

SUBCLASS CARYOPHYLLIDAE.

Representatives of this subclass are descended from the ancient, now extinct Ranunculidae. This subclass includes 3 orders and 19 families. This subclass mainly involves herbs and semishrubs. Most of them have well-defined nodes and internodes, simple leaves, and five-membered flowers.

The order Caryophyllales.

This order includes 17 families. This order includes *Cactaceae*, *Caryophyllaceae*, *Chenopodiaceae* and *Amaranthaceae*.

The family Caryophyllaceae

Family Caryophyllaceae has about 80 genera and 2000 species. It can be found on all continents and in a wide variety of habitats. They play an important role in many herbaceous plant communities from tundra to deserts. Some of them are invasive weeds that produce huge amounts of seeds. There are about 850 species in the CIS countries.

They are annual and perennial herbs with opposite, rarely alternate simple, entire and often entire leaves, sometimes with scale-like stipules (if leaves are alternate), but more often without them. The stems usually have clearly defined nodes and internodes and are often articulate.

Flowers are actinomorphic, bisexual, assembled in various inflorescences based always on dichasial type, which are very characteristic of the entire family. Occasionally, the flowers are solitary. Flowers are almost always (with very rare exceptions) pentamerous. Calyx is fused, consisting of 4-5 sepals fused into a tube (rarely free in *Stellaria media*). Petals are more often 5, free, with a bend (a broad, bent, sometimes repeatedly divided into lobes, petal plate) and a marigold (a narrow petal base). At the place where the marigold meets the bend, there are sometimes outgrowths that form a crown. Stamens are arranged in two circles, 5 in each (rarely less). Ovary consists of 2-5 fused carpels, with usually loose styles. As a rule, they are pollinated by insects, but there are also wind-pollinated species (*Herniaria*) Fruit is a capsule, dehiscence with denticles at the top; sometimes they are nut-like or berry-like.

Seeds are numerous, small, with a starchy perisperm, but no endosperm. Seeds often have fleshy appendages and are spread by ants. In steppe and desert areas, clove plants often form the "tumbleweed" life form. In such plants, after the fruits ripen, the above-ground part of the plant breaks off and is carried by the wind, often over very long distances. In this process, the seeds gradually fall out of the capsules, dispersing over a large area (*Gypsophila paniculata*).

Dianthus superbus *Ca₍₅₎Co₅A₅₊₅G₍₂₎

<https://www.youtube.com/watch?v=KQUu3NQuVB8>

Members of the *Caryophyllaceae* family contain triterpene saponins. There are also many ornamental plants widely used in gardening and landscaping.

The family Chenopodiaceae

The *Chenopodiaceae* family includes 105 genera and more than 1600 species. Representatives of this family are distributed on all continents, but they are especially characteristic of saline deserts, where other plants do not survive.

Most of the marae are herbaceous plants, semi-shrubs and shrubs, sometimes - small trees - the saxaul (*Haloxylon* spp.). Among them, there are many malignant weeds, difficult to eradicate, because of the huge number of seeds and their not simultaneous germination (species of the genera Quinoa (*Atriplex*) and *Chenopodium*).

Leaves are simple, alternate or opposite, without stipules, often covered with whitish bloom formed by stellate hairs or salt glands. Leaves may be modified: fleshy, filmy, scaly, spiny, in the last three cases photosynthesis is performed by stalks (Saxaul (*Haloxylon*) and *Salicornia* spp.) These adaptations allow members of this family to survive in arid and saline habitats.

Their flowers are not conspicuous, in most cases they are wind-pollination, aggregated in panicle inflorescences; partial inflorescences are called globules. Flowers are small, actinomorphic, bisexual, less often divided, often with bracts. The perianth is simple, calyx-shaped, sometimes completely reduced. Stamens are often five, less frequently less. The bases of stamen filaments fuse, forming a roller, the subpistillate disk. Most *Chenopodiaceae* are wind-pollinated plants, but many are pollinated not only by the wind but also by insects. Subpistillate discs of the latter are covered with nectar-forming papillae. The gynoecium is syncarpous, consisting of 2-4 carpels. The ovary is unilocular, upper or median, with one ovule. Styles are more often loose.

Fruits are one-seeded, unopened nuts that fall together with the calyx. The calyx often grows with the fruit and forms wing-shaped or hook-shaped outgrowths, which spread the seeds. Sometimes the calyx becomes fleshy. Beside the calyx, bracts (of *Atriplex*) and also bracts and sepals of many flowers (of Beet and Spinach) can simultaneously take part in fruit formation, resulting in formation of a infructescence.

Seeds are small, numerous, with starchy perisperm and without endosperm. They are propagate by wind, animals. Plants often have a life form of "tumbleweed."

Many *Chenopodiaceae* are useful plants. Beets and spinach are widely used as food. Beets are a major source of sugar. In addition, many species of quinoa (*Atriplex*) and *Chenopodium* can be used as food, and some are even cultivated for this purpose. Many of the *Chenopodiaceae* are valuable fodder plants.

Some species are used to produce medicines that contain alkaloids.

