SUBCLASS DILLENIIDAE

One of the largest subclasses includes 31 orders, 97 families, about 1910 genera, and about 36000 species. It is one of the central groups of flowering plants. The most primitive representatives belong to the family *Dilleniaceae*, which has much in common with the Illiciaceae.

Most of the Dilleniidae have gone far down the road of specialization and have lost the primitive features that linked them to the Magnoliidae.

The *Euphorbiaceae*, *Primulaceae*, *Salicaceae* have very specialized flowers, it even seems strange that they were placed in this subclass. The most specialized representatives, the intermediate groups, and the groups with the most primitive features are very heterogeneous. Shrubs and grasses belong to this subclass. Flowers with the double perianth, without petals, or perianth at all. The androecium is either of many or a limited number of stamens, arranged in a centrifugal sequence. The gynoecium is syncarpous, less often apocarpic, seeds with endosperm.

The order *Theales.*

The order *Theales* includes 12 tropical families (the old textbook had 13). The *Theales* plants have many primitive characters. Trees, sometimes large shrubs: tea bush, lianas, less often herbs: Hypericum wort. Leaves are more often alternate, less often supposed, or whorled. A characteristic feature is the presence of secretory canals. Flowers are actinomorphic, more often spiral. Gynoecium apocarpous, syncarpous.

Family *Theaceae*

Includes 560 species from 24 genera, according to other sources 1100 species, 29 genera. Representatives of the family are trees and shrubs, most with leathery evergreen leaves. Leaves are simple, leathery, alternate, without stipules. Flowers are solitary, large, regular, bisexual. The perianth is usually double, brightly colored, calyx and corolla sometimes indistinctly separated, pink, rarely red. The number of perianth segments varies from 5 to 16. There are usually bracts, often similar to the sepals. Stamens are numerous, free. The gynoecium is syncarpous. The ovary is an upper one. All Theaceae plants are cross-pollinated. Insect-pollinated

Camelia sinensis $*Ca_{5–7}Co_5A_\infty G_{\underline{(2–3–5)}}$

The fruit is an indehiscent capsule, sometimes a berry. The calyx remains in the fruit with tiled segments. Seeds without endosperm with a straight or bent embryo. The studied species contain tannides and tannins, and alkaloid caffeine.

The genus *Camellia* includes 80 species. In our country, there are 5 ones. It is cultivated in Krasnodar. Tea (*Camellia sinensis* or *Thea sinensis*) is cultivated in

Transcaucasia, Krasnodar region, Central Asia. In culture, this plant is a shrub because of the cuttings. India, Ceylon, China.

Family *Clusiaceae, Hypericaceae*.

Some sources consider them as two different families. Accordingly, if they are combined, it is considered that this family includes 40 genera, 1000 species. If considered separately, *Hypericaceae* includes 9 genera and 400 species. Most members of the family are trees and shrubs (in the tropics), less often - grasses (in temperate climates).

In our country, there are representatives of only one genus - *Hypericum*

Leaves of the genus are simple without stalks, opposite, with pinpoint glandules; stalks and petioles have secretory ducts. Flowers are bisexual, singular, or aggregated in clusters.

The flower has a double five-membered perianth. Perianth segments are loose or fused at the base.

Hypericum perforatum $* Ca_{(5)} Co_5 A_\infty \underline{G_{(3)}}$

Stamens at the base are fused into bundles. In *Hypericum* androceum the external circle of stamens is absent. The gynoecium is syncarpous, the styles are usually free. The ovary is upper. Ovules are numerous. Fruit is capsule or berry. The number of seeds varies. There is no endosperm in the seeds; the embryo is erect, with thin seedpods.

The most common representatives in the country are *Hypericum perforatum* and *Hypericum maculatum*. They contain anthracene derivatives, alkaloids, tannins, flavonoids. Have an astringent and styptic effect. The Volgograd region is found on the right bank of the Volga and the Middle Don *Hypericum perforatum*.

Order *Ericales*.

The order is close to *Theales* plants and has a common origin with them. There are 6-7 families, the largest of which is the Heather (*Ericaceae*) family.

