

ODESSA NATIONAL MEDICAL UNIVERSITY
Department of General and Clinical Pharmacology and Pharmacognosy

METHODICAL DEVELOPMENT OF THE LECTURE

Course: "Pharmacognosy"

Lecture № 15

"Quinones. General characteristics Methods of qualitative and quantitative determination. "

Course: 3rd Faculty: medico-pharmaceutical

The lecture was discussed
at the methodical meeting
departments
30.08.2024

Head department

MD, prof. JV Rozhkovsky



Odessa - 2024

Lecture № 15 “Quinones. General characteristics Methods of qualitative and quantitative determination. ” (2 hours)

1. *Actuality of theme. Rationale for the topic.*

Quinones are a large group of phenolic compounds, which include anthraquinones - the most common in the plant world. On the example of anthraquinones we illustrate the connection between the chemical structure of biologically active substances and their pharmacological action, consider and evaluate the advantages of traditional and modern phytopreparations, pay attention to the application (dosage) of phytopreparations containing together biologically active substances . All this knowledge will be used by students to master some sections of ATL, pharmaceutical chemistry, pharmacology, pharmacotherapy and in future professional activities.

2. *Objectives of the lecture*

-educational:

- to acquaint students with features of a structure, classification of quinones, in particular - anthraquinones;

-to consolidate the idea of the relationship between the chemical structure of biologically active substances and their pharmacological action;

- to draw students' attention to the peculiarities of drying and storage of LRS containing anthracene derivatives;

- pay attention to the dosage and use of drugs based on LRS, which contains anthraquinones and tannins.

-educational:

Education of students of professional thinking, conscious attitude to the choice (replacement) of available herbal medicines with a laxative effect; patriotism and a sense of pride for domestic science, which gave the world a great scientist, Academician VP Filatov.

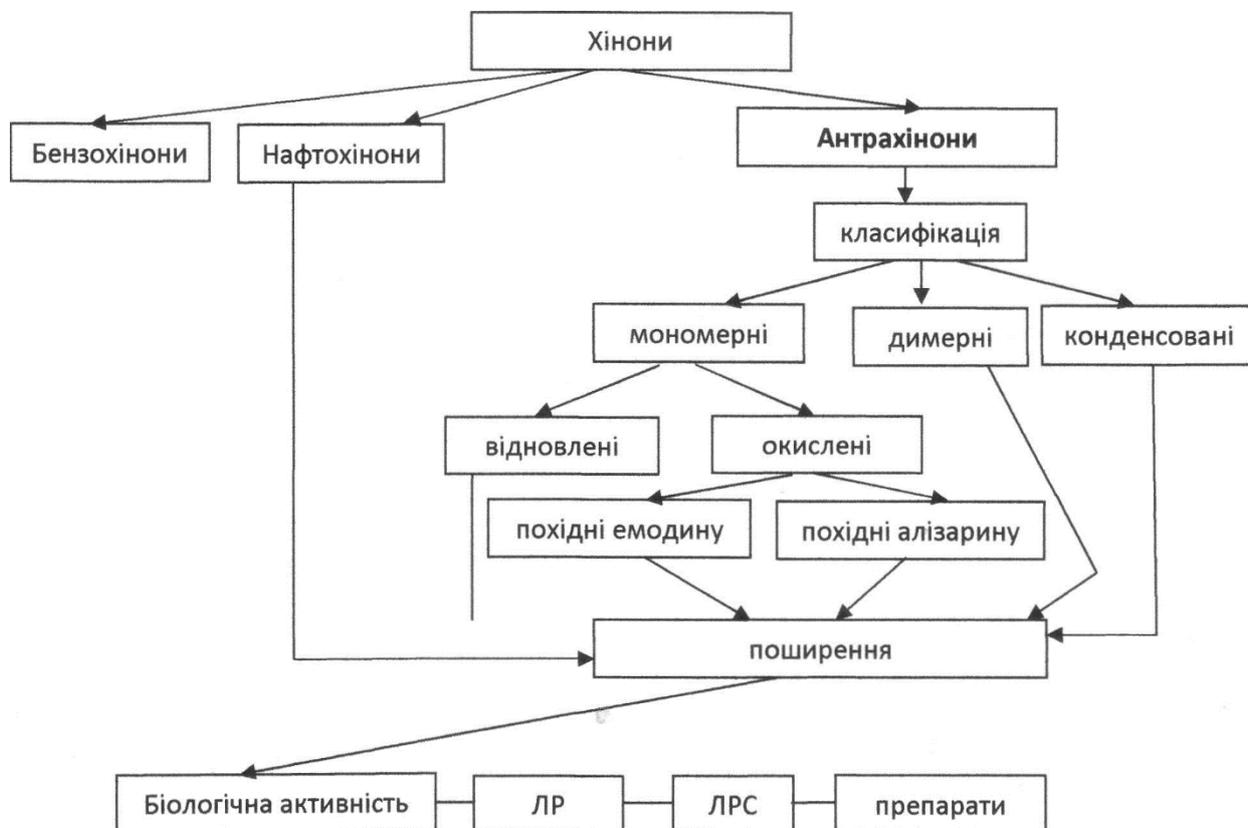
3. *Lecture plan and organizational structure*

