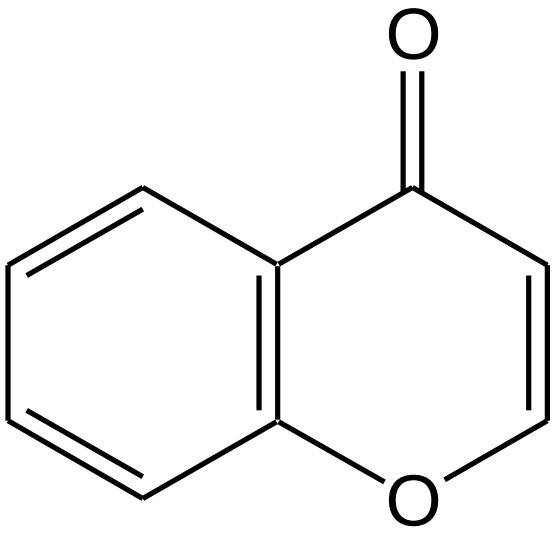
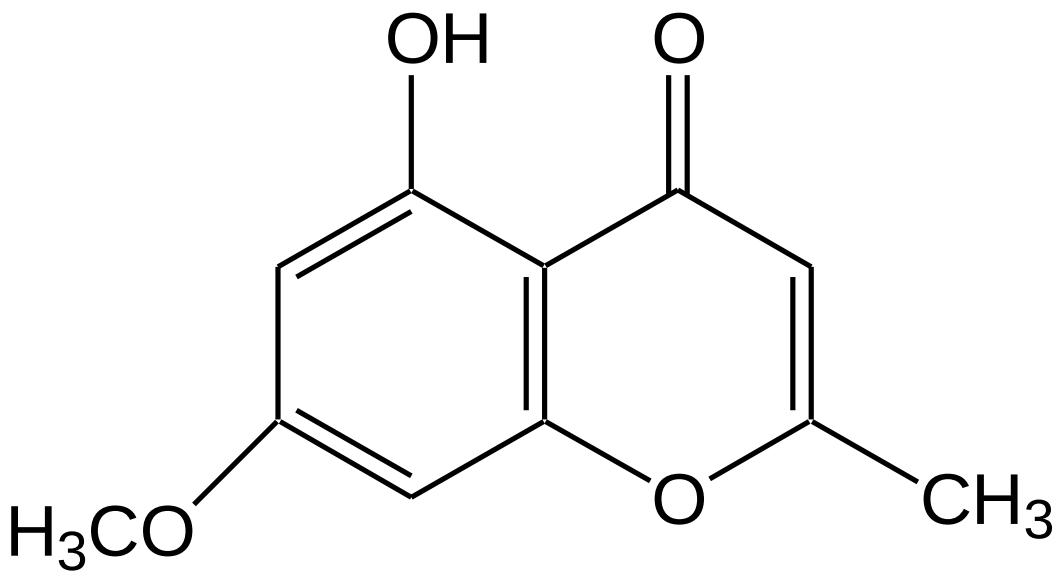
Chromones. Medicinal plants and raw materials containing chromones.

- **Chromones (from Greek chroma - colour, dye, Latin suff. -on-) are phenolic compounds that are similar in structure to both coumarins and flavonoids, but are less common in nature**.

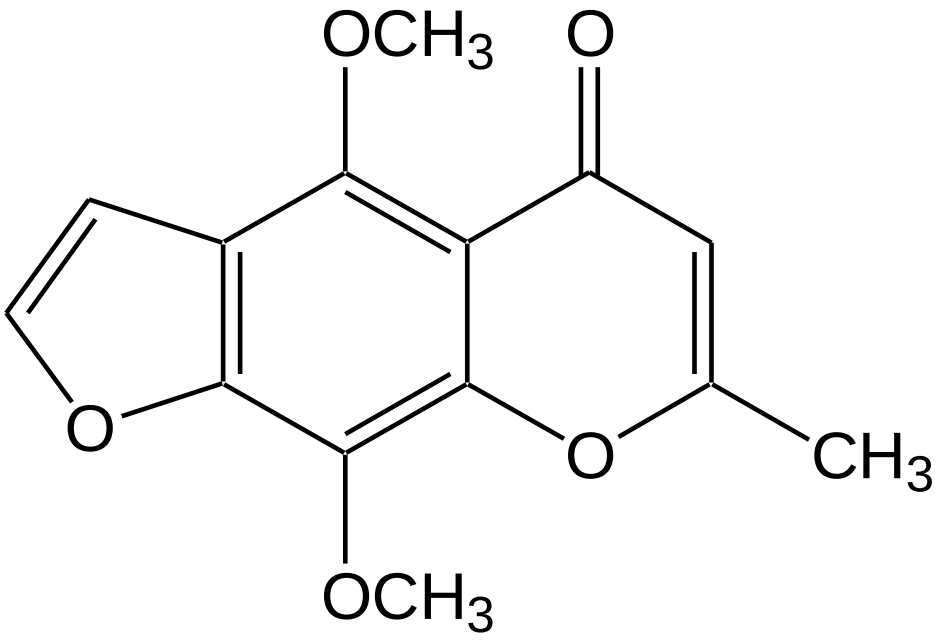
Chromones contain a γ-pyrone ring in their composition

