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

METHODOLOGICAL DEVELOPMENT

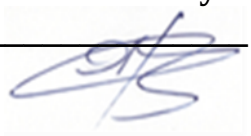
Course: “Pharmacognosy”

practical lesson for students on the topic:

"Alkaloids. True alkaloids. Medicinal plants and raw materials that contain alkaloids: belladonna, black blackberry, datura, thermopsis, opium poppy, yellow cat, celandine, barberry, hornbeam, chilli, species of Rauwolfia, catharanthus pink, periwinkle. »

Course: 3rd Faculty: Medical and Pharmaceutical

Approved on methodical meeting of the department
"30" 08.2024
Protocol № 1
Head department
MD, prof. JV Rozhkovsky



Odessa - 2024

1. Topic: "Alkaloids. True alkaloids. Medicinal plants and raw materials that contain alkaloids: belladonna, black blackberry, datura, thermopsis, opium poppy, yellow cat, celandine, barberry, hornbeam, chilli, species of Rauwolfia, catharanthus pink, periwinkle. »- 10 hours.

2. Relevance of the topic.

Among the natural pharmacologically active substances, alkaloids are the main group from which modern medicine derives the largest number of highly effective drugs.

The medical use of alkaloids and their preparations is very diverse, as each alkaloid has its own specific action, often very valuable and sometimes irreplaceable. The importance of alkaloids in human life was very clearly assessed by the Russian scientist EA Shatsky. He wrote: "Alkaloids have the same significance for medicine as the discovery of iron for world culture."

For therapeutic purposes, alkaloid-bearing raw materials are used in the form of powders, infusions, fees, in the form of galenic and novogalenic preparations, or pure alkaloids and their salts are obtained from it. The pharmacist must know medicinal plants and raw materials containing alkaloids and the rules of work with them, be able to determine the identity and quality of raw materials, taking precautions, because alkaloids are poisonous substances.

3. Objectives of the lesson:

3.1. General goals: to study LR containing isoquinoline, indole and steroid alkaloids and to perform work on macro- and microscopic analysis of medicinal plant raw materials containing these alkaloids.

3.2 Educational goals: formation of a professionally significant substructure of personality with relevant aspects of deontological, ecological, legal, psychological, patriotic, professional responsibility.

3.3 Specific objectives:

- Know (level of assimilation according to Bezpalk - II):

1. Definition of "Alkaloids", their classification.
2. General morphological features of plants of the poppy and cutter families.
3. Morphological characteristics of the studied plants.
4. Characteristics of external features of the studied raw materials.
5. Possible impurities to the raw material (celandine grass, periwinkle grass, rhizome with the roots of Lobel's hellebore).

Based on theoretical knowledge of the topic and practical work:

- Master the techniques (be able to) (level of assimilation according to Bezpalk - III):

- Recognize the external features of the plant (celandine, celandine yellow, barberry, uterine horns, securinega bush, Rauwolfia snake, periwinkle, pink catharanthus, passionflower, Lobel's hellebore) and distinguish them from possible impurities.
- Determine the identity and quality of raw materials by external signs, anatomical structure.
- Know the ways of using raw materials and their medical application.

