THE SUBCLASS LAMIIDAE

Apparently, the Lamiidae originate from ancient representatives of the subclass rosidae and represent a powerful evolutionary branch characterized by high specialization of usually tubular perianth with fused petals and sepals. They belong to 11 orders, 51 families, about 2400 genera and almost 40 000 species.

The flower of laminae is characterized by a small fixed number of parts and "growing" zygomorphy. The gynoecium is always syncarpous.

Order Gentianales

A large order including 13 families. Among them are the family *Rubiaceae*, one of the largest families of flowering plants.

The family Loganiaceae.

Family *Loganiaceae*. The family includes about 12 genera and about 270 species. Loganiaceae are plants mainly in tropical and subtropical countries. The best known genus is *Strychnos* with 200 species.

Most *Loganiaceae* are woody plants, but shrubs, lianas and, less often, grasses can be found as well. Many species of *Strychnos* are lianas, equipped with hook-like twisted thorns and tendrils that are modified leaves.

Leaves are simple, usually leathery, opposite, often with small stipules.

Flowers are actinomorphic, often bisexual, in cymoid or large inflorescences, single, apical. Perianth is four- or five-membered, double. A calyx with fused sepals, which means that the sepals in the bud have an overlap similar to a tile. Corolla tubular (or funnel-shaped), with fused petals. Stamens are usually in equal numbers with the corolla lobes, alternating with them, are attached to the corolla tube or the pharynx. Gynoecium is syncarpous, fused, with 2, rarely 3 or 5 carpels, which form the upper bilocular or threelocular ovary. The style usually has a cephalic or two-lobed stigma. *Loganiaceae*, mainly pollinated by insects.

Fruit is syncarpous: drupe, berry (of the genus *Strychnos*), less frequently capsule. Seeds are sometimes quite large, with a strong endosperm and a small direct embryo.

Plants containing alkaloids, often quite poisonous, are very characteristic of the family. Iridoid glycosides are found in some representatives.

The seeds of the *Strychnos*, or vomit nut (India, Indochina, Malaya), are the main source of the alkaloid strychnine, used in scientific medicine. Extracts from the bark of some South American species, including *Strychnos toxifera*, are used by Indians as part of the paralyzing arrow poison curare.

Some *Loganiaceae* are cultivated as ornamental plants.

Strychnos nux-vomica ♂♀*$Ca_{(5)}Co_{(5)}A_5G_{\underline{(2)}}$

The family Rubiaceae.

The family *Rubiaceae*. *Rubiaceae* is one of the largest families of flowering plants, which includes almost 500 genera and about 11,000 species. In the CIS countries about 260 species belonging to 14 genera grow in the wild, of which the most common are species of *Galium*.

Most of the *Rubiaceae* species are distributed in the tropics and subtropics, but some representatives reach as far as the Arctic and Antarctic. *Rubiaceae* occupy different habitats, grow in humid lowland and mountainous tropical forests, sometimes reaching the upper belt of the forest. They are common on riverbanks, forest edges, swampy forests and even swamps. *Rubiaceae* also occurs in areas with sharply expressed dry climate: deserts, semi-deserts, savannahs and steppes.

Tropical *Rubiaceae* are represented mainly by trees, sometimes reaching a height of 45 meters, by shrubs and arboreal lianas. In temperate and cold areas it is almost exclusively perennial or annual herbs, for example, species of genus *Galium*, many of which are common throughout Russia - *G. boreale, G. odoratum, G. palustre, G. uliginosum, G. verum* and some others. In southern areas of Russia it is possible to meet species from genera *Asperula, Cruciata, Rubia* and some others.

Leaves of *Rubiaceae* are opposite or whorled, simple, usually entire, with stipules. Sometimes (species of *Rubia, Galium*) stipules are externally indistinguishable from the leaves, which creates the appearance of a whorled leaf arrangement.

Flowers are actinomorphic, usually bisexual, aggregated in various cymoid inflorescences of thyrsas type, less often - solitary. Caulifloria is known in several tropical species. Perianth is double with calyx and corolla consisting of 4 or 5 fused sepals and petals. The calyx is often inconspicuous and the corolla tubular or funnel-shaped, sometimes attaining considerable length (in tropical species). Stamens are equally numerous with corolla lobes, alternate with them and attached by threads to its tube or pharynx. The gynoecium is syncarpous, fused from two carpels. The ovary is lower, bilocular, most often with many ovules in each cavity. Style with a cephalic or lobate stigma. At the base of the style base a nectar disk is often visible. *Rubiaceae* is pollinated by insects.

