

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

METHODOLOGICAL DEVELOPMENT

Course: "Pharmacognosy"

practical lesson for students on the topic:

**"Essential oils. LR and LRS containing essential oils (aromatic compounds).
Anise, fennel, thyme, thyme, oregano.**

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: "Essential oils. LR and LRS containing essential oils (aromatic compounds). Anise, fennel, thyme, thyme, oregano. - 4 years.

2. Relevance of the topic.

Essential oils are a mixture of fragrant volatile substances belonging to different classes of organic compounds, mainly terpenoids, less often aromatic and aliphatic compounds. The main parts of essential oils of the aromatic series are derivatives: isoprene - plants of the labiate family (thyme); phenylpropane - plants of the umbrella family (anise, fennel). They have a wide range of pharmacological action: anti-inflammatory, antiseptic, antispasmodic, expectorant and are used in medicine, food, perfume and cosmetics industry and other sectors of the economy. The knowledge and skills acquired in the study of this topic will be used by students to successfully master some sections of pharmaceutical chemistry, pharmacy and factory technology of drugs, pharmacology, pharmacotherapy, as well as in the practical activities of a pharmacist.

3. Objectives of the lesson:

3.1. General goals: to study medicinal plants, essential oils that contain aromatic compounds, and to master the methods of macro- and microscopic analysis of LRS of the research topic.

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. Latin and Russian names of LRS, producing plants and families of the studied objects.
2. Morphological characteristics of plants, their habitats (cultivation areas), places of growth.
3. External signs of the studied types of medicinal raw materials.

4. The main anatomical diagnostic features of aniseed, fennel, creeping and common thyme leaves, oregano leaves.
5. Chemical composition of the studied species of LRS, formulas of anethole, thymol, eugenol.
6. Ways of using raw materials and its medical application.

Based on theoretical knowledge of the topic:

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

- Recognize the external features of the plant (anise, fennel, creeping thyme, thyme, oregano) and distinguish them from possible to bag;
- Determine identity and good quality 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 2. Organic chemistry 3. Analytical chemistry	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. Physical and chemical properties of polysaccharides, glycosides, terpenoids, aromatic derivatives, heterocycles. Methods of acid-base titration (neutralization) and permanganatometry	Use a microscope, prepare surface preparations and cross-sections. Carry out qualitative reactions; purification of organic compounds. Work with analytical scales, measuring vessels, photoelectrocolorimeter, use methods of chromatography on paper and in a thin layer of sorbent.

2.	<p>The following disciplines:</p> <ol style="list-style-type: none"> 1. Physical and colloid chemistry 2. Pharmacy technology of drugs 3. Industrial technology of medicines 4. Clinical pharmacology 	<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: 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</p>	
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	<p>5. Pharmaceutical chemistry</p> <p>6. Organization and economics of pharmacy</p> <p>7. Management and marketing in pharmacy</p>	<p>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. International marketing.</p>	
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5. Topic content (text and thesis), graphological structure of the lesson.

(See the text of the lecture)

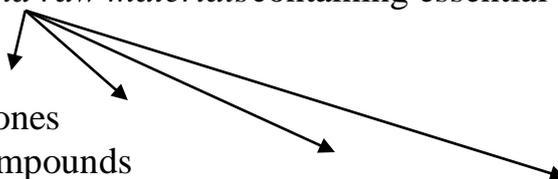
Medicinal plants and raw materials containing essential oils

LRS containing sesquiterpenoids

LRS containing sesquiterpene lactones

LRS containing aromatic compounds

LRS containing resins, balms and gums



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	<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%

2	<i>The main stage</i> Conducting practical lesson	a	III	Herbariums of medicinal plants, LRS, reagents		50%
3	<i>The final stage</i> Testing and assessment of practical skills		II- III	Herbariums of medicinal plants, LRS, reagents	Methodical works for students, album	5%
	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. A batch of medicinal plant raw materials of thyme has arrived at the pharmacy warehouse. According to which indicator in accordance with the requirements of the GF analysis for the content of active substances:

- A. Essential oils
- V. Flavonoids
- WITH.Extractives
- D. Coumarini
- E. Saponins

2. The main parts of essential oils of the aromatic series are derivatives:

- A. Isoprene and phenylpropane
- B. Azulene and proazulena
- S. Lacton
- D. Limonene and foam
- E. Geraniola

