

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

**METHODOLOGICAL DEVELOPMENT**

**Course: "Pharmacognosy"**

**practical lesson for students on the topic:**

**"Terpenoids. Iridoids. Medicinal plants and raw materials that contain terpenoids (isoprenoids): iridoids and bitters. Yellow yarrow, three-leaved legume, golden umbrella and beautiful, dandelion, valerian, viburnum. "**

**Course: 3rd Faculty: medico-pharmaceutical**

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



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**Odessa - 2024**

**1. Topic of the lesson:** "Terpenoids. Iridoids. Medicinal plants and raw materials that contain terpenoids (isoprenoids): iridoids and bitters. Yellow yarrow, three-leaved legume, golden umbrella and beautiful, dandelion, valerian, viburnum. " - 4 years.

## **2. Relevance of the topic.**

Iridoids (bitterness) include glycosides that have an intensely bitter taste. They stimulate the appetite and improve digestion. This group of natural substances is chemically little studied, so the assessment of the quality of raw materials is carried out by the organoleptic method - on the basis of bitterness. Successfully solving the problem of rational use of medicinal plants containing bitters requires the ability to determine their appearance, know the timing and methods of collection, drying and storage conditions, as well as the ability to determine the identity and quality of raw materials.

## **3. Objectives of the lesson:**

*3.1. General goals:* to study LRS containing bitterness, and to carry out work on the morphological and anatomical analysis of raw materials: dandelion root, trifoliolate leaf and goldenrod grass.

*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 "Iridoids", their classification.
2. Russian, Latin names of raw materials, producing plants and families of objects of the research topic.
3. Morphological characteristics of plants, their habitats (cultivation areas), places of growth.
4. Ways of use and medical application of medicinal plant raw materials containing iridoids.

Based on theoretical knowledge of the topic and practical work:

- **master techniques (be able to)** (level of assimilation according to Bezpalk - III):

- Recognize the external features of the plant (dandelion, three-leaf clover, yarrow) and distinguish them from possible impurities;
- Determine the authenticity of raw materials by external features and anatomical structure ..

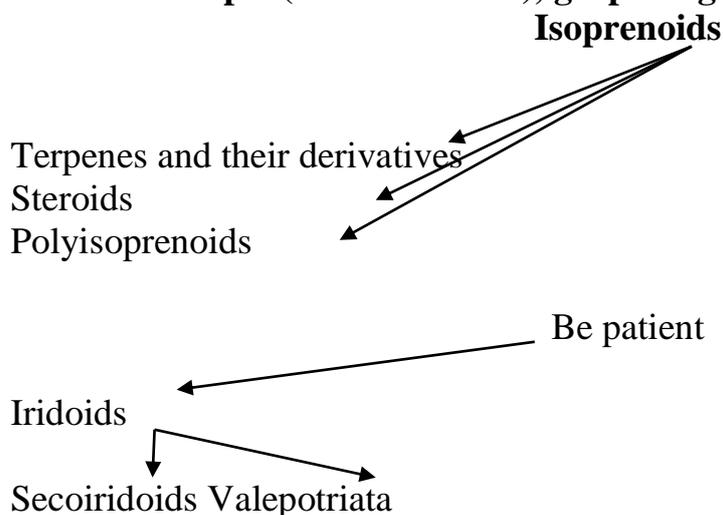
#### 4. Interdisciplinary integration

№ p.p.	discipline	know	be able
1	2	3	4
1.	<p>Previous disciplines:</p> <p>1. Botany</p> <p>2. Organic chemistry</p> <p>3. Analytical chemistry</p>	<p>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.</p> <p>Physical and chemical properties of polysaccharides, glycosides, terpenoids, aromatic derivatives, heterocycles.</p> <p>Methods of acid-base titration (neutralization) and permanganatometry</p>	<p>Use a microscope, prepare surface preparations and cross-sections.</p> <p>Carry out qualitative reactions; purification of organic compounds.</p> <p>Work with analytical scales, measuring vessels, photoelectro-colorimeter, use methods of chromatography on paper and in a thin layer of sorbent.</p>
2.	<p>The following disciplines:</p> <p>1. Physical and colloid chemistry</p>	<p>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:</p>	

