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

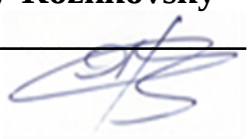
METHODOLOGICAL DEVELOPMENT
Course: “Pharmacognosy”

practical lesson for students on the topic:

"Cardioglycosides. Methods of qualitative and quantitative determination. LR and raw materials that contain cardioglycosides (cardiac glycosides). Purple foxglove, woolly foxglove, large-flowered foxglove, types of strophanthus, mustard, lily of the valley, jaundice. "

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: "Cardioglycosides. Methods of qualitative and quantitative determination. LR and raw materials that contain cardioglycosides (cardiac glycosides). Purple foxglove, woolly foxglove, large-flowered foxglove, types of strophanthus, mustard, lily of the valley, jaundice. " - 10 hours.

2. Actuality of theme.

Cardiotonic glycosides (cardiosteroids) are an important group of natural substances of steroidal structure - derivatives of cyclo-pentaneperhydrophenanthrene. Plants are the only source of cardiac glycosides that selectively act on the heart muscle: in small doses they stimulate and serve as drugs for the treatment of acute and chronic heart failure, and in large - are heart poisons. The knowledge and skills acquired in the study of this topic can be used to master such disciplines as pharmacology, pharmaceutical and toxicological chemistry, pharmacotherapy, as well as in the practical activities of a pharmacist.

3. Objectives of the lesson:

3.1. General goals: to study medicinal plants that contain cardiosteroids and perform work on macro- and microscopic analysis of raw materials (lily of the valley grass, jaundice grass, spring mustard grass, rhizomes with hemp roots, purple foxglove, large-flowered, woolly, seeds).

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 goals:

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

1. Definition of "cardiosteroids".
2. Distribution of cardiosteroids in the plant world and resources of the studied raw materials.
3. Morphological characteristics of plants, their habitats (cultivation areas), places of growth.
4. External signs of the studied types of medicinal raw materials.
5. Possible impurities to raw materials (mustard grass, leaves and lily of the valley grass) and their main differences.
6. The main anatomical diagnostic features of the leaf of foxglove purple, large-flowered, woolly, lily of the valley leaf, mustard grass, jaundice grass, rhizomes with cuttlefish roots.
7. Ways of using raw materials and its medical application.

Based on theoretical knowledge of the topic and laboratory work:

- Master the techniques (be able to) (level of mastering Bezpalkom - III):
- recognize the external features of the plant (foxglove: purple, large-flowered, woolly; strophant Combe, hemp, spring mustard, lily of the valley, yellow jaundice) and distinguish them from possible impurities;
- to determine the identity of raw materials by external features and anatomical structure.

