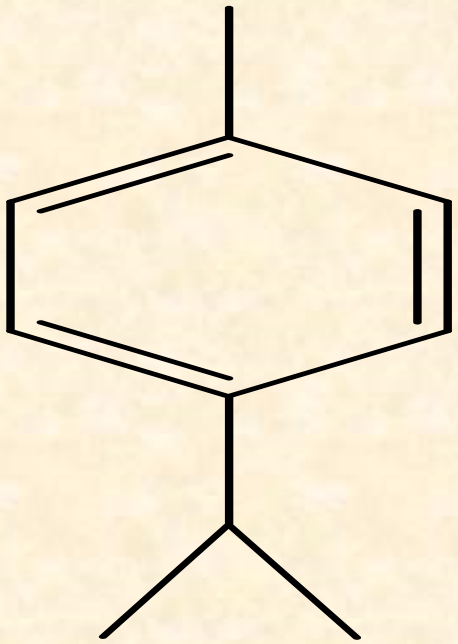
Terpenoids 3

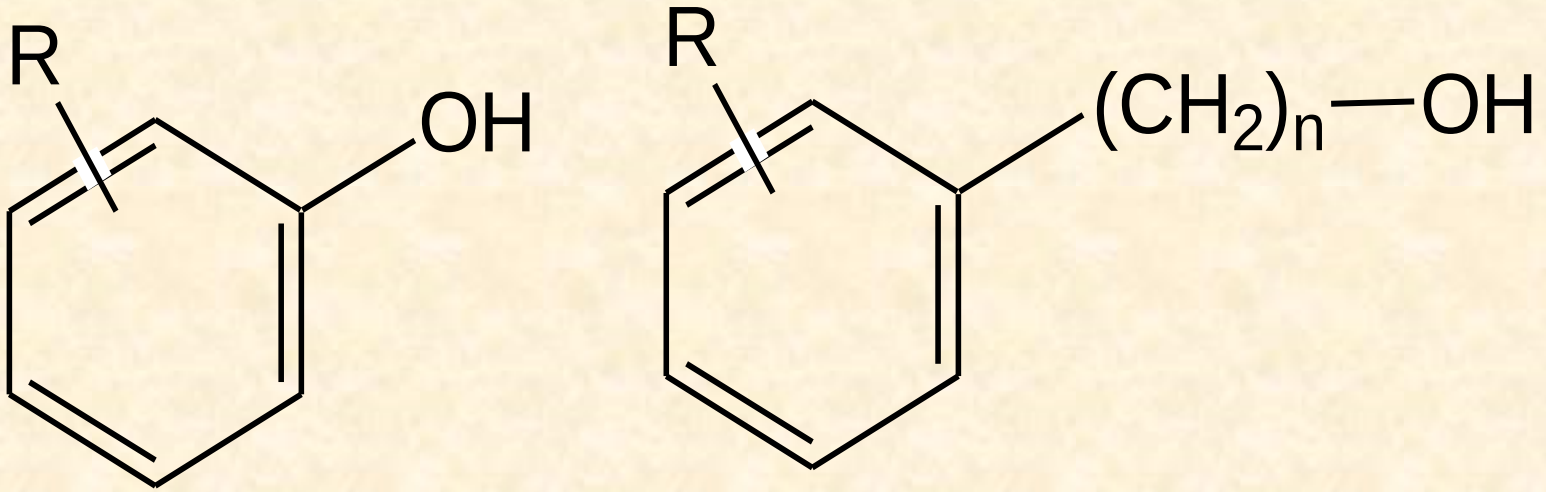
Aromatic compounds

Aromatic compounds in essential oils are much less common than terpenes. Of the aromatic hydrocarbons, **paracymol**, which is paramethyl isopropyl benzene, is the most common.

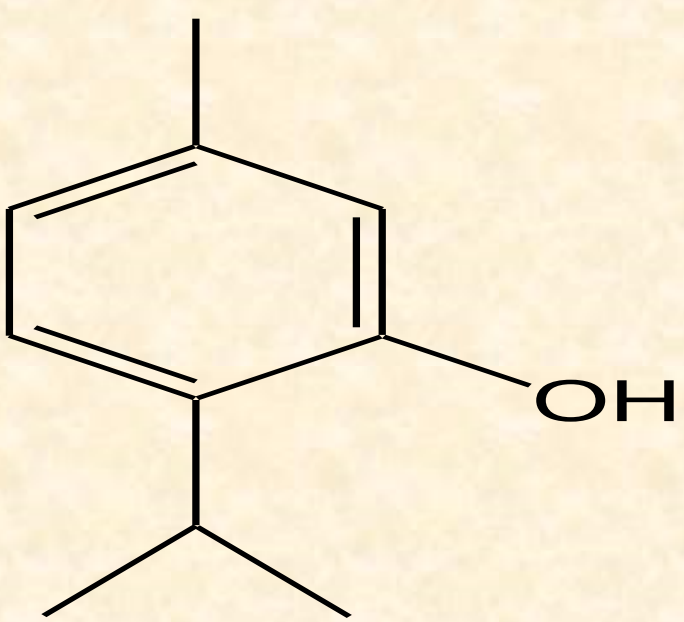


Paracymol

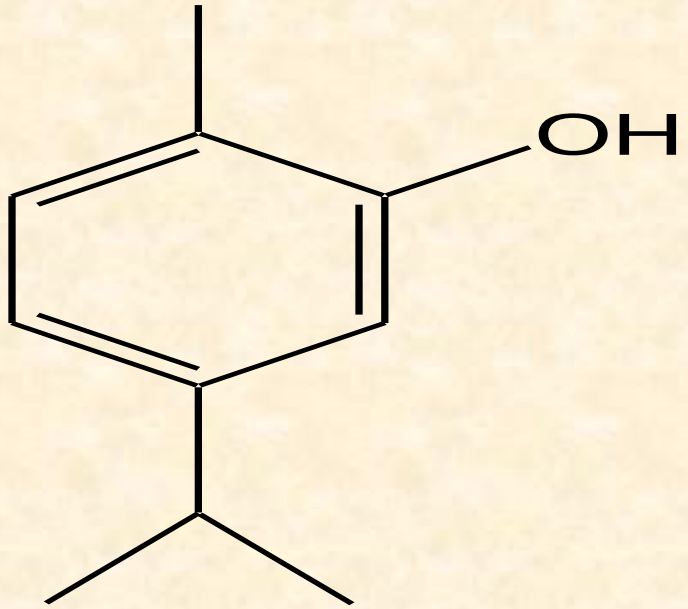
Oxygen-containing aromatic compounds most commonly have a hydroxyl group, which can be located directly in the aromatic ring or in the alkyl radical of the side chain. The first group is phenols and the second group is fatty aromatic alcohols.



The compounds of the first group are acidic and can be isolated in the form of salts from essential oils. The aromatic ring may contain one, two or more hydroxyl groups and may also contain alkyl radicals as substituents.