	<p>2. Pharmacy technology of drugs</p> <p>3. Industrial technology of medicines</p> <p>4. Clinical pharmacology</p> <p>5. Pharmaceutical chemistry</p> <p>6. Organization and economics of pharmacy</p>	<p>paper, column, in a thin layer of sorbent, gel chromatography.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Methods of qualitative and quantitative study of drugs.</p> <p>Pharmaceutical service management. Storage of medicines. Control and analytical service, organization of its work. Accounting for inventory and cash. Economic analysis of the pharmacy.</p> <p>Management and entrepreneurship. Organization as an object of management. Connecting processes in management. Human Resource Management Pharmaceutical Marketing Management. Pharmaceutical market research.</p>	
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		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.

<b>№№ p.p.</b>	<b>The main stages of the lesson, their functions and content.</b>	<b>Learning objectives in the levels of mastery.</b>	<b>Means of training and control.</b>	<b>Materials on methodical forensuring the visibility of the lesson, control the knowledge of those who teachis.</b>	<b>Term (in minutes or in%) of the total class time.</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>1</b>	<i>Preparatory stage</i> Organization of classes Setting learning goals Homework check	II	Oral interview on the topic	Methodical works for students, album	1% 2% 25%
<b>2</b>	<i>The main stage</i> Conducting a practical lesson	III	Herbariums of medicinal plants, LRS, reagents		50%
<b>3</b>	<i>The final stage</i> Testing and	II- III	Herbariums	Methodical	5%

assessment of practical skills		of medicinal plants, LRS, reagents	works for students, album	
Checking the final level of knowledge	II- III		Tests and situational tasks	15%
Providing homework with a reference to the literature				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. Dandelion root contains iridoids. For qualitative detection of this group of BAS is used

- A. Stahl's reagent
- B. Dragendorff's reagent
- B. Mueller's reagent
- G. Wagner's reagent
- D. Bouchard's reagent

2. To determine the composition of biologically active substances to the infusion of viburnum bark was added Trim-Hill reagent (a mixture of acetic, concentrated hydrochloric acid and 0.2% aqueous solution of copper sulfate). Ras-product acquired a blue color, and then formed a purple precipitate, which indicates the presence of raw materials:

- A. iridoids
- B. flavonoids
- In pectin
- G. tannins
- D. coumarins

3. The quality of medicinal raw materials due to little study is checked organoleptically - on the basis of bitterness. The presence of bitterness indicates the presence of LRS:

- A. iridoids
- B. tannins
- V. coumarins
- G. flavonoids
- D. chromonov

4. The quality of LRS containing

- A. iridoids
- B. chromones
- B. simple phenols
- G. anthracene derivatives
- D. lipids

5. What LRS is used as a classic bitter remedy used in indigestion, accompanied by achilles, loss of appetite and dyspeptic symptoms, as a choleric:

- A. dandelion root
- B. valerian root
- B. burdock root
- G. ginseng root
- D. the root of the Manchurian aralia

6. The leaves of which plants are used to obtain an extract in order to prepare a complex bitter tincture, as well as for the manufacture of fees: Appetizing, choleric and sedative.

- A. leaf of water shamrock (leaf of trifoli)
- B. mother-and-stepmother's letter
- B. nettle leaf
- G. primrose leaf

D. foxglove leaf

7. From the root of which plants produce a thick extract used as a bitter to enhance the secretion of the digestive glands:

A. dandelion root

B. male fern root

B. the root of the honeycomb

G. gentian root

D. burdock root

8. The collection of this LR is made during the flowering period. The smell of raw materials is characteristic, fragrant, the taste is very bitter and spicy. it

