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

METHODOLOGICAL DEVELOPMENT

Course: “Pharmacognosy”

practical lesson for students on the topic:

“Carbohydrates. Glycosides. Chemical analysis of LRS. LR and LRS, which contain polysaccharides: species of marshmallow, plantain, coltsfoot (mother-and-stepmother), flax, kelp. Determination of the swelling index of raw materials. "

Course: 3rd Faculty: medico-pharmaceutical

Approved on methodical
meeting of the department
"30" August 2024
Protocol № 1
Head department
MD, prof. JV Rozhkovsky

Odessa - 2024

1. The topic of the lesson: «Carbohydrates. Glycosides. Chemical analysis of LRS. LR and LRS, which contain polysaccharides: species of marshmallow, plantain, coltsfoot

(mother-and-stepmother), flax, kelp. Determination of the swelling index of raw materials. " - 8 hours.

2. Relevance of the topic.

Polysaccharides are high molecular weight products of polycondensation of monosaccharides linked to each other by glycosidic bonds and form linear or branched chains. They make up most of the dry matter of higher plants and algae and are the most common organic compounds on earth.

Mucaltine, plantaglucid, laminaride are successfully used in medical practice. For the practical activities of the pharmacist requires knowledge of the procurement and analysis of LRS containing polysaccharides.

3. Objectives of the lesson:

*3.1. General goals:*To study LR containing polysaccharides and to perform work on macro- and microscopic analysis of raw materials: marshmallow root, flax seeds, mother-and-stepmother, plantain; to carry out qualitative and histochemical reactions to mucus.

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:

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

1. Definition of "Polysaccharides", their classification.
2. Physico-chemical properties of polysaccharides.
3. Morphological characteristics of plants, their habitats (cultivation areas), places of growth.
4. Chemical composition, ways of use and medical application of medicinal plant raw materials containing polysaccharides.

Based on theoretical knowledge of the topic and practical work:

- master the skills (be able) (level of assimilation according to Bezpalk - III):

1. Recognize the external features of the plant (flax, marshmallow and Armenian, mother-and-stepmother, plantain) and distinguish them from possible impurities;

2. To determine the authenticity and good quality of raw materials by external signs, anatomical structure and histochemical reactions.

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.	

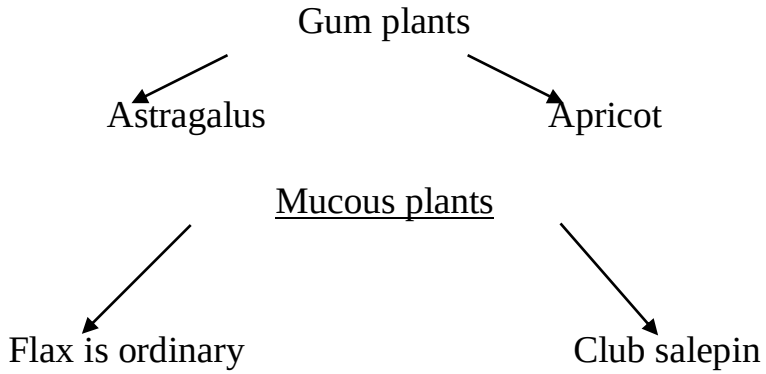
	2. Pharmacy technology of drugs	Methods of measuring mass and volume. Preparation of powders or liquid drugs for internal and external use. Analysis of prepared liquid drugs using a burette system.	
	3. Industrial technology of medicines	Conditions of industrial preparation of medicines. Principles of organization of pharmaceutical production of various dosage forms: liquid, solid, soft, injectable solutions, etc. Machines, devices, equipment for the production of medicines.	
	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. 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. (See the text of the lecture)

LRS and phytopreparations containing polysaccharides

- Marshmallow root
- Althaea grass,
- plantain flea herb (plantaglucid)
- Mother and stepmother
- Seaweed (Laminarid, Spirulina).
- Grass herd (Elekasol, Brusniver)



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 on methodological support of the lesson.

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

Tests.