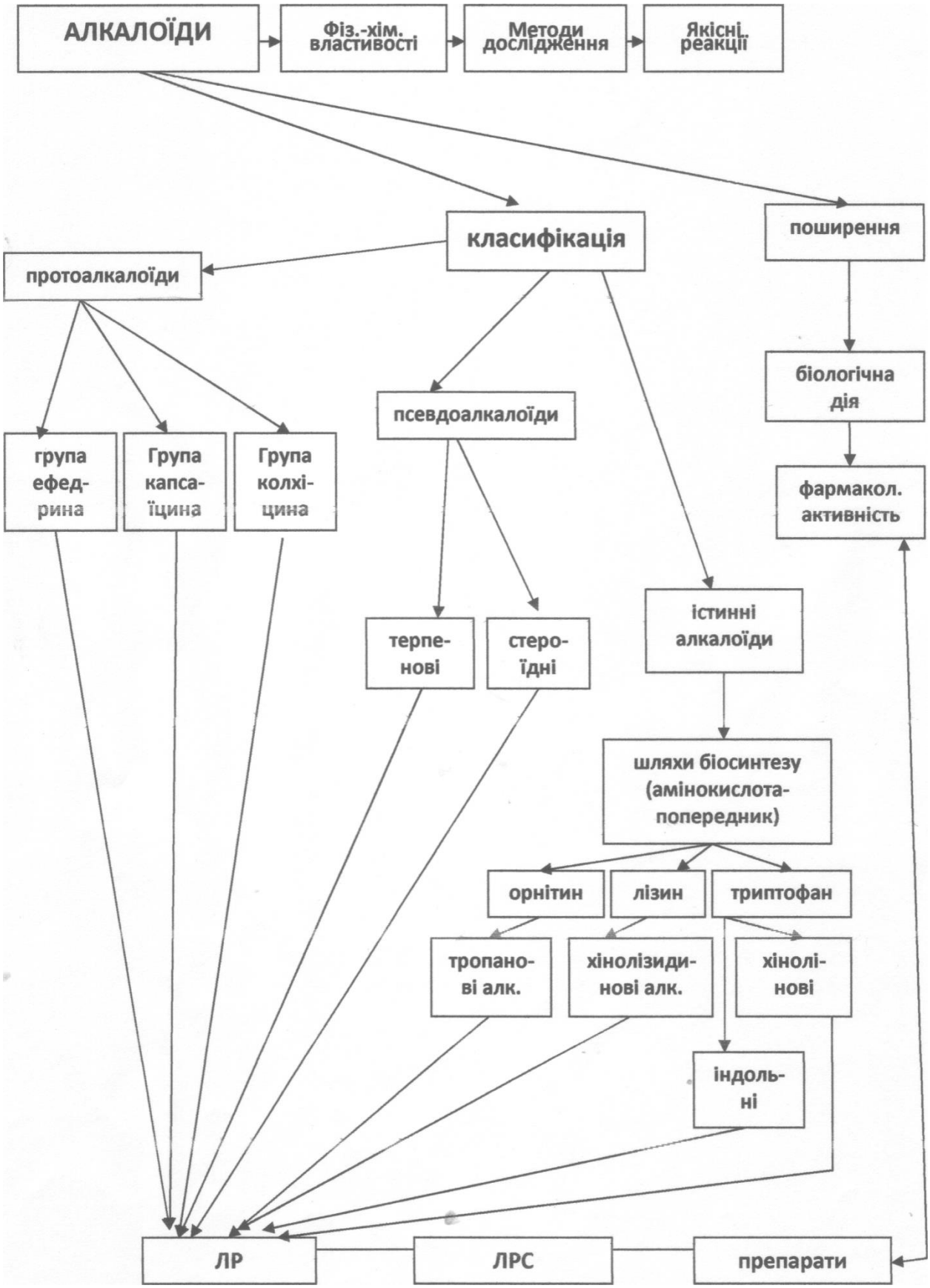
4. Interdisciplinary integration

№ p.p.	discipline	know	be able
1	2	3	4
1.	Previous disciplines: 1. Botany	Characteristic features of the families of the studied plants. Morphology of stem, bark, leaves, flower, fruit, root and rhizome. Anatomical structure of the leaf, bark, fruit, root, rhizome.	Use a microscope, prepare surface preparations and cross-sections.
	2. Organic chemistry	Physical and chemical properties of polysaccharides, glycosides, terpenoids, aromatic derivatives, heterocycles.	Carry out qualitative reactions; purification of organic compounds.
	3. Analytical chemistry	Methods of acid-base titration (neutralization) and permanganatometry	Work with analytical scales, measuring vessels, photoelectro-colorimeter, use methods of chromatography on paper and in a thin layer of sorbent.
2.	The following disciplines: 1. Physical and colloid chemistry	Solubility of solids and liquids in liquids. Distillation. Raoul's law. Konovalov's law. Vapor pressure and composition over mutually insoluble liquids. Buffer solutions. Polarography. Potentiometric titration. Adsorption. Ion exchange adsorption. Chromatography: paper, column, in a thin layer of sorbent, gel chromatography.	
	2. Pharmacy technology of drugs	Methods of measuring mass and volume. Preparation of powders or liquid drugs for internal and external use. Analysis of prepared liquid drugs using a burette system. Conditions of industrial preparation of medicines. Principles of organization of	

	3. Industrial technology of medicines	pharmaceutical production of various dosage forms: liquid, solid, soft, injectable solutions, etc. Machines, devices, equipment for the production of medicines.	
	4. Clinical pharmacology	Pharmacodynamics and pharmacokinetics of drugs. The pattern of action of drugs on the human body and its corresponding reactions. Basic principles of treatment in terms of drug selection, evaluation of their effectiveness and safety.	
	5. Pharmaceutical chemistry	Methods of qualitative and quantitative study of drugs.	
	6. Organization and economics of pharmacy	Pharmaceutical service management. Storage of medicines. Control and analytical service, organization of its work. Accounting for inventory and cash. Economic analysis of the pharmacy.	
	7. Management and marketing in pharmacy	Management and entrepreneurship. Organization as an object of management. Connecting processes in management. Human Resource Management Pharmaceutical Marketing Management. Pharmaceutical market research. International marketing.	