№	The main stages of the lecture and their content	Goals in levels of abstraction	Type of lecture, lecture equipment	Time distribution
1	2	3	4	5
I.	Preparatory stage			
1.	Defining a learning goal			5%
2.	Providing positive motivation			

II. 3.	The main stage Teaching lecture material Plan: 1. Classification of quinones 2. Anthraquinones: - definition of the concept - classification - spread -f.-x. properties - selection and research - activity, application - LR and LRS containing anthracene derivatives 3. Naphthoquinones: 4. - definition of the concept 5. - distribution 6. LR and LRS containing naphthoquinones	 I I I I II II II-III III I I III	Combined, tables, overhead projector, slides, LR herbariums, LRS samples, drugs	90%
III. 4. 5.	The final stage Summary of the lecture, general conclusions. Lecturer's answers to possible questions. Tasks for self-preparation		References, questions, tasks	5% 2% 2% 1%

4. **Contents of lecture material:**

- **Structural and logical scheme of the lecture**



-text of the lecture (attached).

5. Materials on activating students during the lecture:

Question:

1. What is the structure of ketones?
2. What structure should cyclic diketones have?
3. Define the term "quinones".
4. Which group of quinones is the most common?
5. Name a specific qualitative reaction to anthraquinones.
6. Describe the solubility of anthraquinones.

Situational tasks:

1. Suggest a method for isolating the sum of aglycones and anthraquinone glycosides from L PC, based on the known physicochemical properties of these BAS. Answer: extraction with 70 or 96% alcohol.
2. The most common naphthoquinone juglon isolated from the leaves of the plant, the name of which is present in the name BAV. What is this plant? Answer: Walnut, whose Latin name is *Juglans regia* /
3. Explain why it is necessary to take a higher dose of horse sorrel powder to get a laxative effect than to get an astringent effect.

6. General material and methodological support of the lecture:

- educational premises: lecture hall (Malinovsky, 37);
- equipment: overhead projector (or multimedia projector), screen;
- illustrative materials: slides, herbariums of LR, samples of LS, packed up

LRS, pharmaceutical preparations.

7. *Materials for self-preparation of students:*

AND) with topics of the lecture

1.

Question

1. Definition of "quinones"
2. Classification of quinones
3. Definition of "anthraquinones"
4. Classification of anthracene derivatives.
5. Physicochemical properties of anthracene derivatives.
6. Studies (qualitative detection reactions) of anthracene derivatives.
7. Describe the distribution of anthracene derivatives in the plant world.
8. Features of harvesting, drying storage of LRS containing anthraquinones.
9. Ways of using raw materials containing anthraquinones and its medical significance.
10. Describe LRS containing naphthoquinones and its use.

Situational and test tasks

1. Explain, based on the nature of the action of anthracene derivatives, why herbal laxatives are recommended to take at night.
2. Make a table of the distinctive features of buckthorn bark and its impurities.
3. Aglycones of anthracene derivatives are insoluble in
 - A. Water
 - B. Ether
 - C. Benzene
 - D. Chloroform
 - E. Alcohols
4. LRS cashier sharp-leaved is
 - A. Leaves, fruits
 - B. Bark
 - C. Flowers
 - D. Roots
 - E. Grass
5. By which reaction it is possible to determine anthracene derivatives in dry raw materials:
 - A. Microsublimation
 - B. Keller-Killiani
 - C. Cyanidin test
 - D. Lieberman-Buchard
 - E. Iaphon
6. The laxative effect is shown by BAS
 - A. Anthraquinones of the emodin group
 - B. Naphthoquinones

- C. Anthraquinones of the alizarin group
- D. Condensed anthraquinones
- E. Tannins

7. The source of drugs of biogenic stimulants, the technology of which was developed by Academician VP Filatov:

- A. Fresh aloe leaves after special treatment
- B. Dry leaves of aloe vera
- C. Fresh aloe tree leaves
- D. Aloe

8. Describe the method of special preparation of fresh aloe raw materials according to VP Filatov, for its further use as a biostimulator.

