Subclass Ranunculidae - RANUNCULIDAE

Plan

General description of the subclass Ranunculidae

Order Buttercups - Ranunculales

Family Lunoceraceae - *Menispermáceae*

Family Barberry - *Berberidaceae*

Family Buttercups - *Ranunculaceae*

Order Poppies - Papaverales

Family Poppies - *Papaveraceae*

Family Dymyanthaceae - *Fumariaceae*

Order Peony - Paeoniales

Family Peony - *Paeoniaceae*

The subclass Ranunculidae includes 3 (4) orders, 13 families, 200 genera, about 4000 species. Representatives of this subclass are quite close to Magnolidae, but are considered more advanced. In all likelihood, the Ranunculidae are descended from Magnolidae, most likely from ancestors like the modern Illiciales, and are generally more specialized than the Magnolidae. For the most part, Ranunculidae are herbaceous plants, but woody forms also occur. Conductive system is highly developed. There are no vesselless forms among the Ranunculidae. Vessels with simple perforations. Gynoecium is more often apocarpous, but in some families syncarpous is also observed. Secretory cells in parenchyma tissues are usually absent, with the exception of the family Menispermáceae. Stomata are usually without side cells (Anomocytic type of stomata is often also called ranunculoid).

Orders of Ranunculidae:

1. Ranunculales.

2. Papaverales.

3. Paeoniales.

Order Ranunculales.

It is the main order Ranunculidae, to which 8 of 13 families belong. Their leaves are simple or compound, usually without stipules. Secreting cells in parenchyma tissues are found only in representatives of the *Menispermáceae* family. Flowers are bisexual or unisexual, actinomorphic or less frequently zygomorphic, with double or simple perianth, rarely without perianth. Stamens are numerous or there are 6 (rarely 3). Gynoecium is more often apocarpic. Seeds more often have a small embryo and abundant endosperm, more rarely without endosperm. *Ranunculaceae* and *Berberidaceae* families are of greatest economic importance.

Family *Menispermáceae*

Most members of the family *Menispermáceae* are climbing, deciduous or evergreen shrubs; only a few species are erect shrubs, small trees, or perennial grasses.

The foliage is alternate. Leaves of *Menispermáceae* are simple, sometimes trifoliate, mostly entire, less often palmate, almost always without stipules. Leaf petioles are usually long, swollen at both ends, sometimes crankly curved. Leaves of the family vary in shape and size. Their length varies from 1 to 35 cm. The leaf and stem parenchyma of many *Menispermáceae* contains secretory cells or canals filled with bitter juice. Some species of *Tinomiscium* contain guttapercha in all parts of the plant. Veins are palmate, less often pinnate.

Flowers are dioecious, small, actinomorphic, sometimes asymmetrical, usually in axillary racemes, corymbs or panicles, cyclic or very rarely spirocyclic (with spiral calyx), mostly 3-membered, very often with two circles of sepals, petals and stamens. Petals are 6 (sometimes absent), usually smaller than sepals; stamens have 6-24 loose or fused stamens with 2-4 anthers; pistillate flowers usually have 3 pistils, each with one ovule.

Fruits of the representatives of *Menispermaceae* are etaerio of drupelets or etaerio of achenes. Fruits are usually brightly colored, rounded, elliptic, ovoid or pear-shaped, sessile or hanging on stalks, which may reach 2 cm.

The seeds have a wrinkled hard endosperm; the embryo is curved, with flat or convex cotyledons. Etaerio of drupelets of *Menispermaceae* are juicy, red, orange, yellow, white, black or blue in color, which makes them attractive to insects that eat them and propagate their seeds.

Family of *Berberidaceae*.