1. If the root "saws" at the break, we can conclude that it is:

A. marshmallow root

B. the root of delusion

B. ginseng root

G. rhubarb root

D. rhizome of the coil

2. A batch of marshmallow roots arrived at the warehouse. To confirm the authenticity of the slice applied a drop of ammonia solution, a yellow color, sub-confirmed the presence of raw materials

A. mucus

B. gum

B. pectin substances

G. tannins

D. coumarins

3. Marshmallow root contains from 10 to 20% of polysaccharides. What temperature regime is a condition for drying this medicinal plant material:

A. 45-60 ° C

B. 20-30 oC

B. 80-90 ° C

G. 100-120 ° C

D. 85-95 ° C

4. Plantoglucid anti-ulcer drug is obtained from plantain leaf. To establish the good quality of raw materials used when-quantitative determination:

A. polysaccharides

B. flavonoids

V. coumarins

G. vitamins

D. iridoids

5. At microdiagnosis of one of the components of expectorant collection diagnostic signs are established: the root of the secondary, bundleless structure, the presence of heart-shaped rays, bast fiber groups, friends of calcium oxalate and cells-bags with colorless content, which when treated with methylene blue turns blue . Which component of expectorant collection was studied:

A. marshmallow root

B. the root of delusion

B. valerian root

D. rhizomes of azaleas

D. the root of the ancestor

6. In the manufacture of tablets as a binder and filler

use biologically neutral substances, often from the class of polysaccharides. What substances are most suitable for this purpose:

A. starch

B. gum

B. mucus

G. pectin

D. inulin

7. Mother-and-stepmother's letter is an expectorant. This raw material should be harvested:

A. after flowering

B. before flowering

B. during flowering

G. during fruiting

D. at the end of the growing season

8. When instructing on the preparation of letters mother-and-stepmother should indicate possible impurities in this raw material, which are:

A. burdock leaf arachnoid

B. dioecious nettle leaf

B. plantain leaf

G. marshmallow leaf

D. spring primrose leaf

9. A batch of medicinal plant raw materials - plantain leaves - arrived at the pharmacy warehouse. According to which indicator in accordance with the requirements of the Pharmacopoeia conduct an analysis of the content of active substances:

A. polysaccharides

Used flavonoids

B. tannins

G. anthracene derivatives

D. essential oil

10. Preparations of marshmallow root are used to treat diseases of the upper respiratory tract. When procuring these raw materials, the impurity may be:

A. Khatma Thuringia

B. plantain is large

B. tansy ordinary

G. chicory is common

D. dandelion medicinal

Question:

1. Definition of "polysaccharides", their classification.
2. Plants rich in polysaccharides.
3. Features of harvesting, drying and storage of raw materials containing polysaccharides.
4. Chemical structure of polysaccharides and their classification.
5. Physico-chemical properties of polysaccharides.
6. The main reactions to mucus.
7. Latin and Russian names of raw materials, plant derivatives and families of all objects of the research topic.
8. Morphological characteristics of plants, their habitats (growing areas), places of growth.
9. External signs of the studied types of medicinal plant raw materials.

10. Possible impurities in raw materials (marshmallow, plantain, mother-and-stepmother), and their main differences.

11. The main anatomical diagnostic features of marshmallow root and plantain leaves.

12. Reactions to woody elements of marshmallow root.

13. Chemical composition, uses and medical use of medicinal plant raw materials containing polysaccharides.

14. Phytopreparations based on polysaccharides produced by the medical pro-industry.

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 althaea medicinal and Armenian and to carry out the analysis of raw materials on GF XI, item 64 (sections: external signs, microscopy and qualitative reactions).

1. To study the appearance of marshmallow and Armenian herbarium on herbarium specimens (Scheme 1).

Scheme 1: - life form (herbaceous plant, shrub,
shrub, tree).
-type of underground organs (root, rhizome, tuber, etc.)
- stem structure (shape, nature of branching, pubescence,
diameter, etc.)
- leaf 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.).
Write down the Latin and Russian names of raw materials, plants from which they are made
and family.

2. Describe the appearance of marshmallow root on the example of a sample of raw materials (Scheme 2).

Scheme 2: - commodity type of raw materials (unharvested, 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
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 conducting system (beam, beamless).
- odor when scraping or wetting with water.
- taste (in non-toxic objects).