A. wormwood is bitter

B. nettle leaf

B. primrose leaf

G. plantain leaf

D. foxglove leaf

9. Name a plant that contains iridoids in the form of two bitter substances - ab-syntin and anabsintin

A. wormwood is bitter

B. parsnip fruit

B. dill fruit

G. gentian root

D. tansy flowers

10. Which of the following LR has a phytoncide effect. Water infusion and alcohol tincture of this LR are used to stimulate appetite and improve digestion:

A. wormwood is bitter

B. mother-and-stepmother

B. nettle

G. primrose medicinal

D. foxglove purple

**Question:**

1. Definition of "bitterness".
2. Latin and Russian names of raw materials that produce plants and families of all objects of the research topic.
3. Morphological characteristics of plants, their habitats (areas of cultivation), habitats.
4. Features of preparation, drying and storage of raw materials containing iridoids.
4. What is the defect of raw dandelion.
6. External signs of the studied types of medicinal plant raw materials.
7. What is the structure of the dandelion root in the cross section under a magnifying glass.
8. How to determine the end of drying dandelion root.
9. What microchemical reactions can prove the presence of spare nutrients in dandelion root.
10. Name the time and features of the procurement of raw materials watch three-leaf.
11. Is it possible to know the habitat of the plant by the microscopic structure of the leaves of the watch? How to do it.
12. On what diagnostic basis it is possible to define a shamrock water in the cut raw materials?
13. Why do shamrock leaves need to dry quickly?
14. What is the chemical composition of the raw materials of the three-leaf clover and dandelion?
15. Possible impurities to the goldenrod.
16. The main anatomical diagnostic features of the leaves of legumes and dandelion root.
17. Chemical composition, uses and medical use of medicinal plant raw materials containing iridoids.

**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 dandelion and to carry out the analysis of raw materials on AND (sections: external signs, microscopy).

1. To study the appearance of dandelion by herbarium sample (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.).

Write down the Latin and Russian names of the raw materials that produce plants and family.

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

scheme 2

ANALYSIS OF RAW MATERIALS "UNDERGROUND ORGANS" By external signs

- 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 conductive system (beam, beamless).
- Odor when scraping or wetting with water.
- Taste (in non-toxic objects).

3. Prepare a cross section of dandelion root. Draw a diagram of the rooting of the root under a magnifying glass. Examine the micropreparation at low and high magnification. Draw and mark diagnostic signs:

- Cells of a multirow stopper;
- Thin-walled parenchyma cells; filled with inulin (in the form of colorless lumps);
- The bark is permeated with intermittent concentric belts of milk vessels with dark brown content;
- Core rays one -, rarely two-row;
- Cambium cells;

- Vessels;

4. Note the compliance of the test sample of raw materials (by external signs, microscopy and histochemical reactions) to the requirements of GF XI.

**Task 2** Examine the legume and analyze the raw materials on AND, (sections: external signs and microscopy).

1. To study the appearance of a three-leaf watch on a herbarium sample (see scheme 1 above). Write down the Latin and Russian names of raw materials produced by plants and families.

2. Describe the appearance of the grass watch three-leaf on the example of a sample of raw materials according to scheme 3:

Scheme 3:

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).

-character of leaf arrangement (queues, opposite, whorled).

-leaf.

-location of flowers on the stem.

-flowers.

-fruits and seeds.

-sizes of stems, leaves, flowers.

-Color.

Record when rubbing.

-taste (in non-poisonous plants).

3. Prepare a micropreparation of watch leaves from the surface. Examine it at low and high magnification. Draw and mark the diagnostic signs of the letter:

- Cells of the upper epidermis are polygonal with straight walls, the lower - with slightly tortuous walls;
  - stomata on both sides of the sheet slightly protruding, surrounded by 4-7 cells of the epidermis;
  - Near the veins and near the stomata folds of the cuticle;
  - In the pulp of the leaf large air cavities (aerenchyma).
4. Note the compliance of the test sample of raw materials (by external signs, microscopy) to the requirements of GF-XI

**Task 3.** To study the yarrow is small, possible impurities of other species of this genus and to analyze raw materials for AND (sections: external signs).