3. The fruits of which plants are raw materials for the preparation of expectorant and laxative drugs:

- A. Anise is ordinary
- B. Barberry
- C. Raspberry
- D. Lemongrass
- E. Mordovnik

4. What is the percentage of crystalline anethole in anise oil:

- AND. 80%
- B. 65%
- C. 30%
- E. 95%
- E. 20%

5. Raw materials for the production of galenic drug "Pertusin" are:

- A. Thyme
- B. Oregano
- C. Sage
- D. Dried marsh flower
- E. Plantain

6. Name the plant from the essential oil made "Dill Water" ::

- A. Fennel is common
- B. Anise is ordinary
- C. Thyme is puffy
- D. Coriander
- E. Basil

7. The infusion of which fruits is part of the "Anti-asthmatic mixture according to the recipe of Traskov":

- A. Anise is common
- B. Barberry is common
- C. Hawthorn
- D. Rosehip
- E. Richter's solyanka

8. At what drying temperature in the plant continues to determine the essential oils:

- A. 25 - 30° C
- B. 55 - 60° C
- C. 80 - 90° C
- D. 45 - 50° C
- E. 35 - 40° C

Question:

1. Latin and Russian names of LRS, which produce plants and families of the studied objects.
2. Morphological characteristics of plants, their habitats (cultivation areas), places of growth.
3. Rules of drying and storage of LRS.
4. External signs of the studied types of medicinal raw materials.
4. Measures for the protection and rational use of medicinal plants of the research topic.
5. The main anatomical diagnostic features of the fruits of anise, fennel, creeping and common thyme leaves, oregano leaves.
6. Chemical composition of the studied species of LRS, formulas of anethole, thymol, eugenol.
7. Ways of using raw materials and its medical application.

**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.**

**List of educational practical tasks to be performed during a practical
laboratory lesson:**

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

1. To study the appearance of anise ordinary on the herbarium sample (scheme №1).
Write the Latin and Russian names of raw materials that correspond to the plant and
family (give synonyms).

Scheme № 1

DETERMINATION OF WHICH STUDIES PLANTS BY EXTERNAL SIGNS

- Life form (herbaceous old plant, semi-shrub, shrub, tree).
- Type of underground organs (root, rhizome, bulbait, 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).
- 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, thorns, etc.).

2. Carry out macroscopic analysis of anise fruits on the example of a sample of raw
materials (scheme №2). Describe and sketch the appearance of the fetus.

Scheme № 2

RAW MATERIAL ANALYSIS FRUITS AND SEEDS "BY EXTERNAL SIGNS

- Commodity type of raw materials.
 - Fruit type (berry, box, perianth, drupe, achene, bean).
 - Fruit shape (spherical, oblong, crescent-shaped, etc.).
 - The nature of the surface (smooth, pitted, ribbed, wrinkled, shiny, matte, etc.).
 - The shape and structure of the amniotic sac (pericarp).
 - Number of seeds and seeds, their shape and structure, surface structure.
 - Color.
 - Dimensions (length, thickness).
 - Smell (when rubbing or scraping).
 - Taste (for non-toxic objects).
1. Prepare a cross section of the fruit. Draw a general diagram of its structure.
 2. Carry out a histochemical reaction for the presence of essential oil.
 3. Prepare a micropreparation of fruit powder. Examine it at low and high magnification.

Draw and mark diagnostic signs:

- hairs: unicellular, rare-cellular, thick-walled, coarse-grained, curved ;;
 - Essential oil tubules with thin transverse cells;
 - Endosperm cells with small drusen.
4. Note the compliance of the test sample of raw materials (for external signs and microscopy) the requirements of GF XI, Article 30.

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

1. Examine the appearance of fennel on the herbarium sample (scheme №1). Write down the Latin and Russian names of the raw materials that produce plants and families (give synonyms).

2. Carry out a comparative study of the appearance of fennel fruits and possible impurities-fruits of dill on samples of raw materials (see Scheme№2). Describe and sketch the appearance of fennel fruit.
3. Prepare a cross section of the fruit. Draw a general diagram of its structure. Examine the micropreparation at low and high magnification.

Draw and mark diagnostic signs:

- The cells of the epidermis are rectangular;
 - Essential oil tubules lined with a brown layer of secretory cells;
 - leading beams of collateral type, surrounded by cells with a reticular thickening;
 - endocarp fused with the seed coat;
 - endo sperm cells are polygonal, thick-walled, filled with aleurone, fatty oil and small chunks of calcium oxalate.
4. Note the compliance of the test sample of raw materials (on external grounds) the requirements of GFXI, Article 33.

