MINISTRY OF HEALTH OF THE REPUBLIC OF UZBEKISTAN

TASHKENT PHARMACEUTICAL INSTITUTE

METHODOLOGICAL DEVELOPMENT FOR LABORATORY WORK ON

PHARMACOGNOSY COURSE

(PART II)

Tashkent-2021

MINISTRY OF HEALTH OF THE REPUBLIC OF UZBEKISTAN

TASHKENT PHARMACEUTICAL INSTITUTE

"CORFIRMED"

Vice-Rector for Educational Affairs
of the Tashkent Pharmaceutical
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2021 y. " "

Medicinal plants and raw materials,containing anthracene derivatives and their glycosides.

Educational and methodical manual on pharmacognosy for students of the III-year course of the Faculty of Pharmacy.

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Methodical manual was discussed and approved at the meeting of the Department of Pharmacognosy of the Tashkent Pharmaceutical Institute (record № 14 from "15" 03 2021.)

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Methodical manual was discussed and approved at the meeting of CMC of the Institute (record № 8 from "23" 03 2021.)

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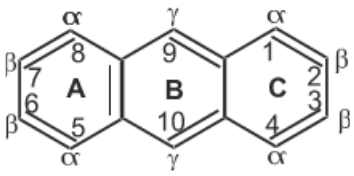
Topic: Medicinal plants and raw materials,containing anthracene derivatives and their glycosides.

The purpose of the lesson. Plants containing anthracene derivatives have been used for the treatment of various skin diseases for a long time, as well as laxatives, neuroleptic drugs, antibiotics, and as biogenic stimulants. Some plants are known as sources of natural dyes.

Anthracene derivatives are a group of natural compounds that are based on the anthracene core of various degrees of oxidation along the middle ring (ring B)

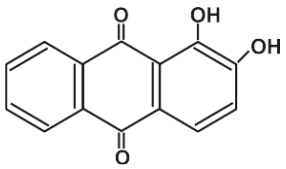


anthracene

Depending on the structure of the carbon skeleton, natural anthracene derivatives can be divided into 3 main groups:

1. Compounds based on 1 anthracene core (monomers)

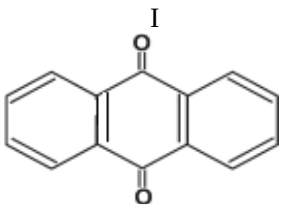
2. Compounds with 2 anthracene nuclei (dimers).



3. Condensed anthracene derivatives.

I. Compounds, depending on the degree of oxidation of the main core, in turn, are divided into 2 subgroups:

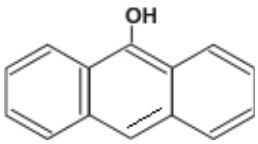
a) oxidized forms - anthraquinone core (I)



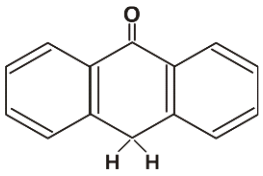
b) reduced forms-derivatives of anthranol (II), antrone (III),

oxantrone (IV).

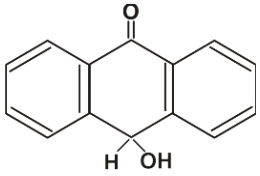
I



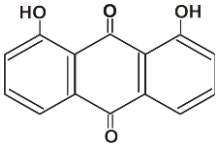
II



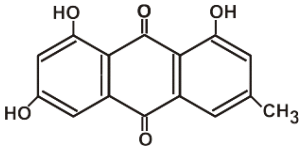
III



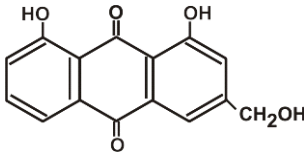
Within a subgroup, the compounds are divided according to the nature and location of the substituents. As substituents, anthracene derivatives contain hydroxyl and methoxyl groups, as well as a methyl group, which can be oxidized to alcohol, aldehyde, or acid. The most well-known derivatives of 1,8-dioxyanthraquinone or chrysacin,frangulaemodine, aloe-emodine and other compounds: rein, chrysophanol.



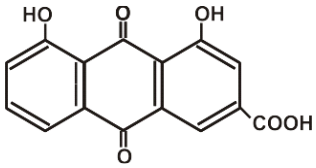
chrysacin



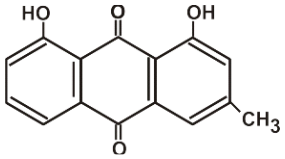
frangulaemodine



aloe-emodine



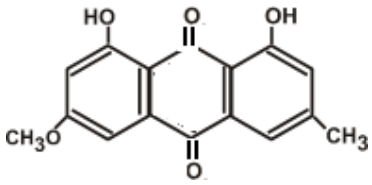
rein



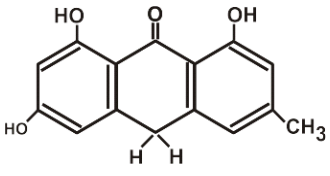
chrysophanol

Anthraquinone derivatives containing oxygen groups in the α-and β-positions-alizarin, lucidin, purpurin rubiadin and their glycosides have a nephrolytic effect.

The reduced forms of anthracene derivatives are based on the nuclei of anthranol, antrone, and oxy-antrone. Fisfion-anthranol, frangulaemodin-antrone, and aloe-emodin-antrone were isolated.

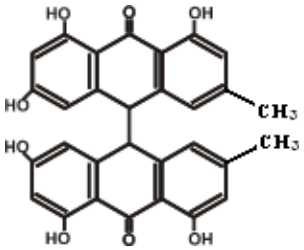


Fisfion-anthranol

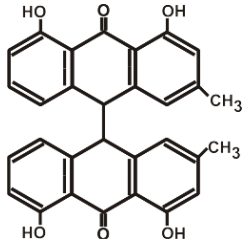


frangulaemodin-antrone

II. Dimers of anthracene derivatives can be either oxidized or reduced forms. The dimer compound molecule can be symmetric.