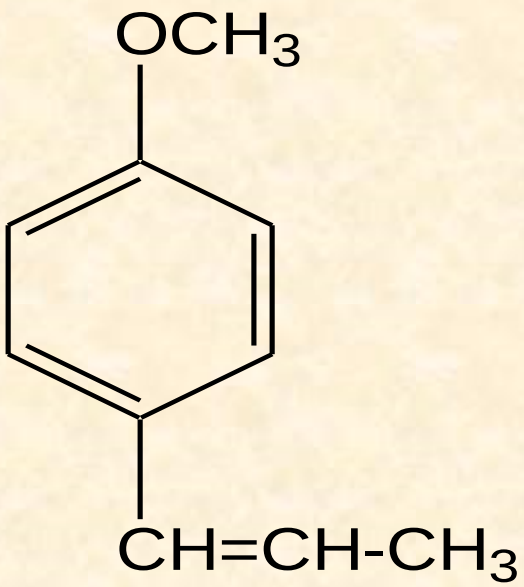
Thymol



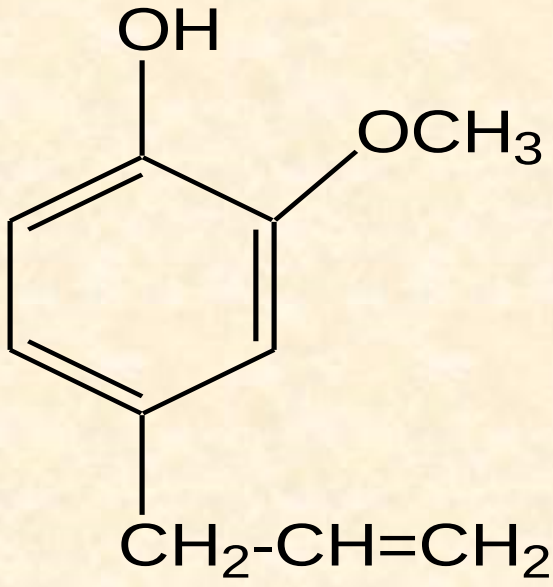
Carvacrol

Phenol molecules can contain aldehyde and keto groups in their side chains. Of the phenols in the plant, the following structures are the most widely represented, thymol, carvacrol, which are isomers.

Phenolic groups can form simple esters and alcohole (compound) esters, and the number of hydroxyl groups that have undergone esterification (ester formation reaction) can vary.

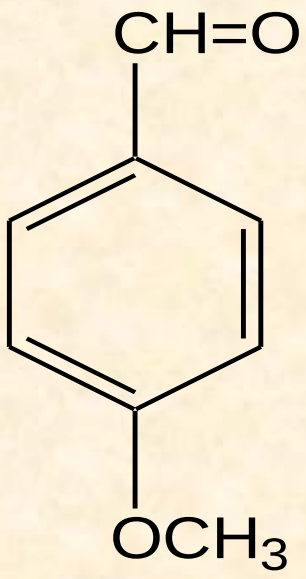


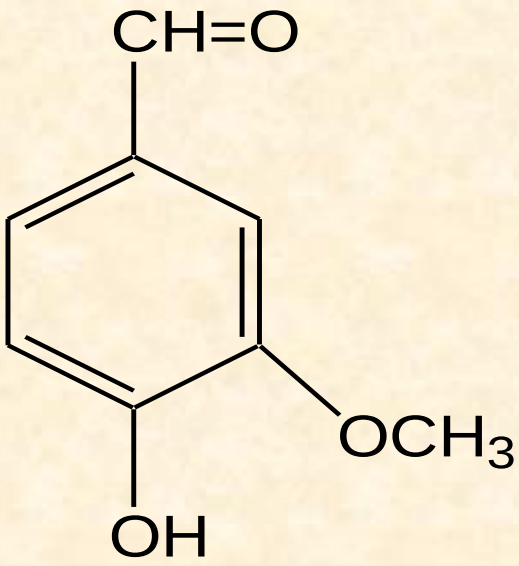
Anetole

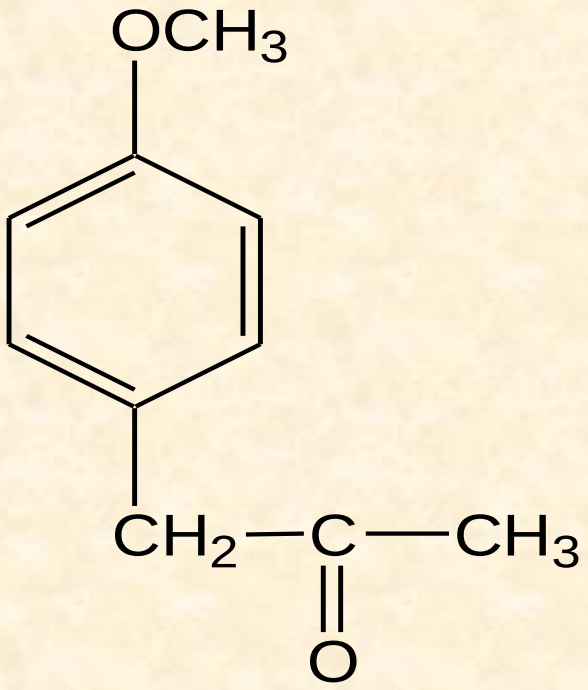


Eugenol

The phenol esters are represented by anetole, eugenol.

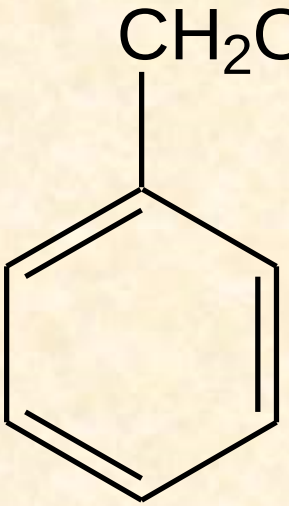




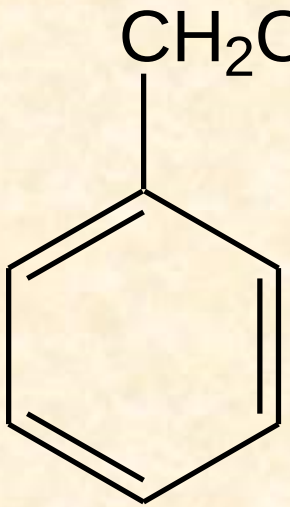


aniseed aldehyde vanillin anisquethone

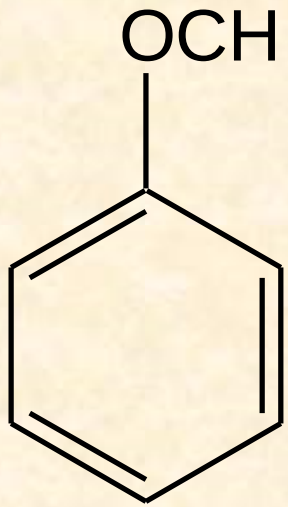
The phenol esters that contain a carbonyl group are aniseed aldehyde, vanillin and anisquethone.



benzyl alcohol



phenylpropyl alcohol



benzaldehyde

Fatty aromatic alcohols are represented in essential oils by benzyl alcohol, phenylpropyl alcohol and, of the aldehydes, benzaldehyde is the most common.

The following species are used worldwide: **Cinnamomum Yerum** of Ceylon and **C.aromaticum** of China, **Syzygium aromaticum** of the clove tree, **Illicium verm** of the star anise, **Pimenta dloica** of the fragrant pepper, **Vanilla planlfolia** of vanilla, **Crocus sativus** of saffron and several other species.

- **Anise** - *Anisum vulgare* Gaertn.

  also called **aniseed** or rarely **anix**

- Family *Apiaceae*

- **Anise fruits -** *Anisi vulgaris fructus*

Anisum vulgare

Anise is an herbaceous annual plant growing to 90 centimetres (3 feet) or more. The leaves at the base of the plant are simple, 1–5 cm long and shallowly lobed, while leaves higher on the stems are feathery pinnate, divided into numerous small leaflets.
The flowers are either white or yellow, approximately 3 millimetres in diameter, produced in dense umbels.
The fruit is an oblong dry schizocarp, 3–6 mm long, usually called "aniseed".