Task 3. Examine creeping thyme and analyze raw materials on AND (sections: external signs, microscopy).

1. Examine the appearance of thyme creeping on a herbarium sample (see Scheme№1). Write the Latin and Russian names of raw materials that produce plants and families (give synonyms)
2. Conduct a macroscopic analysis of thyme herb on the example sample of raw materials and describe its appearance (scheme №3).

Scheme № 3

RAW MATERIAL ANALYSIS "HERBS "On external signs

- «Commodity type "of raw materials (unharvested, cut, threshed).
- Structure 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.
- 3apahprirozriranni.
- Taste (in non-toxic objects).

3. Prepare a micropreparation of the leaf from the surface and study it at low and high magnification (scheme №4).

Scheme № 4

MICROSCOPIC ANALYSIS OF RAW MATERIALS

- Structure (dorsoventral, isolateral).
- Mesophile (nature of palisade and spongy tissues) ..
- Inclusions are crystalline (single crystals, crystal-bearing cover, friends, Rafida, crystalline sand, cystolites); secretory containers, milk vessels, canals) ..
- Epidermis of the upper and lower sides of the sheet (shape and contour of cells: isodiametric, straight-walled, tortuous; stomatal type: diatytic, parasitic, anisocytic, anomonite; number and location near the stomatal cells.
- Trichomes type: hairs, glands ..
- Cuticle: thin, thick, straight, folded, "warty".

Draw and mark diagnostic signs:

- Cells of the epidermis with tortuous walls, places with clearly visible thickening of the cell walls;
- Numerous stomata;
- hairs: bristly-simple multicellular with thickened walls and coarse-warty cuticle; unicellular papillary; capitate-on a unicellular stalk with a pear-shaped head;
- essential oil alozki, built on the type of yasnotkovyh.

4. To note conformity of the investigated sample of raw materials (on external signs and microscopy) to requirements of AND.

Task 4. Examine thyme and analyze the raw materials on AND (sections: external signs, microscopy).

1. Examine the appearance of thyme on a herbarium sample (see Scheme№1). Write down the Latin and Russian names of the raw materials that produce plants and families ..
2. Conduct a macroscopic analysis of thyme herb ordinary example of raw material sample and describe its appearance (see Scheme№3). Draw the appearance of the letter.
3. Prepare a micropreparation of the leaf from the surface and study it at low and high magnification (see Scheme№4).

Draw and mark diagnostic signs:

- The cells of the epidermis are tortuous;
 - Breathes (structure and location by type of yasnotkovyh);
 - Essential oil glands, built on the type of yasnotkovyh;
 - hairs: cranked bend unicellular with warty cuticle; papillary.
4. Note the compliance of the test sample of raw materials (on external signs and microscopy) requirements of AND.

Task 5. Examine the oregano and analyze the raw materialson AND (section: external signs).

1. Examine the oregano on the herbarium sample (scheme №1). Write down the Latin and Russian names of the raw materials that produce plants and families ..
2. Conduct a macroscopic analysis of oregano on the example of a sample of raw materials and describe its appearance (scheme №3) ..
1. Note the compliance of the test sample of raw materials (on external grounds) the requirements of GFXI, Article 55.

Instructional materials for mastering professional skills, skills:

Methods of work, stages of implementation ::

- a) get the necessary LRS
- b) to study and describe the appearance of the obtained LRS, 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 name of the fruit of plants of the umbrella family?
2. What are the external signs of fennel fruit?
3. Where is the essential oil localized in the fruits of plants of the umbrella family?
4. What are the common microscopic signs of the fruits of fennel, anise, coriander?
5. What raw materials are used in oregano?
6. On what microscopic signs mint and oregano leaves differ?
7. What are the external signs of thyme herb differs from thyme herb; why is there a great need for their differences?
8. What is the difference between hairs and thyme leaves in micropreparations?
9. Do the fruits of anise and fennel differ in the number and size of essential oil tubules?
10. What are the "cells with a reticular thickening" in the fruits of fennel; where are they located?
11. What is the significance of essential oils for plants?
12. List the methods of obtaining essential oils from plants.
13. Describe the method of obtaining essential oils by steam distillation.
14. What reagent can be used to detect essential oils in medicinal plants?