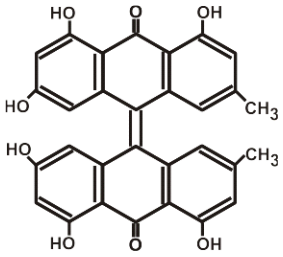


Emodindiantrone



chrysafanoldiantrone

III. Condensed anthracene derivatives are isolated from various types of St. John's wort — hypericin.



hypericin

Anthracene derivatives in plants occur both in free form and in the form of glycosides, which are called anthraglycosides.

Aglycones can be all groups of anthracene derivatives with the exception of dianthraquinones. The sugar component can be glucose, rhamnose, xylose, arabinose.

Anthracene derivatives are crystalline substances of yellow, orange or red color. Free aglycones are well soluble in ethyl ether, chloroform, benzene and other organic solvents; they are not soluble in water, but are well soluble in aqueous solutions of alkalis due to the formation of phenolates.

In the form of glycosides, anthracene derivatives are well soluble in water, even better — in alkali, worse — in ethanol and methanol; they are not soluble in organic solvents — benzene, ethyl ether, chloroform.

When heated to 2100C, anthracene derivatives are sublimated. Most anthracene derivatives fluoresce in UV, the nature of luorescence depends both on the degree of oxidation of the main core, and on the number and location of

substituents; anthraquinones are characterized by orange,pink, red and fiery red fluorescence; antrones and anthranols-yellow, blue, purple.

On the topic, 2 laboratory classes are held for 4 hours.

Technologic map of labaratory session

Topic	Medicinal plants and raw materials containing anthracene derivatives
Aims and tasks	To study a group of natural anthracene compounds and medicinal plants and raw materials containing them. Teach students to work independently and make accurate conclusions.
Content of the study process	Formation of students' ability to consolidate practical skills on the morphological description of the plant, on the established authenticity, quality and purity, as well as the use of medicinal products and methods of chemical analysis of medicinal raw materials.
Technology of the training process	Method — "Brainstorming", "Conversation", "Explanation", "Boomerang", "Turntable", tests Form-laboratory activity, in groups and separately. Equipment — tables, handouts, herbarium and raw materials of medicinal plants, slides, microscopes, chemical reagents and devices Control — written and oral survey, observation, self-control Rating-promotion, according to the 100-point rating system.
Expecting results	Complete assimilation of the material and the formation of knowledge on the topic, the ability to work on new technologies Teacher: to learn and implement new pedagogical information technologies in the educational process, to work on yourself. Student: 1) learn to work independently. defend your point of view; 2) find additional literature on this topic, work with it, analyze your opinion and the opinions of the group, make a certain decision, develop your knowledge and skills.
Future plans (analisys,changes)	Working with literary sources; the ability to work with modern technologies.

Structure and timing of the laboratory session

1. Identification of the initial level - 30 min

2. Correction of the initial level - 10 min

3. Independent work of students - 100 min

4. The results of the work performed and the control of the registration of the protocol of students - during the lesson

5. Final control and discussion of the results - 15 mins

6. Homework for the next laboratory lesson - 5 mins

1-laboratory session

Chemical analysis of raw materials containing anthracene derivatives

Questions for self-preparation

1. Characteristics and classification of anthracene derivatives.

2. Biogenesis, physical and chemical properties of anthracene derivatives.

3. Qualitative determination by the method of alkaline hydrolysis (reaction Bortreger), acid hydrolysis (International Pharmacopoeia), microsublimation, chromatography.

4. Quantitative determination of the photoelectrocolorimetric method by GF XI.

5. The use of medicinal raw materials containing anthracene derivatives.

Tasks for self-preparation

I. Chemical analysis of medicinal raw materials containing anthracene

derivatives.

a) conducting a qualitative reaction on medicinal plant raw materials containing anthracene derivatives by the method of alkaline hydrolysis (Borntreger reaction), acid hydrolysis (International Pharmacopoeia), microsublimation, chromatography;

b) determination of the quantitative analysis of medicinal plant raw materials containing anthracene derivatives by the photoelectrocolorimetric method according to GF XI;

c) write in the protocol the chemistry of qualitative reactions and the results chemical analysis.

1-laboratory work

Qualitative reactions for the detection of anthracene derivatives.

The presence of anthracene derivatives in medicinal raw materials can be judged by its yellow and orange color. The natural color of these compounds is an important diagnostic feature of raw materials. However, very often the orange color is masked by chlorophyll and other coloring substances.

1. When a few drops of concentrated sulfuric acid or a mixture of concentrated sulfuric and boric acids are added to the aqueous extraction, a red staining is formed.

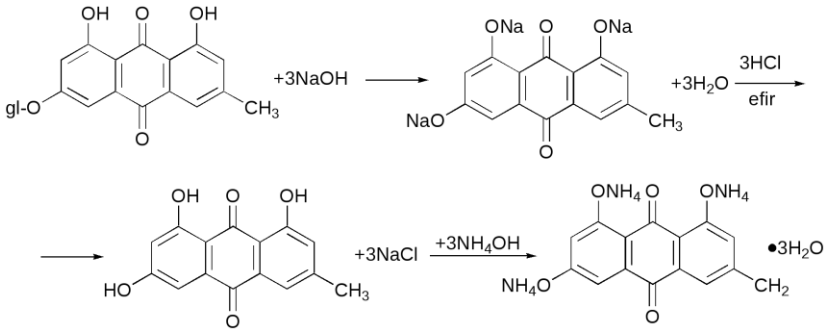
2. With a solution of magnesium acetate (1% solution (CH3COO)2Mg in methanol) gives a red, orange, purple color-depending on the position of the hydroxyl group, and also gives a pink color.