3. Prepare a cross section of marshmallow root.

Examine the micropreparation at high magnification. At high magnification, draw and mark diagnostic signs:

- multi-row plug;
- parenchyma cells are thin-walled single-row;
- in the bark numerous groups of bast fibers, tangentially elongated, arranged in intermittent rows; shell fibers are slightly thickened.
- core rays single-, rarely double-row;
- the cambium line is clearly expressed;
- in wood large vessels, usually surrounded by tracheids;
- cells with mucus are in both bark and wood;
- parenchyma cells are filled with starch grains, and some of them contain friends of calcium oxalate.

Carry out the reaction of double staining:

Place the slice in a solution of ferric oxide for 20 minutes, remove the solution with filter paper, add an alcohol solution methylene blue and rinse with water. Mucous cells are stained in yellow, fibers in blue, vessels - in green, cells of a parenchyma remain colorless.

Examine the micropreparation at low magnification.

4. Carry out histochemical reactions:

- *on woody fiber*

The slice is placed on a glass slide in a 1% solution of floroglucin in alcohol, suck out the reagent with filter paper, apply a drop on the cut concentrated hydrochloric acid and after 1-2 minutes add a drop glycerin; cover with a cover glass and examine under a microscope at low magnification. The woody membranes of the cell acquire cherry color.

- *on mucus with methylene blue*

The slice is placed for a few minutes in a solution of methylene blue, then transferred to glycerin; the mucus turns blue.

5. Record the results of observations in the laboratory journal

6. Note the compliance of the sample of raw materials (by external signs, microscopy and histochemical reactions) to the requirements of GF-XI Article 64.

Task 2. To study flax for sowing and to carry out the analysis of raw materials on AND (sections: external signs and microscopy).

1. To study the appearance of ordinary flax according to the herbarium sample (see scheme 1 above). Write down the Latin and Russian names of raw materials, plants from which families are made.

2.Describe the appearance of flax seeds on the example of a sample of raw materials (Scheme 3).

Scheme 3: Commodity type of raw materials.

-type of fruit (berry, box, perianth, drupe, achene, bean).

-form of the fruit (spherical, oblong, crescent-shaped, etc.)

-nature of the surface (smooth, pitted, ribbed, wrinkled,
shiny, matte, etc.)

-form and features of the pericarp (pericarp).

-number of seeds or seeds, their shape and structure, structure
surface.

-color.

-sizes (length, thickness).

-smell (when rubbing or scraping).

-taste (for non-toxic objects)

3. Prepare a cross section of flax seeds. Draw a general diagram
its structure. Examine the micropreparation at low and high magnification.
Draw and mark diagnostic signs:

- cells of the epidermis are large, quadrangular, covered with thick
cuticle and contain mucus;

- parenchymal layer of seed coat - 1-2-row;

- mechanical single-row layer, its cells are yellow, thickened,

woody, permeated with porous tubules;
- a narrow "transverse" layer consists of thin-walled cells elongated
across the seeds;
- pigment layer - from one row of triangular cells with thickened
porous shells and dark brown contents;
- endosperm, consisting of polygonal cells filled
aleurone and fatty oil.
4. Carry out a histochemical reaction to fatty oil by Sudan III.
The slice is placed for several hours in a solution of Sudan III, then washed with 50% alcohol and transferred to glycerin. Sudan III colors fats in orange
Red colour.
5. Note the compliance of the test sample of raw materials (by external signs
kami, microscopy and histochemical reaction) requirements

Task 3 3. To study plantain and analyze the raw materials for AND (sections: external signs and microscopy).
1. To study the appearance of plantain large and possible impurities - plantain medium, steppe and lanceolate on herbarium specimens (Scheme 1).
Scheme 1: - life form (herbaceous plant, shrub,
shrub, tree).
-type of underground organs (root, rhizome, tuber, etc.)
- stem structure (shape, nature of branching, pubescence,
diameter, etc.)
- leaf 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.).

Write down the Latin and Russian names of raw materials, plants and families.

2. Describe the appearance of plantain leaves on the example of a sample of raw materials. Sketch the appearance of plantain leaves large, medium, steppe and lanceolate.