The fruit is a syncarpous: capsule, berry, syncarpous drupe, very frequent are schizocarpia, i.e., dry syncarpia, which disintegrate longitudinally. Seeds vary in size and shape, endosperm present or absent, embryo straight or bent.

Many *Rubiaceae* contain alkaloids; anthraquinones, anthocyanins, aucubin, cyclitols, coumarins, tannides, iridoids, di- and triterpenoid glycosides and other biologically active substances are also found in them.

The main economically important plants of the *Rubiaceae* family are the Arabian coffee tree (*Coffea arabica*) originally from Ethiopia and the Ledgeriana tree (*Cinchona ledgeriana*) wildly growing in South America. There are many varieties of coffee beans which differ in aroma, caffeine alkaloid content etc. South American countries, mainly Brazil, are the largest exporters of coffee. *Cinchona*

bark is a source of quinine alkaloid which is widely used in medicine. All types of cinchona come from South America, but the largest plantations are in Indonesia.

Cephaelis ipecacuanha is considered a valuable medicinal plant in the same family. Chest-shaped roots of this semi-shrub from tropical forests of Brazil, Colombia and Central America contain a number of alkaloids and are used as an excellent expectorant. In scientific medicine in Russia, the roots of *Rubia tinctorum* are used as an antispasmodic agent.

Many *Rubiaceae* species are grown as ornamental plants. The most famous of them is *Gardenia jasmine*.

Galium verum $*Ca_{(4)}Co_{(4)}A_4G\overline{_{(2)}}$

The family Gentianaceae.

Family *Gentianaceae* includes 1050 species united in 83 genera. In the CIS countries, 135 species of *Gentianaceae* belonging to 12 genera grow.

In general, *Gentianaceae* are very widespread. Grasses dominate in temperate zone and alpine zone, bushes and lianas in tropics and subtropics. The main diversity of species is in the northern hemisphere. *Gentianaceae* can be found in tundra, in steppes, in forests of different types, in meadows, along the banks of water bodies, but they are especially abundant in mountains where in the alpine belt gentians sometimes create an aspect. The largest (400 species) genus of the family, *Gentiana*, is widely represented in the flora of Russia. *Gentianaceae* can be represented by two plants: *Gentiana pneumonanthe* and *Centaurium erythraea* - one- or two-year low (about 30 cm) plant that grows in southern and central European areas of the CIS and the Caucasus. *G. cruciata* and *G. pneumonanthe* are widely distributed in European Russia and Siberia, the Caucasus and the Russian Far East.

In the mountains of the Caucasus and the south of Siberia, *Swertia* are quite common in damp places; one of them - perennial *Swertia perennis* - reaches the latitude of St. Petersburg in spring bogs.

All russian *Gentianaceae* are heliophilous herbs with opposite, entire leaves without stipules and rather large, brightly colored flowers in thyrsoid inflorescences of various shapes. Flowers are usually bisexual, actinomorphic or weakly zygomorphic, almost always 4-5-membered, with halfly fused sepals and a fused-petal, more often tubular corolla with a twisted bend in the bud. Stamens alternate with corolla teeth and are attached to its tube by short threads. The syncarpous gynoecium consists of 2 carpels, which form the upper unilocular ovary with a sessile stigma or a with style with a bilobate or cephalic stigma. *Gentianaceae* flowers usually develop various nectaries and nectar glands, which often take the form of fringed pockets located in the corolla tube at the entrance to its pharynx.

The majority of *Gentianaceae* are cross-pollinated plants facilitated by dichogamy and heterostyly.

Fruit is syncarpous: a capsule that opens along the ovary stitches, rarely a berry. Seeds are small, numerous, having an endosperm.

Many *Gentianaceae* have long been used as medicinal plants. Classic tool to stimulate appetite is the root of yellow gentian (*G. lutea*). Another remedy for the same effect is considered very bitter *Centaurium erythraea* herb.