Свекла обыкновенная (*Beta vulgaris*) *P₍₅₎A₅G₍₂₎

https://www.youtube.com/watch?v=yzfTulZ_P-M

Порядок гречишные *Polygonales*

Семейство гречишные *Polygonaceae* включает 30 родов и 800 видов.

В умеренном климате гречишные – главным образом многолетние травы. В тропиках встречаются также кустарники, лианы и деревья. Гречишные встречаются в самых разных биотопах от арктических тундр до безводных песчаных пустынь.

Листья гречишных простые, очередные. Характерная особенность – наличие в основании листьев сросшихся в пленчатую трубку прилистников, охватывающих основания междоузлий – раструбов. Стебли часто с хорошо выраженными узлами и междоузлиями и тогда – членистые.

Цветки актиноморфные, в ботриоидных соцветиях или в пазухах листьев. Околоцветник простой, чаще – чашечковидный, белый, зеленоватый или розоватый. Цветки обоеполые (горец, гречиха) или реже – однополые (некоторые виды ревеней и щавелей), и тогда растения двудомные.

Число листочков околоцветника варьирует от 2 до 6, но чаще цветки трехчленные. При созревании плодов листочки околоцветника нередко сохраняются и видоизменяются, образуя крылатые выросты и способствуя распространению семян (щавель, ревень, курчавка, джужгун). Тычинок от 3 до 9 причем между их основаниями нередко располагается нектарный диск или отдельные нектарники. Расположены тычинки в два круга. При этом у отдельных представителей может наблюдаться раздвоение тычинок или их редукция. Опыляются гречишные ветром или насекомыми.

Гинецей псевдомонокарпный, завязь одногнездная, верхняя, образована 2, 3 или 4 плодолистиками. Плод – гранистый орех. Семена с крахмалистым, богатым маслом эндоспермом. Перисперм отсутствует.

The order *Polygonales*

The *Polygonales* order includes only one *Polygonaceae* family following the Cronquist and Takhtajian system, but in new systems such as AGP, it is considered within the Carnation-colored (*Caryophyllales*) order

The family *Polygonaceae*

The family *Polygonaceae* includes 30 genera and 800 species.

In temperate climates, buckwheat grasses are mainly perennial herbs. In the tropics, they also include shrubs, lianas and trees. *Polygonaceae* occurs in a variety of habitats from arctic tundra to waterless sandy deserts.

Polygonaceae leaves are simple, alternate. A characteristic feature is the presence of leaf bases with stipules fused into a filmy tube - ocrea. Stems often have well-defined nodes and internodes, and then are articulate.

Flowers are actinomorphic, in botryoid inflorescences or in leaf axils. Perianth simple, more often calyx-shaped, white, greenish or pinkish. Flowers are bisexual (*Polygonum*) or less frequently unisexual (some species of rhubarb (*Reum*) and sorrel (*Rumex*)), in which case the plant is dioecious.

The number of perianth tepals varies from 2 to 6, but most often the flowers are three-membered. When fruits ripen, the perianth tepals often retain and change their form, forming winged outgrowths and contributing to seed dispersal (sorrel, rhubarb, *Atraphaxis*, *Callygonum*). Stamens are 3 to 9, with a nectar disk or separate nectaries often located between their bases. Stamens are arranged in two circles. Some species may have bifurcated stamens or their reduction. *Polygonaceae* is pollinated by the wind or by insects.

Gynoecium is pseudomonocarpous, ovary is unilocular, upper one, formed by 2, 3 or 4 fruiting sepals. The fruit is a faceted nut. Seeds have starchy, oil-rich endosperm. Perisperm is absent.

Rumex obtusifolius * $P_{3+3}A_6G_{(3)}$ The stamens are arranged in pairs opposite the leaves of the outer perianth circle. These stamens are formed as a result of the bifurcation of the stamens of the outer circle. The stamens of the inner circle have not developed at all.

Fagopyrum esculentum * $P_5A_{5+3}G_{(3)}$ In the outer circle of stamens of buckwheat two pairs of stamens are twinned (they appeared as a result of bifurcation of stamens of the outer circle) and one normal; the inner circle consists of three normal stamens.

A number of *Polygonaceae* plants are of great economic importance. Buckwheat includes buckwheat, a valuable cereal and honey crop. Sorrel leaves and fleshy rhubarb leaf petioles are widely used as food. Many *Polygonaceae* plants are valuable dyes, tannins and medicines. *Callygonum* is widely used for fixing moving sands in deserts.

The subclass Hamamelididae

The subclass Gamamelididae is an ancient group of flowering plants, which presumably evolved from Magnolidae. At present it includes 16 orders, 22 families, 71 genera and about 1500 species. Almost all representatives of the subclass are arboreal plants in the evolution of which a reduction in flowering and transition to wind pollination is observed.

Order Juglandales of Fagales

Order Juglandales of Fagales is an order of angiosperms that includes several well-known tree families, such as Birch (*Betulaceae*), Beech (*Fagaceae*), Walnut (*Juglandaceae*) and some others.

