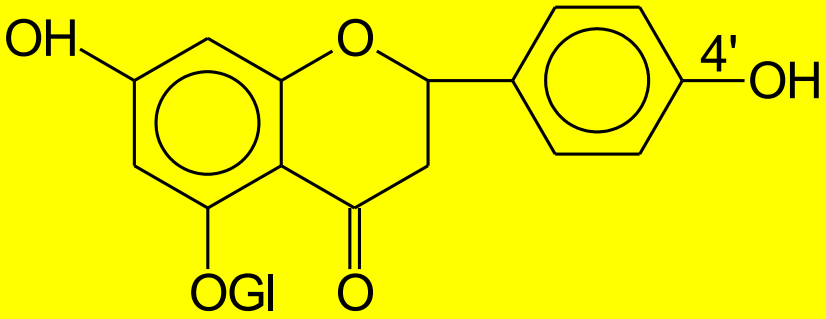
species are used

FLOS HELICHRYSI

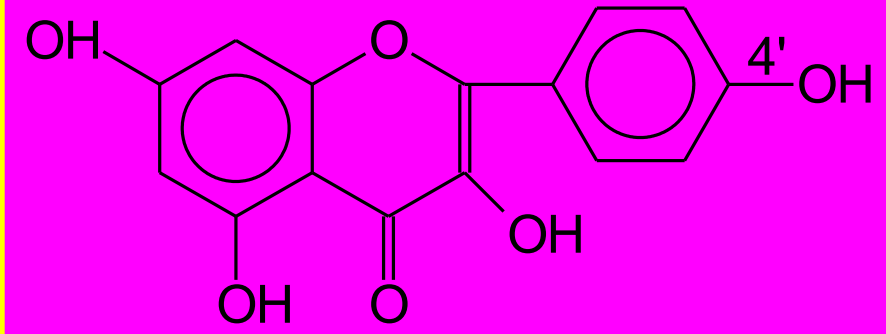
- Glycosyl Flavonols---- Kaempferol diglucoside
- Glycosylchalcones----Isosalipurposide
- Glycosyl Flavanones------Naringenin diglucoside and salipurposide (Naringenin 5-*O*-glucoside)



salipurposide



isosalipurposide



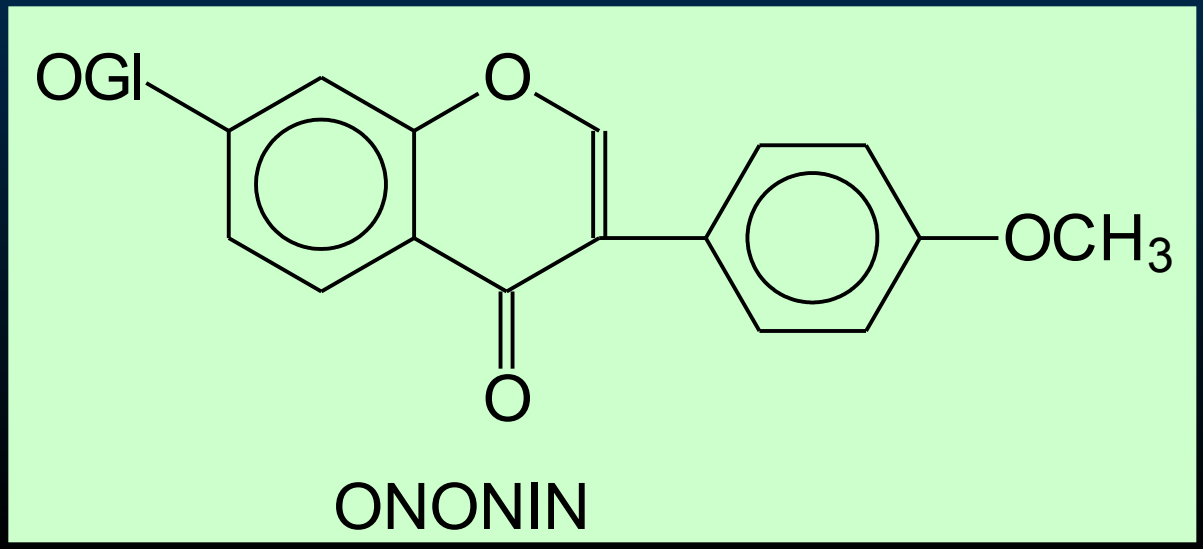
kaempferol

FLOS HELICHRYSI

- Diuretic and against kidney stones
- 3 % infusion/ decoction is used before meals
- Treatment for 10 days, 10 days no treatment and 10 days again treatment

RADIX ONONIDIS, Kayışkıran kökü, restharrow root

- *Ononis spinosa* (Leguminosae) roots
- This name is given due to roots are too strong and induce broken of strap of harvester
- 30-60 cm, has a strong root, spined, pink flower, perennial, suffrutescent
- Leaves are partitite or tripartitite and leaflets margins serrate
- Grows naturally in Europe, West and south Asia, north Africa and Turkey
- Glycosyl isoflavonoid---Ononin



ONONIN

RADIX ONONIDIS

- Diuretic and used for kidney stones
- Antiseptic and used for wound healing and eczema externally
- 2-5% decoction can be used daily 2-3 times
- Decoction is subjected to wounds and then washed.

RADIX ONONIDIS

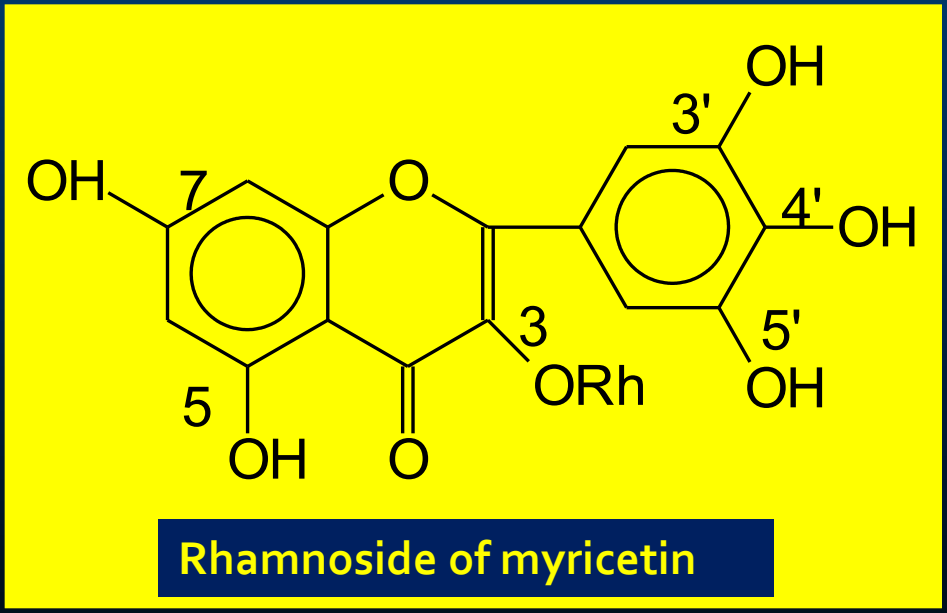
- In our department we have already tested for some activities
- 1) Analgesic activity--- 50 ve 100 mg dosage showed higher activity than acetylsalicylic acid
- 2) Hepatotoxic
- 3) Antimicrobial activity
- 4) Antioxidant activity
- 5) Antiinflammatory activity
- 6) Wound healing activity

FOLIA BETULAE (Ph. E.)