Gentiana pneumonanthe *$Ca_{(5)}Co_{(5)}A_5G_{\underline{(2)}}$

The family Menyanthaceae

The family *Menyanthaceae*. A small family of wetland perennial rhizomatous grasses, consisting of 5 genera and about 590 species. In the CIS countries there are only 4 species belonging to 3 genera. The family is very widely distributed on the globe.

The monotypic, i.e. containing only one species *Menyanthes trifoliata*, genus a is found in all extra-tropical areas of the northern hemisphere.

Leaves are simple, without stipules, alternating, usually arising from a horizontal rhizome. In the *Menyanthes trifoliata* they are tripartite. Inflorescences are cymoid, in closed racemes or single flowers. Flowers are more often bisexual, actinomorfic, rather large, brightly colored, always pentamerous. Perianth is double; sepals are fused only at the base, petals are fused into a short tube. In the bud they are folded, not twisted as in the *Centianaceae*. There are 5 stamens, their bases are fused with the corolla tube and alternate with its lobes. There are 5 nectaries.

The gynoecium is syncarpous, with 2 fused carpels, forming the upper unilocular ovary. Style with a lobate stigma on top.

Fruit is a syncarpous: the capsule, which is opened with short teeth at the top. Seeds are numerous, with an endosperm and a small embryo.

Bitter glycosides and alkaloids similar in structure were found in *Menyanthaceae* plants. Unlike the *Gentianaceae*, *Menyanthaceae* never contains genticopycrine. *Menyanthes trifoliata* is of medicinal importance as its water extracts from leaves increase the secretion of gastric juice and have a biliary action.

Menyanthes trifoliata *$Ca_{(5)}Co_{(5)}A_5G_{\underline{(2)}}$

The family Apocynaceae.

The family *Apocynaceae*. The family includes about 300 genera and more than 1500 species. In the Russian flora, the *Apocynaceae* are represented only by the genera *Poacynum* - 2 species and *Vinca* - 2-3 species. All of them occur only in the very south of the country.

Tree lianas dominate among *Apocynaceae* (in the tropics) arborescens lianas, bushes, shrubs and perennial grasses are less common. In the arid regions of Africa, you can find barrel-shaped shrubs with only a few thick, weakly branched shoots on top. Such forms which give the deserts of Africa and Madagascar a unique appearance are characteristic of the genera *Adenium* and *Pachypodium*. By

the time of their magnificent flowering they usually shed all their leaves, which makes their appearance even more original and peculiar. *Apocynaceae* of similar appearance are also found in the dry savannahs of South America. All organs of this family are characterized by a milky sap (latex) often containing rubber.

Leaves of *Apocynaceae* are entire, opposite, less often whorled or alternate. Flowers are bisexual, almost always actinomorphic, 5-membered (very rarely 4-membered), aggregated in various types of cymoid inflorescences, less often arranged singly on top of shoots or in leaf axils. Calyx is usually dissected almost to the bottom, while corolla is more often tubular, less often saucer-shaped with twisted lobes of bend in bud. There are often scaly or petal-like appendages protruding from the pharynx on the inner side of the corolla tube. Here, alternating with the corolla lobes, 5 stamens are also attached on short filaments. Their anthers are often closely spaced, cone-like overhanging over the stigma. Gynoecium is more often almost apocarpous, formed by 2 carpels. Usually the carpels are free along the whole or almost the whole length, but their styles fuse and end in a thickened stigma on top. The stigma is usually covered by sticky secretions which receive pollen. The ovary is upper.

Apocynaceae are entomophilous plants.

Fruits of *Apocynaceae* are apocarpic in most cases and consist of two folicles fused at their bases and opened at the abdominal sutures.

Seeds are almost always provided with silky hairs or a filmy border. *Apocynaceae* also have juicy unopened fruits distributed endosochorally. Non-opened fruits of coastal oceanic species can be dissipated by water keeping germinating power for many months. In some cases with more or less complete fusion of folicles the fruit becomes capcule-shaped or solid, unopened. There is secondary apocarpy, that is, the gynoecium is initially laid out as syncarpous, but then the peduncles are "released," remaining united only in the stigma and styles area.

Representatives of the family are very rich in indole alkaloids (over 500 compounds). Several genera contain cardiac glycosides (*Apocynum, Nerium, Strophanthus*). Cyanogenic glycosides, leucoanthocyanidins, saponins, tannides, coumarins, phenolic acids and triterpenoids have been found.