The family *Berberidaceae* includes 14 genera and about 650 species distributed in temperate areas. In Russia there are 35 species belonging to 8 genera. They are shrubs or small trees, less often - perennial grasses. It is believed that arboreal Berberidaceae descended from herbaceous ancestors. The vegetative organs contain alkaloids, particularly berberine. The leaves are simple or compound (*Podophýllum peltátum*). Flowers are aggregated in simple or compound racemes, less often in solitary ones, usually small, actinomorphic, cyclic, bisexual The perianth is differentiated into sepals and petals. Most *Berberidaceae* have petals with nectaries in the lower part. Stamens are 4-9, less frequently 12-18, free. *Podophýllum peltátum* and *Nandina* have anthers opened with a longitudinal slit, but all other representatives of the family open upwards with two small flaps. The gynoecium consists of a single carpel. The carpel has an expanded apex stigma, which is almost sessile on a short style. Ovules are more often numerous. In most genera the fruit is fleshy, berry-like.

The genus *Berberis* is the largest and most widespread genus in this family. It is an evergreen or deciduous tree shrub. Widespread in temperate regions of Eurasia, North Africa, Central and South America.

The most common representative is the Berberis vulgaris. A large shrub with a strong root system. Thorns tricepartite.

On long shoots they often have 3 to 5 segmented, sometimes simple prickles up to 2 cm long, in the axils of which there are shortened shoots with tufts of normal leaves.

Flowers are arranged in racemes on short lateral shoots. Flowers are actinomorphic, bisexual, 6-membered. Perianth double, yellow. Calyx is corolla-shaped. The calyx consists of two circles of colored sepals, with three sepals in each. The corolla consists of two circles of petals with three petals each. This makes the flower seem terry. The petals have two large, fleshy, bright orange nectaries at the base. Pollination is cross-pollinated. Pollinated by bumblebees and bees. When an insect grabs the base of a stamen with its proboscis, extracting nectar, the stamen abruptly straightens, the anther hops up and strikes the insect on the head or back, sprinkling pollen over its body. After this blow, the insect, as a rule, immediately flies to a neighboring flower, where it leaves pollen on the stigma of the pistil. The most common representative is the *Berberis vulgaris*. Fruits are 2-3 seed berries. Fruits are spread by birds.

Branches and roots have a lemon-yellow color on the break, which gives off the alkaloid berberine. This is a characteristic systematic trait.

The flower formula of *Berberis vulgaris*: $*Ca_{3+3}Co_{3+3}A_{3+3}\underline{G}_{1}$

Family - *Ranunculaceae*.

This family has about 66 genera and over 2,000 species.

Most representatives are inhabitants of temperate climates. Some are found in tropical countries. There are both inhabitants of water bodies *Batrachium trichophyllum* and arid places *Adonis aestivalis*

Most members of the family *Ranunculaceae* are annual herbs and perennial herbs, overwintering in the form of tubers and rhizomes, but there are also lianas and shrubs. Leaves are simple, very rarely compound, with no stipules. Leaves of-

ten dissected, divided, deep-lobed, less often entire, alternate or opposite. Vessel segments with simple perforation. Flowers are bisexual or unisexual, more often actinomorphic, less often zygomorphic. Stamens are numerous. Stamens of various types. Anthers and filaments are well separated. An apocarpic gynoecium consisting of numerous carpels; less frequently, the number of carpels is 5, 3, or 1. Seeds have a small embryo, rarely without endosperm.

Flowers are various. Coloration varies from white to blue, red or yellow. Perianth simple or double. Floral with simle perianth is usually have only a calyx (*Clematis, Pulsatila, Anemona*). The calyx usually has a bright corolla-like color - white, pink, blue, blue. A colored calyx is also found in some species with a double perianth (*Aquilegia, Delphinium, Aconitum*). Petals of *Ranunculaceae* are staminate origin. Flowers are arranged in pinnate inflorescences from corymbiform to paniculate, less often the flowers are solitary.

Diversity of *Ranunculaceae* is huge. Different genera of this family are on different paths of evolutionary development. The examples of various representatives of this family can trace the main directions of the evolutionary development of the flower, characteristic of all the angiosperms.

Representatives of the most primitive flowers have a simple perianth with an indefinite number of parts, numerous free stamens and sepals, a convex receptacle, an upper ovary, all parts of the flower are arranged in a spiral, nectaries are absent. The most primitive flower of the *Trollius europea*. Such flowers are called acyclic.