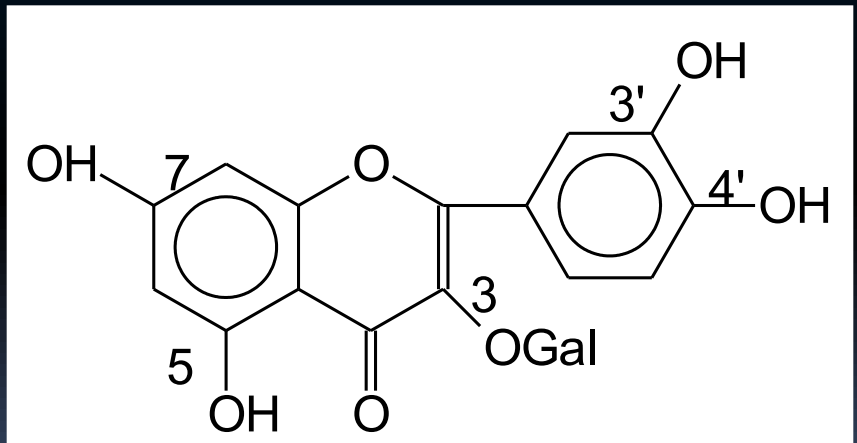
- *Betula* sp. (Betulaceae) leaves (Birch leaves)
- ***Betula alba* (Huş ağacı, Birch) is used commonly**
- Barks are in silver colour and this colour originated due to its betulin (triterpenic) content

FOLIA BETULAE (Ph. E.)

- Glycosides of myricetin------myricetin 3-rhamnoside
- Hyperin-----Quercetin 3-galactoside
- Rutin
- Quercitrin and other quercetin glycosides
- Essential oil
- Grows naturally in northeast and middle parts of the Anatolia
- Diuretic activity, used for inflammation and infection of the urinary tract and urinary lithiasis (approved by Commision E)



Rhamnoside of myricetin



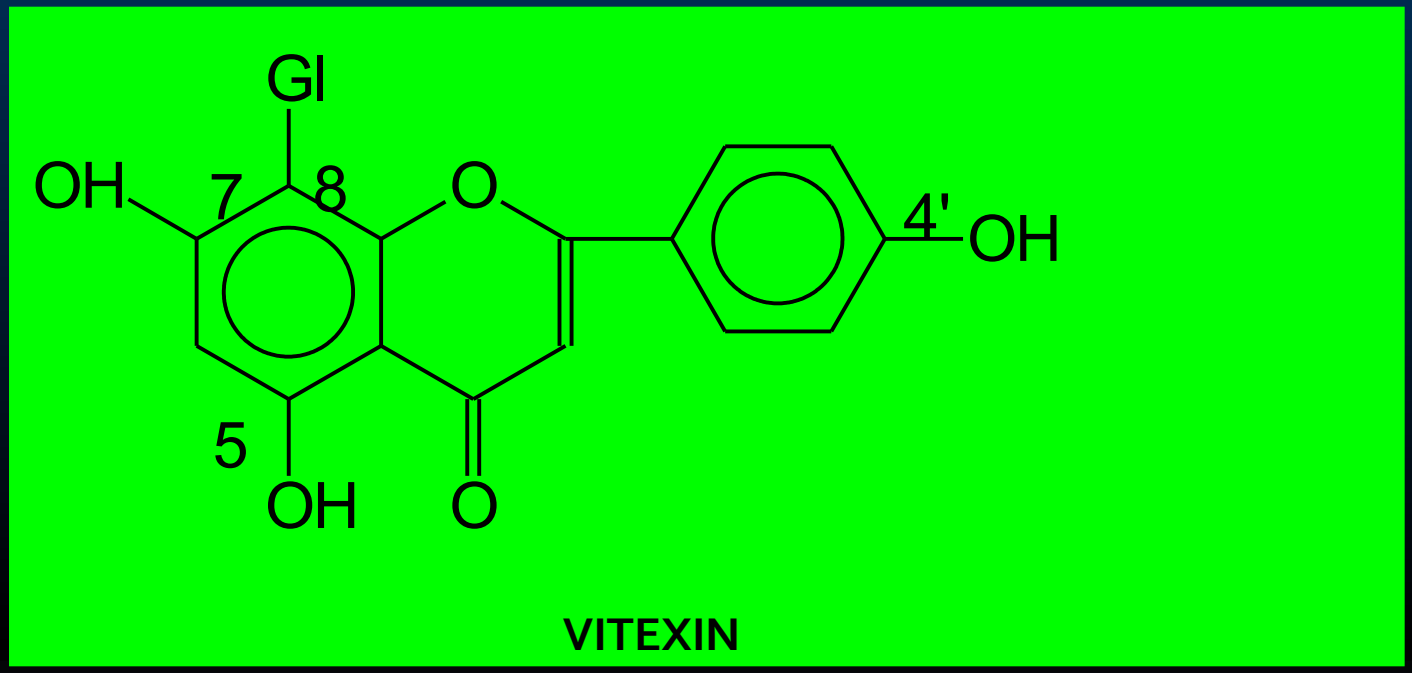
Hyperin

FLOS CRATAEGI, Alıç çiçeği, hawthorn

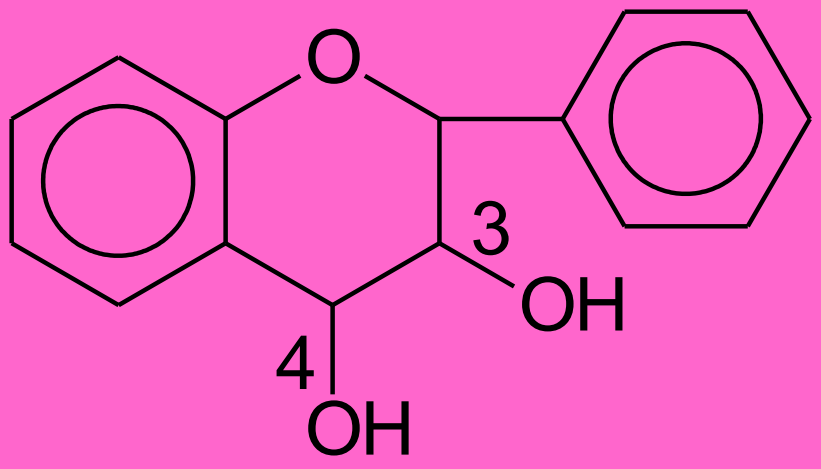
- *Crataegus sp.* (Rosaceae) , especially
- *C.oxyacantha*
- *C.monogyna*
- Branches ending with flowers are used parts (should be dried quickly)
- Whole Europe, north Africa and west Asia are natural growing places
- Naturalised in north America
- 20 species grow naturally in Turkey and the most common one is *C.monogyna*
- *C.oxycantha* is reported to be found in east Anatolia

FLOS CRATAEGI, Hawthorn

- Leaves;
- Hyperin-----quercetin-3-galactoside
- Flowers;
- Vitexin----apigenin 8-C-glycoside
- Vitexin 7-O-rhamnoside
- Orientin---luteolin 8-C-glycoside
- 2”-rhamnosylvitexin (the main flavonoid) and its acylated derivative
- Leucoanthocyanin dimers (connected from –OH groups on 3 or 4 position) procyanidin B-2 and trimer procyanidin C-1



VITEXIN



Leucoanthocyanin dimers

FLOS CRATAEGI

- Positive effect on myocardial contractility and output. Positive inotropic and dromotropic activities and negative bathmotropic activity, increase coronary and myocardial circulation, therefore Commision E approved this drug for cardiac insufficiency corresponding to NHYA (New York Heart Association) stage II.
- Sedative for symphatic nervous system
- Antispasmodic
- Coronary vasodilator
- Antiarrhythmic, antiatherosclerotic
- Does not accumulate in organism
- Show negligible toxicity
- Hawthorn used in many preparations alone or in combination