Apopcynaceae species are widely used. The most famous decorative plants of the tropics are species of the genus *Plumeria*. Very decorative is *Thevetia peruviana* that is called yellow oleander. Oleander (*Nerium oleander*) itself is also very decorative and is widely cultivated for this reason in tropical and subtropical countries. American species *Apocynum cannabinum* and related species of the genus *Trachomitum* produce good fiber used for making coarse fabrics and ropes.

Species of the genus *Rauwolfia* and particularly South Asian *Rauwolfia serpentine* have medicinal importance. Roots of this plant provide an effective treatment for hypertension. The same effect drugs are also produced from the grass *Vinca minor*. *Catharanthus roseas* alkaloids are a cure for *Apocynum* and *Nerium* are widely used in medicine.

Poacynum sarmatiense $*Ca_{(5)}Co_{(5)}A_5\underline{G}_{(2)}$

The family Asclepiadaceae.

This mostly tropical family is very close *Apocynaceae* family, which includes more than 250 genera and about 3,000 species. There are 39 species in CIS countries. On the Black Sea coast of Caucasus in brushwood thickets and along forest edges the woody liana *Periploca graeca* is often found.

Asclepiadaceae are perennial herbs (most russian representatives), lianas, as well as shrubs and trees, many of which have white latex (milky juice). Leaves of *Asclepiadaceae* are simple, entire, with small stipules, opposite or whorled.

Flowers are regular, bisexual, aggregated in cymoid inflorescences. The periant is double, pentameric. The calyx is dissected almost to the bottom and is usually small. Petals are fused for the most part of their length. Several appendages which form one or several "crowns" are visible inside the corolla, sometimes becoming fused with each other. In some cases these appendages become reservoirs of nectar. Very uniquely arranged are the androceum and gynoecium, where everything is adapted to a highly specialized entomophilia. Pollen is peculiar as well, which is held together in special clumps, pollinia, and in such a form is carried from flower to flower by pollinating insects.

Gynoecium is composed of 2 fused only at the top (in the area of the stigma) carpels, which form the upper ovary (see remarks of the Apocynaceae family).

The fruit is an opening double-folicle with numerous seeds, usually provided with a tuft of hairs, which promotes their propagation by the wind.

Latex of the *Asclepiadaceae* contains triterpenoids. In addition, alkaloids and cyanogenic glycosides; saponins and tannides are found in representatives of the family.

The practical importance of *Asclepiadeceae* is small. In addition to plants of decorative value (*Vincetoxicum*), several species with medical application should be noted. The most famous is Marsdenia condurango, a liana from the South America that produces condurango bark used for a number of stomach diseases. Another medicinal plant - *Periploca graeca*- contains in its bark cardiac glycosides, which were previously used in scientific medicine in Russia.

Periploca graeca *$Ca_{(5)}Co_{(5)}A_5\underline{G}_{(2)}$

The order Solanales

This order includes 5 closely related families, of which only one family, the *Solanaceae*, is of great economic importance.

Solanaceae family is one of the most important families of the world flora, consisting of about 90 genera and at least 2900 species. In CIS countries 74 species belonging to 15 genera are naturally growing and cultivated. It is easy to imagine the appearance of *Solanaceae* by recalling the common potato (*Solanum tuberosum*), the widely spread biennial herbaceous weed - *Hyoscyamus niger* and fairly common climbing semi-shrub Solanum sweet- bitter (*Solanum dulcamara*).

Solanum is the best known genus of *Solanaceae*, which includes more than 1700 species, the majority of which inhabit South America. *Solanaceae* are distributed fairly widely, but the greatest concentration of species is found in Central and South America and in Australia. In Russia *Solanaceae* don't play any essential role in creating vegetative cover, but some species are rather common on the edges of forests and in thickets of low shrubs.

Solanaceae are mostly perennial herbs or semi-shrubs, more rarely shrubs or even small trees (in the tropics). Their leaves are simple, entire or dissected, usually alternate and always without stipules.