3. Reaction with an alkali solution. The reaction is based on the principle of alkaline hydrolysis and the reaction of the interaction of aglycones with alkali to form anthraquinolates - colored compounds. When heated, 0.5 g of raw material with 5 ml 5% solution of alkali forms a staining, the shades of which depend on the position of the phenolic hydroxyls. In the presence of anthracene in the raw material derivatives and the position of hydroxyls. In the presence of anthracene derivatives in the raw material and the position of hydroxyls 1-8, red and pink coloring is formed; in the position 1-2 - purple.

This reaction will give only the oxidized forms, the restored ones are included in the reaction after oxidation.

4. Borntreger reaction: 0.5 g of crushed raw material is placed in a conical flask and boiled for a few minutes with 10 ml of 10% alkali solution, after cooling, it is filtered through a filter into a dividing funnel. The filtrate is acidified with diluted hydrochloric acid (12.5%) to a slightly acidic reaction (red staining turns to yellow) and extract 10 ml of ether.In this case, the ether takes on a yellow color. 5 ml of essential extract shaken with 5 ml of 10% ammonia solution, the latter acquires a blood-red staining (formation of quinolate).

Chemistry of the Borntreger reaction



yellow staining (yellow precipitate) crimson staining

5. The International Pharmacopoeia recommends acid hydrolysis for the recognition of anthracene derivatives, which eliminates the process of purification from concomitant substances.

0.1 g of the crushed raw material is boiled in a flask with 10 ml of diluted sulfuric acid for 2 minutes. After cooling, the filtrate is slightly shaken for I minute with an equal volume of benzene in the dividing funnel. Separate the benzene layer, shake it with half the volume of diluted ammonia and leave it for 15 minutes.A cherry-red staining appears in the ammonia layer.

6. Micro-distillation. The presence of anthracene derivatives can be proved by microsublimation, for this purpose, the coarse raw materials are placed on a slide, covered with another glass at an angle between the glasses, a cork is laid, placed on an asbestos grid and heated. When the atom is formed, a yellow or orange sublimate is formed, in which, after cooling, small crystals of anthracene derivatives are formed, which turn red when treated with an alkali solution.

7. Qualitative recognition of anthracene derivatives is also carried out by the method of chromatographic analysis, with the advantage for thin-layer chromatography on silufol: 0.3 g of crushed vegetable raw materials is heated with 3 ml of ethyl alcohol for 5 minutes, bringing to a low boil. After cooling, filter. The filtrate is then applied to the start line and chromatographed in the ethyl acetate-formic acid-water system(10:2:3).

Chromatography time is 30-40 minutes. The chromatogram is air-dried, treated with 5%NaON in ethyl alcohol, and examined in daylight and UV light before and after treatment. At the same time, the standard "witness" is chromatographed, applying its solution next to the test extraction.

Quantitative determination of anthracene derivatives

Determination method: 0.05 g (exact weight) of crushed raw materials is placed in a conical flask with a capacity of 100 ml and 7.5 ml of glacial acetic acid is added. The flask is connected to the reverse refrigerator and heated in a boiling water bath for 30 minutes. Then the liquid in the flask is cooled, after which 30 ml of ether is added through the refrigerator, and the mixture is boiled again for 15 minutes (in a cooled bath). After the specified time, the vinegar-ether mixture is filtered through cotton wool into a dividing funnel with a capacity of 250 ml, the cotton wool is washed with 10 ml of ether. To the raw material in the flask, re-add 25 ml of ether and boil for 15 minutes. The ether extraction is filtered through the same cotton wool, attaching the filtrate to the original extraction. The flask with raw materials and the funnel with cotton wool are washed twice with ether,10 ml each time. To the vinegar-ether extraction in the dividing funnel,pour 100 ml of a 5 % solution of caustic soda containing 2% ammonia,shake for 3 minutes.

After settling the mixture in the dividing funnel, the alkaline-ammonia layer is drained into a measuring flask with a capacity of 250 ml, and the essential extract in the dividing funnel is continued to be shaken with new portions of the alkaline-ammonia solution of 25 ml until the latter is no longer colored pink.