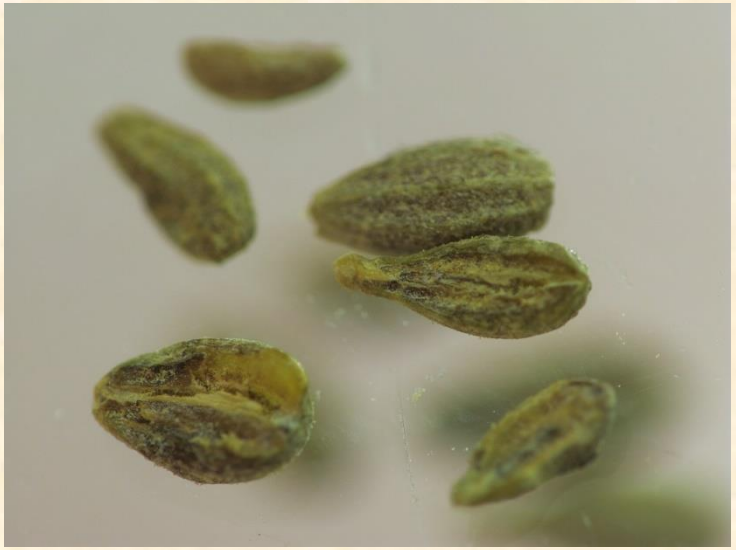
Anise was first cultivated in Egypt and the Middle East, and was brought to Europe for its medicinal value. It has been cultivated in Egypt for approximately 4,000 years.

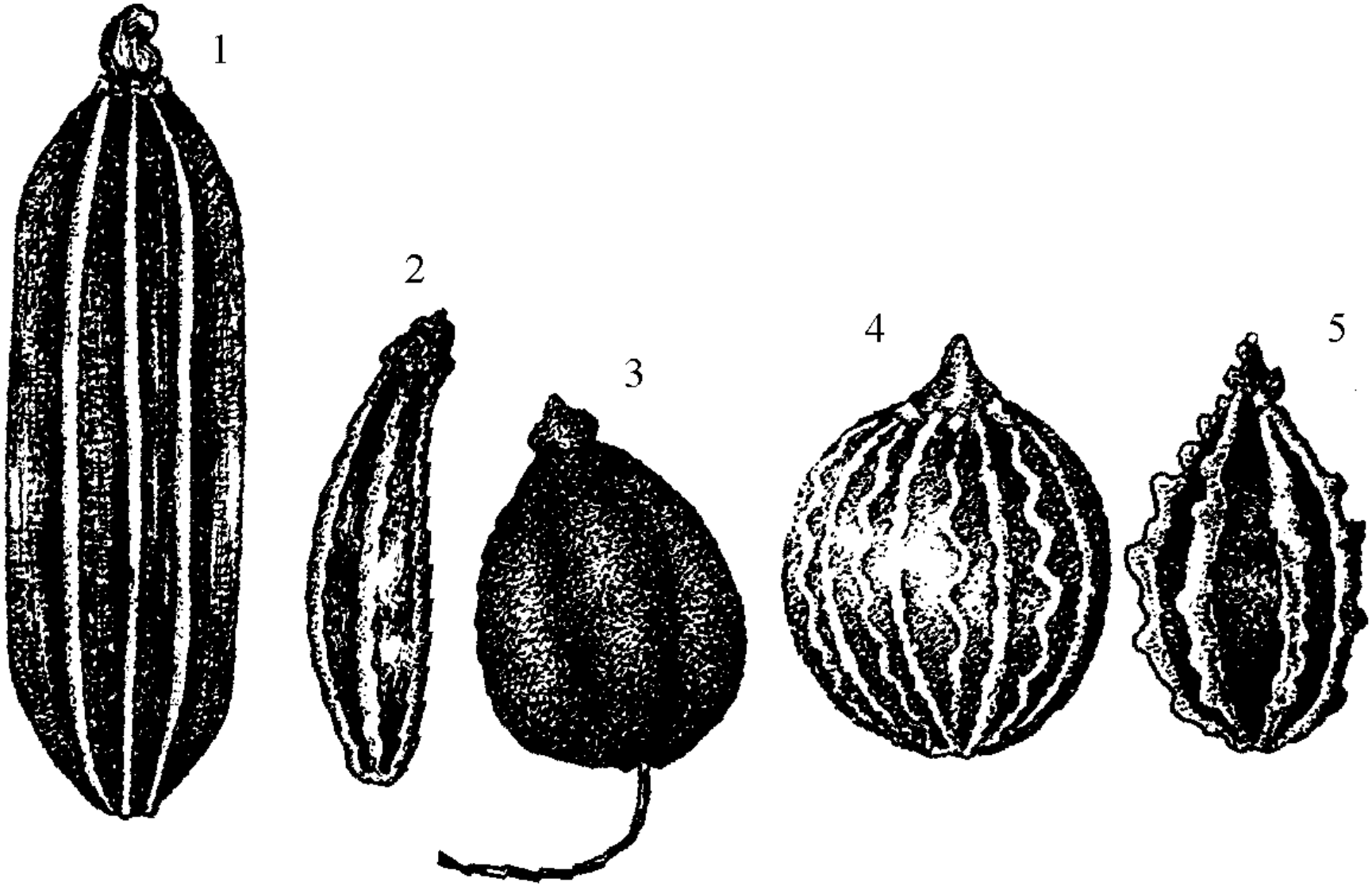
Anise plants grow best in light, fertile, well-drained soil. The seeds should be planted as soon as the ground warms up in spring.

Because the plants have a taproot, they do not transplant well after being established so they should either be started in their final location or be transplanted while the seedlings are still small.