Irregular or slightly zygomorphic bisexual flowers are in cymoid inflorescences which are sometimes reduced to a single flower (*Datura*). Flowers themselves are rather large with double five-membered perianth. Sepals fuse to form a five-toothed calyx of various shapes and fusing petals form a tubular, bell-shaped or wheel-shaped corolla. The androceum consists of 5 stamens, attached to the corolla tube and alternating with its lobes. Gynoecium is syncarpous, formed by two fused carpels. The ovary is upper, bilocular or (as a result of the development of transverse septa) tetralocular. The style is one, with a two-lobed or a head-like stigma. Seeds are numerous. Example of flower formula:

Solanum laciniatum - *$Ca_{(5)}Co_{(5)}A_5\underline{G_{(2)}}$

Solanaceae are cross-pollinating entomophilous plants; sometimes (in potatoes) self-pollination is observed. The fruit of *Solanaceae* is syncarpous: usually a berry, more rarely a capsule. Seeds contain abundant endosperm.

The family is rich in alkaloids. In addition to alkaloids, steroid saponins, vitanolides, coumarins, flavonoids and carotenoids are found. Anthraquinones are found occasionally.

Solanaceae are plants of exceptional practical value. This family gave a number of important food and medicinal plants to mankind. The first place undoubtedly belongs to potato, the annual production of which by the middle of the XX century was close to 300 million tons, about a third of which fell on the USSR. The cultivated potato is native to the Andes (South America), where there is still growing its probable wild progenitor, the *Solanum andigenum*, which differs from the ordinary European potato only by longer internodes and some peculiarities of flower structure.

Another important cultural plant of *Solanaceae* family is eggplant (*Solanum melongena*). It grows in wild form in India and Burma reaching 4-6 m height in tropics during perennial culture. Tomato is very close to *Solanum*, one of the species of which *Lycopersicon esculentum*, originally from Peru, is cultivated nowadays all over the Earth from the tropics to the temperate zone.

As for medicinal plants, first of all let us mention belladonna, or *Atropa belladonna*, which is a source of alcaloid atropine widely used in medicine.

In addition to belladonna, preparations made of datura and hemp species as well as *Scopolia* (*Scopolia carniolica*), a genus closely related to belladonna, are used in scientific medicine. All of these plants are poisonous and can sometimes cause poisoning. *Nicotiana* species containing nicotine alkaloid are the source of

tobacco and tobacco powder. They come from America and introduced to Europe at the end of XV - beginning of XVI centuries. In culture the most common is real tobacco (*Nicotiana tabacum*), much more seldom grows snuff (*N. rustica*). *N. rustica* leaves can also be used to obtain citric acid and the preparation of nicotine sulfate, which is used to control insect pests of agricultural products. Several ornamental Solanaceae are known, of which South American *Petunia hybrida*, as well as sweet tobacco (*Nicotiana affinis*) are the most common in the CIS countries.

ORDER BORAGINALES

This order includes 7 families. One of them, the family Boraginaceae, is widely represented in the flora of the CIS countries.

Family Boraginaceae.

This family includes 100 genera and up to 2500 species as it is supposed. About 450 species of *Boraginaceae* belonging to 56 genera grow in the CIS countries.

Myosotis species, very common in wetlands along reservoirs and rivers, gives a good idea of the mesophilic representatives of this family. *Pulmonaria obscura*, one of the earliest flowering plants in the forest zone, however many Boraginaceae are xerophytes, i.e. they adapted to arid living conditions and weedy habitats. They include many widely distributed species - *Anchusa officinalis*, *Asperugo procumbens*, *Borago officinalis*, *Cynoglossum officinale*, *Echium vulgare*, *Lappula squarrosa*, *Symphytum officinale* and many others.

Leaves of *Boraginaceae* are simple, entire, alternate, without stepules, often containing cystoliths. As the stems, they are often covered with characteristic tough bristly hairs on the multicellular outgrowths of the epidermis.

Partial inflorescences are cymoid, arranged usually as a drepanium, but the whole inflorescens is a thyrs. Flowers are usually actinomorphic and bisexual but in some genera, such as the genus *Echium* the flower is clearly zygomorphic. Perianth is double, four-five-membered. The calyx is fused, five-lobed or five-toothed; under fruit, it mostly accretes and sometimes falls off together with it. Corolla is fused petal, funnel-shaped or tubular, with a five-lobed or five-toothed branch. Petals of the flower buds are tortuously folded or twisted. The corolla color varies, often changing during the flowering period of one and the same plant. More often the first pink corolla becomes blue and yellow or white corolla becomes reddish. It is believed that this is due to the peculiarities of pollination, but there is no reliable explanation. Scales and tufts of hairs often develop in the corolla pharynx which is believed to be an adaptation to insect pollination. Androceum consists of 5 stamens attached by threads to the corolla tube.