15. What are the features of drying raw materials containing essential oils?
16. Draw the structure of the fruit of anise and indicate its diagnostic features (cross section under a microscope)
17. Draw the structure of the fruit of fennel (cross section under a microscope) and indicate its diagnostic signs.
18. Name the possible impurities in the fruits of anise and fennel and indicate their distinctive features.
19. How to store anise and fennel in a pharmacy and in a warehouse?
20. What is the chemical composition of raw materials and essential oil of anise and fennel?
21. Describe the appearance of raw oregano
22. What is the chemical composition of raw oregano and where it is used?
23. Name the life form of thyme and thyme and indicate the external signs of raw materials.
24. On what morphological grounds can be distinguished raw thyme from thyme?
25. What is the chemical composition of raw materials and oils of thyme and thyme?
26. What are the ways to use medicinal plant raw materials, whose essential oils contain compounds of the romantic series?

Tests:

1. Alcohol extract of which medicinal plant is an integral part of the drug "Gastrovitol", used in gastroenterological practice:
 - A. Oregano is common
 - B. Astragalus woolly
 - S. St. John's wort perforated
 - D. Horsetail
 - E. Wormwood is bitter

2. The pharmacy prepared the herb oregano. Which drying mode should be used to obtain raw materials that meet the requirements of GFHI:

A. 35-400 C

B. 80-900 C

Pp. 20-250 p

D. 50-600 C

E. 70-800 C

3. For preparation of the galenic preparation "Pertusin" possessing expectorant action use an extract of a grass:

A. *Thymus serpyllum*

B. *Bursae pastoris*

C. *Hyperici*

D. Diffuse erythema

E. *Polygoni avicularis*

4. The extract of which of these plants is part of the drug "Urolesan", which has antispasmodic action in renal and gallstone diseases:

A. Oregano is common

B. Chamomile peeled

S. The herd is threefold

D. St. John's wort

E. Burkun medicinal

5. During the commodity analysis of medicinal plant raw materials it was found that it consists of a branched stem, alternate leaves, cut into narrow linear lobes, small, yellow flowers, collected in complex umbrellas; fruit type umbrella-vysloplodnik. It is concluded that this LRS:

A. *Foeniculum vulgare*

B. *Herba Senecionis*

- C. *Ephedra equisetina*
- D. *Ammi visnaga*
- E. *Anethum graveolens*

6. The main active properties of oregano are thymol and carvacrol. To which class of biologically active substances do they belong:

- A. Essential oils
- B. Flavonoids
- C. Alkaloids
- D. Iridoids
- E. Xanthoni

7. Which medicinal plant of the family Apiaceae contains essential oil, which includes anethole:

- A. *Pimpinella anisum*
- B. *Coriandrum sativum*
- C. *Auethum graveoleus*
- D. *Allium sativum*
- E. *Allium sulfur*

8. At the microscopic analysis of raw materials in a preparation are found: cells of the lower epidermis with tortuous walls, numerous pores, the porous device of diacite type, hairs simple, coarse-warty; 1 5 cellular; head with an oval unicellular head on a unicellular stalk. Essential oil glands are built on the type of labiate. For which of the following types of raw materials these properties can serve as confirmation of authenticity:

- A. Oregano herb
- B. Thyme herb ordinary
- C. Creeping thyme herb
- D. Sage leaf

E. Peppermint leaves

9. Specify medicinal plant raw materials, the fruits of which contain up to 6% of essential oil, the main components of which are anethole (80-90%), methylhavicol; in addition, it contains up to 28% fatty oil. In medical practice, fruits are used and oil is used as an expectorant; with flatulence in the form of infusion, is part of the gastric, choloretic and invading fees:

A. Fennel is ordinary

V. Dill garden

S. Juniper ordinary

D. Carrot wild

E. Sophora is Japanese

10. Specify the timing of procurement of raw fennel:

A. During fruiting

B. During the movement.

C. During flowering.

D. During November

E. During rest

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:

"Triterpenoids. Steroids. Saponins. General characteristics. Methods of qualitative and quantitative determination. LR and raw materials containing triterpenoids and triterpene saponins. Types of licorice, bitter chestnut, horsetail, orthosiphon stamen, ginseng, Manchurian aralia, woolly astragalus »

Methodical recommendations were made by  *associate professor Boyko IA*

(Signature)