FLOS CRATAEGI

- Standardised on flavonoids by 2.2% and proanthocyanidins by 18.75%
- 160-900 mg dosage should be taken daily by 2-3 times
- Commision E approved the usage

CORTEX VIBURNI (TK)

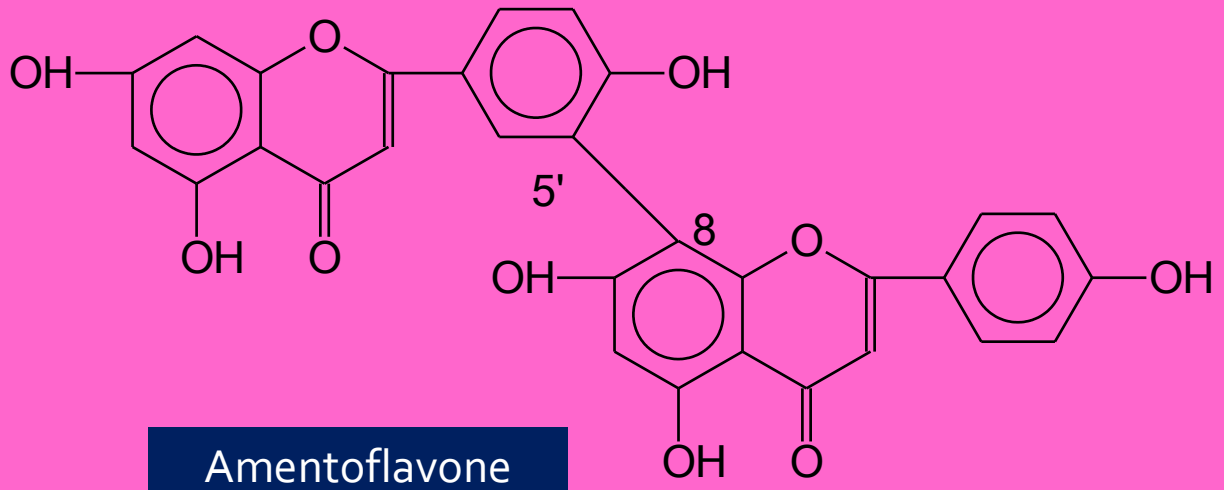
- *Viburnum prunifolium* (Caprifoliaceae) barks of stem and branches
- 3-8 m, red-black colour and with a thin lines
- Smell of the barks is similar to Radix Valerianae
- Originated from north America and grows as ornamental plant in Europe

CORTEX VIBURNI (TK)

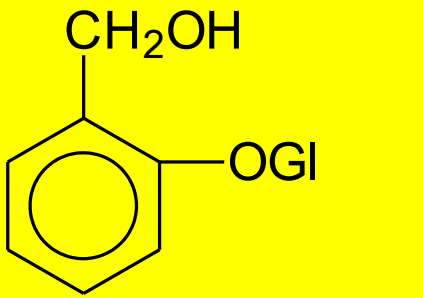
- *V.opulus*, *V.lantana*, *V.orientalis* and *V.tinus* grow in Turkey.
- Analgesic, antiinflammatory, hepatoprotective and hypoglycemic activities

CORTEX VIBURNI (TK)

- Biflavonoid -----Amentoflavone (Apigenin dimer)
- Phenol heterosides------Salicoside (Salicylic alcohol heteroside)
- Antispasmodic activity on uterine (1g drog activity equivalent to activity of 500 µg papaverine)
- Amentoflavone has antiinflammatory and antiulcer activity
- Salicoside has analgesic activity



Amentoflavone
Biflavonoid



Salicoside

FLOS SAMBUCI (TK), Mürver çiçeği, European elder

- *Sambucus nigra* (Caprifoliaceae) flowers
- Naturally grows in Europe, north Africa and west Asia
- Widespread in Turkey and especially in north Anatolia
- 10m, shrub with white flowers

FLOS SAMBUCI (TK), Flowers

- Mucilage
- Essential oil (%o.3)
- Flavonoids;
- Rutin----quercetin 3-O-glucorhamnoside (gl+rh)
- Isoquercetin----quercetin 3-glucoside
- Cyanogenic glycosides

FLOS SAMBUCI (TK)

- Diuretic, diaphoretic
- Emollient (due to its mucilage content) -bronchial secretion is increased by this drug
- Emetic at higher dosage

FLOS SAMBUCI (TK)

- Used in microscobic analysis for sectioning of the tissues (extract of the branches)
- 4-8 % infusion and decoctions are used

Fruits

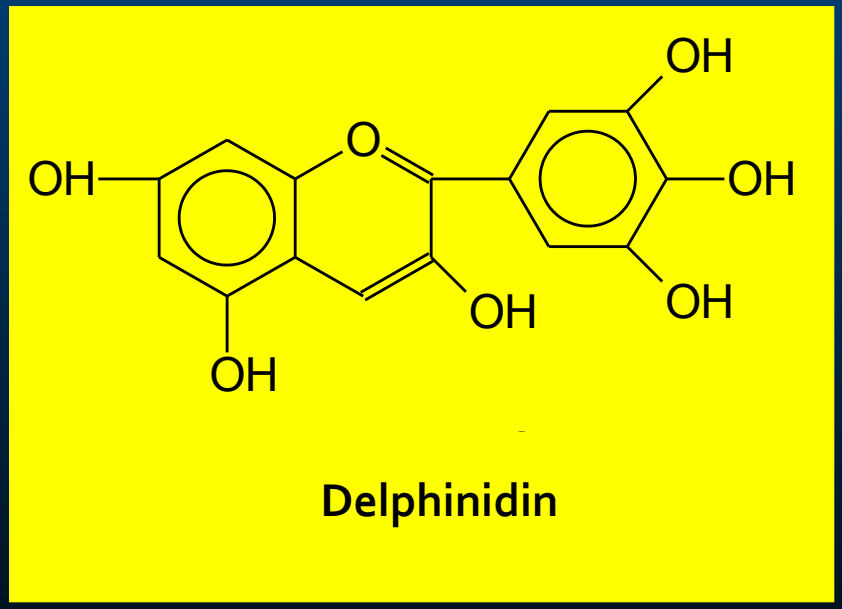
- Fruits are edible
- Cyanidin glycosides, flavonoids, acids (malic acid, citric acid)
- Seeds contain cyanogenic glycosides
- Ripe fruits are the source of an extract used as food colorant

HERBA VIOLAE TRICOLORIS (TK), Hercai menekşe, wild pansy, heartsease

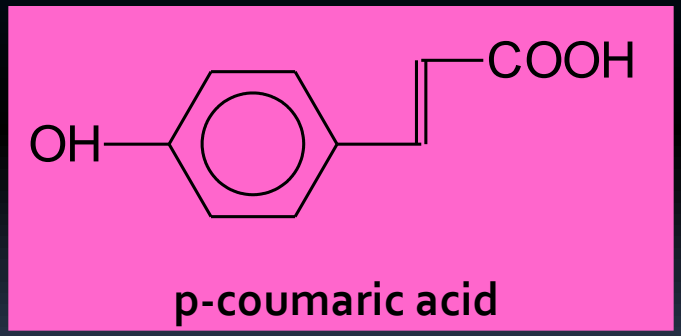
- *Viola tricolor* (Violaceae) aerial parts in flowering time
- Widespread in Turkey
- Grow naturally in Europe
- Leaves are sessile, flowers are yellowish or light purple colour. Fruits are glabrous, triangular capsule. Flowers has light odour.