- 

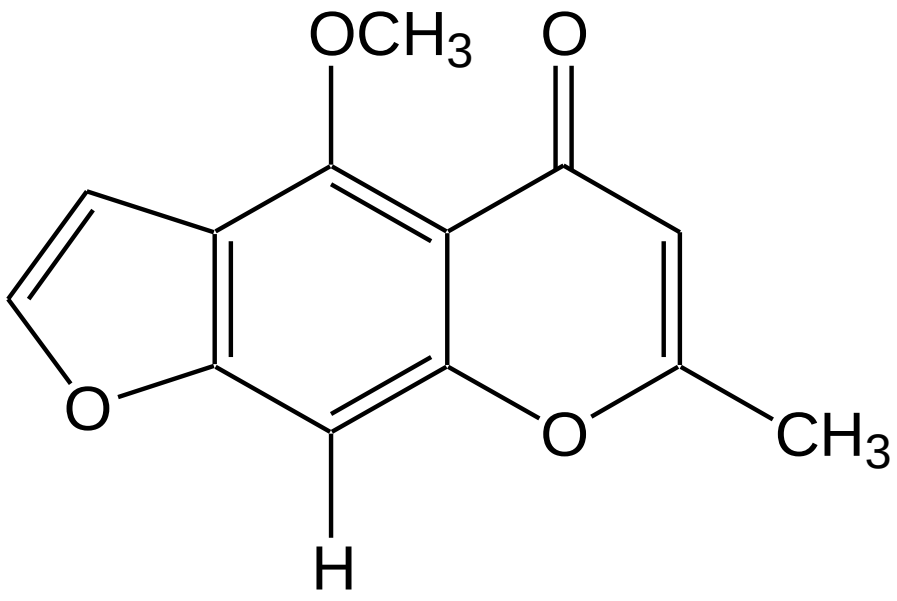
Chromone
(5,6-benzo-γ-pyrone)