9. A drop of 5% NaOH solution was applied to the inner surface of the bark and a dark red color was observed, which indicated the presence of raw materials.

- A. Anthracene derivatives
- B. Tannins
- C. Essential oil
- D. Phenol glycosides
- E. Furanochromones

10. Find the correspondence between the LRS and the group of quinones it contains:

A. Walnut leaves	Naphthoquinones (A)
B. Buckthorn bark	Dimeric anthraquinones (G)
B. Rhizomes and roots of madder	Condensed anthraquinones (D) Monomeric anthraquinones-derivatives of alizarin (B)
G. Cassia leaves	Monomeric anthraquinones-derivatives of emodin (B)
D. St. John's wort	

11. This type of raw material containing anthracene derivatives requires special drying conditions (for 1 hour, etc. and 100 °, and if in the air - the raw material is used only for the next year). This raw material:

- A. Bark buckthorn
- B. The fruits of ragweed
- C. Rhubarb roots
- D. Shadow leaves
- E. Rhizomes and roots of madder

12. Nephrolytic action is inherent in drugs based on

- A. Roots and rhizomes of madder
- B. Buckthorn bark
- C. Shadow leaves
- D. Aloe leaves

- E. Horse sorrel roots
13. Hypericin, contained in the grass species of St. John's wort, belongs to
- A. Condensed anthracene derivative
 - B. Naphthoquinone
 - C. Derivatives of alizarin
 - D. Benzoquinone
 - E. Dimeric derivative of anthracene

Question

1. Definition of "tannins".
2. Localization of tannins in plant organisms.
3. Physico-chemical properties of oak. substances.
4. Methods of selection and research of oak. substances.
2. What types of raw materials are used for the industrial production of tannin?
3. What phenolic compounds are part of tannins and cause bactericidal action?
4. What chemicals can not be used to prepare dosage forms containing tannins?

Test tasks

1. Tannins are:
 - A. Derivatives of polyhydric phenols
 - B. Anthracene derivatives
 - C. Derivatives of simple phenols
 - D. Glycosides of phenol alcohols
 - E. Condensed anthracene derivatives

2. *Tanninum* in medical practice used as:
 - A. Astringent and hemostatic agent
 - B. Antispasmodic
 - C. Antistatic
 - D. Antiviral
 - E. Antitumor agent

3. One of the components of the drug "Tanalbin", which has a specific effect on the intestinal tract, is
 - A. Tannin
 - B. Catechin
 - C. Pyrogallol
 - D. Phloroglucin
 - E. Pyrocatechol

4. Name the plant, a decoction of the bark of which gives a solution of iron ammonium alum black and blue color:
 - A. Oak
 - B. Cherry
 - C. Buckthorn
 - D. Guelder rose
 - E. Zhostir

5. To determine the identity of the raw material to the decoction of the roots of rodovik added a few drops of a solution of iron, ammonium alum. The appearance of black and blue color indicates the presence of raw materials:

- A. Tannins
- B. Vitamin C
- WITH. Anthracene derivatives
- D. Simple phenols
- E. Coumarins

6. 3 JPC tannins extract:

- A. Hot water
- B. Chloroform
- C. Benzene
- D. Ethyl acetate
- E. Diethyl ether

7. Halotanines are

- A. Tannins that hydrolyze
- B. Tannins that do not hydrolyze
- C. Tannins are the fruit of alder
- D. Condensed derivatives of catechins
- E. Flavonoids

8. Literature used by the lecturer to prepare the lecture

- additional

1. Фармакогнозія: підручник (I—III р. а.) / І.А. Бобкова, Л.В. Варлахова. – 3-є видання Всеукраїнське спеціалізоване видавництво «Медицина» 2018, 504с.

2. Фармакогнозія: базовий підручн. для студ. вищ. фармац. навч. закл.(фармац. ф-тів) IV рівня акредитації / В.С. Кисличенко, І.О. Журавель, С.М. Марчишин та ін.; за ред. В.С. Кисличенко. – Харків: НФаУ: Золоті сторінки, 2015. - 736 с.