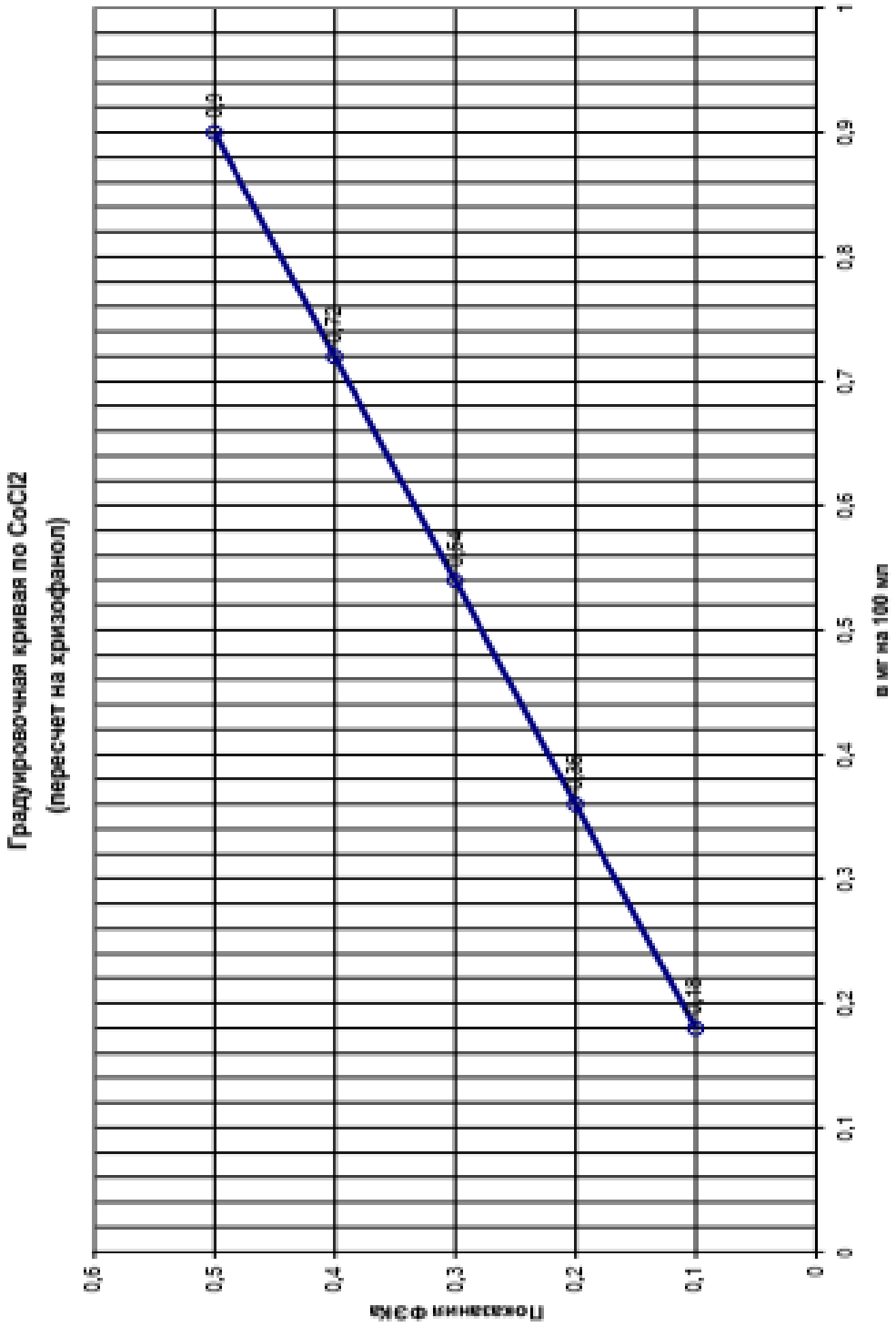
The liquid in the measuring flask is brought to the mark with a solution of an alkaline-ammonia mixture. 25 ml of the resulting solution in a wide-mouthed flask is heated in a water bath with a reverse refrigerator for 15 minutes, with periodic stirring, then cooled and quantitatively transferred the liquid is placed in a measuring flask with a capacity of 25 ml and the volume is brought to the mark.

The optical density of the solution is measured on a photoelectrocolorimeter (FEC-M) with a green light filter in a cuvette with a layer thickness of I cm. The zero point is set by distilled water. If too intense coloring is obtained, the solution is diluted before colorimetry with an alkaline-ammonia solution. The concentration of anthracene derivatives in the colorimetric solution,expressed in istisna, is determined by a calibration graph constructed from solutions of cobalt chloride (Coc L2 6H20).

The content of anthracene derivatives as a percentage in terms of absolutely dry raw materials, is calculated by the formula:

$$X = \frac{C \cdot V \cdot K}{a \cdot 10 \cdot (100 - W)};$$

where, C is the concentration of anthracene derivatives in mg per 100 ml, found according to the calibration schedule; V is the initial volume of alkaline extraction; a is the weight of the raw material in grams; W is the moisture as a percentage; K is the dilution coefficient after heating.



2-laboratory session

Medicinal plants and raw materials containing anthracene derivatives

Questions for self-preparation

1. The name of the plant, the raw material and the family of Cassia hollyleaf, Cassia narrowleaf. Morphological description of the plant and the appearance of the raw material of Cassia hollyleaf, Cassia narrowleaf. Distribution, collection, and drying.Anatomical structure. Chemical composition. Medical applications and dosage forms.

2. The name of the plant, the raw material and the family of joster laxative.Morphological description of the plant and the appearance of the raw material of joster laxative. Distribution, collection, and drying. Chemical composition. Application to medicine and dosage forms.

3. The name of the plant, the raw material, and the rhubarb family. Morphological description of the plant and the appearance of rhubarb raw materials. Distribution, collection, and drying. Anatomical structure. Chemical composition. Application and dosage forms.

4. The name of the plant, raw materials and the family of horse sorrel.Morphological description of the plant and the appearance of raw materials of horse sorrel.Distribution, collection, and drying. Chemical composition. Medical applications and dosage forms.

5. The name of the plant, raw materials and family of madder dye.Morphological description of the plant and the appearance of the raw material of madder dye.Distribution, collection, and drying. Chemical composition. Medical applications and dosage forms.

6. The name of the plant, the raw material, and the aloe family. Morphological description of the plant and the appearance of the raw material. Distribution, collection, and drying. Chemical composition. Medical applications and dosage forms.

2-laboratory work

Tasks for independent work

I. Study of objects: Cassia hollyleaf, Cassia narrowleaf, joster laxative, rhubarb, horse sorrel, madder dye, aloe.

The nature of the work:

a) morphological study of the herbarium;

b) description of the appearance of the raw material;

c) microscopic examination of senna leaves, rhubarb root;

d) to study the chemical composition of the studied raw materials, application and dosage forms.

Senna leaf, Alexandrian leaf-Folium Sennae

Senna fruit (Alexandrian pod) - Foliculae Sennae

The producing plant. Cassia acutifolia-Cassia acutifolia Del.

Narrow-leaved cassia-Cassia angustifolia Vahl.