1. To study the appearance of a small goldenrod and a possible impurity - a beautiful goldenrod by herbarium specimens (Scheme 1)

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

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

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

**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 is the fracture of the dandelion root (smooth, fibrous, rolling), which is noticeable in the cow under a magnifying glass?
2. What is the color of dandelion raw materials, the nature of the surface (smooth, rough, wrinkled)?
3. What is the reserve nutrient in the root of the dandelion; what microchemical reactions can prove it ??
4. In which part of the dandelion root are the milk vessels, the nature of their location?
5. What are the microchemical reactions to the contents of milk vessels; their results?
6. On what grounds can we determine the authenticity of the raw material of water shamrock?
7. Is it necessary to examine both surfaces of the leaf to determine the authenticity of the water shamrock in the micropreparation? Why?
8. Why spongy tissue of shamrock water has the character of an aerenchyma?
9. What is the color of the flowers of goldenrod umbrella? Does it matter for the definition of identity and good quality of raw materials?
10. How to determine the bitterness in medicinal raw materials?

**Tests:**

1. Microscopic analysis of raw materials in the drug revealed: essential oil glands and T-shaped hairs. For which of the following types of raw materials these features can serve as confirmation of authenticity:
  - A. leaves of wormwood
  - B. yarrow leaf
  - B. mint leaves
  - G. belladonna leaves
  - D. herbs mountain pepper

2. Herbal infusion containing iridoids significantly increases the rate of blood clotting, drugs have anti-inflammatory and bactericidal properties. The infusion and extract are used for internal, mainly uterine bleeding. Name this plant:

- A. yarrow herb
- B. grass cat yellow
- B. stinking basil grass
- G. horsetail grass
- D. grass and periwinkle leaves

3. Name the LRS containing iridoids, which is used to prepare appetizing and gastric fees, bitter tincture. A possible impurity to it is a yellow iris.

- A. rhizome of calamus
- B. rhizome with levzei roots
- B. rhizome podophila
- G. rhizome of the serpent
- D. rhizome of pansy

4. This is a perennial herb containing iridoids, has a short simple, rarely multi-headed rhizome, taproot. The flowers are bright yellow, all ligulate, with a tuft instead of a calyx, achenes with a fluffy fly.

- A. dandelion medicinal
- B. ephedra horsetail
- B. anise ordinary
- G. valerian medicinal
- D. spherophysis Solontsevo

5. Specify a plant that contains milk juice, blooms from spring to late autumn, grows like a weed. The root of this plant is harvested in autumn, when the root rosette begins to wither. The taste of the root is bitter, the smell is absent, co-contains the bitter substance taraxerol.

- A. dandelion medicinal
- B. dope is common
- B. calendula
- G. horsetail
- D. kendir Konoplyova

6. The leaves of which of these LR are used for the preparation of Tinctura amara, used in medical practice to improve appetite and stimulate digestion.

- A. three-leafed watch, or trifol
- B. ephedra horsetail
- B. linden heart-shaped
- G. male fern
- D. hawthorn blood red

7 What group of biologically active substances in yarrow, marsh marigold, three-leaf clover, wormwood, goldenrod umbrella:

- A. iridoids
- B. anthracene derivatives
- B. flavonoids
- G. alkaloids
- D. polysaccharides

8. Which of these LR contains two bitter substances - absinthe and Anab-syntin, the cleavage of which produces a derivative of azulene - chamazulene.

- A. wormwood is bitter
- B. mother-and-stepmother
- B. nettle
- G. primrose medicinal
- D. foxglove purple

## **8. Literature**

### **Basic literature**

**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.

**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:**

Essential oils. Analysis of essential oils. LR and LRS containing essential oils (monoterpenoids).Coriander, lemon balm, peppermint, sage, eucalyptus, valerian, juniper, cumin. - 4 years.

*Methodical recommendations were made by*  *associate professor Boyko IA*

(Signature)