HERBA VIOLAE TRICOLORIS

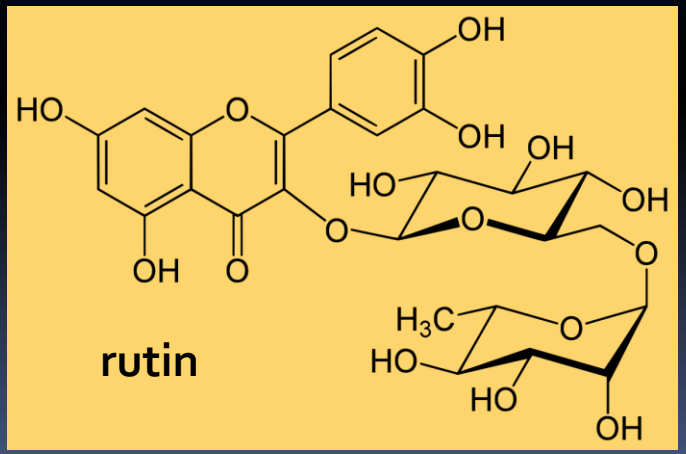
- Glycosylflavonol-----Violanthin (quercetin 3-O-rutinoside). Rutin (same compound)
- Anthocyanin----Delphinidin derivative (5,7,3′,4′,5′- pentahydroxyanthocyanin)
- Phenolic acids



Delphinidin



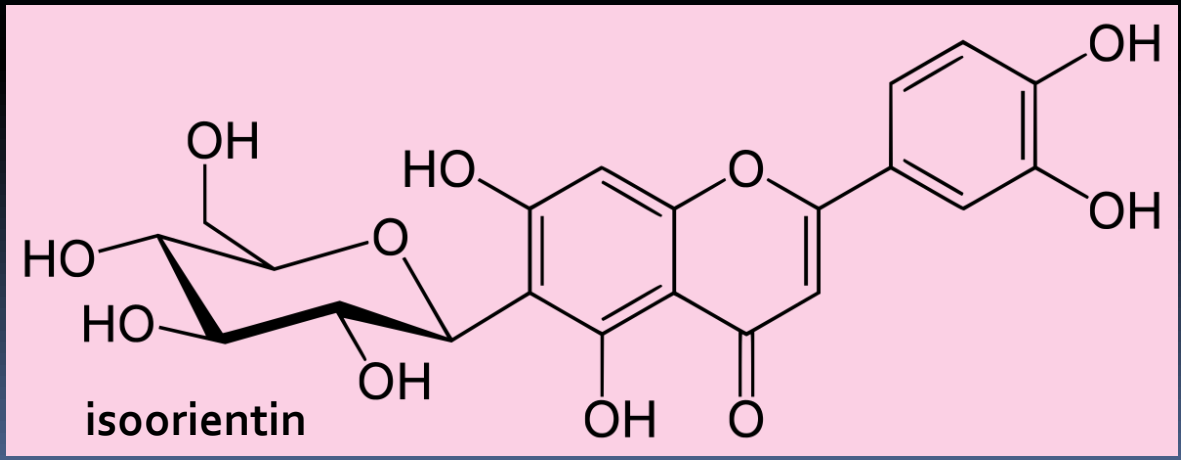
p-coumaric acid



rutin

Lespedeza capitata (Leguminosae)

- Branches with leaves are used as drug
- 60-120cm, perennial, does not grow in Turkey
- Originated from north America
- Cultivated in mediterraneaen area
- Tannin and catechin
- Flavonoid derivatives (1%)
  homoorientin=isoorientin (luteolin- 6-glucoside)



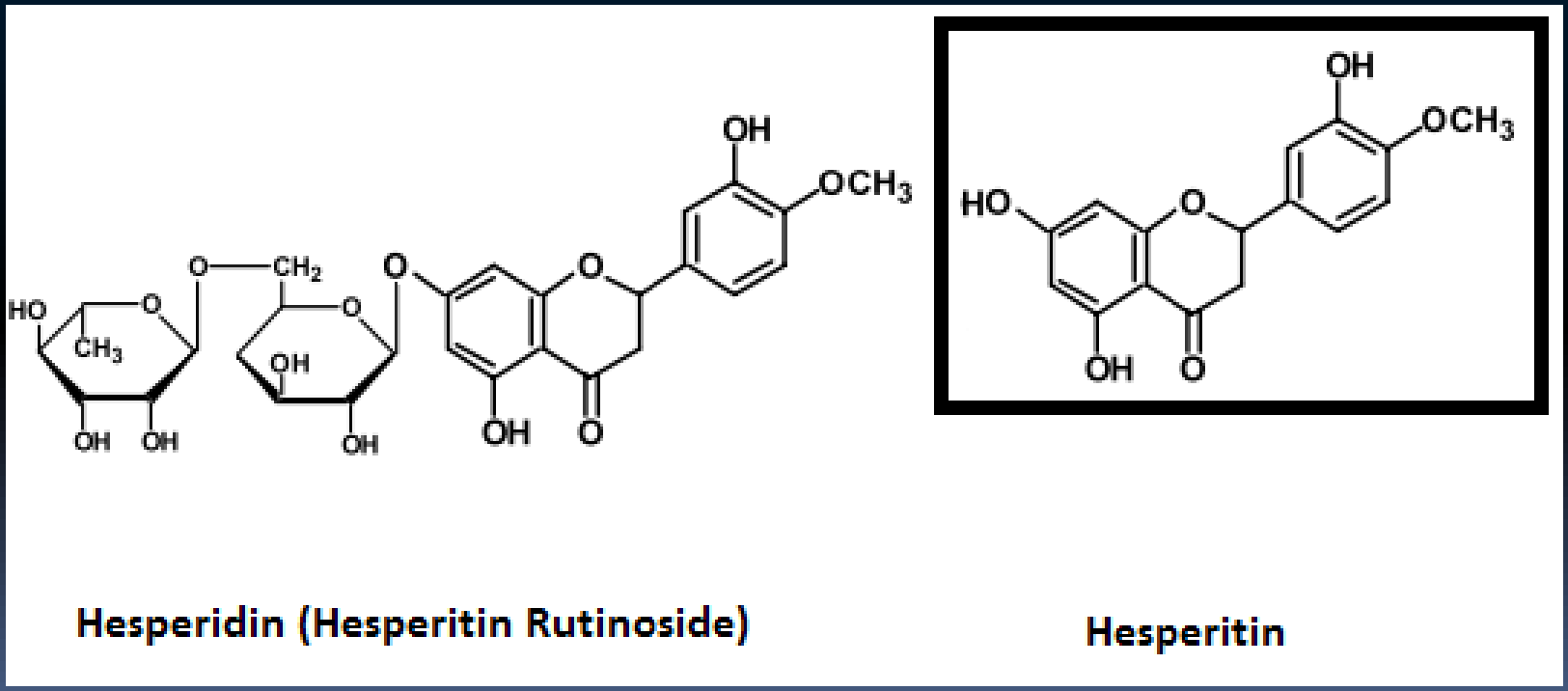
isoorientin

Lespedeza capitata (Leguminosae)

- Used for treatment of chronic kidney problems
- Used againt hyperuricemia
- Protective against atheroma
- Low toxicity
- Extract 10% is used for acute and chronic kidney failure and nephrosclerozis
- Decrease serum creatine level

Hesperidin, Hesperetin 7-*O*-rutinoside- Vitamin P)

- Pericarpium of *Citrus* (Rutaceae)sp. fruits
- Orange pericarps contain 8%
- Hesperidin---- acid hydr--- Hesperetin+rhamnose+glucose
- Used against capillary fragility, in venous and lymphatic vessel insufficiency