Family. Legumes-Fabaceae

Subfamily. Caesalpinae - Caesalpinioidae

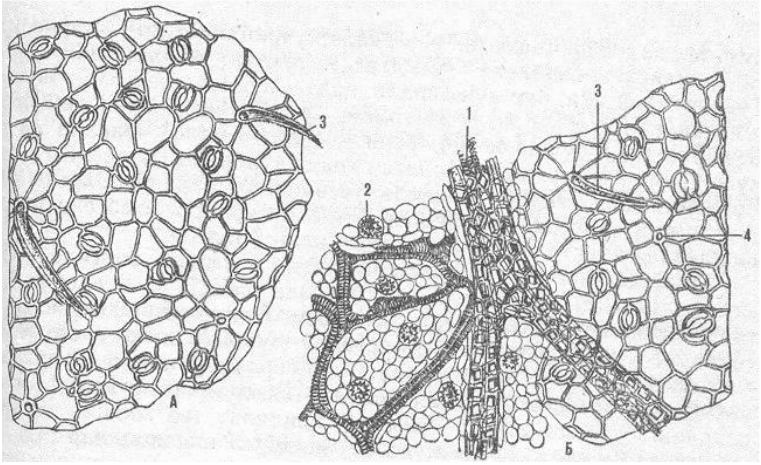
Cassia is a semi-shrub up to 1 m in height, with a branched stem, the leaves are alternate compound, parnoperiform, the leaflets are whole-edged, slightly unequal at the base, lanceolate or elongated-lanceolate. Inflorescences -axillary brush. The flowers are zygomorphic, five-dimensional. The calyx is five-leaved, the corolla consists of 5 short-legged unequal yellow free petals. Stamens 10. The fruit is a bean, flat, leathery, slightly curved.

Appearance of raw materials. The raw material is individual leaves of a complex double-pinnate leaf. The leaves are thin, brittle, elongated-lanceolate in shape, at the base uneven, whole-edged. The main veins and the second-order veins stand out slightly on the underside. The secondary veins depart from the main one at an acute angle and merge with each other in arcs parallel to the edge of the leaf. The color of the leaves is grayish-green. The smell is subtle and peculiar. The taste is bitter with a feeling of mucusiness. Leaf sizes: length 1-3.5 cm, width 0.4-1.2 cm.

Alexandrian bean pods are broad — oval, sometimes curved,webbed dry, multi-seeded, brownish-green.

Microscopy. Preparation of the leaf from the surface in chloral hydrate (after boiling the leaves in alkali). The epidermis consists of small cells,polygonal in outline. Simple hairs in a significant amount over the entire surface of the leaf-unicellular, slightly curved, rough-bearded. Often the hairs fall off and

sometimes a small round roller remains at the attachment points of the hair, surrounded by a rosette of cells. Numerous calcium oxalate druses are visible in the leaf mesophyll. The leaf veins are surrounded by a crystalline lining, made of prismatic crystals of calcium oxalate.

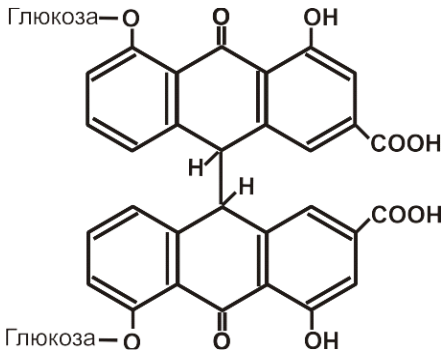


.Preparation of senna leaf from the surface (x 280).

A — epidermis of the upper side; B-epidermis of the lower side; 1-veins with a crystal-bearing lining, made of prismatic crystals of calcium oxalate; 2 - calcium oxalate druses; 3-simple hairs; 4 - places of attachment of the hair.

Chemical composition. Cassia leaves contain up to 3% of anthracene derivatives of aloe-emodin, glucorein, dimeric compounds-sennoside A and B, flavonols isoramnetin, kaempferol and their glycosides, organic acids. There are resinous substances that cause side effects (pain in the intestines).

Beans contain the same anthraglycosides as the leaves, but only in smaller amounts.



Sennosides A and B

Application. Senna leaves are prescribed in the form of infusions, resinous substances can be disposed of if the water infusions are filtered after cooling from

the released flake-like sediment. Dry Senna Extract it comes out in the form of "Senade"tablets. Senna leaves are part of anti-hemorrhoid and laxative teas.

In beans, resinous substances are absent, so the laxative effect of their infusions is more gentle.

Rhubarb Root - Radix Rhei

The producing plant. Tangut rhubarb - Rheum palmatum L.

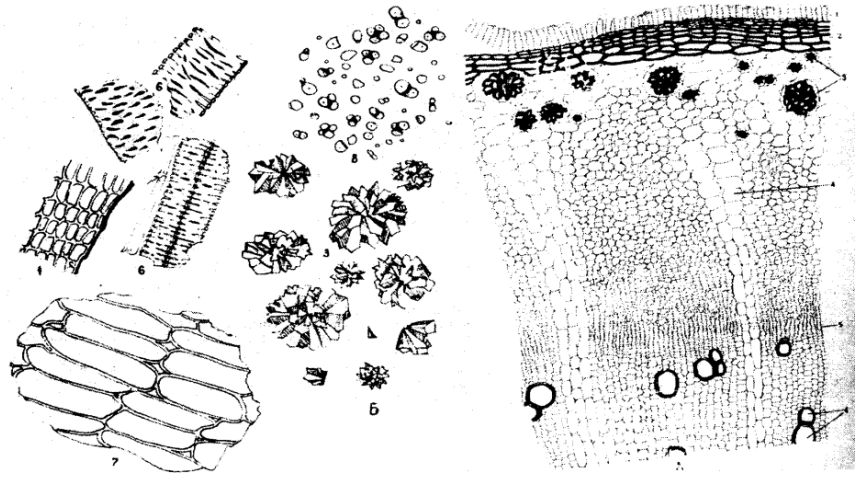
Family. Buckwheat-Polygonaceae

Rhubarb is a powerful herbaceous plant with a height of up to 2.5 m. The rhizome is short, multi-headed, dark brown with fleshy yellow roots. The basal leaves are collected in a rosette, petiolate, petioles are reddish to 30 cm long and leaf blade up to 75 cm, broadly ovate, five-semilopastnye. The stem leaves are alternate on short petioles, with sockets at the base. The flowers are collected in a paniculate inflorescence, a perianth simple, six-branched, corolla-shaped, whitish-pink or red. Stamens 9, pistil with three columns. The fruit is a triangular brownish-red nut.