The gynoecium is syncarpous, fused from two carpels, which in the early stages of development are separated longitudinally by a septum, as a result of which the ovary turns out to be tetralocular and four-lobed. Each cavity contains one ovule. A style is solid, with a small, cephalic or two-lobed stigma, which emerges from the hollow between the four lobes of the ovary. The ovary is upper, surrounded at the base by a circular disc which secretes nectar.

Most domestic borage has a cenobium fruit, i.e. a dry and fractional syncarp (schysocarp) divided into 4 parts (erema). Fractional fruit lobes are very often covered with hook-like bristles, which allows their spreading by animals and humans. Less often the fruits are spread by wind, water, etc.

Representatives of the family contain naphthaquinones, phenolic acids, tannides, pyrolizidine alkaloids and alantoin. Some substances contained in roots of Lithospermun have hormonal activity.

Economic importance of boraginaceae is small. First of all, they are decorative types of *Heliotropium* and *Miosotis*. *Alkanna tinctoria* gives harmless vegetable dye alkanin, which is mainly used in Western Europe sometimes for dyeing some food. Many boraginaceae plants are not bad honey plants. Several species of the *Cynoglossum* genus, *Litospermum* and *Borago* are used in folk medicine, but they are not used in scientific medicine yet. Example of a flower formula:

Borago officinales *$Ca_{(5)}Co_{(5)}A_5\underline{G_{(2)}}$

ORDER -SCROPHULARIALES

This order includes 17 families. This is one of the most specific and flourishing groups of dicotyledons. Some of the families belonging to this order will be described here.

Family Scrophulariaceae.

It is a large family including at least 350 genera and about 4500-5000 species distributed all over the world mainly in temperate zone and in mountain and submountainous areas of tropics and subtropics.

In the flora of CIS countries 47 genera and about 780 species of this family are known.

One can easily form an idea of the appearance of *Scrophulariaceae* by recalling the most widely cultivated ornamental plant native to Southwestern Europe - the *Antirrhinum majus* with its large, sharply zygomorpic bilabiate flowers.

Grasses predominate in the family, among which there are many annuals. There are also small lianas, shrubs and bushes. There are several submersed species among norichnikas. Very common in our forests and meadows are norichnikas of the genera *Euphrasia, Melampyrum, Pedicularis, Rhinanthus, Scrophularia, Verbascum, Veronica* and others. *Linaria vulgaris* often grows along roadsides and railway embankments. Many forest and forest fringe noctuid plants are semiparasitic, and some of them, such as *Lathraea squamaria*, become obligate parasitic, thus completely losing their green color and normally developed leaves. However, sometimes in addition to herbaceous plants there are trees and bushes (perhaps in this case this life form is secondary and derived from grassy ones). In particular, such are representatives of the genus Hebe, from Australia and South America, differing from our veronicas only habitually.

Leaves of *Scrophulariaceae* are simple, as a rule, entire, without stipules, alternate, opposite or whorled. Inflorescences are more often botryoid, less often cymoid. Flowers are bisexual, more or less zygomorphic. Perianth is double, most

often pentamerous. Calyx is actinomorphic or bilabiate, usually five-toothed or five-lobed, less frequently with 5 free sepals (*Digitalis*). One sepal is often much smaller than the others. Corolla is fused petals, various in shape: bilabiate, tubular, thimble-shaped or almost wheel-shaped with a relatively short tube (Verbascum). If bilabiate corola usually has 2 petals on its upper labium and 3 on its lower one, sometimes there is a sacciform projection (*Antirinum*) or spur (*Linaria*) in the lower part of the corolla tube.

The lower labium of the American genus *Calceolaria* has a voluminous, almost spherical sack which acts as a trap for insect pollinators. Externally and functionally it is very similar to the labia of the lady's slipper orchid (*Cypripedium*). Occasionally, such as the mullein or veronica, the lobes of the calyx are almost free, while the corolla is wheel-shaped. Some species have large, sometimes brightly colored bracts, which contrast with the corolla. Especially it is characteristic for common in our forests *Melampyrum*, one of the species, therefore, is called Ivan-and-maria. Flowers with bilabiate corolla are adapted to pollination by large insects, which may by their weight bend back the lower labium and thus gain access to nectar, located at the bottom of the corolla tube.