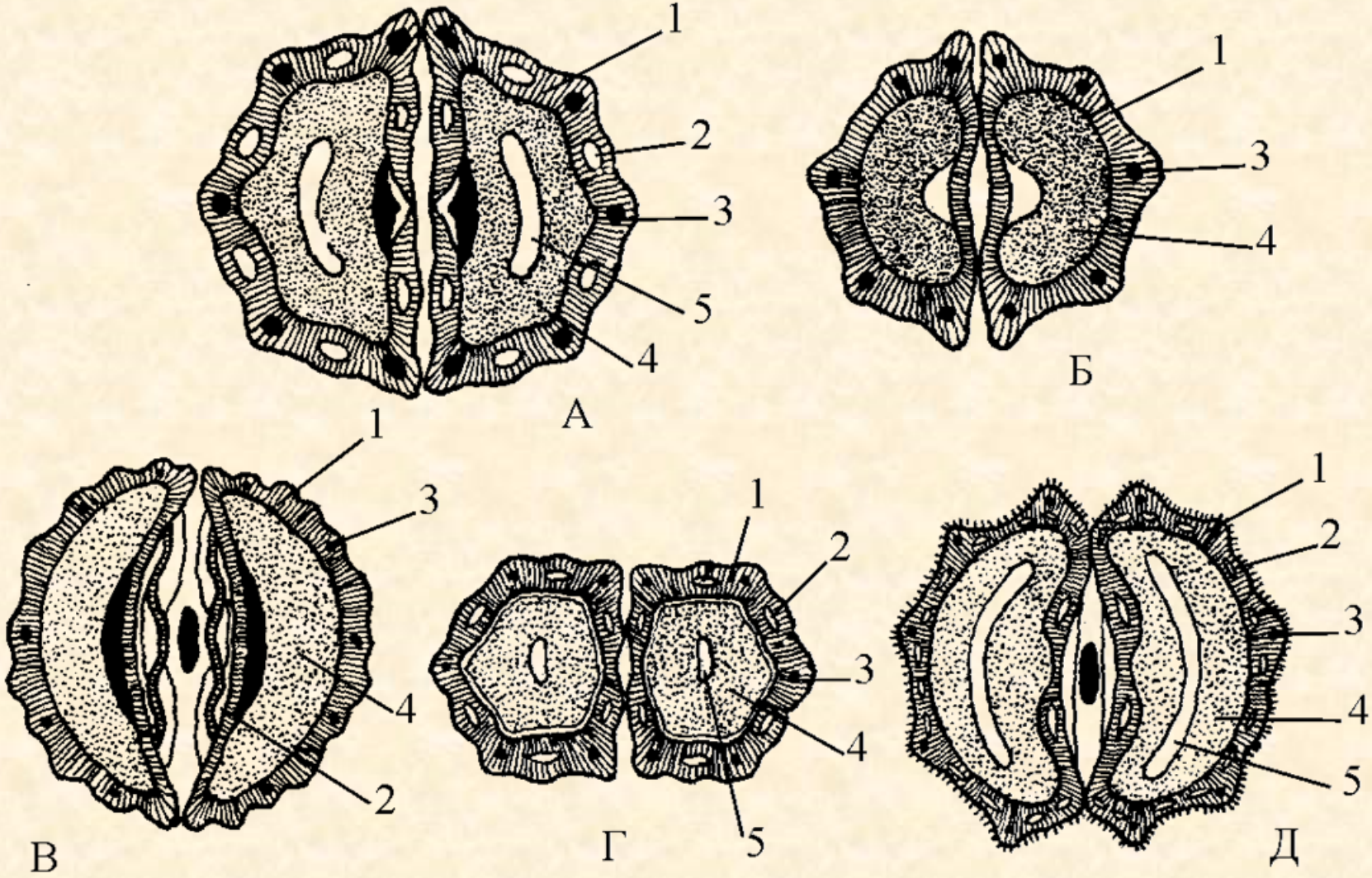
I

II





1-Fennel, 2-Caraway, 3-Anise, 4-Coriander, 5- Hemlock



А-Fennel, Б- Hemlock, В-Coriander, Г-Caraway, Д-Anise


1 cm

Conium maculatum, colloquially known as **hemlock**, **poison hemlock** or **wild hemlock**, is a highly poisonous biennial herbaceous flowering plant in the family Apiaceae, native to Europe and North Africa

Anise fruits contain 1.2 - 3% (sometimes up to 6%) essential oil. Anise essential oil contains about 80% crystalline anethol, 7-10% liquid methylhavicol, aniseal aldehyde and aniseic acid.

The seed kernel of the fruit is rich in protein and fatty oil (15 - 20%).

According to the State Pharmacopoeia of Russia XIV the essential oil content in the whole raw material is not less than 1.5%.

The essential oil is obtained by distilling the crushed fruit with water vapour.

Anise oil –
Oleum anisi

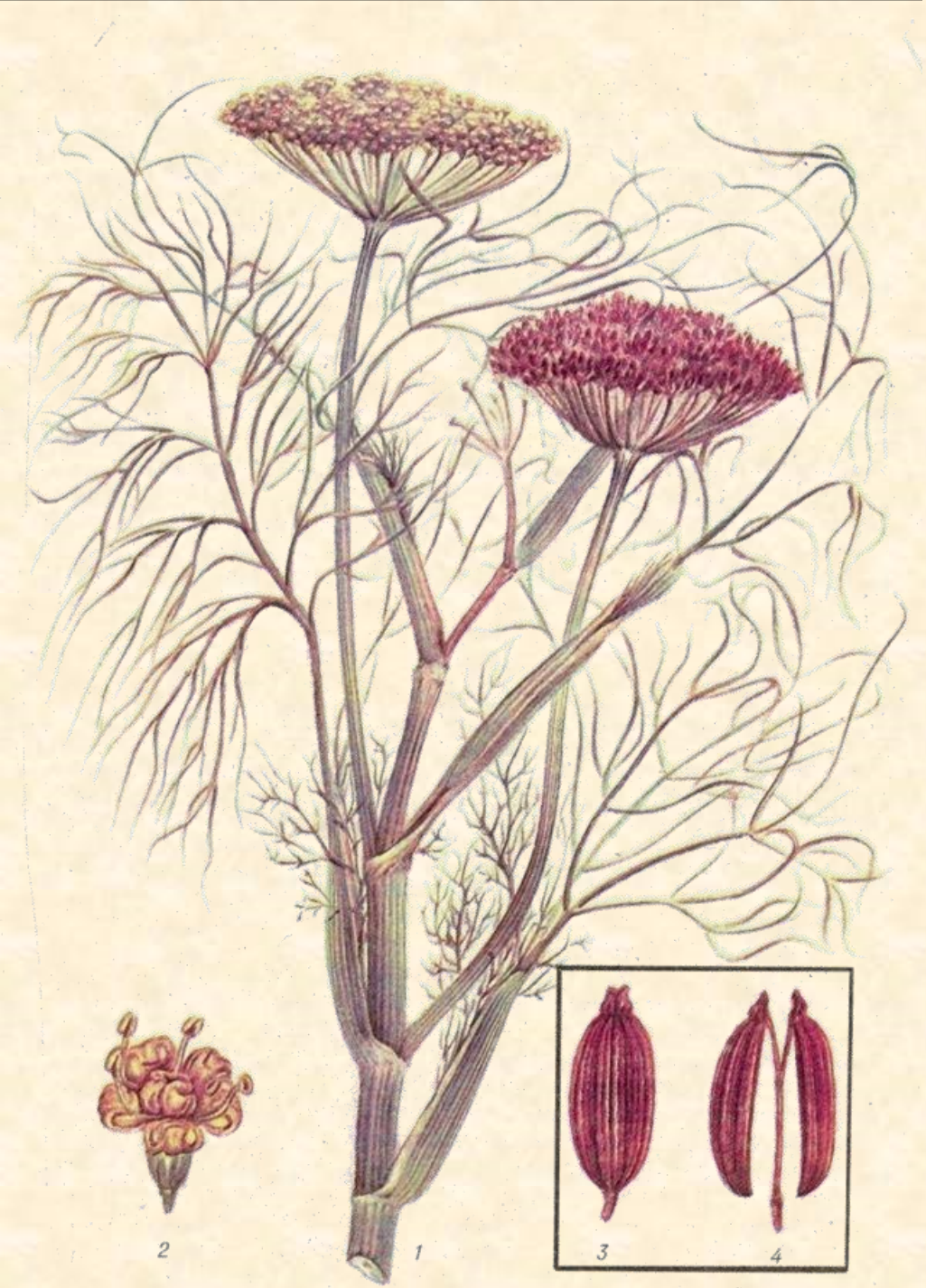
Pharmacological action - expectorant.

Usage. Anise fruits are used in the form of an infusion as an expectorant. Included in the composition of the officinal mixture. Anise oil is obtained from the fruits of anise, which is part of the ammonia and anise drops. Anethole is extracted from anise oil and used in the chemical-pharmaceutical industry for the synthesis of synestrol.

- **Fennel –** *Foeniculum vulgare* Mill.