Appearance of raw materials. The raw material consists of pieces of roots and rhizomes. The roots are cylindrical, thick, split lengthwise; outside they have a dark brown plug, inside they are brown or orange-brown. The break is smooth, grainy white orange, the smell is peculiar, the taste is bitter-astringent. When chewing, it crunches on the teeth (very large druses), while saliva turns pink.

Numerical indicators. Extractive substances not less than 33%; moisture not more than 12%; total ash not more than 8%; ash insoluble in 10% hydrochloric acid not more than 1%; crushed parts of rhubarb passing through a sieve with a diameter of 3 mm, not more than 5%, roots and rhizomes blackened in a break, not more than 5%, organic admixture not more than 0.5% mineral admixture not more than 0.5%.

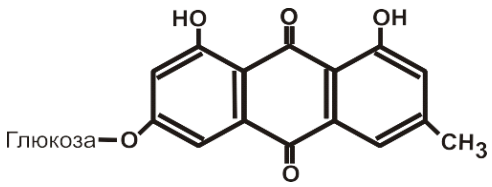
Microscopy. Rhubarb root powder in a drop of lye. In large quantities, there are fragments of cork, parenchyma containing simple and complex starch grains, rounded in shape with a center of growth in the form of a dot; a lot of large drusas of calcium oxalate up to 100 microns and their fragments; fragments of wide mesh vessels.

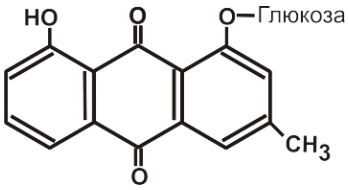


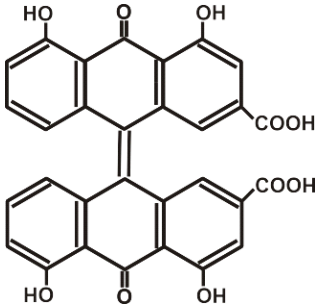
Rhubarb root. Powder elements (x 280).

1-fragments of cork; 2-parenchyma; 3-druses of calcium oxalate; 4 - fragments of vessels; 5-starch grains.

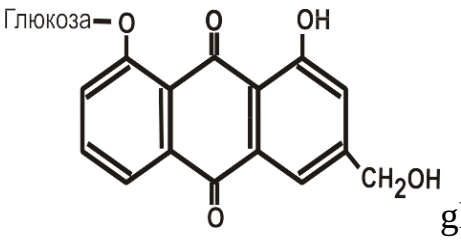
Chemical composition. The roots and rhizomes of rhubarb contain two groups of active substances: anthraglycosides (5% and higher) and tannins (up to 12%). Anthracene derivatives are represented by gluco-reum emodin, chrysophanein, gluco-rein, gluco-aloe-emodin, anthranols.Tannins are represented by gallotanins; a lot of starch and pectin substances.







gluco-reum emodin, chrysophanein,



gluco-aloe-emodin, anthranols

Application. Rhubarb preparations are diverse - dry extract, tincture, syrups, powders, tablets.

Water extracts have a laxative effect, and alcohol extracts have an astringent effect.

Fruits of laxative buckthorn

Fructus Rhamni catharticae (Baccae spinae servinae)

The producing plant. Joster laxative (buckthorn laxative) Rhamnus cathartica.

Family. Buckthorn-Ramnaceae

A small tree or large shrub is dioecious, with protruding opposite branches bearing thorns at the ends. Leaves opposite, petiolate, elliptical or rounded, slightly pointed, finely sawn (unlike brittle buckthorn), with three arched veins (unlike brittle buckthorn). The flowers are small four-dimensional, unisexual, collected in the axils of the leaves. The fruits are juicy, drupes, spherical, almost black, shiny with 3-4 seeds.

Appearance of raw materials. The fruit is a drupe 5-8 mm in diameter, wrinkled, black, shiny; at the end of the fruit there is a barely noticeable remnant of a column, at the other end there is a depression-the place of attachment of the peduncle, and sometimes peduncle. Soaked fruits are spherical in shape. In the greenish-brown pulp there are 3-4 (less often 2) bones of 5 mm in length in a dense non- opening shell. Bones in cross-section are triangular-rounded,ovoid, with a convex back and a weak edge on the ventral side.

It is necessary to monitor the absence of admixture of alder buckthorn bones, which cause vomiting. They are recognized by the bones, of which the alder buckthorn has 2-flat-rounded with a cartilaginous beak.

Chemical composition. The fruit of jouster contains the sum of oxymethylanthraquinones, represented by glucofrangulin or rhamnocatartin, frangulin (rhamnoxanthin), frangulaemodin and zosterin (bioside). The total content of oxymethylanthraquinones does not exceed 1%. Contain flavonoids rhamnocitrin, rhamnetin, quercetin, kaempferol, sugars, pectin substances. The bark of the trunks and branches contains the primary anthraglycoside rhamnocatarticoside, chrysophanol and other anthraglycosides (up to 7%).

Application. The fruits of joster are used in the form of a decoction as a mild laxative for atonic and spastic constipation.

Horse Sorrel Root-Radix Rumici

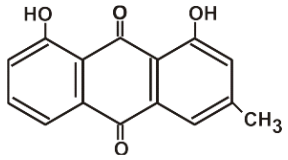
The producing plant. Horse sorrel-Rumex confertus Wibt.

Family. Buckwheat-Polygonaceae

Perennial herbaceous plant, up to 150 cm tall, with a short multi- headed rhizome. The leaves are alternate, the lower ones are triangular-ovate, heart-shaped at the base, obtuse, up to 25 cm long, with a wavy edge; the stem leaves are ovate-lanceolate, gradually decreasing, at the base of the petioles with filmy sockets. The inflorescence is narrow-lobed, the flowers are small, greenish with a simple perianth, consisting of 6 petals. Stamens-8, The fruit is an egg-shaped triangular light brown nut.

Appearance of raw materials. Pieces of dried roots, mostly dissected lengthwise. Outside they are covered with a black-brown cork, inside they are orange-yellow. The taste is bitter-astringent, the smell is weak, peculiar.