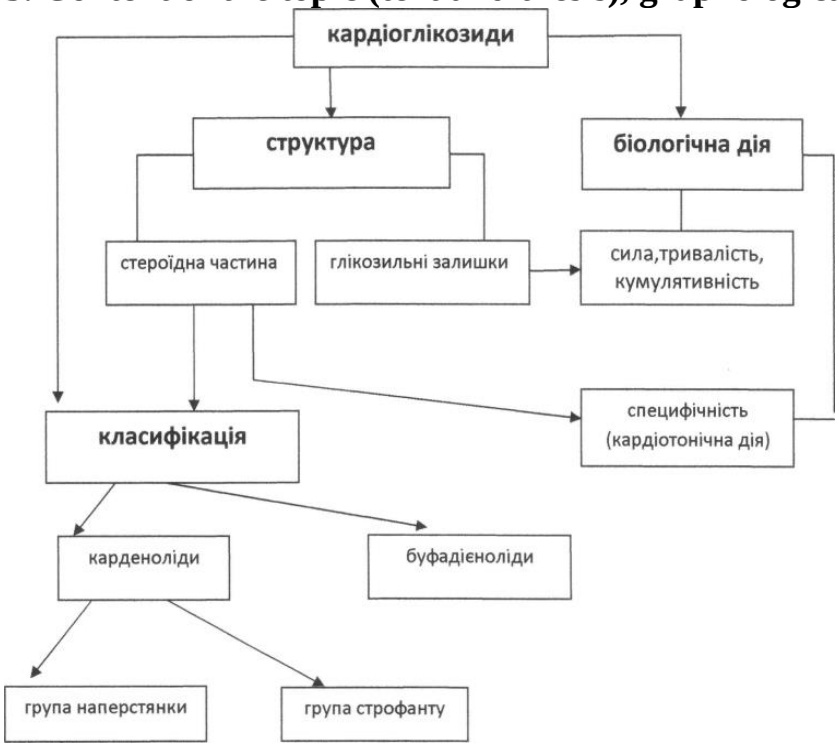
4. Interdisciplinary integration

№ 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. Methods of measuring mass and volume. Preparation of powders or liquid drugs for internal and external use. Analysis of	

	2. Pharmacy technology of drugs 3. Industrial technology of medicines 4. Clinical pharmacology 5. Pharmaceutical chemistry 6. Organization and economics of pharmacy	prepared liquid drugs using a burette system. Conditions of industrial preparation of medicines. Principles of organization of pharmaceutical production of various dosage forms: liquid, solid, soft, injectable solutions, etc. Machines, devices, equipment for the production of medicines. 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. Methods of qualitative and quantitative study of drugs. Pharmaceutical service management. Storage of medicines. Control and analytical service, organization of its work. Accounting for inventory and cash. Economic analysis of the 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.	

	7. Management and marketing in pharmacy		

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



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 methodical forensuring 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 of methodical providing of employment.

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

Tests:

1. It is known that the glycosides of foxglove are subjected to enzymatic hydrolysis, as a result of which the raw material loses biological activity. At what temperature should the raw material be dried to avoid the loss of glycosides? Choose the optimal mode of drying the leaves of foxglove:
A. 50-60 ° C
B. 25-30oC
B. 100 ° C
G. 40-50 ° C
D. 35-40oC

2. In the warehouse are stored foxglove leaves containing cardioglycosides. Annually quantitative analysis of this raw material is carried out using the method:
A. biological standardization
B. complexometry
B. iodometry
G. chromatography
D. gravimetric

3. The leaf of the foxglove contains lantosides, the carbohydrate component of which is deoxysaccharide. This type of carbohydrate can be identified by the reaction:
A. Keller-Killiani reaction
B. Dragendorf reaction
B. Legal's reaction
G. Rosenheim's reaction
D. Lieberman-Burhard reaction

4. Lily of the valley herb contains cardioglycosides, the carbohydrate component of which is deoxysugar. This type of carbohydrate can be identified by the reaction:
A. Keller-Killiani reaction

B. Dragendorf reaction
B. Legal's reaction
G. Rosenheim's reaction
D. Lieberman-Burhard reaction

5. Establishing the benignity of spring mustard grass is carried out on the quantitative content of cardiac glycosides. To do this, use the method:
A. biological standardization
B. chromatographic analysis
B. method of steam distillation
G. gravimetric analysis
D. back titration method

6. Establishing the benignity of lily of the valley leaf is carried out on the quantitative content of cardiac glycosides. To do this, use the method:
A. biological standardization
B. chromatographic analysis
B. method of steam distillation
G. gravimetric analysis
D. method of back titration

7. Determining the benignity of foxglove leaf is carried out on the quantitative content of cardiac glycosides. To do this, use the method:
A. biological standardization
B. chromatographic analysis
B. method of steam distillation
G. gravimetric analysis
D. back titration method

8. Plant raw materials containing cardioglycosides are stored according to list B. Particularly toxic species of plant raw materials containing cardioglycosides and stored according to list A include
A. strophanthus seeds
B. mustard leaf
B. foxglove leaf
G. lily of the valley leaf
D. jaundice leaf

9. Herbal drug "Cardiovalen" is used as a cardiotonic agent. The herbal source of this remedy is:
A. jaundice grass
B. dog nettle grass
B. roots of Baikal sagebrush
G. ginseng roots
D. licorice roots

10. Raw lily of the valley contains cardiac glycosides. At what temperature should it be dried?
A. 50-60 ° C
B. 30-40oC
B. 80-90 ° C
G. 20-25oC
D. 80-100 ° C