Eugenin



Kellin

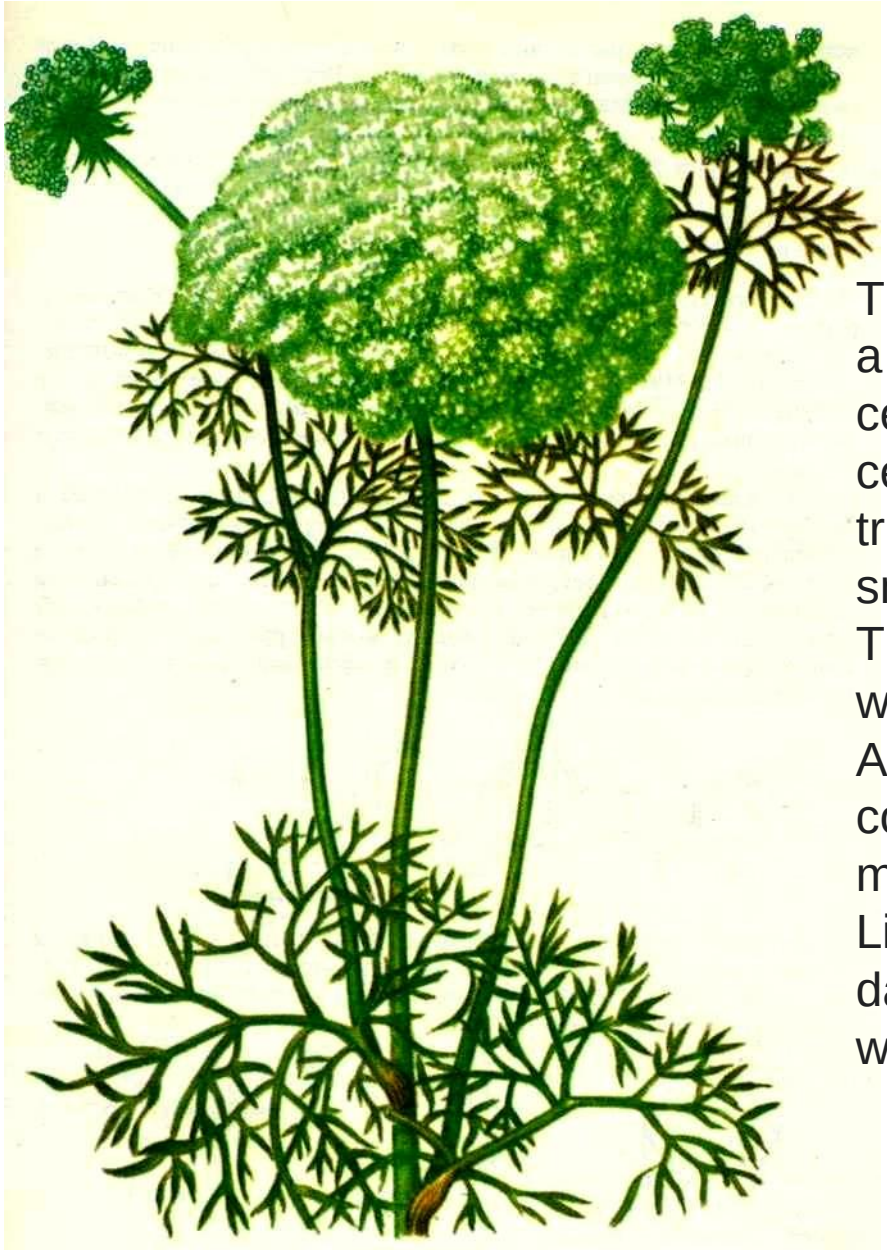


Visnagin

- **Toothpick ammi** - *Visnagae daucoidis* (*Ammi visnaga*) (L.) Lam
- Family *Apiaceae*

- **Toothpick ammi fruits** - Visnagae daucoidis fructus

Ammi visnaga



This is an erect annual plant growing from a taproot to a maximum height near 80 centimeters. The leaves are up to 20 centimeters long and generally oval to triangular in shape but dissected into many small linear to lance-shaped segments. The inflorescence is a compound umbel of white flowers similar to those of other Apiaceae species. The fruit is a compressed oval-shaped body less than 3 millimeters long.

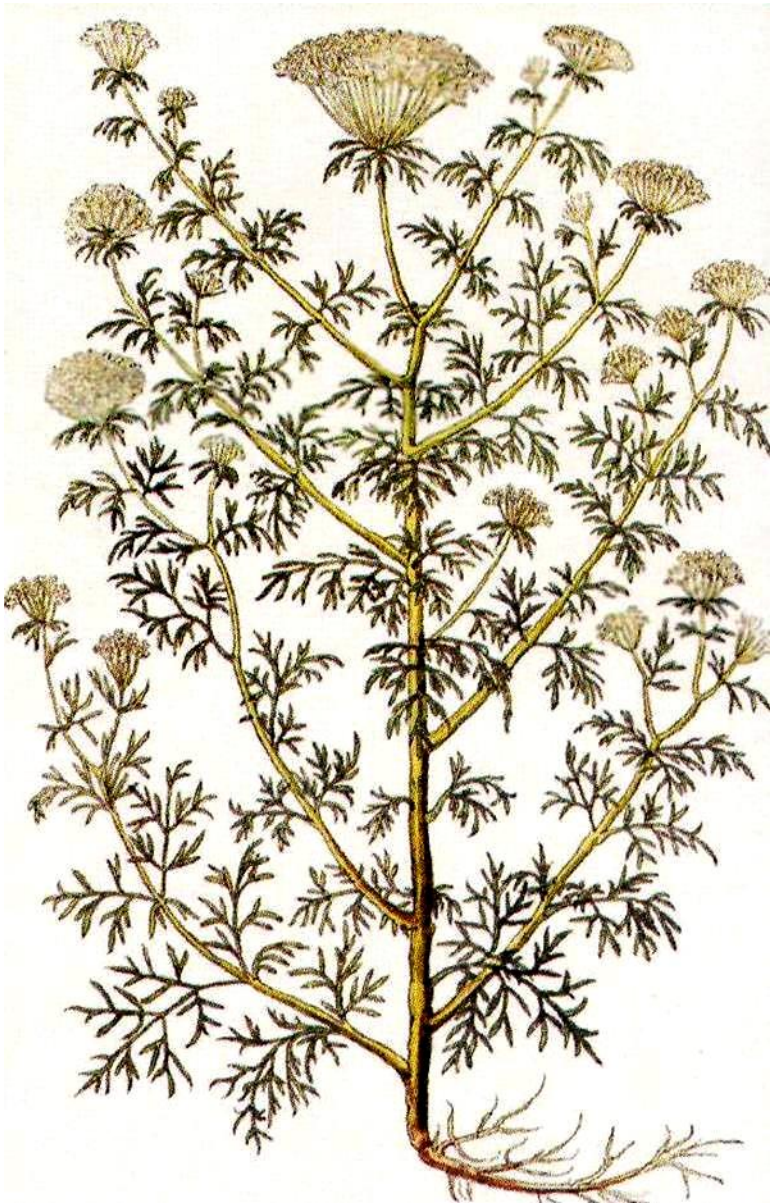
Like its close relative Ammi majus, Visnaga daucoides is commonly seen in gardens where it is grown from seed annually.

Ammi visnaga

It is native to Europe, Asia, and North Africa, but it can be found throughout the world as an introduced species.