5. Content of the topic (text and thesis), graphological structure of the lesson.

(See the text of the lecture)



6. Plan and organizational structure of the lesson.

№№ p.p.	The main stages of the lesson, their functions and content.	Learning objectives in the levels of mastery.	Means of training and control.	Materials on the method-wild for-ensuring the visibility of the lesson, control the knowledge of those who teachis.	Term (in minutes or in%) of the total class time.
1	2	3	4	5	6
1	*Preparatory stage* Organization of classes Setting learning goals Homework check	 II	 Oral interview on the topic	 Methodical works for students, album	 1% 2% 25%
2	*The main stage* Conducting a practical lesson	III	Herbariums of medicinal plants, LRS, reagents		50%
3	*The final stage* Testing and assessment of practical skills Checking the final level of knowledge Providing homework with a reference to the literature	II- III II- III	Herbariums of medicinal plants, LRS, reagents	Methodical works for students, album Tests and situational tasks	5% 15% 3%

7. Materials on methodological support of the lesson.

7.1. Control materials for the preparatory stage of the lesson: questions, tasks, tests.

Tests.

1. Rauwolfia roots contain reserpine, which has antihypertensive and sedative effects. A representative of which class of biologically active substances is reserpine:

A. alkaloids
B. saponins
B. flavonoids
G. anthracene derivatives
D. tannins

2. In the chemical analysis of barberry roots, a positive result was obtained with Dragendorf's reagent, indicating the presence of:
A. alkaloids
B. steroids
B. triterpenoids
G. furocoumarins
D. chromonov

3. To determine the biologically active substances to the infusion of celandine grass was added 1% solution of picric acid. A yellow precipitate formed, which indicates the presence of raw materials:
A. alkaloids
B. flavonoids
B. tannins
G. saponins
D. anthracene-derived

4. Datura leaf contains tropane alkaloids and is a poisonous impurity to other leaves. This impurity primicrodiagnostics can be determined by the following anatomical features:
A. numerous friends
B. cells with mucus
B. cells from Rafid
G. cells with needle crystals
D. cells filled with calcium oxalate sand

5. Belladonna leaf contains tropan alkaloids and is a poisonous impurity to other leaves. This impurity primicrodiagnostics can be determined by the following anatomical features:
A. cells filled with calcium oxalate sand
B. cells containing essential oil
B. cells containing fatty oil
G. cells filled with spherocrystals
D. cells filled with prismatic crystals