Question:
1. Definition of "cardiotonic (cardiac) glycosides."
2. Distribution of cardiac glycosides in the plant world and resources of the studied raw materials.
3. Measures for the protection and rational use of wild medicinal plants containing cardiac glycosides.
4. Features of harvesting, drying and storage of raw materials containing cardiac glycosides.
5. Russian and Latin names of raw materials that are derived from plants and families of all objects of the research topic.
6. Morphological characteristics of derived plants, their habitats (areas of cultivation), distribution.
7. External signs of the studied types of medicinal raw materials.
8. Possible impurities to raw materials (mustard grass, leaves and lily of the valley grass) and their main differences.
9. The main anatomical diagnostic features of foxglove leaf purple, large-flowered, woolly, lily of the valley leaf, mustard grass, jaundice grass, rhizomes with kendyra roots.
10. Ways of using medicinal raw materials and drugs.

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 a foxglove and to carry out the analysis of raw materials on AND (sections: external signs, microscopy).
1.To study the appearance of foxglove on the herbarium pattern (scheme № 1). Write the Latin and Russian names of the raw materials from which the plant and family come.
Scheme № 1
DETERMINATION OF DERIVATIVE PLANT BY EXTERNAL SIGNS
- Life form (herbaceous plant, shrub, shrub, tree).
- Type of underground organs (root, rhizome, tuber, etc.).

- Stem structure (shape, nature of branching, pubescence, diameter, etc.).
- Sheet placement (alternate, opposite, whorled).
- Leaves (simple or complex, the shape of the leaf blade or leaves, edge, veining, color, size).
- Flowers (single or inflorescence, flower structure, color, size, etc.).
- Fruit (type, shape, color, size).
- Bark (in woody species), (color, presence, shape and color of lentils, cotyledons, etc.)

2.Describe the appearance of the leaf of foxglove on the example of a sample of raw materials (scheme № 2). Draw the appearance of the letter.

Scheme № 2

ANALYSIS OF RAW MATERIALS "LEAVES" BY EXTERNAL SIGNS

- Type of leaf and dissection of the leaf blade: (simple: pal-chatorozsechenny, palchato- or peristorozdelny, peristolopasny, three- or petiilopasny).
- Stem stem or sessile.
- Shape (round, elliptical, ovoid, lanceolate, linear).
- The edge of the leaf (solid, serrated, toothed, crenate, etc.).
- The nature of veining (arcuate, reticular, finger, pinnate, parallel).
- pubescence.
- Color of the upper and lower sides.
- The size of the leaf or leaves.
- Odor when rubbing the object or wetting
- Taste (for non-toxic objects).
- Specific properties.

3.Prepare the micropreparation sheet from the surface. Study it at low and high magnification (scheme № 3). Draw and mark diagnostic signs:

- slightly tortuous walls of the epidermis of the upper side of the leaf and strongly tortuous - from the bottom;
- the cuticle is thin on both sides, sometimes folded;
- stomata oval, slightly protruding, numerous on the underside, on the upper - liquid, surrounded by 3-7 bilyaustic cells, simple hairs (with 2-8 cells, with thin shells, often twisted or fused) and capped 2 species: with two-celled head on a short 1-2-cell stalk; with a unicellular round (oval) head on a multicellular stalk.

Scheme № 3

MICROSCOPIC ANALYSIS OF RAW MATERIALS

- Structure (dorziventral, isolateral).
- Mesophile (nature of palisade and spongy tissues).
- Inclusions are crystalline (single crystals, crystalline coating, friends, raffides, crystalline sand, cystolites); secretory (storages, milkweeds, channels).
- Epidermis of the upper and lower sides of the leaf (shape and contour of the cells: isodiametric, rectangular, tortuous;
- Type of trichomes: hairs, glands.
- Cuticle: thin, thick, straight, folded, "warty".