- Family *Apiaceae*

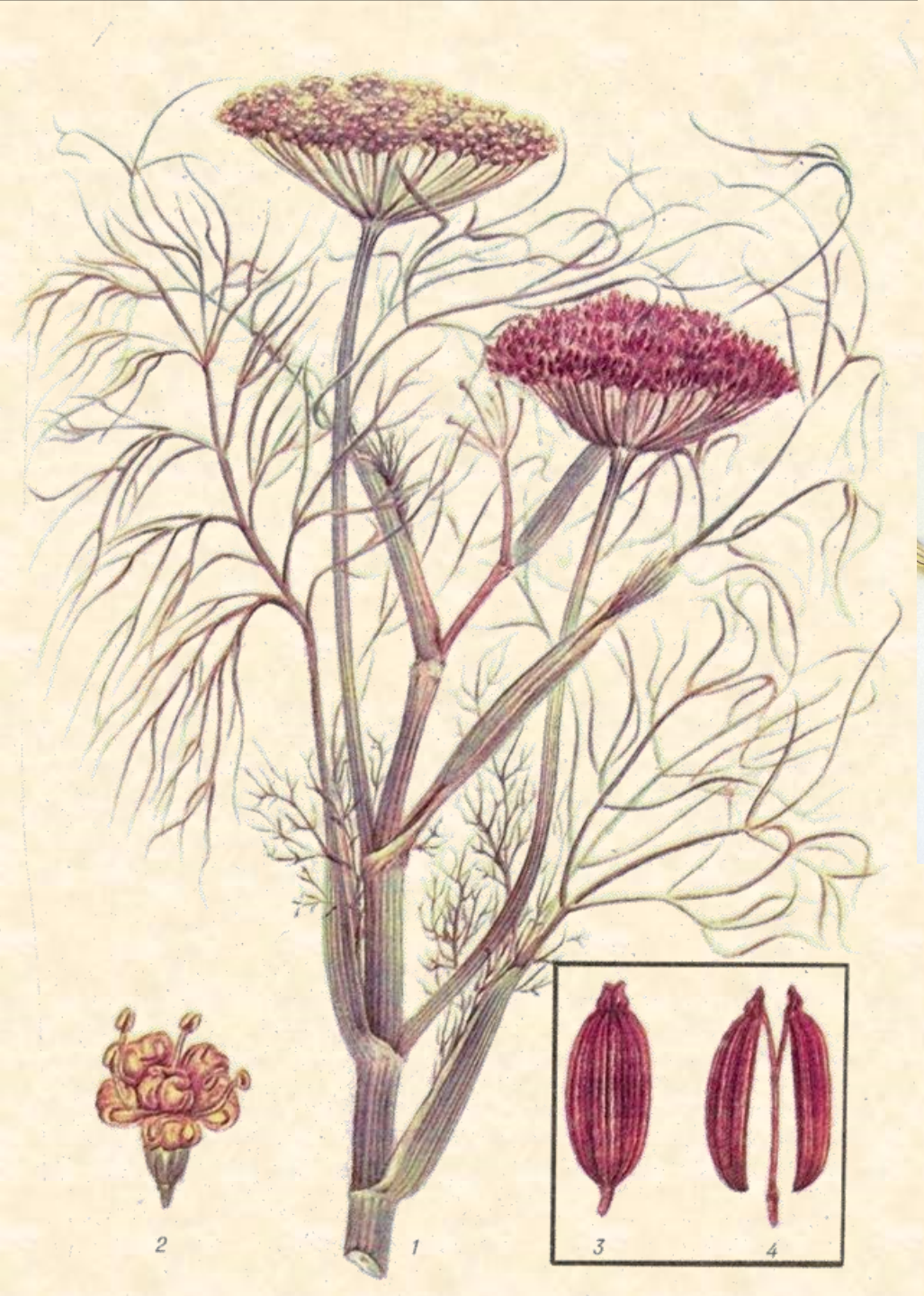
- **Fennel fruits** – *Foeniculi vulgaris fructus*



Foeniculum vulgare is a perennial herb. It is erect, glaucous green, and grows to heights of up to 2.5 metres, with hollow stems. The leaves are finely dissected, with the ultimate segments filiform (threadlike), about 0.5 millimetres wide. (Its leaves are similar to those of dill but thinner.) The flowers are produced in terminal compound umbels 5–17.5 cm wide, each umbel section having 20–50 tiny yellow flowers on short pedicels. The fruit is a dry schizocarp from 4–10 mm long, half as wide or less, and grooved. Since the seed in the fruit is attached to the pericarp, the whole fruit is often mistakenly called "seed."

Fennel is widely cultivated, both in its native range and elsewhere, for its edible, strongly flavored leaves and fruits.

Foeniculum vulgare Mill.

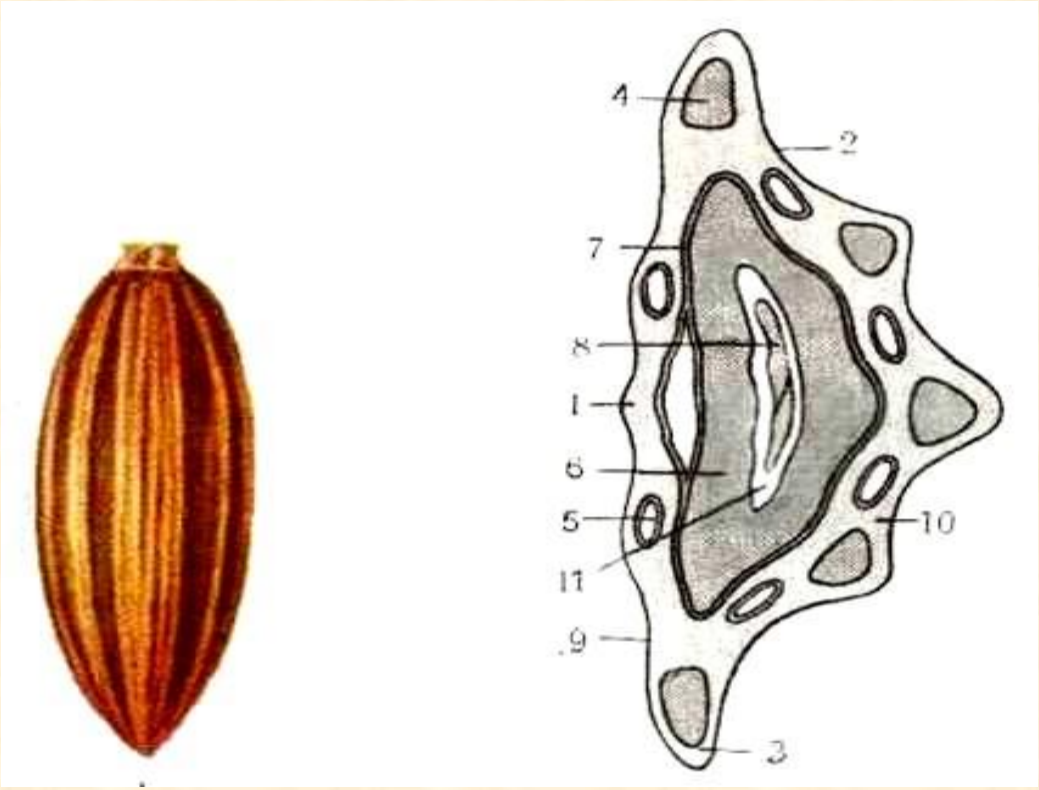

2
1
3
4

Chemical composition.