Stamens are often 4, attached to the corolla tube. Two of them, as a rule, longer than others. Less commonly, there are 5 stamens (*Verbascum*), or the 5th stamen is turned into a staminody (*Scrophularia*). Sometimes flowers have only 2 stamens (*Veronica, Hebe*). Gynoecium of *Scrophulariaceae* is syncarpous, formed by 2 fused carpels. The ovary is bilocular, upper one, with numerous ovules. The style is simple, ending in a two-lobed or head-shaped stigma. Nectar is distinguished by a special subpistillate disc, which is an outgrowth of the base of the carpels.

Entomophilia is characteristic of the *Scrophulariaceae*.

Fruit is syncarpous: capsule opening in various ways. Seeds are small, with an erect or bent embryo and endosperm. Often seeds are surrounded by a filmy border and distributed by the wind. They may be dispersed by ants attracted by the juicy oily appendage. Seeds of some species of *Melampyrum* somewhat resemble ants' pupae, which attracts these insects.

Some *Scrophulariaceae* contain cardiac glycosides of the cardenolide group. Steroid and triterpene saponins, cyanogenic glycosides (in *Linnaria*), naphthaquinones and anthraquinones, aurones and iridoids are also found. Alkaloids are rare.

In general, *Scrophulariaceae* are of minor practical importance, however Digitalis species are used to produce extremely important cardiotonic drugs. Handsome flowering species of *Antirinum, Digitalis*, etc., are well known ornamental indoor and outdoor plants.

The family Plantaginaceae.

A small family, includes 270 species belonging to 3 genera. There are 54 species of 2 genera in the CIS countries.

Our common *Plantago major* with its rosette of basal leaves and non-transparent flowers dense on the flower arrow gives a good view of many species

of this family. As weeds, a number of plantain species are widely dispersed throughout the world.

All *Plantaginaceae* plants are perennial or annual herbs, and occasionally bushes. Leaves without stipules, usually alternate, less often opposite, very often included in the root rosette. They are small, actinomorphic flowers of bisexual are arranged in apical spikelet-shaped inflorescences or heads. Perianth is double, more often four-membered. Calyx is tetraspaceous or tetrasepartite. Corolla fused, quadri-petal, painted or filmy; stamens usually 4, attached to the corolla tube. Gynoecum syncarpous, with 2 carpels, forming the upper ovary, unilocular or bilocular. Ovules are few, sessile on axial placentae. Style with a small globular stigma.

Plantago are mostly wind-pollination but sometimes insecti-pollination species.

Fruit is syncarpium, which is a capsule opened with a lid. Seeds are small, navicular, with a small upright embryo and fleshy endosperm; they are dispersed by the wind when they fall from the fruits when they open.

When moistened by the mucus in the outer cells of the spermoderm (seminal coats), they stick to various moving objects such as legs of animals or people, and thus they disperse.

Plantagos are found polysaccharides in the form of mucus, phenolic acids, iridoids, flavonoids and sugars.

Plangos are fairly widely used in folk and scientific medicine. Most commonly, preparations of Greater Plantain and Flea Plantain (*P. psyllium*), distributed from the Western Mediterranean Sea to India, are used as wound-healing, anti-inflammatory and antiulcer agents.

Plantago major $*Ca_{(4)}Co_{(4)}A_4\underline{G_{(2)}}$

ORDER OF LAMIALES

A highly specialized order that unites 3 families: *Verbenaceae*, *Lamiaceae (Labiatae)* and *Callitrichaceae*.

The family is Labiatae, or Lamiaceae.

There are about 5,500 species of *Lamiaceae*, grouped into 270 genera. In Russia and the CIS countries, the number of species reaches about 1000, belonging to 69 genera. Representatives of the family are easily recognized by the characteristic bilabiate corolla, opposite leaves and tetrahedral stems. Many *Lamiaceae* are well known to residents of temperate climates. Let's mention mint (*Mentha*), whose species are common in wet habitats. Representatives of the huge genus of sage (*Salvia*), numbering more than 700 species, on the contrary, are associated with relatively dry habitats.