4. Note the compliance of the sample of raw materials (by external signs and microscopy) to the requirements of the AND.

Task 2. To study foxglove large-flowered and to carry out the analysis of raw materials on AND (sections: external signs and microscopy).
1. To study the appearance of large-flowered foxglove according to the herbarium pattern (see Scheme № 1). Write the Latin and Russian names of raw materials, plant derivatives and families.
2. Describe the appearance of the leaf of large-flowered foxglove on the example of a sample of raw materials (see Scheme № 2). Draw the appearance of the letter.
3. Prepare a micropreparation of large-flowered foxglove leaf from the surface. Study it at low and high magnification (see Scheme № 3).
Draw and mark diagnostic signs:
- cells of the epidermis are larger than those of foxglove;
- on the upper side polygonal or slightly wavy and in the upper part of the leaf have small papillary outgrowths, and on the lower - strongly tortuous; stomata oval, surrounded by 3-6 cells;
- hairs simple, large, with 4-6 cells, brittle, with a rough warty surface;
- head hairs with a two-celled head on a unicellular stalk.
4. Note the compliance of the sample of raw materials (by external signs and microscopy) to the requirements of GF XI, Article 14.

Task 3. Examine the foxglove and analyze the raw materials for AND (sections: external signs and microscopy).
1. To study the appearance of the foxglove on a herbarium pattern (see Scheme № 1). Write the Latin and Russian names of raw materials, plant derivatives and families.
2. Describe the appearance of the sheet on the example of a sample of raw materials (see Scheme № 2).
3. Prepare a micropreparation of the leaf from the surface. Study it at low and high magnification (see Scheme № 3).
Draw and mark diagnostic signs:
- cells of the epidermis on the upper side of the leaf, in the contour polygonal or slightly tortuous, and on the lower - strongly tortuous. The membranes of epidermal cells on both sides have a pronounced thickening of the membranes (especially in the bends of the cells).
- stomata oval, slightly convex on both sides, surrounded by 3-5 cells of the epidermis. Around the mouths - the fold of the cuticle; hairs simple (consisting of 6-12 cells; thin, twisted) and capitate with a single-celled head on a short stalk, as well as with 3-4 cell heads.
- on the stem leaves - head hairs on a very long multicellular stalk.
4. Note the compliance of the test sample of raw materials (by external signs and microscopy) to the requirements of FS 42-614-72.

Task 4. To study a lily of the valley and to carry out the analysis of raw materials on AND (sections: external signs and microscopy)
1. Examine the appearance of lily of the valley and possible impurities:

mounds of medicinal and pears round-leaved on herbarium o6raztsam (see scheme № 1). Write the Latin and Russian names of raw materials, plant derivatives and families.
2. To carry out the comparative macroscopic analysis of a leaf of a lily of the valley and a bush of medicinal, flowers of a lily of the valley and a pear round. Make a table of the distinctive features of lilies of the valley and possible impurities (see Scheme № 2 and Scheme № 4).

Scheme № 4

ANALYSIS OF RAW MATERIALS "FLOWERS" BY EXTERNAL SIGNS

- Commodity type of raw material (inflorescences, single flowers or their parts).
- Type of inflorescence (ear, ear, brush, basket, shield, umbrella, etc.), or single flowers.
- The structure of the flower (features of the perianth, the number of petals, sepals, etc.).
- The shape and nature of the florist (conical, flat, hollow inside or solid).
- Dimensions.
- Coloring.
- The presence of bracts.
- 3apah when rubbing.
- Taste (in non-toxic objects).

3. Prepare a micropreparation of lily of the valley leaf from the surface. Study it at low and high magnification (see Scheme № 3).
Draw and mark diagnostic signs:
- cells of the epidermis, elongated along the length of the sheet on both sides.
- stomata rounded, oriented along the length of the leaf and surrounded by 4 cells;
- polysad tissue consisting of elongated long cells lying in one layer in a plane parallel to the leaf surface.
- spongy tissue loose, consisting of cells of different shapes, elongated across the width of the sheet, and also located parallel to the surface of the sheet;
- in cells devoid of chlorophyll, large needle crystals and raphides of calcium oxalate.

4. Note the compliance of the test sample of raw materials (by external signs and microscopy) to the requirements of GFHI, Article 49.