Hesperidin (Hesperitin Rutinoside)

Hesperitin

Hesperidin

- PRODUCTION

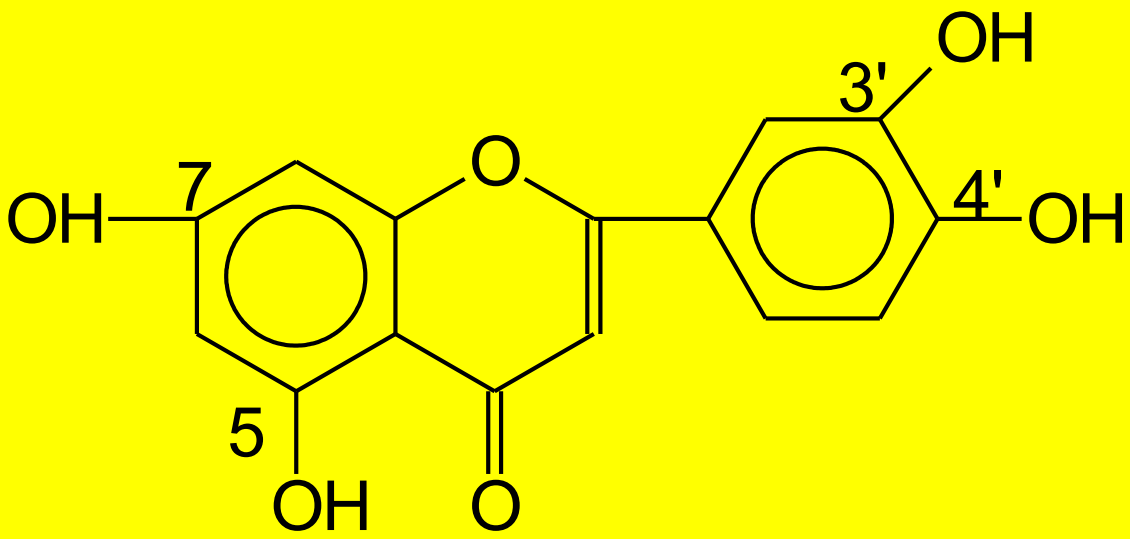
- 1.Method: Dried orange peels are extracted with petroleum ether (essential oil extracted with petroleum ether) then methyl alcohol used for extraction and from extract hesperidin obtained by precipitating with acetic acid
- 2.Method: Orange peel are subjected to alkaline solutions and then acetic acid is added to precipitate hesperidin. Hesperidin is purified by solving with formamide and cleaning with active carbon.
- Preparation:DAFLON (hesperidin+diosmin)

Luteolin

- 5,7,3′,4′- tetrahydroxy flavon derivative
- Glycosyl derivatives commonly occured from –OH group at 7. position
- luteolin found in plant kingdom sometimes in aglycone form but usually in glycosidic form
- Isolated from many plants;
- -Olive leaves
- -Digitalis leaves
- Diuretic activity

Luteolin

- Labiatae family plant leaves such as; F.Menthae, F. Rosmarini, F. Thymi, F. Salviae rich in luteolin
- Plants from Compositae family including; Fl. Chamomillae romanae,
- Fl. Chamomillae matricariae,
- *Cynara scolymus* contain luteolin



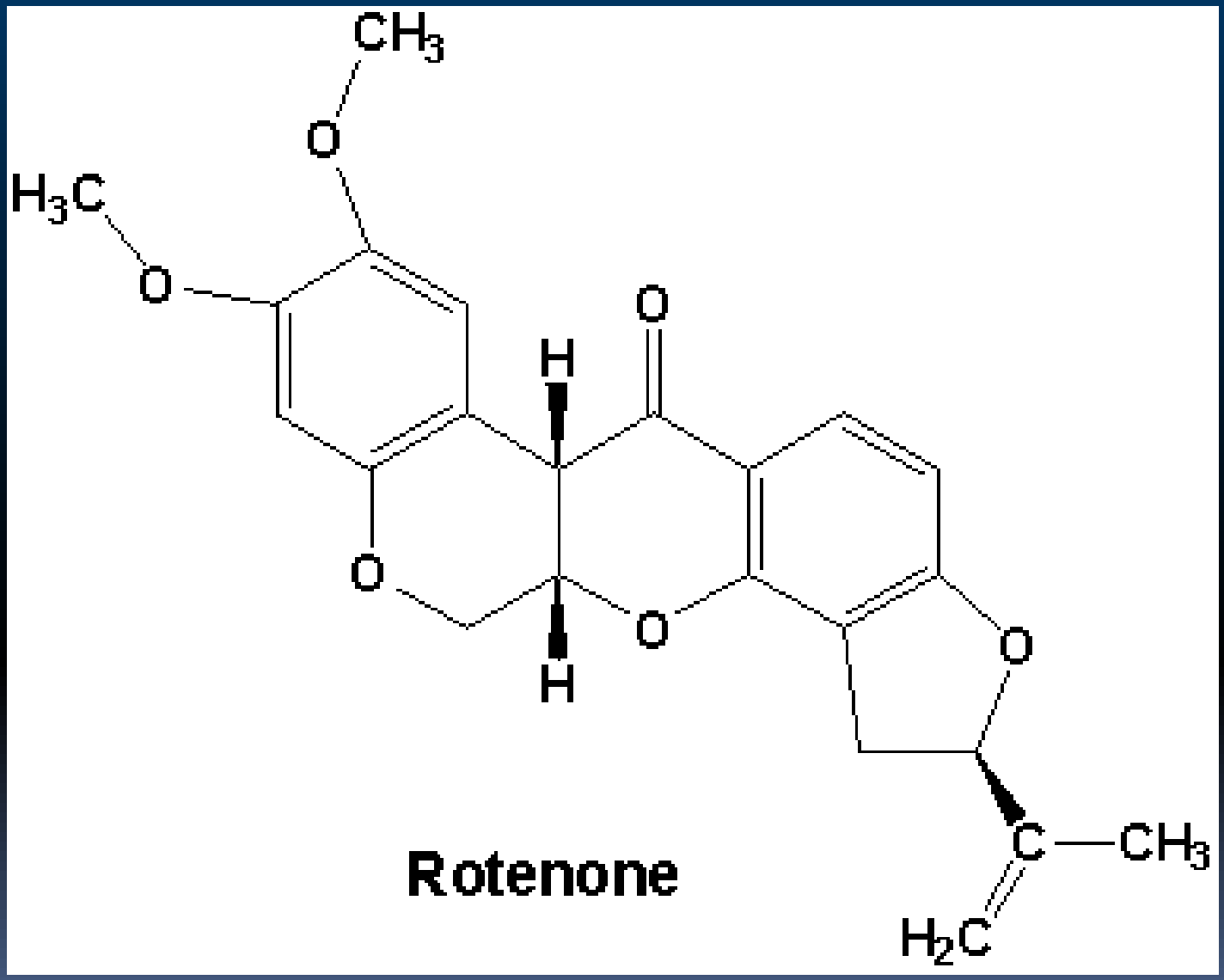
LUTEOLIN

RADIX DERRIDIS

- *Derris elliptica* (Leguminosae)
- South Asia
- **Roots are 1cm thickness**
- Roots contain isoflavonoid derivatives ROTENONE by 8%
- **Insectisidal agent**
- Roots are diluted with talc powder to adjust percentage of rotenone to 5%.