Ammi majus

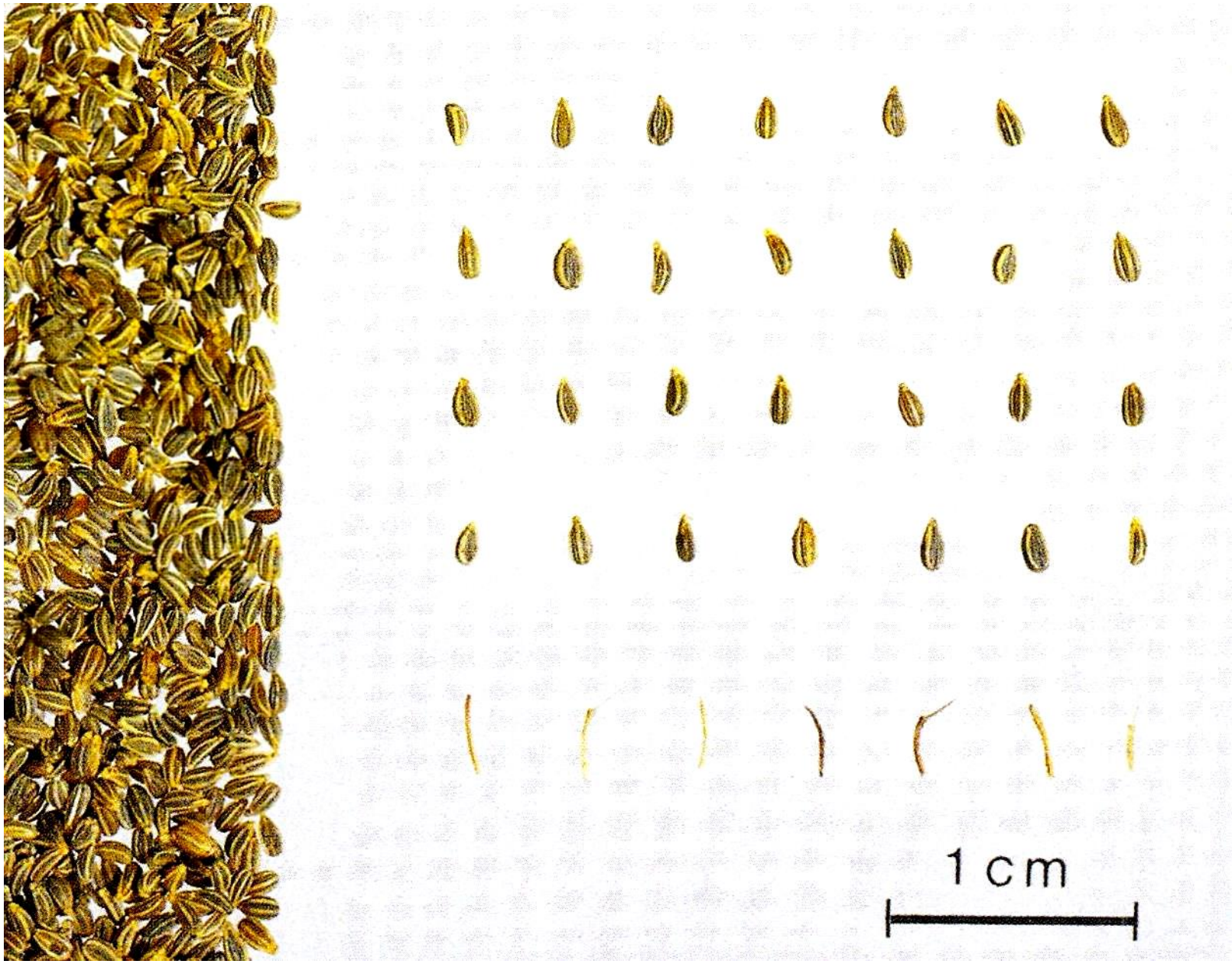
Ammi visnaga



Ammi visnaga

- **Chemical composition.** Fruits contain furanochromones kellinin (up to 2.5%), visnagin, kellinin.
- Besides, there are pyranocoumarins (derivatives of Y-benzopyron) - visnadin, dihydrosamidin; flavonoids; essential oil up to 0.2%; fatty oil up to 20%.
- The quality of ammi tooth fruits is regulated by Pharmacopeal Article 42-2098 - 83. The content of the sum of chromones in the fruits (in terms of kellin) should be not less than 1%.

Ammi fruits



Pharmacological action. Antispasmodic agent.

- **Uses.** From a mixture of fruit and seeds, the preparation "Kellin" is obtained, and from the fruit - "Avisan".
- **Kellin -** individual substance, has antispasmodic effect in spasms of smooth muscles. It is prescribed for bronchial asthma, spasms of the gastrointestinal tract, angina pectoris.

- **Avisan** is a total purified preparation; it has antispasmodic activity and is used in renal colic and ureteral spasm, for the treatment of kidney stone diseases and uric acid diathesis.
- Aqueous infusions of the herb ammi visnaga are recommended for hypertension and as diuretics.

- **Dill** - *Anethum graveolens* L.
- Family *Apiaceae*
- **Dill fruits** - *Anethi graveolentis fructus*
-

Dill (***Anethum graveolens***) is an annual herb. It is native to North Africa, Iran, and the Arabian Peninsula; it is grown widely in Eurasia, where its leaves and seeds are used as a herb or spice for flavouring food.