The family of *Ericaceae* has about 140 genera and more than 3500 species. They are distributed throughout the Earth, except desert and steppe regions. Most heathers are berry shrubs, sometimes grasses or large trees. *Érica arbórea* is 20 m tall and 50 cm in diameter. Among the shrubs, there are creeping forms. Among Asiatic rhododendrons, there are epiphytes, semi-epiphytes. Most have a particular type of mycorrhiza that is characteristic of this family. These include many beautifully flowering shrubs and bushes. These include rhododendrons, azaleas. The heath also includes marsh rosemary (*Lédum palústre*), bearberry (*Arctostaphylos uva-ursi*), many valuable berry plants: cowberries (*Vaccinium vitis-idaea*), bilberries (*Vaccinium myrtillus*), blueberries (*Vaccinium uliginosum*), cranberries (*Oxycoccus quadripetalus*). In total in our country, there are 66 species from 23 genera.

Leaves are usually alternate less often opposite or whorled, solid, lacking stipules. It may is of three types:

- flat, relatively broad, leathery (e.g., in the genera *Vaccinium, Rhodododendron, Andromeda*);

- tapered, needle-like (as in *Émpetrum*);

- small, linear, with a groove on the underside, in which stomata are located (*Colluna*, *Erica*, etc.);

Leaves of the latter type are characteristic of plants in the *Ericaceae* family with so-called "ericoid shape" (after the name of erica, a type genus of the family), the essence of which is woody shoots covered with small leathery leaves (this shape is also characteristic of some plants not belonging to this family).

Leaves of *Ericaceae* are usually adapted to reduce water loss and therefore are often covered with thick cuticles, hairs, have an undercut edge, and submerged stomata. In marsh heaths, recent evidence suggests that this leaf structure is in response to a lack of nitrogen compounds. Leaves curl up into a tube during drought.

Flowers in botryoid inflorescences of racemes, umbels, or corymbs. Flowers are bisexual, with the double perianth, pentamerous (sometimes 2- or 4-membered). Petals are loose or accreted, forming an actinomorphic or weakly zygomorphic corolla. Most have a nectar disk formed by the bases of the petals. Stamens are very diverse, often having two distinctive horn-shaped outgrowths and anthers, which open with valves. The stamens are arranged in two circles and their number is twice that of the petals. The gynoecium is syncarpous, formed by 4- or 5 fused carpels. The style of the stalk is single, terminated by a cephalic stigma. The ovary is upper in the *Ericoideae* and *Rhododendronoideae*, and lower in the *Vacciniideae*.

Fruit is syncarpous, a small capsule, syncarpous drupe (R*hododendronidea*, *Ericoideae*), berry (*Vacciniideae*).

Vaccinium myrtillus $*Ca_{(5)}Co_{(5)}A_{5+5}\underline{G}_{(5)}$

Rhododendron dauricum $\uparrow Ca_{(5)}Co_{(5)}A_{5+5}\underline{G}_{(5)}$

Ericaceae are commonly divided into 3 subfamilies according to the structure of their flowers.

1. *Ericoideae* with the free actinomorphic perianth, upper ovary, and fruit capsule.

2. *Rhododendronoidae* with a fused actinomorphic perianth, upper ovary, and capsule fruit.

3. *Vacciniideae* with the spiny-leaved perianth, lower ovary, and berry fruit.

Vacciniideae is often referred to as an independent family of *Vacciniaceae*.

Among the *Ericaceae*, only some species of the genus *Vaccinium* with edible fruits have economic value: lingonberry, common bilberry, large-fruited cranberry, common cranberry, and common bilberry. The berries of these plants are ed-

ible both ray and processed; they are used to make jam, syrup, and wine. Some species (cranberries, common cranberries, and large-fruited cranberries) are grown on an industrial scale on special plantations. Heather is used in the production of heather ale, the traditional Scottish strong beer.

The traditional use of *Ericaceae* is associated with the medicinal properties of some species. Lingonberry leaves and shoots are used as a disinfectant and diuretic in scientific medicine. Decoction or potion made from dried blueberries helps with diarrhea. Cranberries are rich in vitamin C, are used as an anticyngotic, for colds, rheumatism, angina, avitaminosis.

Order *Primulales*

This order includes four families. The most famous of them is the family *Primulaceae*.

The family *Primulaceae*. *Primulaceae* occur in mountainous and temperate areas of the northern hemisphere. This family includes 30 genera and about 1000 species. They are rhizomatous or rosette-forming herbs, sometimes annuals or ephemeroids. They get their name from the very early flowering of the majority of representatives of the largest genus, Primula, a popular ornamental outdoor plant.