RADIX DERRIDIS

- Rotenone affects to coldblooded animals by contact. Warmblooded animals do not affected by oral administration but induce paralysis of respiration by IV direction.
- Insectiside
- Antihelmintic



Rotenone

FOLIA MYRTILLI, FRUCTUS MYRTILLI, Çoban üzümü, Bilberry

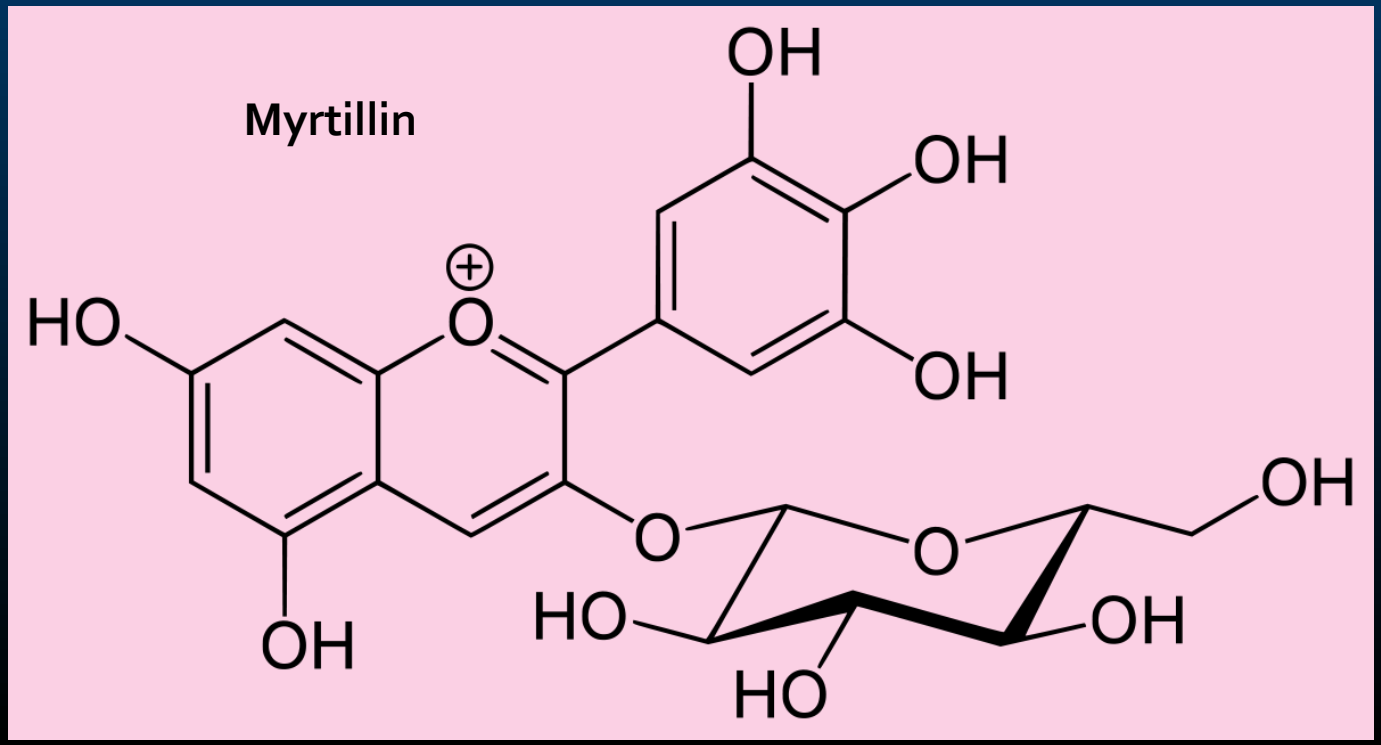
- *Vaccinium myrtillus* (Ericaceae) dried leaves and fruits
- 30 cm, grows in forests, arbours, humic soil
- Grows in Europe, Asia, north America and north Anatolian mountains
- Leaves have very short petiole, ovoid
- Fruits are in blue-black colour, berry and contain several seeds

FOLIA MYRTILLI, FRUCTUS MYRTILLI

- Leaves;
- Phenolic acids 2-5% (quinic, malic, benzoic acid)
- Glycosyl Flavonols---quercetin arabinoside
- Tannin 6-11%
- Triterpenic acids
- Gallic acid derivative----Neomyrtillin

FOLIA MYRTILLI, FRUCTUS MYRTILLI

- Water extract of the leaves astringent and antidiaretic because of the tannin content
- Fruits;
- Anthocyanins 5%
- Mostly delphinidin derivatives
- MYRTILLIN---delphinidin derivative
- Catechin 5-10%


Myrtillin
OH
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OH

FOLIA MYRTILLI, FRUCTUS MYRTILLI

- Fruits are used as a food in Europe. Contain pectin, sugar, phenolic acids and used to prepare jam
- Astringent and antidiareic
- Antimicrobial activity against pathogens in intestine

FOLIA MYRTILLI, FRUCTUS MYRTILLI, Çoban üzümü

- Extract and tinctures are used;
- Internally----Intestinal infections
- Externally---eczema and stomatitis
- Production of anthocyanins
- Anthocyanins also have vitamin P activity

FOLIA MYRTILLI, FRUCTUS MYRTILLI

- For treatment of diabetic neuropathy
- For treatment of eyestrain especially people who generally used computer
- Against eye infections as infusion or decoction prepared from leaves

FOLIA MYRTILLI, FRUCTUS MYRTILLI

- During II. World war fruits were used by English pilots to improve eyesight
- For orientation of eyes to radiant light
- Advised for treatment of cataract
- Antioxidant activity
- MYRTOCYAN (Ophtalmic) preparation containing 1% anthocyanin
- Aqueous leaf extract hypoglycemic

FOLIA MYRTILLI, FRUCTUS MYRTILLI

- **PRODUCTION OF ANTHOCYANIN**

- Pressed fruit juice are left for fermentation for 20-25 days
- *Saccharomyces oviformis* is used for fermentation at 20-25°C Sugar quantity reduced under 0.15%
- Filtered from cellulose to remove resin, salt and free anthocyanins
- Filtrate is consantrated under vacuum to the dryness
- Crude extract washed with 96° EtOH
- Remaining resin, phenolic acids and anthocyanins are removed in this step
- Residual part dissolved in water , filtered and evaporated under vacuum
- The product is obtained as red-purple powder and contain anthocyanin 70%

FOLIA MYRTILLI, FRUCTUS MYRTILLI, Çoban üzümü

- In Turkey;
- *V.myrtillus*
- *V.arctostaphylos*
- *V.uliginosum*
- *V.vitis idaei* species grow on north Anatolian mountains

CYNARA SCOLYMUS, Enginar (ARTICHOKE)

- Compositae family
- The reseptacle and the base of the bracts constitute edible part of this vegetable
- 1-1.5 m , perennial
- Flowers in violet colour
- Leaves are used for treatment
- 1.year plant gives rosette leaves, leaves are bigger and compound leaf
- 2.year the flower appear, leaves are smaller, sessile and entire or lobed

CYNARA SCOLYMUS, Enginar (ARTICHOKE)

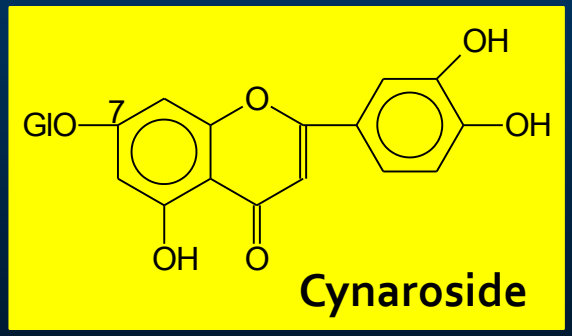
- Grows widely in Turkey
- *Cynara scolymus* is a variety of *cynara cardunculus* that is known as wild artichoke (*C.scolymus* var. *sativa*)
- Mediterranean plant
- 1. year leaves are preffered in pharmacy from cultivated plants. They are collected in summer.