Anethum graveolens

Dill grows up to 0.46–1.52 m from a taproot like a carrot. Its stems are slender and hollow with finely divided, softly delicate leaves; the leaves are alternately arranged, 10–20 cm long with ultimate leaf divisions are 1–2 mm broad, slightly broader than the similar leaves of fennel, which are threadlike, less than 1 mm broad, but harder in texture.

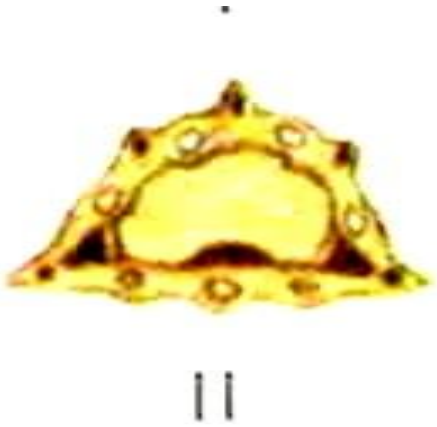
In hot or dry weather, small white to yellow scented flowers form in small umbels 2.5–8.9 cm diameter from one long stalk. The seeds come from dried up fruit 4–5 mm long and 1 mm thick, and straight to slightly curved with a longitudinally ridged surface.

Successful cultivation requires warm to hot summers with high sunshine levels; even partial shade will reduce the yield substantially.

Dill fruits

Dill fruits

I



II

I —external features; II — transverse section

- Fruits contain up to 4% essential oil containing carvone, limonene, α-phellandrene; furanochromones - visnagin and kellin, as well as pyranocoumarins (derivatives of β-benzopyrone) such as dihydrosamidin, visnadin.
- In addition, there are flavonoids: quercetin, isoramnetin, kaempferol, fatty oil (up to 20%), vitamin C (up to 120 mg%), B1, B2, PP, carotenoids, salts of potassium, calcium, phosphorus and iron.
-

The quality of raw materials is regulated by the State Pharmacopoeia of Russia XIV, according to which the essential oil in the whole raw material should be at least 2%.

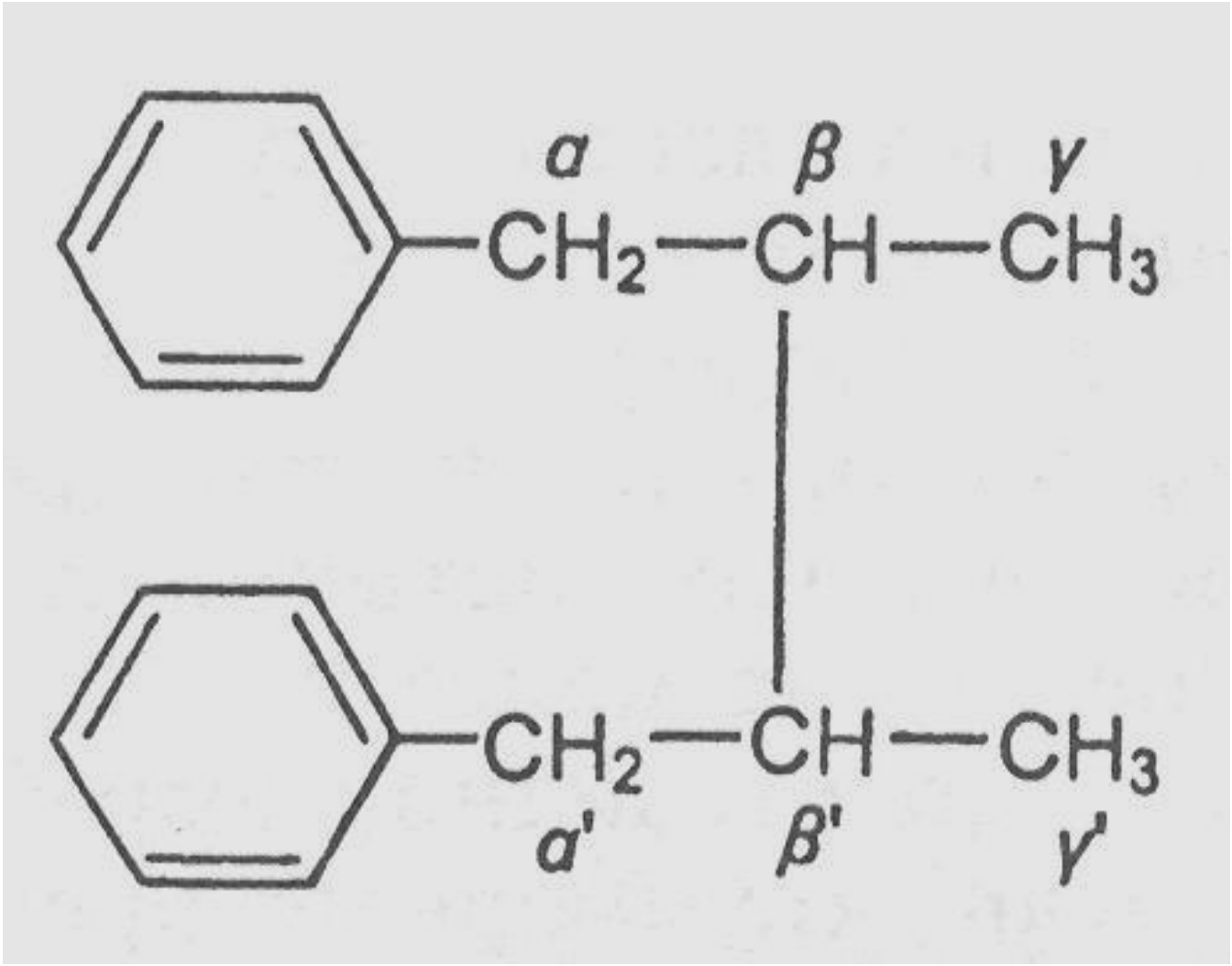
- **Pharmacological action.** Dill fruit - antispasmodic agent with diuretic properties.
- Dill fruit in the form of infusion used in hypertension, as well as diseases of the kidneys, urinary tract, gastrointestinal tract as antispasmodic, vetrogonny drug.