Chemical composition. The roots contain anthraglycosides (up to 4%): reumemodin and chrysophanol. Tannins (13% - 15%) of the condensed group. Flavonoids, vitamin K, resins, iron, and organic acids are present.



Application. Prescribe decoctions, powder, horse sorrel extract for the treatment of colitis, enterocolitis, cracks in the anus, as an anthelmintic and hemostatic agent, as well as for rinsing with inflammatory diseases of the oropharynx (stomatitis, gingivitis, angina, etc.).

Rhizoma Rubiae tinctorum

The producing plant. Madder dye-Rubia tinctorum L.

Family. Madder-Rubiaceae

Madder dye is a perennial herbaceous plant, clinging, with long horizontal rhizomes. The stems are decumbent or catchy, up to 150 cm long, tetrahedral, prickly-rough along the ribs from prehensile backward-curved spines. Leaves whorled; 4-6, glabrous, about 10 cm long, 3 cm wide, lanceolate or elliptical, pointed, almost without petioles, spiny along the edge and below the veins. The flowers are small, greenish-yellow, in axillary branched semizontics. The calyx is not pronounced, the

corolla is srostnolepestny, five-dimensional, 5 stamens. The fruit is drupe-shaped, first red, then black.

Appearance of raw materials. The rhizome is cylindrical, longitudinally columnar, 3 - 10 mm thick. The color is reddish-brown on the outside, with red-brown bark and orange-red wood visible on the cross section. In the center there is a cavity, the smell is weak, specific, the taste is sweet, then slightly astringent and bitter.

Chemical composition. It contains 5-6% of the amount of anthracene derivatives,represented by the main glycoside ruberitric acid of the alizarin series - alizarin, rubiodin, munistin and others; organic acids, sugars, pectin substances and proteins.

Application. Madder preparations (tablets of dry extract, tablets of root powder) are used for kidney stones, cholelithiasis, gout. Promotes the dissolution and elimination of phosphates, oxalates, ureates from the body. Prepare the drug cystenal-a complex drug containing tincture of madder root.

Sabur and Aloe leaf - Aloe

The producing plant. Aloe arborescens Mill.

Real aloe vera L.

Aloe prickly - Aloe ferox L.

Family. Lilaceae - Liliaceae

Succulent plants, the trunks of which at home reach a height of 4 m, and the leaves are 65 cm long, usually crowded on the top of the trunk. The cultivated species are relatively stunted. The leaves are elongate-xiphoid with spiny edges. The flower brush is high, ending in a long brush of red or yellow beautiful flowers. Flowers with a simple perianth.

Appearance of raw materials. Aloe is used in the form of:

1. Dry juice-sabura.

2. Fresh juice.

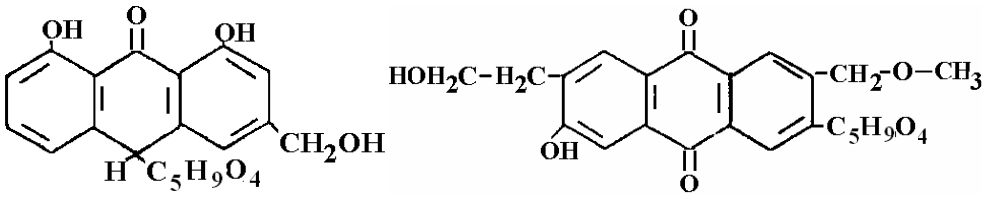
3. Preparations of biogenic stimulants.

Sabur is a dry, hardened after thickening juice of aloe leaves. Sabur has the appearance of black-brown brittle pieces of different sizes. The taste is very bitter, the smell of traces of essential oil is weak, unpleasant.

Fresh juice-obtained after pressing from the leaves, preserved with 20% alcohol-bitter taste, spicy smell.

Biogenic stimulant preparations - liquid extract for injection and complex emulsion. Cut aloe leaves are exposed to adverse external conditions (darkness, temperature 4-8°C, term-12 days). In these conditions of "experience" in the leaves of aloe, substances are produced that can stimulate the fading life processes. These substances are V. P. Filatov called biogenic stimulants.

Chemical composition. The juice of the leaves of the tree aloe contains aloe -emodin (about 2%). Anthraglycosides have been isolated from the leaves of other aloe species: aloin, which forms during the hydrolysis of aloe-emodin; nataloin, rabarberon (isoemodin), etc.



aloin,nataloin

Application. Tincture and dry extract are prepared from sabur. In large doses, its drugs act as a laxative, in small doses they improve digestion and increase appetite.

Canned juice is bactericidal. It is used in the form of lotions for purulent inflammatory processes and for irrigation of wounds.

The preparation of biogenic stimulants in ampoules increases the protective functions of the patient's body. Aloe emulsion is used for skin lesions, especially after radiation therapy.

Assessment of students ' knowledge

Determine the degree of preparation of tasks and the development of the topic in various fields at the stages of the students ' laboratory work during the class by written and oral questioning, as well as by other methods of pedagogical technologies (boomerang,turntable, blitz game, mental attack).

1 - Training " Boomerang»

Students are divided into groups, and each group is given its own task on the topic of the lesson. Each group of 3-4 students expresses their opinion and a discussion begins between the groups in the form of questions and answers.

Task for the 1st group.

1. Morphological description of the raw material of senna (Cassia hollyleaf).

2. Chemical composition of joster laxative.

Task for the 2nd group.

1. Morphological description of aloe.

2. Chemical composition of madder dye.

Task for the 3rd group.

1. Morphological description of the raw materials of madder dye.

2. Dosage forms and the use of aloe in medicine.

Task for the 4-group.

1. Morphological description of horse sorrel.

2. Dosage forms and application of madder dye.

Task for the 5th group.

1. Microscopic diagnosis of senna leaf (Cassia acutifolia).

2. Dosage forms and use of horse sorrel.

Task for the 6th group.