3. Навчальний посібник з дисципліни «Фармакогнозія» / Я. В. Рожковський, Б. В. Приступа, І. А. Бойко, Н. В. Герасимюк, В. В. Черногорюк -: Методична розробка кафедри фармакогнозії ОНМедУ. – Одеса: ОНМедУ, 2019 – 51 с.

4. Державна Фармакопея України: в 3 т. / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1500 с.

Додаткова література:

1 Державна Фармакопея України: в 3 т. / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 3. – 732 с.

2. Сербін А.Г., Сіра Л.М., Слободянюк Т.О. Фармацевтична ботаніка. Підручник. – Вінниця: НОВА КНИГА, 2007. – 488 с.

3. Практикум з ідентифікації лікарської рослинної сировини: навч. посіб. / [В. М. Ковальов, С. М. Марчишин, О. П. Хворост та ін.] ; за ред. В. М. Ковальова, С. М. Марчишин. – Тернопіль: ТДМУ, 2014. – 250 с.

5. Pharmacognosy with the basics of phytotherapy A. Pastushenkov, N. Beshpalova Phoenix Publishing House 2016.

The lecture was composed by _____ MD, Professor Ya.V. Rozhkovsky

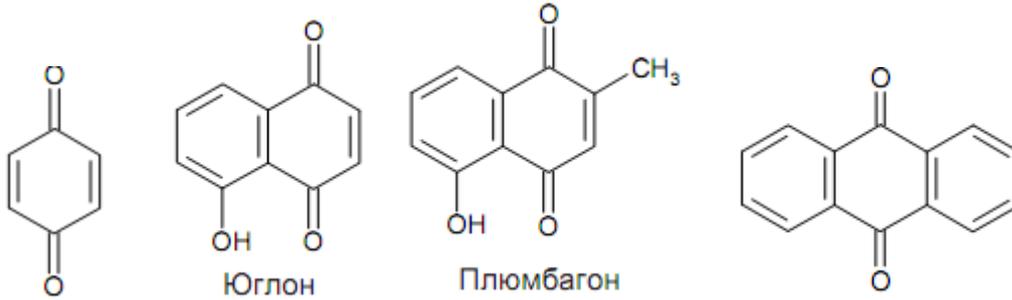


LECTURE TEXT

QUINONS

Quinones are cyclic diketones

Benzoquinones (C₆) Naphthoquinones (C₁₀) Anthraquinones (C₁₄)

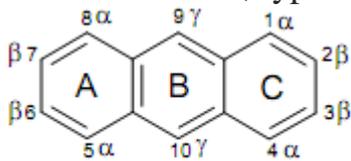


Anthraquinones - the largest group of natural quinones (more than 200 are known to present.)

Of the naphthoquinones known: yuglon isolated from walnut leaves; plumbagon and drozeron isolated from sundew grass.

ANTHRACHINONS AND OTHER DERIVATIVES OF ANTHRACENE

Definition: Anthracene derivatives are compounds based on the anthracene nucleus of different oxidation state, type of compound and condensation of monomeric structures.



Антрацен

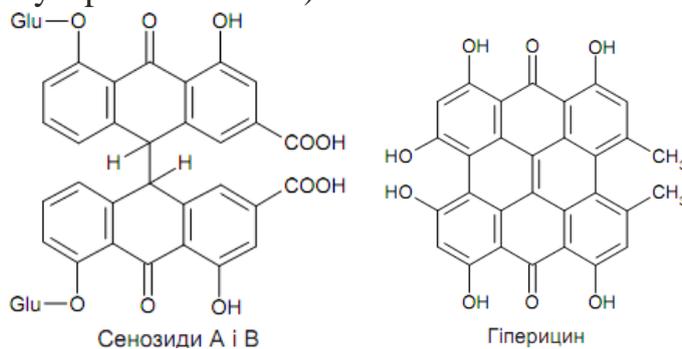
Classification:

by the number of anthracene nuclei:

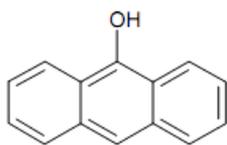
Monomeric;

Dimeric (senosides A and B, chrysophanol-dianthrol) -

condensed (hypericins)



Monomeric: Reduced forms (derivatives of Anton, anthranols and oxyanthrone)