CYNARA SCOLYMUS, Enginar (ARTICHOKE)

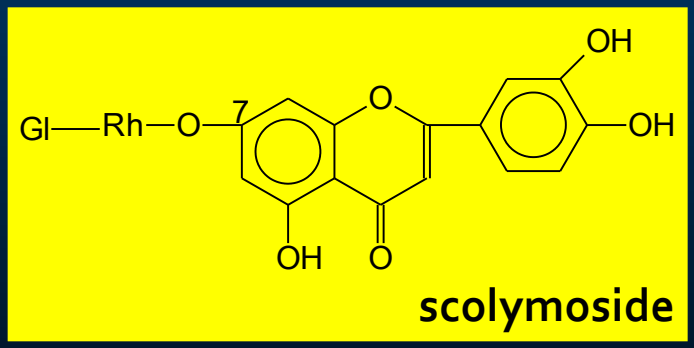
- Median vein of the leaves are removed and leaved as thin layer to dry by air conditioning under 40°C
- Leaves contain water at high amount 90%, therefore drying process is important
- Plant contains oxidase enzymes, compounds can be oxidised easily, therefore the drug should be dried in summer season

CYNARA SCOLYMUS, Enginar (ARTICHOKE)

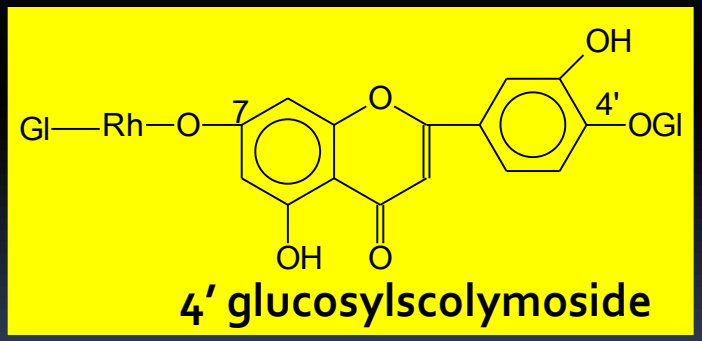
- When dried under convenient conditions the drugs retains its original colour, greenish-grey top side and whitish underside, hot taste
- Chemistry;
- 1) Polyphenolic compounds;
- Glycosylflavonoids; Luteolin derivatives,
- 1- Cynaroside----luteolin-7-monoglucoside
- 2- Scolymoside---luteolin-7-rhamnosylglucoside
- 3-4'-glucoside of scolymoside