1. Chemical composition and description of the raw material of aloe.

2. Microscopic diagnosis of Tangut rhubarb root.

2 - Training " Turntable»

In this training, students are divided into 3 or 5 groups, each group enjoy the same table; students fill it yourself then 3-5 times table moves to the other groups in a circle, again students Express their opinions, in the end, with the help of instructor

material presented in the table are summarized in the discussion process, it turns out correct answers.

Types of fruits in plants

No.	Type of fruit	Name of the plant				
		Joster	Cassia	Rhubarb	Sorrel	Madder
1	Juicy drupe, spherical, almost black, shiny, with 2-3 bones					
2	The bean is flat, leathery, slightly bent					
3	Three-sided brownish-red nut					
4	Egg-shaped triangular light brown nut					
5	Drupe-shaped fruit, first red, then Black					

Name the raw matrials of medicinal plants

No.	Raw material	Name of the plant					
		Joster	Cassia	Rhubarb	Sorrel	Madder	Aloe
1	Fruit						
2	Leaf						
3	Rhizome						
4	Sabur Dry Juice						
5	Fresh juice						
6	Preparations of biogenic stimulants						

Name the families of medicinal plants

No.	Family	Name of the plant					
		Joster	Cassia	Rhubarb	Sorrel	Madder	Aloe
1	Buckthorn						
2	Legumes						
3	Buckwheat						
4	Madder leaves						
5	Lily pads						

3 - Training " Blitz game»

Students are divided into groups. Each group is given two herbariums, after describing and defining their family, genus and species, students prove the correctness of the definition, exchange opinions, and after discussion, students ' knowledge is evaluated. Such descriptions are carried out by students independently, after the description they determine the family, genus and species of the plant, and write the names in Latin and Russian in a notebook.

Morphological analysis of plants

№.	Name of plant	Familie	Root	Stem	Leaf	Flowers (inflorescences)	Fruit
1	Joster laxative Rhamnus cathartica						
2	Cassia (holly) Cassia acutifolia						
3	Tangut rhubarb Rheum palmatum						
4	Horse sorrel Rumex confertus						
5	Madder dye Rubia tinctorum						
6	Tree-like Aloe Aloë arborescens						

Morphological analysis of raw materials

№.	Name of the plant in russian and latin	Family	Nam of raw material in russian and in latin	Morphlogical descri[ption of raw material	Microscophy	Chemical composition	Application
1	Senna (Cassia acutifolia) Cassia acutifolia						
2	Tangut rhubarb Rheum palmatum						

Tests

1. Raw materials rhubarb roots are harvested from the plant:

A. Rheum asperum

B. Rhamnus cathartica

C. Rheum nanum

*D. Rheum palmatum var tanguticum

2. The presence of anthracene derivatives in the raw material can be proved by the reaction:

A. With concentrated sulfuric acid

B. With formaldehyde and hydrochloric acid

C. With aluminum chloride

*D. Sublimation

3. In small doses, rhubarb powder has:

a. Laxative effect

* B. Astringent action

C. Hemostatic action

D. Expectorant action

4. The sum of anthracene derivatives in the bark of alder buckthorn according to GF XI is determined:

* A. Photocolorimetrically

B. Spectrophotometrically

C. Gravimetrically

D. Titrometrically

5. The composition of the drug cystenal includes:

* A. Tincture of rhizomes and madder roots

B. Joster fruit extract

C. Aloe juice

D. Dry Rhubarb extract

6. Preparations from bio-stimulated raw materials of aloe are used as a means:

A. Astringent

*B. Wound healing

S. Diuretic

D. Sedative

7. Hay leaves are used to produce the drug:

A. Solutan

B. Cystenal

*S. Cafiol

D. Ramnil

8. Microscopic structure of the raw material of cassia

A. Leaf epidermis cells sinuous, multicellular hairs, vein with a crystal-bearing lining, there are druses in the mesophyll.

*B. The cells of the epidermis of the leaf are erect, the hairs are unicellular,warty, the vein with a crystal-bearing lining in the mesophyll there are druses,around the hairs the cells of the epidermis form a rosette

C. The cells of the epidermis of the leaf are sinuous, the hairs are multicellular,warty, in the mesophyll there are druses, in the cells around the vein there are single crystals

D. The cells of the leaf epidermis are erect, the hairs are multicellular, warty, in the mesophyll there are druses, in the cells around the vein there are single crystals

9. What reagent is used for the development of anthracene derivatives on chromatograms?

A. 10% solution with hydrochloric acid

B. 1% solution of aluminum chloride

C. With iodine vapor

*d. 5% solution of alkali

10. Chemical composition of madder dye

A. Chrysacin derivatives

B. Essential oils, flavonoids

*C. Alizarin derivatives, Saponins, tannins.

Situational issues

Determine the medicinal plant containing anthracene derivatives according to the proposed herbarium sample. Give the main morphological characteristics of the plant, its range, describe the conditions for collecting, drying and storing raw materials, its chemical composition, preparations and their biological activity.

Identify the proposed sample of raw materials containing anthracene derivatives by macroscopic, microscopic, and chemical methods. Specify the use of this raw material and preparations based on it.

Make instructions for collecting and drying cassia raw materials. For the analysis, a crushed vegetable raw material called

"Senna leaf"was received. Microscopic examination of the raw material revealed cells of the epidermis sinuous, crystals of calcium oxalate in the form of druses, simple and multicellular coarse-bearded hairs, glandular hairs with a multicellular head on a single-celled drooping leg. Your opinion regarding the conformity of the raw material to its name and the possibility of its reception. Give a brief justification for the chromatographic analysis of anthracene derivatives.

Expecting results

Teacher:

a) give the concept of a new goal on the topic of the lesson;

b) arouse students ' interest in this topic;

c) use methods of teaching new technologies;

Student:

a) complete assimilation of the material of the new topic;

b) formation of knowledge on the topic;

c) the ability to work on a new technology;

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