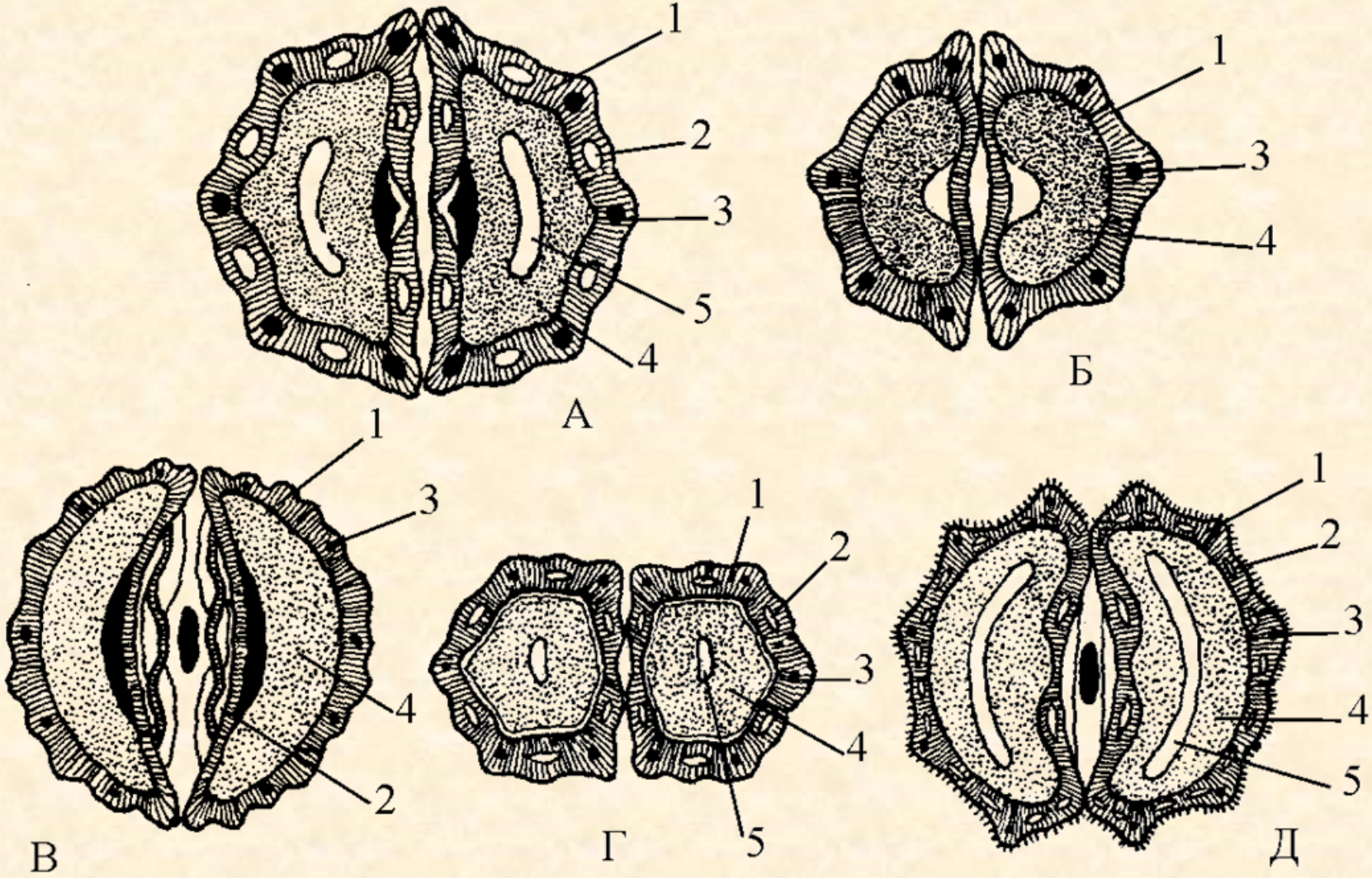
Common fennel fruits contain up to 6% essential oil with a high content of components - anethole (up to 60%), anisic aldehyde, anisic acid, fenchone, pinene and many terpenoids.According to the State Pharmacopoeia of Russia XIV, there should be at least 3% of essential oil.

The oil is a clear yellowish liquid with a strong peculiar odor reminiscent of anise. The taste is first bitter, then sweet. Pour point from 6 to 3°C. The seeds contain up to 18% fatty oil, protein substances.

Fennel fruits



I —appearance; II — transverse section



А-Fennel, Б- Hemlock, В-Coriander, Г-Caraway, Д-Anise

Pharmacological action. Antispasmodic with expectorant, choleretic properties.

Fennel fruit is used in the form of infusions to improve appetite, digestion and as an expectorant, choleretic, antispasmodic and diuretic.

Fennel is also used as part of a diarrhoeal mixture to treat flatulence.

The essential oil is used in the preparation of dill water which is used as a carminative in children.

Anetole is extracted from the oil.

The fruit is used as a spice in the canning industry.

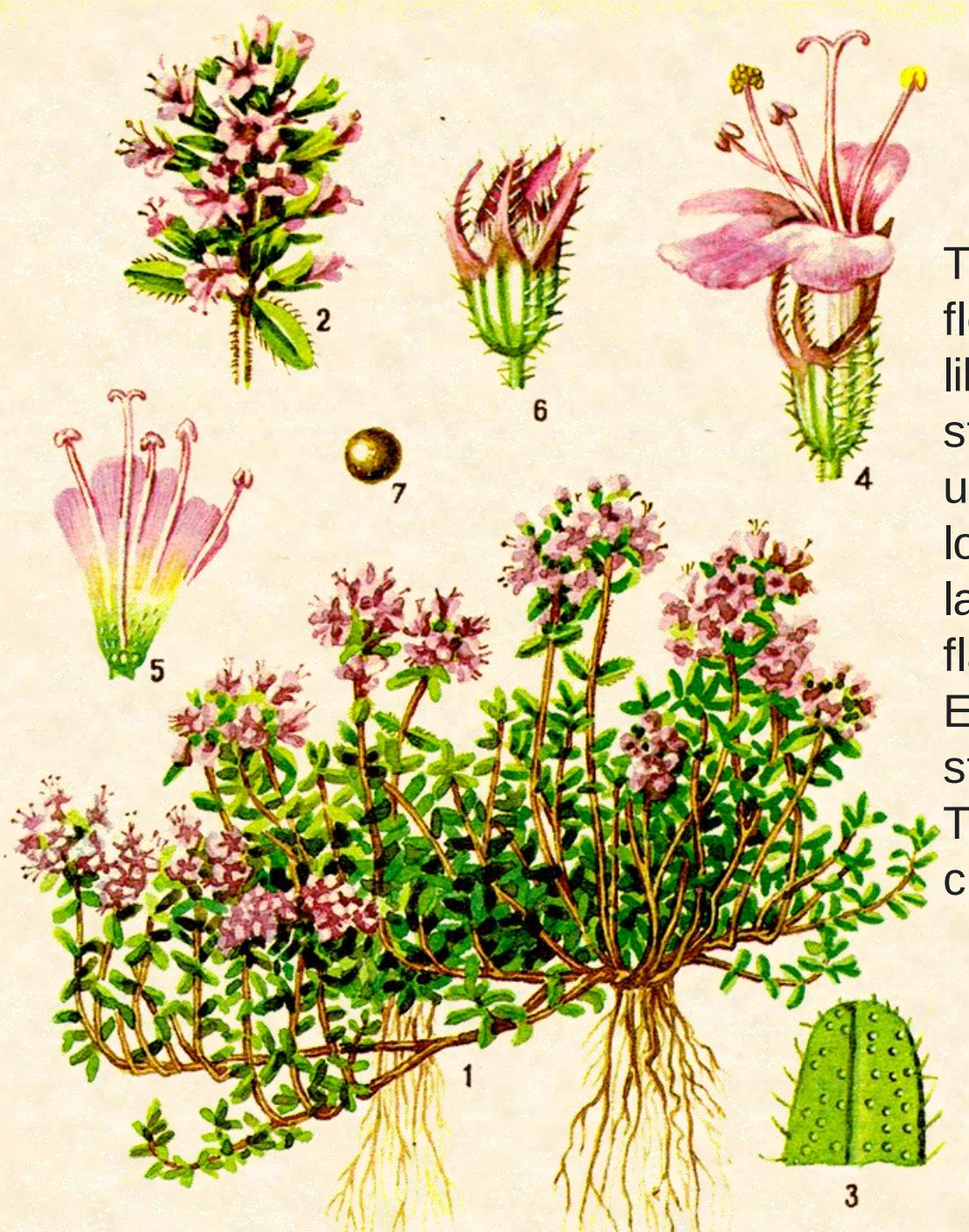
- **wild thyme**, **creeping thyme** - *Thymus serpyllum* L.