Leaves of primroses are simple, without stipules, alternate or opposite, rarely arranged in whorls, often covered with glandular hairs. Flowers are aggregated in different kinds of thyrses. Flowers are actinomorphic, bisexual. The perianth is double, pentamerous, the calyx is with fused sepals; corolla is with fused petals, forming a tube. Five stamens attach filaments to the corolla tube. The gynoecium is syncarpous; the ovary is upper or semi-lower. The ovules are numerous. Heterostyly is characteristic (stamens and styles of various lengths). Fruit is a capsule.

Primula veris $*Ca_{(5)}Co_{(5)}A_5\underline{G_{(5)}}$

In addition to primulas, species of the genus cyclamen are widely known.

Order *Violales*.

Includes about 15 tropical families.

Family *Violaceae*

Includes 29 genera and about 900 species. Members of the family are distributed throughout the world. In the tropics, they are trees and shrubs, in temperate climates - grasses. Leaves are simple, alternate with stipules. Flowers are bisexual, in racemes or singly, on pedicels coming out of the leaf axils. Species of the genus *Viola* have zygomorphic flowers; some others have actinomorphic flowers. The perianth is double, with 5 tepals and petals each, which are free. One of the petals of the violet forms a spur. Stamens may be free or fused, the gynoecium is syncarpous. The ovary is an upper one. The fruit is a capsule. Opening with three valves. Seeds are numerous, with endosperm and a direct embryo. *Violaceae*

are insect-pollinated plants, but they often self-pollinate - cleistogamy. The *Viola tricolor* and *Viola arvense* are used in medicine because of the flavonoids they contain.

Viola arvense $\uparrow Ca_5Co_5A_5\underline{G_{(3)}}$

Family *Passifloraceae*.

The family includes 16 genera and up to 600 species found mainly in tropical America and Africa. This family is known to us thanks to the greenhouse plant Passionflower.

The best-known genus is *Passiflora*. Perennial herbaceous lianas. The stem is climbing, leaves are alternate, lobate, with early-fallen stipules. There are tendrils in the axils.

Passiflora has large, very unusual flowers because of the peculiar structure of stamens, stigma lobes, an ovary carried out on a gynophore, and two circles of large perianth segments.

Inflorescences are axillary with a double perianth, regular, bisexual, solitary, usually axillary, with a double perianth. Sepals and petals are loose or slightly accreted at the base. Corolla purple, with 5 petals and filiform fringe. The receptacle is continued in a peculiar formation having the form of a column, called gynophore, with stamens and pistil attached to its apex. In the center of the gynophore, there is a raised ovary with a 3 stellate spaced stigma. There are 5 stamens with large anthers. Inside the large corolla, there is an even larger bright crown of long, curved, or straight filaments. It is formed by numerous sprouts of the receptacle. *Passiflora* flowers are often called "Cavalier's Star" because they resemble a magnificent order.

In Transcaucasia, cultivate Passiflora flesh-red.

The gynoecium is syncarpous. The fruit is a yellowish-orange berry. Contains indole alkaloids, flavonoids, coumarins, used as a sedative. In addition, it grows also *Passiflora caerulea*.

Passiflora caerulea $*Ca_{(5)}Co_5A_5\underline{G_{(3)}}$

Order Willow - *Salicales*

This order includes only one family, the Willows (*Salicaceae*).

Family Salicaceae is a family of willows. It is characterized by a high specialization of reproductive organs. The willow family includes about 400 species belonging to 3 genera. The majority of species belong to temperate climates of the northern hemisphere. Eurasia, North America. All of them are light-loving plants, always trees or shrubs. Willows are deciduous plants. Their leaves are simple, with entire (rarely lobed) laminae, alternate, with stipules. All willows are dioecious. Flowers are strongly reduced and aggregated in inflorescences - catkins. The perianth is extremely simplified only for poplars. Willows have no perianth, having

only 1-3 small nectaries. Androceum of willows has 1-6 free stamens, while that of poplars has 6-40. The gynoecium is syncarpous. The ovary is unilocular, with many ovules. The fruit is an opening capsule.

Seeds are numerous, small, without endosperm, with a direct small embryo, equipped with a tuft and propagated by the wind. Poplars are wind-pollinated plants, willows are pollinated by insects. Both bloom very early before the leaves open.