The best idea of the appearance of domestic representatives of the sponges can be made by recalling the widespread weed - deaf nettle, or white cloverleaf (*Lamium album*), whose leaves without leaflets resemble the leaves of German nettle of the nettle family.

Species of the genera *Ajuga,* green-leaved (*Galeobdolon*) and *Glechoma* are very typical for broad-leaved and spruce-broad-leaved forests of Russia. Representatives of the genera *Betonica* and *Prunella* are common in wet meadows, while *Mentha arvensis* and *Scutellaria galericulata* are always to be found in humid pools and on pond banks. Many spongifers readily inhabit clearings and fallow land, and are often found near houses, often becoming weeds. Such species are especially numerous in the genera *Galeopsis, Leonurus, Stachys* and *Lamia*. Most sponges are found in steppes, steppified meadows, open slopes of river valleys and in dry light forests.

Spongifers are widespread, but the Mediterranean is the main center of their diversity. Here they constitute the main component of plant communities of the region. Grasses, middens and bushes are the main mass of spongifers. Very often non-tree plant parts are covered with hairs and head glandules containing aromatic essential oils. The perianth is always double. The calyx is five-toothed, bilabiate, actinomorphic or zygomorphic. Corolla is usually bilabiate. Few *Lamiaceae*, which include mint, have almost actinomorphic corolla. Large middle lobe of the lower labium is a kind of landing-ground for insect pollinators. Stamens are usually four, attached to the corolla tube. A pair of posterior stamens is, as a rule, shorter than the anterior pair. Sometimes posterior stamens are reduced, in which case their number in the flower is 2 (*Salvia*). Below the attachment of stamens, there is usually a hairy ring in the corolla tube, protecting the nectar supply from unwanted visitors.

Gynoecium of the *Lamiaceae* is rather monotonous in structure. It is syncarpouss, formed by 2 carpels, each of which is then divided in two by a longitudinal septum, with the upper ovary becoming quadruple and quadripetal.

Each socket contains one ovule. One style with a two-lobed stigma emerges from the base of the ovary lobes. Nectar-bearing disk, surrounding the ovary, is conspicuous at its base.

Most *Lamiaceae* are cross-pollinated entomophiles and their flowers are therefore designed to be pollinated by bees, bumblebees or butterflies. Pollination mechanisms are different. The most advanced type of pollination is found in sage. The essence of it is that the insect, removal nectar, pushes his head part of a stamen, converted into a lever. Under the action of pushing the second part of the stamen, carrying the anther, tilts, hitting the insect on the back, which falls out some pollen.

Fruit of the *Lamiaceae* is syncarpium: a cenobium divided into 4 parts (erema). As a rule, the fruits are enclosed in a growing calyx which facilitates their dissemination by the wind. Seeds are usually without endosperm.

This family is very rich in essential oil plants. In addition to essential oils, di- and triterpenoids, saponins, polyphenols and tannides, iridoids, quinones, coumarins and insect molting hormones have been found. Alkaloids are rare and not typical for the family of *Lamiaceae*.

Practical importance of *Lamiaceae* is very high. Many species are cultivated as ornamental plants in the open air. Let us mention a very common sage brilliant (*Salvia splendens*) with its fiery red flowers, often cultivated in flowerbeds. A con-

siderable number of *Lamiaceae* are used to produce essential oils used in perfumes and food industries. The most important crop is peppermint (*Mentha * piperita*), a hybrid species that contains menthol as a valuable terpenoid in its essential oil. Except food industry menthol is used in many medicines. *Salvia officinalis* is used in medicine, its essential oil has bactericidal action. It was highly valued in the Middle Ages, as evidenced by the verse: “Cur moritur homo cui Salvia crescit in hortis” (why should a person die if there is sage growing in the garden).

Of the other medicinal representatives of the *Lamiaceae*, in addition to the aforementioned mint and sage, let us mention *Leonurus cardiacis* (*Leonurus cardiaca*), the herb from which preparations are obtained to produce sedative (sedative) effects; Roots of *Scutellaria baicalensis* - hypotensive agent, flowers of intoxicating hare-reed (*Lagochilus inebrians*), growing in Central Asia have hemostatic properties.

Essential oils of *Lavandula angustifolia = L. vera* and *Pagostemon cablin* are important components of several perfumes and colognes.