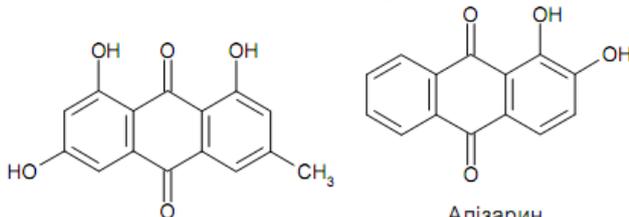
Антранол

Anthron

Oxidized forms (anthraquinone derivatives)

Monomeric anthraquinones by position of OH groups:

Derivatives of emodin (chrysacin) Derivatives of alizarin



Frangulin A, B

Алізарин

Localization and distribution:

Anthracene derivatives are found in higher plants, fungi (especially lower ones), lichens, bacteria, insects, and marine animals. Buckthorn, buckwheat, legumes, asphodel, verbena, fescue, and others. They accumulate in different parts of plants, but in large quantities most often in the leaves, bark, underground organs. (Most anthraglycosides - O-glycosides C-glycosides - in aloe). Anthraglycosides are contained in dissolved form in cell sap, less often - in dead parts of plants, and aglycones - in special containers.

Physico-chemical properties:

A. - crystalline substances of yellow, orange or red color.

Aglycones are soluble in organic solvents and insoluble in water. Anthraglycosides - well soluble in alcohol-water mixtures, in water, worse - in alcohol. Aglycones and glycosides are well soluble in alkali solutions due to the formation of phenolates.

Anthraquinones having OH groups in the β -position form salts with both alkali solutions and carbonate and ammonia solutions. If OH groups in the β -position are absent, the substances are insoluble in solutions of carbonates and ammonia.

Selection and identification:

The amount of aglycones and glycosides is isolated by extraction with 70 or 95% alcohol. Only aglycones are isolated with an organic solvent after acid or enzymatic cleavage of glycosides. Chromatographic methods are also used to separate anthraquinones.

Specific reaction: when interacting with an alkali solution, anthraquinones give a cherry-red (red-violet) color.

Quantitative definition: by determining the optical density on a photoelectrocolorimeter or spectrophotometer.

Biological action and use:

A. participate in redox processes.

A. group of emodin - increase peristalsis of a large intestine - laxative action in 10-12 hours after drug use

Alizarin groups cause antispasmodic and diuretic effects and promote the excretion of stones from the kidneys.

Restored forms of anthraquinone derivatives - anti-inflammatory effect

Condensed anthraquinones (hypericin) - antidepressant, antiviral, photodynamic, antitumor action.

The achievement of recent years is the discovery of antibiotics produced by actinomycetes -anthracyclines (daunorubicin, idarubicin, doxorubicin), which have high antitumor activity. Some anthracycline derivatives have an inhibitory or stimulating effect on enzyme activity.

LR and LRS that contain naphthoquinones:

Walnut leaves—*Folia Juglandis* (*Juglans regia*, Juglandaceae). Wild- Sir. Asia. Cult.!

Chem. composition: naphthoquinone juglone; flavonoids, tannins.

Action and drugs: Anti-inflammatory, tonic for May. system, antioxidant (tincture - in the composition of drops and pills "Tonsilgon" antimycotic ("Yuglon").

Dewdrop grass- *Herba Droserae* (*Drosera rotundifolia*, *D. obovata*, Droseraceae) Комахотруйне., Вис. 10-25 см, on peat bogs. Fresh or dry (drying 400).

Chem. composition: naphthoquinones: drozeron, plumbagon; flavonoids, proteolytic enzyme, org. to-you., pigments, oak substances, etc.

Action and drugs: antispasmodic, antibacterial (staphylococcal, streptococcal, tuberculosis); analgesic., expectorant., diuretic., sedative - for cough, pharyngitis, bronchitis, asthma -infusion, tincture, v.h.v composition of cough drops "eucalyptus" Official rast.v Zakh.Evr ..

LR and LRS containing anthraquinones

emodin groups:

Buckthorn bark - *Cortex Frangulae* (*Frangula alnus* = *Rhamnus frangula*, Rhamnaceae)

Drying at 20-300 or in the air, then another 1 hour at 1000, or stored for 1 year!

Chem. composition: anthracene derivatives (8%): glucofrangulin A and B, frangulin A IB, frangularoid, emodin; oak. substances (10%), org. to-you, derivatives.oxynaphthalene.