The flower formula of *Trollius europea*: $* P_{\infty} A_{\infty} G_{\underline{\infty}}$

Representatives of this family with acyclic flowers may also have double perianth; in addition, in some species petals or their parts may be changed into nectaries, inflorescence may be elongated (*Myosurus minima*).

Ranunculus, Adonis, Anemona, Pulsatila, etc. have some flower parts arranged in circles (as a rule, sepals or sepals and petals) and some - in spirals (stamens and pistils). Such flowers are called hemicyclic or semicyclic.

Aquilegia has all flower parts arranged in circles. Such flowers are called cyclic.

The most advanced flowers among representatives of the *Ranunculaceae* family are *Aconitum* and *Delphinium*. They have zygomorphic flowers. Some parts of the zygomorphic perianth of a fused to form a spur.

Nectaries formed from petals or their parts are generally characteristic of buttercups. They can be observed even in the most primitive representatives (*Myosurus minima*). The most specialized representatives (*Aquilegia, Delphinium*) have nectaries represented by spurs - long, tube-shaped outgrowths containing nectar.

Fruits of *Ranunculaceae* are mainly apocarpic: etaerio of folicle, etaerio of achenes. Fruits are often poisonous and not eaten by animals. All other plant parts, including honey and pollen, can also be poisonous in *Ranunculus*. In addition to alkaloids, Ranunculaceae may contain cardiac glycosides.

The flower formulas:

Ranunculus repens $*Ca_5Co_5A_\infty G_{\underline{\infty}}$

Ficaria verna $*Ca_3Co_{8–12}A_\infty G_{\underline{\infty}}$

Aquilegia hybridum $*Ca_5Co_5A_\infty G_{\underline{\infty}}$

Aconitum napellus $\uparrow Ca_5Co_{2\,nectaries}A_\infty G_{\underline{3}}$

The order Papaverales.

Representatives of this order are close to the order Ranunculales, especially to the family *Berberidaceae*. They are perennial and annual herbs, seldom shrubs or small trees. Leaves are alternate, rarely opposite or whorled, without stipules. Flowers are 2-3-membered, bisexual, actinomorphic or zygomorphic. Sepals are usually 2 (less frequently 3 or 4), and fall off. The petals are more often 4 or 6, in two circles. Stamens are numerous, free or united in bunches. The gynoecium is syncarpous; the ovary is usually upper, with numerous ovules. Seeds are small, with a fleshy, oily endosperm. All *Papaverales* have non-membered laticifers,

which are filled with glutinous juice containing alkaloids. The order Papaverales includes three families: *Papaveraceae, Fumaraceae* and *Hypecoeae,* all of which differ in the number of stamens. These families are often considered subfamilies of the *Papaveraceae* family.

In our country there are 180 species of 13 genera of this order. Including *Fumaria, Chelidonium, Papaver, Corydalis, Glaucium*.

The family *Papaveraceae*.

The family *Papaveraceae* contains 26 genera and about 250 species. *Papaveraceae* are mainly herbs containing latex (milky sap). In the tropics, the genera *Bocconia* and *Macleaya* are found as shrubs or small trees. Leaves are simple, often dissected, rounded, the upper ones nearly opposite, the lower ones alternate, without stipules. Basal leaves often form a dense rosette. All members of the family *Papaveraceae* have non-membered laticifers with latex white or yellow in all plant organs.

Flowers are actinomorphic, large, bisexual, often solitary or aggregated in small apical inflorescences on long leafless pedicels. The perianth is double. Sepals have 2-3 and tend to fall off as the flower unfurls. The calyx is often a closed receptacle, which contains crumpled, tortuously arranged petals of a bud *Papaver*, *Chelidonium*. The petals are 4 (5, 6-12), arranged in two circles. The exceptions are the flowers of *Bocconia* and *Macleaya*, without petals. Most representatives have petals without nectaries, not differing from each other in shape and size. Petals of *Chelidonium* of the inner circle are somewhat smaller than those of the outer one. Stamens are numerous, loose. The gynoecium is syncapous. The ovary is upper. Pollination is realized with the help of insects, but many species have adaptations for self-pollination as well. For example, when *Chelidonium* begins flowering, stamens are bent toward the edge of the flower. As the flower ages, stamens gradually straighten and then bend toward the stigma. This eliminates the lack of

pollination during unfavorable weather, when pollinators are few or absent. Fruit capsule. Seeds are small.