6. Black leaves contain tropan alkaloids and are a poisonous impurity to other leaves. This impurity primicrodiagnostics can be determined by the following anatomical features:
A. cells filled with prismatic crystals
B. cells filled with calcium oxalate sand
B. cells containing essential oil
G. cells containing fatty oil
D. cells filled with spherocrystals
7. A characteristic microdiagnostic feature of medicinal plant raw materials - datura leaves is the presence of multicellular warty hairs, as well as the inclusion of calcium oxalate, called

A. friends
B. Rafid
B. cystoliths
G. microcrystalline sand
D. needle crystals

8. A characteristic microdiagnostic feature of the leaf blekoty is the presence of multicellular head hairs, as well as inclusions of calcium oxalate, called:
A. prismatic crystals
B. friends
B. cystoliths
G. needle crystals
D. Rafid

9. Late-flowering bulbs contain alkaloids and are used to treat skin cancer. This raw material should be stored in the warehouse:
A. on list A
B. on list B
B. on the general list
G. according to the list "Scented"
D. separately from other types of raw materials

10. Black leaf contains tropane alkaloids and is used to treat bronchial asthma. This raw material should be stored in the warehouse:
A. on list A
B. on list B
B. on the general list
G. according to the list "Scented"
D. on the list of "Dyes"

Question:

1. Definition of "alkaloids".
2. Plants rich in alkaloids.
3. Features of preparation, drying and storage of raw materials containing alkaloids.
4. Formulas: ephedrine, platyphylline, pachycarpine, cytisine, atropine, scopolamine.
5. Latin and Ukrainian names of raw materials, producing plants and families of all objects of the researched topic.
6. Morphological characteristics of plants, their habitats (cultivation areas), places of growth.
7. External signs of the studied types of medicinal plant raw materials.
8. Possible impurities to raw materials (celandine, celandine yellow, barberry, uterine horns, securinega bush, Rauwolfia snake, periwinkle, catharanthus pink, passionflower incarnate, hellebore Lobella).

9. Chemical composition, uses and medical use of medicinal plant raw materials containing alkaloids.

7.2. Materials of methodical support of the main stage of employment: professional algorithms, orientation maps for formation of practical abilities and skills, educational tasks.

The list of educational practical tasks that must be performed during the practical laboratory lesson:

Task 1. To study celandine large and to carry out the analysis of raw materials on AND (sections: external signs, microscopy).

1. Examine the appearance of celandine large herbarium pattern. Write Latin and Russian names for raw materials produced by plants and families.

2. Carry out a macroscopic analysis of celandine grass and describe the external its view on the example of a sample of raw materials (scheme 1.)

Scheme 1

DEFINITIONS OF PRODUCING PLANTS According to external signs

-Life form (herbaceous plant, shrub, shrub, tree).

-type of underground organs (root, rhizome, tuber, etc.)

- The structure of the stem (shape, nature of branching, pubescence, diameter, etc.)

- Sheet placement (regular, opposite, whorled)

- Leaves (simple or complex. The shape of the leaf blade or leaves, edge, veining, color, size).

- Flowers (single or inflorescences, flower structure, color, size, etc.)

- Fruit (type, shape, color, size).

- Bark (in woody species), (color, presence, shape and color) lentils, thorns, etc.).

2. Prepare a micropreparation of the sheet from the surface, study it at low and high magnification (Scheme 2.)

Scheme 2

Microscopic analysis of RAW MATERIALS "LEAVES"

- Structure (dorsoventral, isolateral). - Mesophile (nature of palisade and spongy tissues).

- Inclusions are crystalline (single crystals, crystal-bearing coating, friends, Rafida, kristal¬lichesky sand, cystolites); secretory (containers, milk vessels, canals).