- Family *Lamiaceae*

- **wild thyme herb** - *Thymi serpylli herba*

Thymus serpyllum L.

Wild thyme is a creeping dwarf evergreen shrub with woody stems and a taproot. It forms matlike plants that root from the nodes of the squarish, limp stems. The leaves are in opposite pairs, nearly stalkless, with linear elliptic round-tipped blades and untoothed margins. The plant sends up erect flowering shoots in summer.



The usually pink or mauve flowers have a tube-like calyx and an irregular straight-tubed, hairy corolla. The upper petal is notched and the lower one is larger than the two lateral petals and has three flattened lobes which form a lip. Each flower has four projecting stamens and two fused carpels. The fruit is a dry, four-chambered schizocarp.

Thymus serpyllum L.

It is a polymorphic species consisting of smaller species and forms that grow in specific geographical areas and under specific conditions. Marshall's thyme with its cylindrical inflorescence can be found in large numbers in the Black Earth zone. Pallas's thyme, which has a pleasant, slightly lemony smell and inflorescences of bright pink flowers, forms thickets on sands, especially coastal ones.

Thymus marschallianus Willd.

Thymus pallasianus H. Br.

Chemical composition.

The herb contains 0.1 to 1% essential oil. Two closely related aromatic phenols dominate: thymol (up to 65% of the phenols sum) and carvacrol. And their ratio varies. Thymol predominates in some thyme samples and carvacrol in others, sometimes in equal proportions. The essential oils contain n-cymol, myrcene, citral, geraniol, etc.

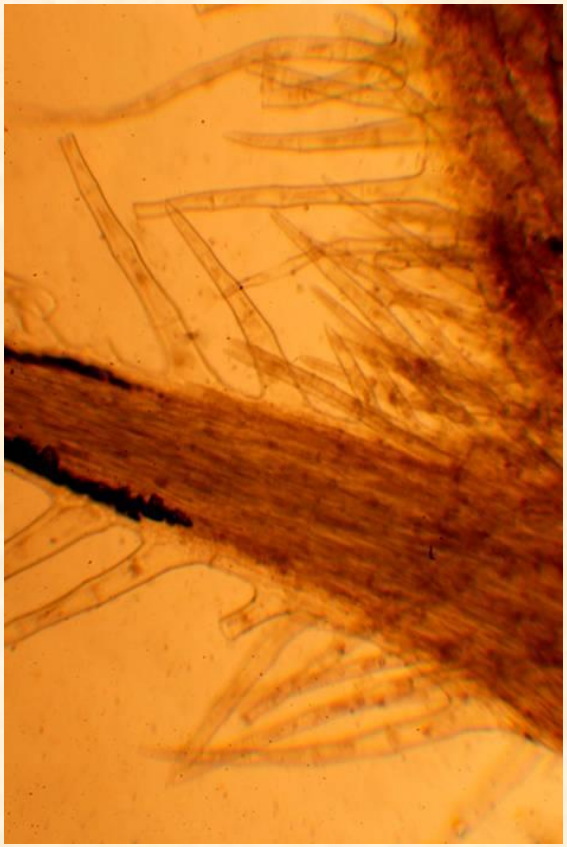
The herb also contains oleanolic and ursolic acids, which have hypocholesterolemic effect, tannins (about 5%), flavonoids.

According to GF XIV in the whole, crushed raw material in the powder: the sum of flavonoids in terms of luteolin-7-O-glucoside - not less than 0.9%; extractive substances extractable with water - at least 18%; extractive substances extractable in alcohol 30% - at least 18%.

Marshall's thyme herb

Pallas's thyme herb

In the microscopic analysis of the raw material, the particular structure of the calyx is also an important feature.



Ciliated hairs on the calyx teeth of Th. serpillum

The hairs on the lower teeth of the T. marshall's calyx

- **Pharmacological action.** An expectorant with antimicrobial, antifungal and analgesic properties.
- Thyme herb is used in the form of infusion as an expectorant, as well as in sciatica and neuritis as an analgesic. In the form of inhalations - for inflammatory diseases of the mouth, chronic tonsillitis.

In special clinics, the infusion is also prescribed for the treatment of alcoholism in women. Thyme liquid extract is part of Pertussin.

In dentistry, liquid thyme extract with glycerine is used to treat dental canals.

In kidney disease, thyme infusion is used internally as a diuretic and disinfectant.


ФармаЦвет
ФармаЦвет
Чабреца трава
Serpylli herba
20
20
фильтр-пакетов


КОДЕЛАК
БРОНХО с чабрецом
комбинированный препарат для лечения кашля
УМЕНЬШАЕТ ВЯЗКОСТЬ МОКРОТЫ И СПОСОБСТВУЕТ ЕЕ ОТХОЖДЕНИЮ
СПОСОБСТВУЕТ УМЕНЬШЕНИЮ ВОСПАЛИТЕЛЬНОГО ПРОЦЕССА В ДЫХАТЕЛЬНЫХ ПУТЯХ
ЭЛИКСИР
КОДЕЛАК
ЭЛИКСИР


Туссамаг
Капли для приема внутрь
Туссамаг
20 г


МосФарма
ПЕРТУССИН-Ч
СИРОП
ДЛЯ ПРИЁМА ВНУТРЬ
ОТХАРКИВАЮЩЕЕ СРЕДСТВО
100 г
ЗАО "Московская фармацевтическая
МосФарма
ПЕРТУССИН-Ч
ДЛЯ ПРИЁМА ВНУТРЬ

- **common thyme**, **German thyme** – *Thymus vulgaris* L.