Most members of the *Papaveraceae* family contain alkaloids. Many of them are used medicinally.

The *Papaver somniferum* contains the alkaloids morphine, codeine, papaverine. It is not currently grown in Russia. There are oil and opium varieties.

The medicinal properties of *Chelidonium majus* are associated with the alkaloid chelidonin.

The flower formulas:

Papaver somniferum $*Ca_2Co_{2+2}A_{\infty}G_{\underline{(\infty)}}$

Chelidonium majus $*Ca_2Co_{2+2}A_{\infty}G_{\underline{(2)}}$

Family *Fumariaceae*

The family *Fumariaceae* is very close to the *Papaveraceae* family (recently Fumariaceae was considered as one of the subfamilies of the *Papaveraceae* family).

Fumariaceae is a highly specialized family consisting of 16 genera and about 400 species distributed mainly in the northern temperate zone. A small number of species are found in Southeast Africa.

The largest genus in this family is Corydalis. Corydalis, as well as its closest relatives *Fumaria*, are typical representatives of early spring flora of temperate zone and prefer mesophytic habitat conditions. Tuberous root nodules with a reserve of nutrients are an adaptation to early vegetation. Some of shrubberies sometimes appear in crops and on lawns as weeds.

Representatives of the family are herbs with basal, ordinary or rarely nearly opposite, usually strongly dissected leaves. Secreting tubes and laticifers are absent, but there are secretory cells homologous to them.

Flowers are in racemose inflorescences, bisexual, bilateral symmetrical or more often zygomorphic, with horizontal symmetry plane. The perianth consists of 2 small, usually falling tepals, which do not form a closed receptacle (sometimes the tepals are completely inconspicuous or absent), and 4 petals arranged in two circles, with nectaries. Androceum consists of 6 stamens, three of which are arranged in two lateral bundles. The pollen sheath is triple-bearded (Dicentra), scattered-multi-bearded, or multi-bearded (Fumaria). The gynoecium consists of two carpels, with a flattened lobate stigma and two to many ovules.

Fruit is a pod-shaped capsule, opening with two leaves, with retained placentas, without a septum, rarely a mono-seeded achene.

Corydalis is a valuable medicinal plant. Its tuber is the most rich in alkaloids, which leads to the mass destruction of the plant.

The flower formula *Corydalis solida* $\uparrow Ca_2Co_{(3)+(3)}A_{\infty}G_{\underline{(2)}}$

Order Peony - Paeoniales

The order includes a single family Paeonia with a single genus Paeonia. Currently, the systematic position of this family is debatable and a number of researchers refer it to the order Garryales (Garryales)

Family *Paeoniaceae*

One genus *Paeonia* includes more than 40 species in subtropical and temperate Eurasia and North America. Representatives have herbaceous or shrubby forms. Often used in gardens as ornamental plants.

Peony flowers are apical, solitary, very large, bisexual and actinomorphic. The perianth consists of 5 green stiff sepals and 5 (10-12) large, brightly colored petals. The coloring is usually white, pink, crimson. Stamens are numerous. The

gynecum is apocarpous, consisting of 2-5 carpels. The ovary is upper. Fruits are etaerio of folicles.

Many peonies are valuable medicinal plants, such as the evasive peony or March's root (*Paeonia anomala*). In our region, among the wild peony (*Paeonia tenuifolia*) is found, which is included in the Red Book of the Russian Federation.

The flower formula *Paeonia tenuifolia* $*Ca_5Co_{5-10}A_{\infty}\underline{G_3}$