- The fruit is used to produce the preparation "Anetin" (in tablets), containing the sum of pyranocoumarins and furanochromones, which has antispasmodic action, so it can be used for the prevention of asthma and treatment of chronic coronary insufficiency.
- Dill essential oil is used in the confectionery and perfume industry. Dill herb in fresh or dried form is widely used for food purposes.

Lignans. Medicinal plants and raw materials containing lignans.

- **Lignans** are dimeric compounds of phenolic nature consisting of two phenylpropane fragments connected by β-carbon atoms of side chains. Each phenylpropane fragment is written as C6 to C3.

- The term "lignans" was first introduced by Heaworth in 1936.


α
β
γ
CH2—CH—CH3
CH2—CH—CH3
α'
β'
γ'

- **Physical properties.** As a rule, they are solid crystalline substances of lipophilic nature. They are well soluble in fatty, essential oils and resins. Their solubility in alcohol and chloroform varies. Lignans do not distill with water vapour. Lignans fluoresce blue or yellow in UV light.

- Many lignan compounds have valuable pharmacological properties - antitumour (podophyllotoxin), -stimulating and adaptogenic (schizandrin and syringaresinol derivatives), -antihemorrhagic (sesamin), -antimicrobial (arctiin), etc.
- Silibum marianum flavolignans have hepatoprotective effect.

- **Chinese magnolia-vine** - *Schisandra chinensis* (Turcz) Baill.

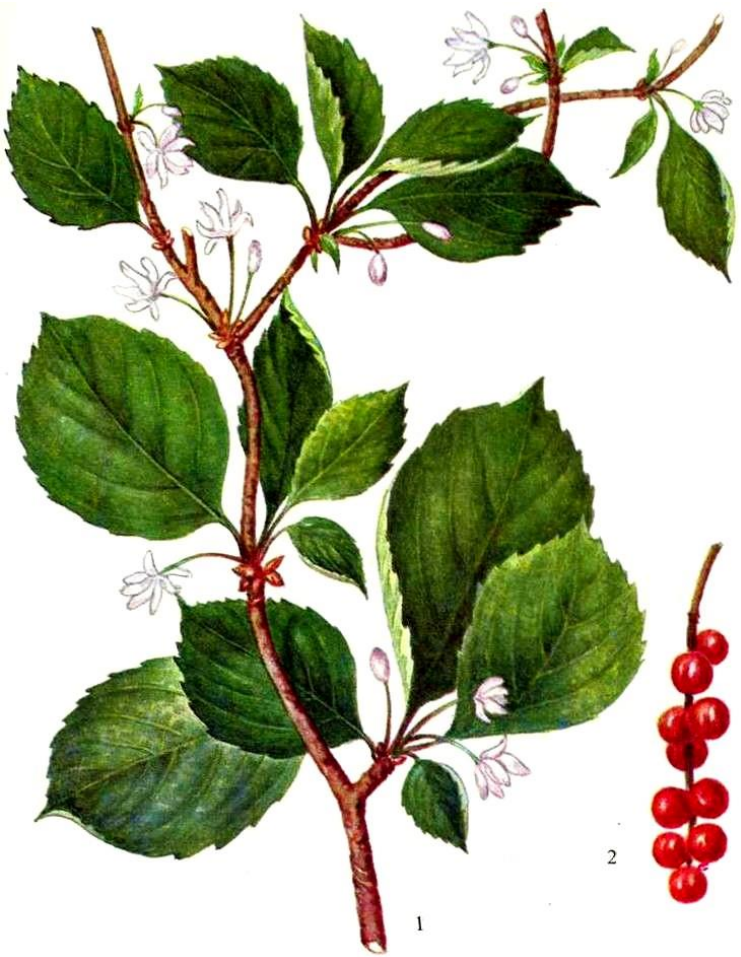
- Family *Schisandraceae*

- **Chinese magnolia-vine fruits** – *Schisandrae chinensis fructus*
- **Chinese magnolia-vine seeds** - *Schisandrae chinensis semina*

Schisandra chinensis

Schisandra chinensis is a perennial, deciduous woody vine plant found at high latitudes and in cool climatic conditions. It commonly grows in natural coniferous or mixed forests or along streams and climbs up other trees or shrubs to reach optimal light conditions. In Russia, Schisandra chinensis is also called Limonnik or Maximowich's red grape. The name Limonnik comes from the lemony smell of different plant organs, especially the leaves. The prostrate woody stems usually grow 8–9 metres tall, but can reach a length of up to 25m. They are dark brown in colour and can reach 1.5–2 cm in thickness.