Task 5. To study hemp cuttings and to analyze raw materials according to AND (section: external signs).
1. To study the appearance of hemp kendir by herbarium sample (see diagram № 1). Write the Latin and Russian names of raw materials, plant derivatives and families.
2. Describe the appearance of the rhizome and root of hemp hemp on the example of a sample of raw materials (scheme № 5).

Scheme № 5

ANALYSIS OF RAW MATERIALS "UNDERGROUND AUTHORITIES" BY EXTERNAL SIGNS

- Commodity type of raw material (whole, cut, cleaned or uncleaned, etc.).

- Type of underground organs (roots, rhizomes with roots, rhizomes, tubers, bulbs, bulbs, etc.).
- Shape (cylindrical, conical, lumpy, twice curved, etc.).
- Dimensions.
- Surface (smooth or wrinkled, the presence of longitudinal or transverse folds, scars from leaves, stems, traces of lateral roots, etc.).
- Color on the outside, at the break.
- The nature of the fracture (granular, fibrous, smooth, rolling, bristly, etc.).
- The presence of the core.
- Type of structure of the conductive system (beam, beamless).
- Odor when scraping or wetting with water.
- Taste (in non-toxic objects).

Task 6. To study the Strophant Combe and to analyze the raw materials for AND (section: external signs).
1. Examine the appearance of the Strophant Combe according to the table (see Scheme № 1).
Write the Latin and Russian names of raw materials, plant derivatives and families.
2. Describe the appearance of strophanthus seeds on the example of a sample of raw materials (scheme № 6).
Scheme № 6

ANALYSIS OF RAW MATERIALS "FRUITS AND SEEDS" BY EXTERNAL SIGNS

- Commodity type of raw materials.
- Type of fruit (berry, box, pistil, stone fruit, achene, bean).
- The shape of the fruit (spherical, oblong, crescent-shaped, etc.).
- The nature of the surface (smooth, pitted, ribbed, wrinkled, shiny, matte, etc.).
- The shape and structure of the pericarp (pericarp).
- The number of seeds or seeds, their shape and structure, surface structure.
- Color.
- Dimensions (length, thickness).
- Smell (when rubbing or scraping).
- Taste (for non-toxic objects).

Task 7. To study a spring mustard, possible impurity and to carry out the analysis of raw materials on AND (sections: external signs, microscopy)
1. To study the appearance of spring mustard and possible impurities: Siberian mountain-flower and Volga mustard (see Scheme № 1).
Write the Latin and Russian names of raw materials, plant derivatives and families (give synonyms).
2. Carry out a comparative morphological analysis of spring mustard grass, Siberian mustard and Volga mustard (scheme № 7). Make a table of external features of the analyzed species of mustard.
Scheme № 7

ANALYSIS OF RAW MATERIALS "GRASS" BY EXTERNAL SIGNS

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

3. Note the compliance of the sample of raw materials (on external grounds) to the requirements of GF XI, Article 43.

Task 8. To study jaundice and to carry out the analysis of raw materials on AND (section: external signs).

1. To study the appearance of jaundice spreading (gray) on the herbarium sample (scheme № 1). Write the Latin and Russian names of raw materials, plant derivatives and families (give synonyms).
2. Describe the appearance of jaundice on the example of a sample of raw materials
(See Scheme № 7).
3. Note the compliance of the test sample of raw materials (on external grounds) to the requirements of FS 42-683-72.

Instructional materials for mastering professional skills, abilities:

Methods of work performance, stages of performance:

a) get the necessary LRS
b) to study and describe the appearance of the obtained LRS, to draw LRS
c) to conduct LRS training
d) to study the anatomical and diagnostic features of roots and rhizomes
e) to study the anatomical and diagnostic features of fruits and leaves
f) record the observations in a laboratory journal

7.3. Control materials for the final stage of the lesson: tasks, tasks, tests, etc.

Question:

1. What are the general external signs in the raw materials of foxglove large-flowered, woolly, rusty and ciliated; what is their difference from the foxglove.
2. What is characteristic of the petiole of the leaf of foxglove. Why in raw materials with large leaves it is torn off?
3. Is it possible to raw foxglove purple and ciliated distinguish from other species along the edge of the leaf?
4. Why did the foxglove get a species name, because in the raw material it has a bare leaf?
5. What types of hairs are found on the leaves of foxglove; what type predominates?