Salix caprea $* P_0 A_2 G_0 * P_0 A_0 G_{(\underline{2})}$

Order Pumpkin *Cucurbitaceae*.

The order includes a single-family *Cucurbitaceae*.

Family *Cucurbitaceae* has 700 species, 90 genera. In Russia 5 genera and 29 species.

Mainly herbaceous creeping grasses, lianas. Widespread in Africa Asia America. Flowers are mostly unisexual, plants are usually monogamous. Leaves are simple with palmate veins. Most with tendrils of shoot origin.

Perianth fused with stamen bases, forming a flower tube adherent to the ovary. Flowers with the double perianth. Calyx with five fused sepals, corolla with five fused petals. The perianth is fused with the bases of the stamens, forming a flower tube adhering to the ovary. Five stamens are developed in the male flower, of which either one is free, and the remaining four fuses in pairs or all five stamens fuse into one column; the stamens bear only half of the developed anther (their anther is bilocular), either straight or convoluted in the form of the letter S, ring or spiral. The male flower sometimes contains the rudiment of a pistil. In a female flower, barren stamens (staminodes) sometimes appear in the number of 3-2 or 5; the pistil consists mostly of three carpels, rarely of 4-5, fused at their edges and forming a corresponding number of nests in the ovary; ovary lower, multi-seeded; ovules anatropous, mostly surrounded by mucus; the style is simple, tripartite at the apex, with a thick, curved, lobed or ciliated stigma.

Cucurbita pepo $* Ca_{(5)} Co_{(5)} A_{(2)+(2)+1} G_{\underline{(0)}} * Ca_{(5)} Co_{(5)} A_{(0)} G_{\overline{(3)}}$

Most have a fruit similar to a berry, called a pepo. Among the representatives of the family, there are many vegetable plants - pumpkin, watermelon, cucumber, melon, zucchini, and patisson.

Pumpkin seeds are anthelmintic. Cucumber promotes digestion, Watermelon is a diuretic. All pumpkin seeds contain terpenoids.

Order *Capparales*

Representatives are herbs, shrubs, and trees. Leaves are alternate, simple, without stipules. Vegetative organs contain special cells - myrosin pouches. Often there are mustard oils and glycosides.

This order includes 4 families, the most well-known of which is the *Cruciferae* or *Brassicaceae* family.

The *Crucipherae* or *Brassicaceae* family.

This family includes 380 genera and 3000 species. In Russia, there are 176 genera and 1070 species. Distributed throughout the world, but mostly in temperate countries of the northern hemisphere. Representatives of the family are grasses, shrubs.

Leaves are simple, the ground leaves often form a dense rosette, while the stem leaves are alternate, without stipules, often lyre-shaped. Covered with stellate hairs. Such pubescence is characteristic of the majority of families.

All representatives show a remarkable uniformity in flower structure. For cross-patterned four sepals and petals. Nectaries are found in swollen pedicels. Stamens six, of which two short and four long. The style of the ovary is often detached from the ovary and ends in a cephalic or two-lobed stigma. The ovary is bilocular, with numerous ovules. Fruits are silique or silicle There is a septum inside, to which seeds are attached. The pods (silique) are three or more times longer than the thickness. The silicles have close values of length and width.

The variety of fruits is enormous. Silique and silicle can be of different shapes: rounded, heart-shaped, flat, cylindrical, have outgrowths, wings, notches, they can be articulate and opening. Fruit structure is an important systematic feature of crucifers, so collect them in herbarium only in fruits. Seeds have no endosperm, the embryo is bent. The characteristic feature is the presence of special glycosides in tissues. Sugar molecules of these glycosides are attached not through an oxygen atom, but a sulfur atom. This gives crucifers a characteristic cabbage-reddish flavor (most pungent in horseradish and mustard).

Brassica juncea $* Ca_{2+2} Co_4 A_{2+4} \underline{G_{(2)}}$

Among the family members are many important food plants: cabbage, radish, turnip.

Order *Malvales*

The order unites 11 families, of which only representatives of two of them can be found in our country. We will consider the family *Malvaceae*.

Family *Malvaceae*

Family *Malvaceae* includes 1500-1600 species from 80 genera. In our country, there are 80 species from 12 genera. They are herbs, shrubs, and trees. Leaves are simple, alternate, with stipules, sometimes covered with stellate hairs.