New shoots are typically short, but they continue their growth after flowering until late in the season. The leaves are simple, oval-shaped (5–11 cm long and 3–7 cm wide) and alternating and the petioles have a slight red colouring. Multicellular trichomes are located on the abaxial leaf lamina. Stomata show a irregular, random distribution.



The flowers of Schisandra are unisexual and the species itself is dioecious.

The female flowers are white or cream-coloured and turn slightly reddish to the end of the flowering season. They have 5–12 waxy, spirally arranged tepals forming the perianth and 12–120 pistils. The tepals show a transition in colour from green for the outer tepals to more pigmentation for the inner ones. The flowers typically grow out of the leaf axils in clusters, later forming grape clusters with berries, but can also be found solitary. The male flower has 5 stamens with filaments of different lengths. The flowers of S. chinensis are important for various pollinators such as bees, beetles and small moths. The fruits of Schisandra chinensis are red berries which are smooth and shiny, have a spherical shape and reach 5–10 mm in diameter. They grow in dense hanging clusters of 2–5 berries which reach a length of about 6–8 cm. Each berry usually contains 1–2 brownish yellow kidney-shaped seeds. The seeds have the capacity to stay dormant and to form seed banks.

Major cultivation of Schisandra is located in Korea and China. The production however declined continuously due to the increased deforestation in Asia.

- **Chemical composition.** All parts of Schizandra chinensis contain lignans: in the pericarp and seeds - up to 4-5%, and the sum of lignans in the juicy pericarp and seeds increases as the fruit matures. The most characteristic are schizandrin, schizandrol, deoxyschizandrin, and homisine lignans are found in the fruit.

- In addition, the fruit is rich in organic acids: citric acid (11%), malic acid (10%), tartaric acid, oxalic acid, succinic acid, ascorbic acid (up to 500 mg%). There are sesquiterpenoids, pectin substances and sugars.
- Seeds contain essential oils (1.9-2.9%), sesquiterpene ketones, vitamin E, fatty oil (up to 33%).

- According to the State Pharmacopoeia XIV in whole fruits of Schizandra chinensis the sum of lignans in recalculation to schizandrin should be not less than 0.7%;

- Seeds. In whole, ground raw material content of the sum of lignans in terms of schizandrin should not be less than 1%.

Harvesting

The first fruit harvest of the Schisandra plant usually takes place 4–5 years after planting. In China, the ripe fruits are harvested in September.The berries in Europe may ripen earlier, possibly in August.

- Fruits and seeds are used to produce a tincture, which is used as a tonic and stimulant of the central nervous system. Fruits and seeds have a tonic effect on the body.
- Schizandra seeds in the form of powder contain more lignans than the tincture. They are widely used in the people as an effective remedy for hyperacid gastritis, also increase visual acuity.

- Preparations of Schizandra are contraindicated in case of increased nervous excitability, insomnia, high blood pressure and cardiac disorders.
- Preparations of Schizandra should be taken in the first half of the day. From the fruit is obtained juice, which is used as a drink, in addition, from the fruit of Schizandra make jam.

- **Spiny eleuterococcus** (Siberian ginseng) - *Eleutherococcus senticosus* (Rupr.et Maxim)