- Epidermis of the upper and lower sides of the leaf (shape and contour of cells: isodiametric, erect, convoluted; stomatal type: diapitic, parasitic, anisocytic, anomonite; number and location of periosteal cells. - Type of trichomes: hairs, glands.

- Cuticle: , smooth, folded, "warty".

Draw and mark diagnostic signs:

- Cells of the epidermis in the contour of the tortuous, especially the lower surface of the leaf;

- stomata oval, surrounded by 4-7 cells of the epidermis;
- At the top of each leaf teeth there is a water-releasing apparatus - hydatota;
- Articulated milk vessels filled with yellowish-brown contents;
- On the veins there are simple (7-20 cells) hairs with well-defined nuclei in each joint. Their shells are very thin, so often the hairs are twisted, crumpled from the sleeping joints.

4. Note the compliance of the test sample of raw materials (by external signs, microscopy) to the requirements of FS 42-817-79.

Task 2. To study Lobel's hellebore and to carry out the analysis of raw materials on AND, (sections: external signs and microscopy).

1. Prepare a micropreparation of a cross-section of hellebore root. Examine it at low and high magnification (Scheme 4).

Scheme 4

Microscopic analysis of RAW MATERIALS "UNDERGROUND ORGANS":

• structure: primary, secondary; (Beam, non-beam type);
• integumentary tissue (plug, epidermis);
• elements of xylem, phloem (histological composition, location);
• shape and structure of core rays;
• main parenchyma (dense, loose, aerenchyma, etc.);
• crystalline inclusions;
• spare nutrients (starch, inulin).

Draw and mark diagnostic signs:

- Integumentary tissue, represented by a multilayered epidermis that consists of small cells;
- Adjacent to the epidermis dense layer of parenchyma of 2-4 rows of cells;
- Further location of the parenchyma is radial, resulting in the formation there are air cavities (aerenchyma);
- Parenchyma cells are filled with starch;
- Occasionally there are calcium oxalate rafid;
- The epidermis consists of cells with horseshoe-shaped thickened bile those shells;
- The pericycle is represented by a layer of small thin-walled cells;
- Bast and wood are located radially: between the rays of wood lie oval or in the form of a semicircle of the bast (including 10-15), that consist of small thin-walled cells of the leading elements of the bast and parenchyma;
- In wood, the largest vessels are located in a ring, but above they are 1-2 smaller vessels;
- In the center is a large area of the core consisting of cells of slightly thickened cellulose shells.

4. Note the compliance of the test sample of raw materials (by external signs, microscopy and histochemical reaction) to the requirements of FS 42-1051-76.

Task 3. To carry out the analysis of uterine horns on AND (Section: external signs).
1. To study the appearance of the horns on the herbarium sample (scheme 1).
Write down the Latin and Russian names of raw materials, plants and families.
2. Carry out a macroscopic analysis of a sample of raw materials and describe its appearance.

Task 4. To study barberry ordinary and to carry out the analysis of raw materials on AND (sections: external signs). (Scheme 3).

Task 5. To analyze the grass of the yellow cat on the AND (section: external signs). (Scheme 5).

Scheme № 5

ANALYSIS OF RAW MATERIALS "GRASS" On external signs

• "Commodity type" of raw materials (unharvested, cut, threshed)
• Stem structure (shape, branching, pubescence, color, size, specific features).
• The nature of the leaf arrangement (alternate, opposite, whorled).
• Leaves.
• Location of flowers on the stem.
• Flowers.
• Fruits and seeds.
• Sizes of stems, leaves, flowers.
• Coloring.
• 3apah when rubbing.
• Taste (in non-toxic objects).

Task 6. To analyze the root of Rauwolfia snake on AND (section: external signs). (Scheme 3).

Task 7. To carry out the analysis of a grass of a periwinkle small on AND (section: external signs). (Scheme 5).

Task 8. To carry out the analysis of shoots of a securinega on AND (section: external signs). (Scheme 5).