The flowers are characterized by the presence of sub-calyxes, where additional sepals are located under the main calyx. Stamens fuse into a tube by stamen filaments and attach in a ring to the base of the petals. The styles also fuse at the bottom and, together with the stamens, form a column. The gynoecium is syncarpous, with 5 to many carpels. Fruit is a capsule or schizocarp. Seeds without endo-

sperm. Embryo straight or bent. Representatives of the family often contain mucus, saponins, tannides, phenolic acids. Cotton yields 50% of the world's fiber production. *Hibiscus* flowers are used to make the Carcade drink. Many plants are used as ornamental. *Althea* is a medicinal plant.

Althaea officinalis $* Ca_{3+(5)} Co_5 A_\infty G_{(\underline{\infty})}$

The order Nettle *Urticales*.

The order includes 5 families; of which we will consider the nettle family.

Family Nettle *Urticaceae*.

Includes 45 genera and 850 species, widespread throughout the globe, mainly in the tropics. In our country, there are 29 species from 7 genera.

Nettles are herbs and shrubs. Leaves are simple, decussate opposite, less often alternate, with leaflets, often covered with stinging hairs-emergency. Flowers are actinomorphic, unisexual, male and female, usually located on different individuals, aggregated in apical olive thyrsas. The perianth is simple, unsightly, 4-5-segmented. Flowers are wind-pollinated. In the male flower, stamens are bent inside the flower until maturation, then straightened, ovary reduced. In the female stamens are completely reduced or transformed into staminodes. The fruit is pseudomonocarpous, i.e., the achene. The seed has an endosperm and a direct embryo. The calyx with the fruit sometimes proliferates and becomes fleshy, forming a false fruit. Fruits are spread by animals. Used sparingly. Nettle is used in medicine as a vitamin plant, representatives of genera *Peleia* and *Pelionia* are cultivated as ornamental plants, ramie is used as a source of spinning fiber.

Urtica dioica $* P_4 A_4 G_0$ $* P_{(4)} A_0 G_{(\underline{2})}$

Order *Euphorbiales*

This order includes 4 families, the largest of which is the *Euphorbiaceae* family.

The family *Euphorbiaceae* includes at least 300 genera and about 7500 species. Disseminated everywhere except in the circumpolar tundra. *Euphorbiaceae* is the most diverse in the tropics. Among thrush are large trees and shrubs, lianas, perennial and annual grasses, stem and leaf succulents, and even aquatic forms. In our country the most widely represented representatives of the genus *Euphorbia*. For most *Euphorbia* is characterized by the presence of latex (which gave them their name). Latex in thrush can accumulate inarticulate and non articulate lactifers, idioblasts, or sac-like receptacles localized in all parts of plants.

Leaves of *Euphorbia* with stipules, simple or compound (but in this case necessarily palmate). Leaves are alternate, very rarely opposite.

Flowers are always unisexual, actinomorphic, aggregated in thyrses. Inflorescences are very specialized and are called pleiochasias. The perianth may be double, simple, or completely reduced. Partial inflorescences of thrush are called

cyathia. Cyathia consist of one female flower surrounded by several highly reduced male inflorescences (4-5), each consisting of 1-10 flowers. The perianth of all flowers is strongly or even completely reduced. The fused bracteoles of male flowers form a bell-shaped inflorescence. Often brightly colored beaker, which attracts insect pollinators. On the whole, the cyathium performs the function of a separate bisexual flower. The number of stamens in male flowers varies from one to an indeterminate number. The gynoecium is syncarpous, consisting of three fused carpels. The ovary is three-nucleated. Each socket contains one ovule. Styles are 3, each of them may have several stigmas. Fruit is a fractional capsule (regma, disintegrating into monogynous parts, with a column remaining in the center). Seeds are large with abundant endosperm and an erect germ.

Euphorbias are widely used in medicine and agriculture. The sap of the Brazilian *Hevea* contains up to 50 % of rubber, the sap of representatives of the genus Crotone produces resin, which is used to manufacture natural varnishes, the seeds of the Tunga, and Castor oil plant produce most valuable fatty oils. Crotons and poinsettias are grown as ornamental plants. Manioc is one of the most important edible plants of the tropics, its tubers contain up to 30% of starch and weigh up to 15 kg.

Most Euphorbias are poisonous, their sap can cause severe poisoning and severe skin burns.

Euphorbia helioscopia $* P_0 A_1 G_0 * P_0 A_0 G_{(\underline{3})}$