- Family *Lamiaceae*

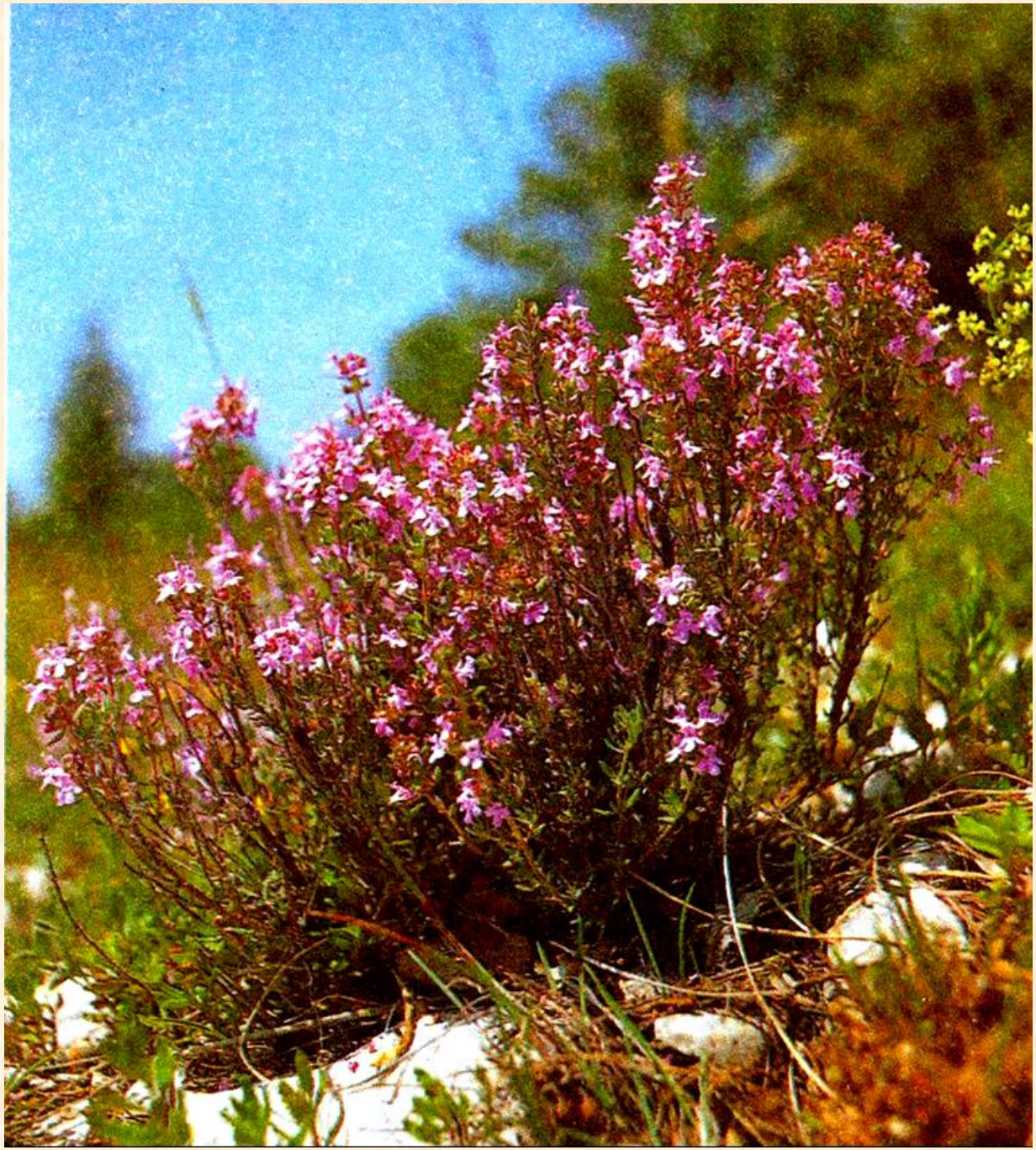
- **common thyme herb** – *Thymi vulgaris herba*

It is a species of flowering plant in the family Lamiaceae, native to southern Europe from the western Mediterranean to southern Italy. Growing to 15–30 cm (6–12 in) tall by 40 cm (16 in) wide, it is a bushy, woody-based evergreen subshrub with small, highly aromatic, grey-green leaves and clusters of purple or pink flowers in early summer

1 – wild thyme flower; 2 - wild thyme leaf; 3 - common thyme leaf

Thymus vulgaris L.

Native to Spain, France, i.e. Mediterranean countries. Also grows in northern Morocco, Tunisia and Algeria on dry open slopes. It does not grow wild anywhere else. If thyme is found in the Pharmacopoeia of other countries, it is either cultivated or imported. Now in Russia, it is cultivated in Krasnodar Krai, in the Crimea.



Chemical composition.

The raw material contains 0.8 to 1.2 % essential oil. Its main components are thymol (up to 40%), slightly less carvacrol, even less n-cymol. There are monoterpenoids, the sesquiterpene cariophyllene.

Various oxycinnamic acids, flavonoids (apigenin, quercetin) are found in the herb.

According to the State Pharmacopoeia of Russia XIV in a whole, crushed raw material essential oil should be not less than 1%; the sum of flavonoids in terms of luteolin-7-glucoside - not less than 1%; extractive substances extracted in 70% alcohol - not less than 35%.

The essential oil, Oleum Thymi, is obtained by distillation. The oil is yellow in colour.

- **Pharmacological activity** is an expectorant with antimicrobial properties.
- The herb Thyme is used to produce a liquid extract and an essential oil. The liquid extract is part of 'Pertussin' which is used as an expectorant and cough suppressant in bronchitis and other upper respiratory tract illnesses.

The essential oil has an antimicrobial effect and is included in liniments as well as in Phytolysin. The essential oil is a valuable source for thymol.

Thyme leaves are used as a spice in the food industry as well as in perfumery.

- **Clove** – *Cariophyllus aromaticus* L.

- Family *Myrtaceae*

- **Clove flowers** - *Caryophylli flores*

The clove tree is an evergreen that grows up to 8–12 metres tall, with large leaves and crimson flowers grouped in terminal clusters. The flower buds initially have a pale hue, gradually turn green, then transition to a bright red when ready for harvest. Cloves are harvested at 1.5–2 centimetres in long, and consist of a long calyx that terminates in four spreading sepals, and four unopened petals that form a small central ball.

The clove tree is native to the Moluccas and other islands of South-East Asia, but is also bred in other tropical countries: islands off the east coast of Africa (Zanzibar etc.), the Antilles (Jamaica etc.).

Fresh cloves

Dried cloves

- Clove flowers contain 17-20% essential oil (Oleum Caryophylli), which contains 70-85% eugenol, acetyl eugenol (about 3%) and caryophyllene, a mixture of bicyclic sesquiterpenes. Eugenol is obtained from the oil by solvent extraction or carbon sorption. The buds contain about 2% tannins.
- The oil is pale when fresh, but gradually turns purplish-brown when standing in the air and in the light.

- **Pharmacological action.** An antiseptic agent. With analgesic properties.
- Clove flowers are used to improve digestion and used mixed with other spices in a powder or alcoholic tincture. Cloves are more important for food industry than for medicine. The essential oil is used for medicinal purposes - in dentistry as an antiseptic. Pure eugenol is used for this purpose, which is obtained from the essential oil.

*Cinnamomum cassia (*called **Chinese cassia** or **Chinese cinnamon***)*

*Cinnamomum ceylanicum (*called **true cinnamon tree** or **Ceylon cinnamon tree***)*

Family *Lauraceae*

Cinnamon bark – *Cortex cinnamomi ceylanici*

Cassia bark – *Cortex Cinnamomi cassiae*

Cinnamomum cassia, called **Chinese cassia** or **Chinese cinnamon**, is an evergreen tree originating in southern China, and widely cultivated there and elsewhere in South and Southeast Asia (India, Indonesia, Laos, Malaysia, Thailand, and Vietnam). It is one of several species of Cinnamomum used primarily for their aromatic bark, which is used as a spice. The buds are also used as a spice, especially in India, and were used by the ancient Romans.
The tree grows to 10–15 m tall, with greyish bark and hard, elongated leaves that are 10–15 cm in long and reddish when young.

Cinnamomum verum trees are 10–15 metres (30–50 feet) tall.
The leaves are ovate-oblong in shape and 7–18 cm (3–7 inches) long.
The flowers, which are arranged in panicles, have a greenish color and a distinct odour. The fruit is a purple 1cm drupe containing a single seed.

The old botanical synonym for the tree, *Cinnamomum zeylanicum*, is derived from Sri Lanka's former name, Ceylon. Sri Lanka still produces 80–90% of the world's supply of C. verum, which is also cultivated on a commercial scale in the Seychelles, Madagascar and Tanz ania.

Cinnamomum ceylanicum

Cassia bark

Cassia bark


1 cm

Chemical composition. Chinese cinnamon bark contains 1 to 2% essential oil, consisting mainly of cinnamic acid aldehyde (about 90%). The aroma of Ceylon cinnamon is subtler than that of Chinese cinnamon, which is why it is much more valuable. Its essential oil (1%) consists of cinnamon acid aldehyde (65 - 75%), phellandrene and eugenol (about 10%).

It is used as a digestive stimulant, as an antiseptic and to correct the smell of medicines. It is also used as a spice. Cinnamomi essential oil (Oleum Cinnamomi) is obtained from trimmings and other bark scraps.

Thanks for your attention