Cynaroside



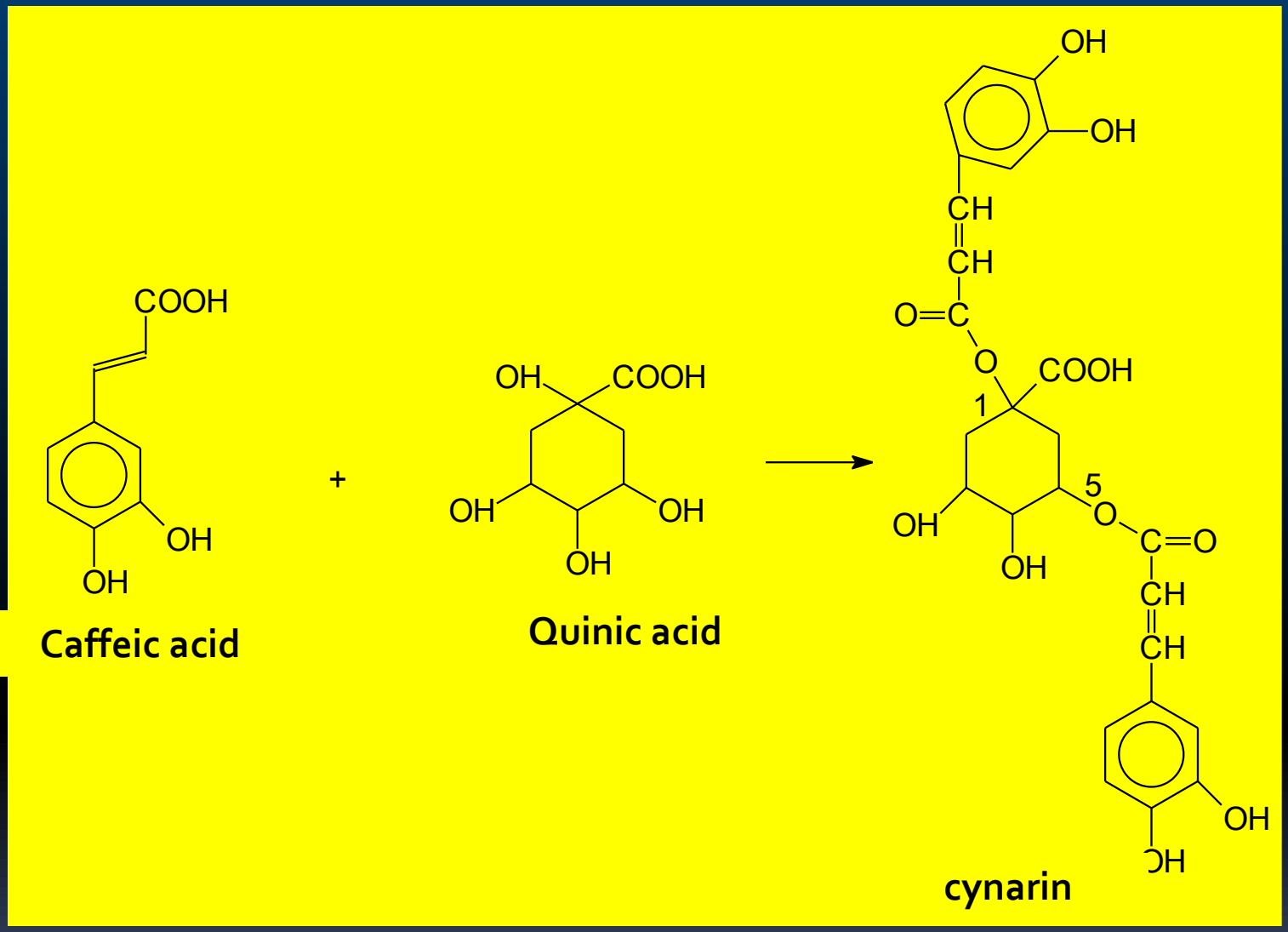
scolymoside

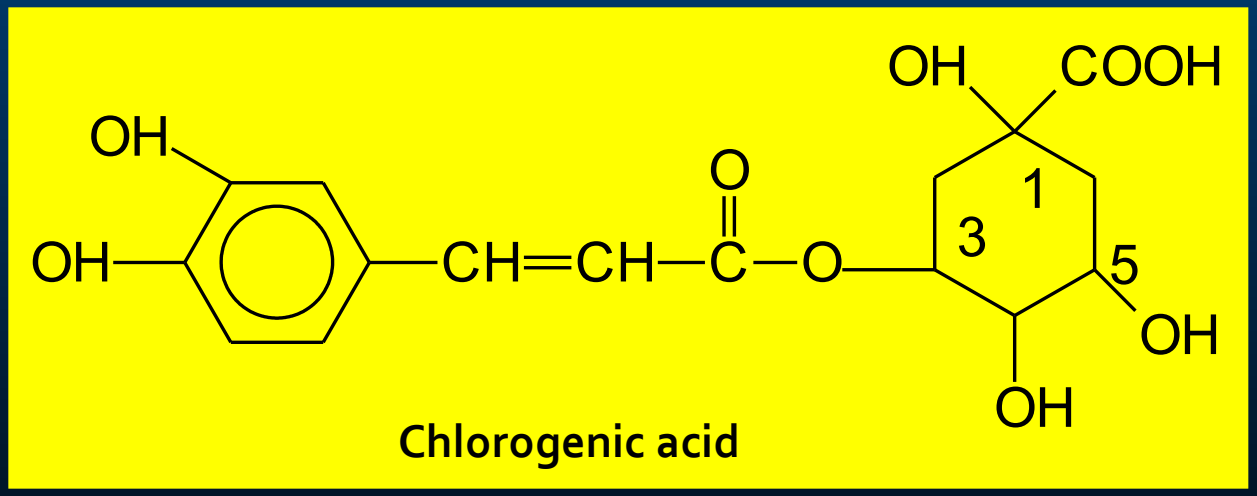


4′ glucosylscolymoside

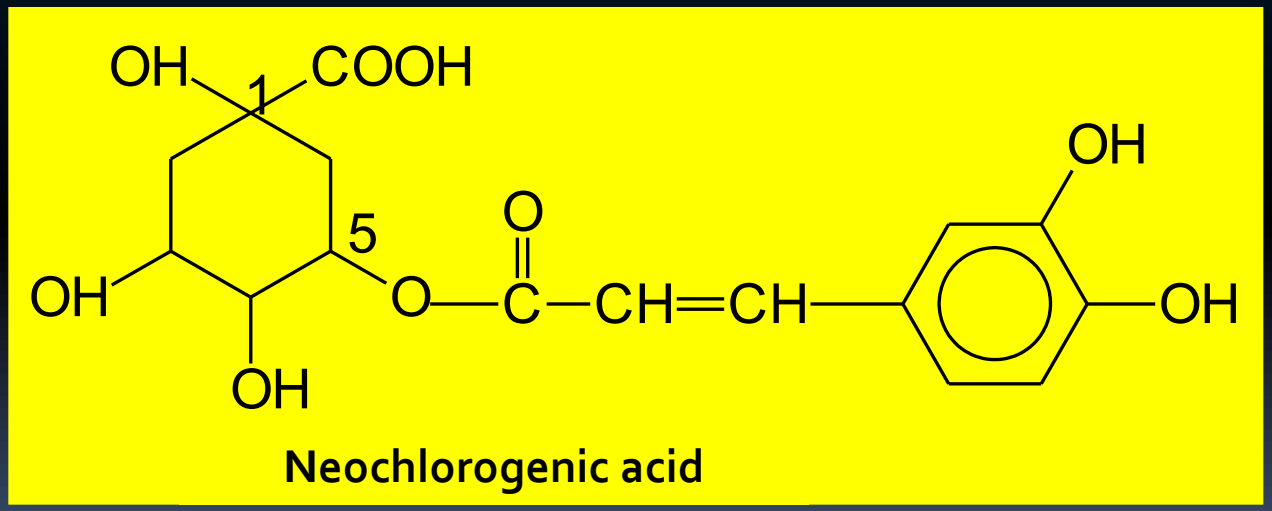
CYNARA SCOLYMUS, Enginar (ARTICHOKE)

- These compounds returning to dihydroxy phenolic derivates by active oxidase enzymes
- 2) Phenolic acids;
- Caffeic acid
- Chlorogenic acid
- Neochlorogenic acid
- 1,5 dicaffeoylquinic acid (Cynarin)


COOH
OH
OH
Caffeic acid
+
OH
COOH
OH
OH
OH
Quinic acid
OH
OH
CH
CH
O=C
O
1
COOH
OH
OH
5
O
C=O
CH
CH
OH
OH
cynarin



Chlorogenic acid



Neochlorogenic acid

CYNARA SCOLYMUS, Enginar (ARTICHOKE)

- Cynarin is responsible for the activity. This compound is colourless, crytalline easily, solubile in hot water and poorly solubile in cold water

- EFFECTS

- Diuretic---against kidney stones
- For treatment of liver diseases (Hepatoprotective)

CYNARA SCOLYMUS, Enginar (ARTICHOKE)

- Many preparations are found in Europe. Commission E approved this drug for usage as;
- Diuretic
- Choleretic and cholagogue
- Lower cholesterol level
- Hepatoprotective
- Should not be used in case of bile duct obstruction

CYNARA SCOLYMUS, Enginar (ARTICHOKE)

- **PREPARATIONS**

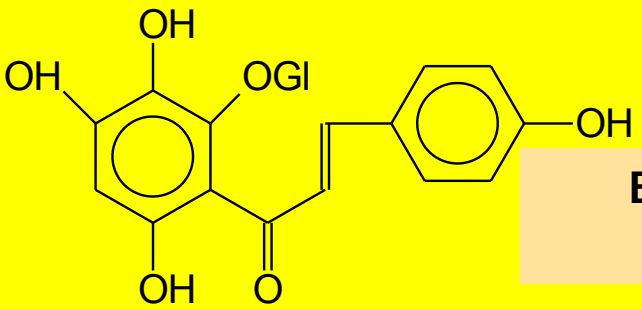
- CYNARIX ®
- HEPAR SL ®
- HEKBILIN ®
- CARMINAGAL ®
- LYSROCHOL®

FLORES CARTHAMI, Aspir, Yalancı safran (SAFFLOWER)

- *Carthamus tinctorius* (Compositae)
- 10-60 cm high, yellow flowers, annual and herbaceous plant
- Leaves are sessile
- Originated from Arabia
- Cultivated in Europe, America, Asia and Egypt
- In our country middle and south Anatolia

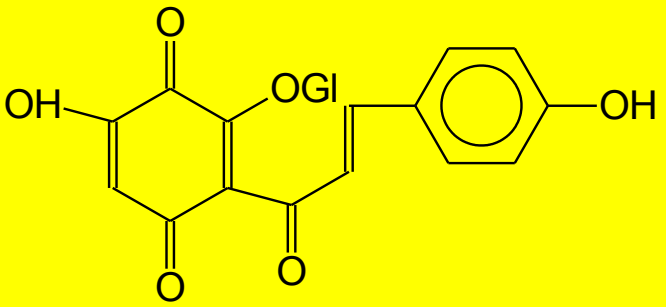
FLORES CARTHAMI, Aspir, Yalancı safran (SAFFLOWER)

- Glycosyl chalchones.-------Carthamin (yellow)---enzymatic oxidation---changed as Chartamon (red colour)
- This oxidation resulting red colour extracts
- Flavanone derivatives-----Carthamidin (colourless)
- Luteolin glycosides



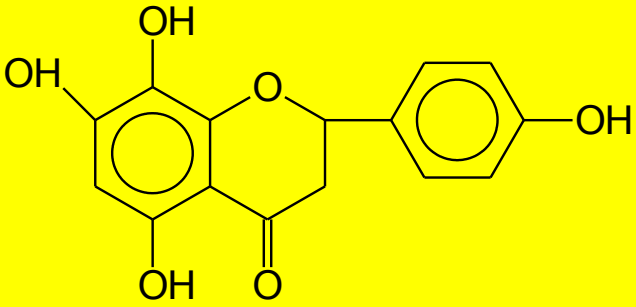
Carthamin (Yellow)

Enzymatic-oxidation



Carthamon Red-orange

H2



Carthamidin (Colourless)

FLORES CARTHAMI, Aspir, Yalancı safran (SAFFLOWER)

- Flowers are used;
- In cosmetic industry
- Colouring agent in food industry
- Seeds are used as purgative 10% decoction
- In rheumatism treatment
- Emmanogogue, purgative, expectorant, used against cold