The family of beech trees (*Fagaceae*)

The family of beech trees (*Fagaceae*) includes about 950 species belonging to 8 genera. Beeches occur mainly in the temperate zone of the northern hemisphere and only few species of southern beeches live south of the equator.

The outward appearance of beech species is suggested by the common oak (*Quercus robur*) that forms the broad-leaved forests of Europe. Almost all beech trees are large deciduous or evergreen trees with thick valuable wood, much more rarely shrubs or even bushes. Leaves of these trees are simple leathery leaves with stipules falling off early. Plants are usually monoecious. Flowers are unisexual, in catkins or head-shaped thyrses, where dichasids, sometimes reduced to 1 flower, are partial inflorescences. Inflorescences contain, as a rule, either female or male flowers.

The perianth is simple, inconspicuous. In male flowers, the perianth is fused, consisting of 4-7 lobes. Stamens of the male flower are loose, and their number usually exceeds the number of perianth tepals by two times.

Some female dichasids are usually enclosed by a scaly, knobby or thorny cup-shaped wrapper, or cupule (cup), formed by abnormal terminal branches of the inflorescence or by fused bracteoles. Perianth tepals are loose, poorly developed, little conspicuous. Gynoecium is syncarpous, consisting almost always of 3 carpels, forming a three-locular ovary, each socket bearing 2 ovules, but only one of all the ovary's ovules develops. The ovary is lower. Flowers are pollinated almost always by the wind.

Oak (*Quercus robur*) ♂ * $P_{(5)}A_{5-6}G_0$ ♀ * $P_6A_0\overline{G_{(3)}}$

Fagaceae fruit is a pseudomonocarp, single-seeded nut, wholly or partially surrounded by a woody cupula, called an acorn. Acorns are mainly propagated by animals, for which they often form the basis of their diet. Many *Fagaceae* species live as long as 500 years or more.

Fagaceae are rich in tannides, and triterpenes and flavonoids have been found. Fruits of some of them are edible.

Roasted and baked fruits of the real chestnut (*Castanea sativa*) are a well-known delicacy. In addition, the fruits of another chestnut, called the "Brazil nut", are widely known. The bark and leaves of many oaks are rich in tannins, and the galls that form on the leaves of the dye oak (*Q. infectoria*) when they are damaged by insect larvae are a source of medical tannin. The cork oak (*Q. suber*), common in the Western Mediterranean, produces high-quality cork. In medicine, in addition to galls, the bark of the English oak is used quite widely as an astringent.

The birch family is *Betulaceae*.

The birch family is *Betulaceae*. This family includes 6 genera and about 200 species distributed almost exclusively in temperate latitudes of the northern hemisphere. Species of birch (*Betula*) and alder (*Alnus*) are the most common tree species of northern Russia. These deciduous trees and shrubs form extensive, so-called small-leaved forests in Russia. Individual species of birch, such as the dwarf birch (*Betula nana*), dominate the shrubby tundra. The hazel or common hazelnut (*Corylus avellana*), whose cultivated varieties produce hazelnuts, is no less well known. The leaves of the birch are entire, with early-fallen stipules, usually glandularly pubescent. Many birches are characterized by transversely peeling leathery bark, or birch bark, the color of which is due to a white powdery substance, betulin, contained in the bark cells.

Inflorescences form in late summer and bloom the following year in spring. Flowering is often very early, often before the leaves open. The pollen is very abundant and is carried by the wind.

Flowers are small, unsightly and unisexual. The plants are monoecious. Male and female inflorescences arise on different shoots. The perianth is simple, consisting of 2-4 lobes in male flowers and completely reduced in female ones. Male flowers with 2-4 (to 12) stamens are combined into hanging catkins, while female ones into small cone-shaped thyrses. Both female and male inflorescences consist of dichasias, sometimes reduced to 1-2 flowers. The bracts of female flowers often fuse to form the covering scales of the dichasium. Sometimes this scale is massive and woody, as in alder. In other cases, the fused scales grow into a leathery cupule encompassing the fruit, as is the case with the hazel. The gynoecium is pseudomonocarpous, consisting of 2 carpels, which form a unilocular ovary with long stigma. The ovary is upper. Flowers are pollinated by the wind, aided by early flowering, which often occurs before the leaves open. Only one ovary develops in the ovary.

Birch (*Betula pendula*) ♂* $P_2A_2G_0$ ♀* $P_0A_0G_{(2)}$

Alder (*Alnus glutinosa*) ♂* $P_{(4)}A_4G_0$ ♀* $P_0A_0G_{(2)}$

Common hazelnut (*Corylus avellana*) ♂* $P_0A_4G_0$ ♀* $P_4A_0G_{(2)}$

The fruit is pseudomonocarp (nut), often with filmy wing-shaped outgrowths on the sides. Fruits are spread by the wind, while hazelnut trees are spread by various animals that store the nuts for future use.

Many phenolic compounds of various groups, as well as terpenoids, such as lupeol and betulin, have been found in representatives of birch. The latter undoubtedly has anticancer activity and needs further study. Most birch trees yield quality wood used in joinery and furniture production, for various processing and as fuel. The buds and leaves of birch are used in medicine as a bactericidal and choleric agent.