For each of the objects specified in tasks 5-8:
1. Examine the appearance of the plant on herbarium specimens and tables.
Write down the Latin and Russian names of the raw materials that produce plants and family.
2. Describe the appearance of the object on the example of a sample of raw materials, using diagrams.
3. Note the compliance of raw materials (on external grounds) to the requirements of the NTD.

Instructional materials for mastering professional skills, abilities:
a) get the necessary ARS
b) to study and describe the appearance of the obtained ARS, to draw ARS

c) to conduct ARS training
d) to study the anatomical and diagnostic features of roots and rhizomes
e) to study the anatomical and diagnostic features of fruits, leaves, flowers
f) record the observations in a laboratory journal

7.3. Control materials for the final stage of the lesson: tasks, tasks, tests, etc.
Tests:
1. In the procurement of vegetable raw materials by students there were cases of poisoning. It is not recommended to involve children in the collection of any raw materials:
A. dope is common
B. dioecious nettle
B. sea buckthorn buckthorn
G. gray alder
D. plantain is large

2. The alkaloid reserpine has antihypertensive, sedative activity. From which vegetable raw materials is this indole alkaloid obtained?
A. Radix Rauwolfiae
B. Radix Althaeae
B. Radix Inulae
G. Radix Belladonnae
D. Rhizoma Calami

3. In the identification of raw materials containing alkaloids, a large number of druses, a head hair with a multicellular head, a unicellular stalk and a simple warty hair were found. These raw materials are:
A. Folium Daturae
B. Folium Belladonnae
B. Folium Vincae minor
G. Folium Hyoscyami
D. Folium Theae

4. In the microdiagnostic analysis of herbs containing alkaloids, were found stomata anocytic type, numerous bicellular hairs with a short basal and long terminal cell and large-bumpy surface, spherocrystals of phenolic glycoside, which allows to identify:
A. Herba Thermopsidis
B. Herba Belladonnae
B. Herba Chelidonii
G. Herba Delphinii
D. Herba Ephedrae

5. Vegetable raw materials containing alkaloids are stored according to list B. Particularly toxic types of vegetable raw materials, which are stored according to list A, include:
A. timeless tubers

B. the fruits of capsicum
C. passionflower grass
G. tobacco leaf
D. nightshade grass

6. To determine the benignity of black bleached leaf conduct a quantitative analysis of the content of alkaloids in terms of atropine. To do this, use the method:
A. reverse titration
B. biological standardization
V. distillation with water vapor
G. gravimetric analysis
D. chromatographic analysis

7. To establish the benignity of datura leaf, perform a quantitative analysis of the content of alkaloids in terms of atropine. To do this, use the method:
A. reverse titration
B. biological standardization
V. distillation with water vapor
G. gravimetric analysis
D. chromatographic analysis

8. To establish the benignity of the leaf of the beetle conduct a quantitative analysis of the content of alkaloids in terms of atropine. To do this, use the method:
A. reverse titration
B. biological standardization
V. distillation with water vapor
G. gravimetric analysis
D. chromatographic analysis

9. The leaves of comfrey are used to obtain tinctures, thick and dry extracts. To detect hyoscyamine in the leaves of belladonna should use the reaction:
A. with Dragendorf's reagent
B. azo combination reaction
B. with a solution of ferric chloride
G. Keller-Killiani reaction
E. Legal's reaction

10. Bleached black leaves are used in the manufacture of anti-asthmatic drugs. To detect hyoscyamine in bleached leaves, use the reaction:
A. with Dragendorf's reagent
B. azo combination reaction
B. with a solution of ferric chloride
G. Keller-Killian reaction
D. the reaction is legal

8. Literature for the teacher.

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. фтів) 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.

10. The topic of the next lesson:

LR and raw materials that contain various biologically active substances. Chaga, Kalanchoe periste.

Methodical recommendations were made by

associate professor Boyko IA