3. Prepare a micropreparation of plantain leaves from the surface. Examine it when low and high magnification according to the scheme:

- structure (dorziventral, isolateral).
- mesophile (nature of palisade and spongy tissues).
- inclusion of crystalline (single crystals, crystalline coating, friends, raffids, crystalline sand, cystolites); secretory (containers, milk vessels, canals).
- epidermis of the upper and lower sides of the sheet (shape and contour of the cells): isodiametric, straight-walled, tortuous; type of stomata: diacytic, parasitic, anisocytic, anocytic; the number and location of cells around the stomata.
- Type of trichomes: hairs, glands.
- Cuticle: thin, thick, straight, folded, warty.

Draw and mark diagnostic signs:

- cells of the epidermis with straight, rarely with slightly tortuous walls;
- cuticle folded in places;

hairs: simple multicellular with a broad base and glabrous

- on a unicellular stalk with an elongated bicellular head;

less often on a multicellular stalk with a spherical or oval head;

- cells of the epidermis form a rosette in the places of attachment of hairs.

4. Note the compliance of the investigated sample of raw materials (by external signs, microscopy) to the requirements of GF-XI, Article 20.

Task 3 4. Study the mother-and-stepmother and analyze the raw materials for AND (section: external signs).

1. To study the appearance of the mother-and-stepmother and possible impurities: clover

(lining hybrid, marjoram, burdock and burdock

arachnoid on herbarium specimens (see scheme 1).

Write down the Latin and Russian names of raw materials, plants and families.

2.Describe the appearance of the leaves of the mother-and-stepmother on the example of a sample of raw materials.

Scheme 4.

- Type of leaf and dissection of the leaf blade: simple: finger-dissected, finger- or pinnate, peristolopastny, three- or five-lobed; complex: even or imparipinnate.
- leaf stem or sessile.
- shape (round, elliptical, ovoid, lanceolate, linear).
- leaf edge (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 and leaves
- odor when rubbing the object or wetting with water.
- taste (for non-toxic objects)
- specific features.

Draw the appearance of the leaves of the mother-and-stepmother.

Note the compliance of the test sample of raw materials (on external grounds) to the requirements of GF-XI, Article 16.

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.

Tests:

1. Powder which LRS can be used as a laxative, especially in old age

A. sugar kelp

B. nightshade particle grass

B. the root of Rauwolfia snake

G. marigold flowers

D. rowan fruit

2. Which plant powder is used in atherosclerosis and for the treatment of goiter (presence of iodine):

A. sugar kelp

B. parsnip fruit

B. dill fruit

G. gentian root

D. tansy flowers

3. Name the plant that secretes gum:

A. apricot ordinary

B. Eucalyptus ordinary

B. bird cherry

G. juniper

D. sea buckthorn buckthorn

4. Name the plant that is the raw material for the drug "Mukaltin"

A. althaea medicinal

B. marigold flowers

B. nightshade grass

G. gentian root

D. apricot ordinary

5. The roots of which plants are washed quickly to prevent slipping, cut into pieces 10-25 cm, and then knives are cleaned of cork and immediately dried:

A. marshmallow root

B. valerian root

B. burdock root

G. ginseng root

D. the root of the Manchurian aralia

6. The root of a plant has a therapeutic effect due to the presence of mucus, which protects the nerve endings of the mucous membrane of the gastrointestinal tract from the irritating effects of other substances

A. marshmallow root

B. valerian root

B. burdock root

G. ginseng root

D. the root of the Manchurian aralia

7. From the root of which plants prepare an infusion of cold water (1:10)

A. marshmallow root

B. azalea root

B. burdock root

G. valerian root

D. dandelion root

8. The root of which plant is used as an anti-inflammatory and enveloping agent, mainly in diseases of the respiratory tract:

A. marshmallow root

B. the root of Rauwolfia snake

B. the root of the honeycomb

G. licorice root

D. the root of the Manchurian aralia

9. The root of which plant is often an admixture of marshmallow root:

A. burdock root

B. valerian root

B. dandelion root

G. the root of the honeycomb

D. the root of the Manchurian aralia

10. From which LRS prepare antiulcer drug plantaglucid:

A. plantain leaf

B. mother-and-stepmother's letter

B. nettle leaf

G. primrose leaf

D. foxglove leaf

8. Literature

Basic literature

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Additional literature:

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. 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:

Fats and fat-like substances. Analysis of fatty oils. Olive, almond, peach, castor, sunflower oil. Cocoa butter.

Methodical recommendations were made by _____ associate professor Boyko IA

(Signature)