Action and drugs: laxative, antacid, astringent, anti-inflammatory - Decoction, extract ri., E. dry, "buckthorn syrup", RAMS (Table); comp.-vykalin, vikair, holagol, fees: laxative №1, gastric №3, antihemorrhoidal.

The fruits of ragweed- *Fructus Rhamni catharticae* (*Rhamnus cathartica*, Rhamnaceae)

Drying at a temperature not exceeding 500.

Chemical composition: frangulaemodin, chrysophanol, glucofrangulin, frangulin, josterin; flavonoids (ramnetin, kaempferol), pectin islands, gums, org.k-ti.

Action and drugs: Laxative, decoction.

Hay leaves (cassia);fruits senni- Folia Sennae; Fructus Sennae (Cassia acutifolia, Fabaceae). Africa-bass. Sr. Nila, semi-desert districts. Zagot before the beginning or during the count. Drying-up to 450.

Chemical composition: anthracene derivatives. (L.-6%, pl.-2.7%): senosides A and B, C, D, glucorrein, glucoaloe-emodin; flavonoids, resin. substances, mucus.

Action and drugs: Laxative.- Infusion, extract l. in table., Senadexin, Glaxen, Xena and com .: agiolax, kafiol, regulax, Carmolis, livolek, anti-hemorrhoid collection., tea "grace".

Rhubarb roots- Radices Rhei (Rheum palmatum var. Tanguticum, Polygonaceae). Cult. Collection for 3-4 years. Sush.-up to 600.

Chem. composition: anthracene proizv. (Up to 6%): 20 compounds of the group of rhein, aloe-emodin, fragulaemodin, chrysophanol, etc .; oak. substances cond. (6.7-10.6%), resins, flavonoids, bitterness, pect. substances, starch.

Action and drugs: Laxative - in large doses (0.5-2.0 g); binder - in small doses (0.05-0.2 g)! - Rhubarb powder, rhubarb tablets, dry rhubarb extract.

Horse sorrel roots- Radices Rumicis (Rumex confertus, Polygonaceae)

Chemical composition: anthracene derivatives (Up to 4%): emodin, chrysophanol, aloe-emodin; dub.v-va (8-

Action and drugs: Laxative - in large doses, astringent - in small! -powder, broth, comb. Sinupret.

Fresh aloe vera leaves- Folia Aloes arborescentis recens (Aloe arborescens, Liliaceae). Homeland - semi-deserted areas of the east. South Africa. Cult. indoors. Prepared throughout the year.

Chem. composition: aloe-emodin, C-glycosides: barbaloin, isobarbaloin, aloinosides A and B, polysaccharides; enzymes, amino acids., bitterness, resin, vit., org.k-ti (amber).

Action and drugs: Immunomodulatory, bactericidal, anti-inflammatory, wound healing, laxative, antiseptic, analgesic. Biogenic stimulants (according to VP Filatov-will sustain. At low temp. In the dark): Liquid extract for others, Tab .; juice and com .: Alor-liniment, Grail balm. Hardened juice - sabur (homeopath.) - From other types of aloe.

St. John's wort - Herba Hyperici (H.perforatum, H.maculatum, Hypericaceae)

Chem. composition: dianthrone (hypericin, pseudohypericin), flavonoids (hyperoside, rutin, quercetin), anthocyanins, catechin; oak. substances (10-12%), ef.m., carotenoids, antibiotic hyperforin, xanthones.

Action and drugs: antidepressant, astringent, antimicrobial, anti-inflammatory, antiviral, hemostatic - Novoimanin-rr, bark - pills, Gelarium hypericum, Deprim, Deprim Forte, Neuroplant hyperflav; set: phytoldite, Fitulvent, herbogastrin, Phyton SD, Armon, passit, Savior, Prostopol ..., fees ... (Arfazetin, uroflox, lech.-prof.2,3, sedaflox tea). alizarin group:

Rhizomes and roots of madder- Rhizomata et radices Rubiae (Rubia tinctorum, Rubiaceae). Pivden.Evr., Iran, Sr.Az. Cult. In Ukraine. Prepared by 3 G.Zh. Drying -450.

Chem. composition: anthracene derivatives (5-6%): lutidine, alizarin, ruberitrin to-that; flavonoids, iridoids, org.k-ti, sucrose, fatty.k-ti

Action and drugs: Nephrolytic, antispasmodic, diuretic. - Dry extract, cystenal, marelin -set.