6. What are the features of the structure of the epidermis in woolly and ciliated foxglove?
7. What type of hairs predominates on the leaves of foxglove; what are they characteristic of?
8. What types of medicinal raw materials lily of the valley provides GF XI?
9. What plant derivatives are the source of raw lilies of the valley?
10. By what external sign is it easy to establish the authenticity of lily of the valley leaves?
11. What is the peculiarity of the structure of the mesophile in the leaves of lilies of the valley?
12. What is the originality of the structure of the epidermis of lily of the valley leaves?
13. What are the parts of the plant consists of raw spring mustard; what does GF XI indicate on this issue?
14. How to prepare a micropreparation of mustard leaf to provide all the diagnostic signs?
15. What is characteristic of the epidermis of the mustard leaf?
16. What are the Russian synonyms for spring mustard in GF XI?
17. What is the name of the raw material of hemp kendir; what parts of the plant does it consist of?
18. What is the color of raw hemp hemp, the nature of the surface (smooth, rough, wrinkled)?
19. What is the peculiarity of the location of milkweed in the root of hemp hemp?
20. What types of mechanical tissue are found in the rhizome and root of hemp hemp?
21. What parts of the plant are raw raw jaundice?
22. What "family" signs can be noted in the micropreparation of jaundice leaf?

Tests:
1. The pharmacy received a batch of rhizomes with valerian roots. How should these raw materials be stored?
A. separately from other types of raw materials
B. according to list A
B. according to list B
G. in a dark place
D. in a cool place

2. Which of the following plants is a raw material for the production of drugs with cardiotonic action:
A.Herba Adonidis
B.Herba Bursae pastoris
B.Herba Thymi vulgaris
G.Herba Hyperici
D.Herba Belladonnae

3. When instructing on the procurement of valerian raw materials, it is necessary to indicate to the procurer the unacceptable impurity to valerian:
A. labaznik six-petalled
B. devyasil high
V. thyme creeping
G. wormwood is bitter
D. steel field

4. Lily of the valley leaf contains cardiac glycosides. What is the qualitative reaction to establish the presence of a steroid cycle in the molecule of cardiac glycosides:
A. Lieberman-Burhard reaction
B. Dragendorf reaction
B. Wagner reaction
G. Mayer's reaction
D. Vitali-Morena reaction

5. The drug "Celanid" with cardiotonic activity is obtained on the basis of vegetable raw materials:
A. leaf foxglove
B. foxglove leaf
V. lily of the valley leaf
G. oregano leaf
D. leaf of jaundice

6. Lily of the valley leaf is a cardiotonic agent. This raw material should be harvested in time:
A. before flowering
B. during flowering
B.after flowering
G. during fruiting
D. during budding

7. Spring mustard grass contains cardiac glycosides, so the raw material is stored:
A. according to list B
B. separately from other types of raw materials
B. on list A
G. in a dark place
D. in a cool place

8. Preparations of May lily of the valley are prescribed as a cardiotonic and sedative. When preparing a lily of the valley leaf may get impurities:
A. bought medicinal
B. foxglove purple
V. foxglove woolly

G. goritsvetu spring
D. zheovtushnika sprawling

9. Herbal drug "Korglikon" is used as a cardiotonic agent in diseases of the cardiovascular system. Raw materials for production are:
A. leaf of the lily of the valley
B. foxglove leaf
V. leaf of jaundice gray
G. eucalyptus leaf
D. leaf dope

10. Lily of the valley grass is a raw material for the production of cardiotonic drugs. To identify cardioglycosides in this raw material, you can use the reaction:
A. with Legal's reagent
B. with Dragendorf's reagent
B. cyanidin test
G. with a solution of tannin
D. azo coupling reaction

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.
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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:
Phenolic compounds. Methods of qualitative and quantitative determination. LR and LRS containing simple phenols and their glycosides. Common bearberry, cranberry, rhodiola rosea, violet tricolor and field, male fern.

Methodical recommendations were made by

associate professor Boyko IA