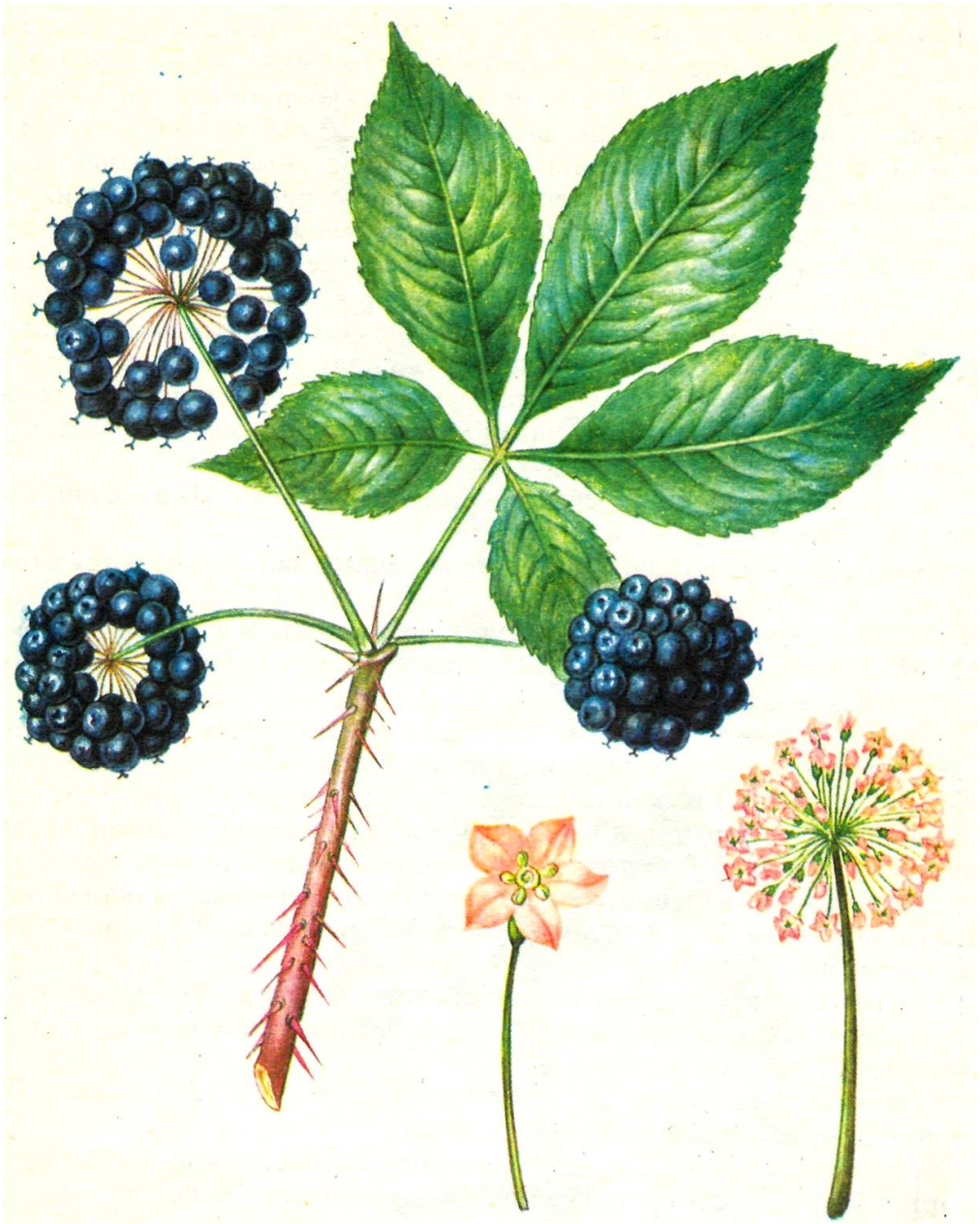
- Family *Araliaceae*

- **Spiny eleuterococcus rhizomes and roots** – *Eleutherococci senticosi rhizomata et radices*

It is a species of small, woody shrub, that grows 5 to 8.5 ft high. Its erect, spiny shoots, 1.5 to 2.5 inches in diameter, are covered with a light gray or brownish bark. The leaves are long petioled in a compound, palmate configuration. The five leaflets are elliptic and finely serrated at the margins on both sides, with scattered, minute spinules along the veins.

Eleutherococcus senticoccus

Eleuthero grows abundantly in parts of Russia, the Far East, Korea, China, and Japan, north of latitude 38. Its distribution is much greater than that of *Panax ginseng*



- **Chemical composition.**
- Biologically active substances of eleutherococcus rhizomes and roots are glycosides called eleutherosides. Chemically, they belong to different groups of substances.
- One of the main eleutherosides (eleutheroside E) is a lignan derivative, a diglycoside of syringoresinol formed by condensation of two synap alcohol links.

- Another eleutheroside is identified as daucosterol and on hydrolysis forms β-sitosterol and glucose, as it is genetically close to triterpenes.
- The next eleutheroside is a 7-glucoside of isofraxidine, i.e. a coumarin derivative. The nature of the remaining eleutherosides has not yet been fully elucidated, as they themselves and their aglycones are very labile substances.

- In addition, the raw material contains chlorogenic acid, resins, tannins, gum, essential oil, starch, lipids.
- According to the State Pharmacopoeia of Russia XIV in whole, ground raw materials and powder content of the sum of eleutherosides in terms of eleutheroside B should be at least 0.3%; eleutheroside B - at least 0.03%.

External features of medicinal raw material

- **Pharmacological action.** General tonic-nitrating agent that has tonic and expressed adaptogenic, hypoglycaemic and immunomodulatory effect.

- Systematic study of the properties of Eleutherococcus began in 1960.

- **Uses.** Raw materials are used to prepare a liquid extract of Eleutherococcus, used as an adaptogenic agent.
- Eleutherococcus preparations stimulate physical and mental performance, increase the body's resistance to harmful factors and diseases, normalise blood pressure, lower blood glucose levels.
- By improving the general condition eleutherococcus makes the body more resistant to colds and other diseases, increases appetite, reduces the toxicity of anti-blastoma substances (cyclophosphan, sarcolysin).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Dry and liquid extracts are used as adaptogenic means for asthenic states, neuroses, arterial hypotension, mental and physical fatigue.

Thank you for your attention