Odessa National Medical University

Department of General and Clinical Pharmacology and Pharmacognosy

methodological developments
workshops
for full-time department faculty

Discipline: "Resursovedenie medicinal plants"

Session № 6 "**Accounting for medicinal plant resources, the principles of rational use and protection**. Methods for determining the RL resources. Methods for determining the yield LR: to test the accounting portions of the projective coating on model instances. Calculation of biological, operational reserves and volumes of possible annual herbal drug preparations. Development of rational harvesting LR recommendations"

Course 3 Faculty medico-pharmaceutical

approved by
in the methodical meeting of the Department
August 28, 2025
Protocol № 1
Head. Department of

_____ prof.Rozhkovsky YV

Odessa 2025

Subject of practical lesson № 6: Resursovedenie medicinal plants "
Session № 6 "**Accounting for medicinal plant resources, the principles of their management and protection.**Methods for determining the RL resources. Methods for determining the yield LR: on the trial count units at proektivnymu coating on model instances. Calculation of biological, operational reserves and volumes of possible annual herbal drug preparations. Development of rational harvesting LR recommendations (4 hrs.)

1. Background. The main objectives of the study is to define the resource inventory density native RL and reserves calculations and possible volume preform RL. The general procedure of accounting HR resources are designed for a long time (1966), and the last time it has undergone significant changes. Special attention being given to the rational use of resources, which is why proposed to calculate the value of the operational reserve of raw materials under the new formula. In recent years Ukraine has become a very significant reduction in the carrying out of the field directly resursovedcheskih works spending, but keep in mind that the correct choice of method and compliance with recommendations on accounting depends on the correctness of the expected results, so the treatment of students of this technique at specific sites is very important.

2. Purpose of the activity:

- elect the method of determining resources RL and a method for determining yields;
- possess method of statistical material processing determine the field RL and yields of raw materials inventory calculations;
- to formulate recommendations for the rational exploitation of natural resources, the main raw LR.

2.1. Learning Objectives:

-know (The level of assimilation of Bespal'ko -II):

1. Summary of operating instructions for determining the RL resource
2. The names of the respective RL and methods for determining their yields.
3. Virus propagation, breeding, ecological conditions of existence of the main kinds of raw LR
4. Contemporary requirements for the organization of a rational exploitation of the natural resources of the Republic of Lithuania
5. Formula for the calculation of biological and operational stocks of HR resources.

- to be able (Mastering level -III):

1. Select shuttle moves to determine the yield of specific LR in specific conditions.
2. Select the best ways to determine the yield for a particular LR in specific communities.
3. Carry out statistical processing data and calculations yield RL: biological, operational margin and volume RL possible annual operation.

4. Using lookup tables with information about the output of dry raw material, the order of the exploitation of natural thickets of specific species.

5. Compile the calculated ratio of the table of cover and the corresponding yield of certain types of raw materials and the Republic of Lithuania to use the existing tables.

2.2. Educational goals:

-sposobstvovat formation of ecological outlook and liability for future pharmacists the use of natural resources, the RL.

3. Interdisciplinary integration:

number pp	**discipline**	**Know**	**be able to**
one.	**previous** Medical botany	Phase of development, the environmental conditions of growth of medicinal plants;	To assess the current conditions of growth of specific types of LR
2.	pharmacognosy	The effect of various factors on the contents of the main storage and a bar RL	Choosing optimum blank areas and periods native RL
3.	Intra integration (the topic of this discipline, which integrates that which is studied) ...	Resursovedenie as science and academic discipline. The raw material base of medicinal plants in Ukraine. The use of herbal medicines in the Republic of Lithuania and the modern world medical practice. Accounting for medicinal plant resources, the principles of their management and protection. Cultivation of Latvia in Ukraine and the world.	develop: on the harvesting instructions, drying and storage of raw wild higher plants, algae, lichens and fungi, newsletters; make reports for doctors and advise the public on matters related to the harvesting and use of raw materials and products of natural origin.

4. Content of the topic

The theoretical material topics outlined in the text of the lecture number 4, and the following sources of information:

1. Heinrich M., Barnes J., Prieto-Garcia J., Gibbons S., Williamson E. M. Fundamentals of Pharmacognosy and Phytotherapy. 3rd ed. Elsevier, 2023. 282 p.
2. Medicinal Plant Resources : textbook / V. M. Minarchenko et al. Kyiv : Palyvoda A. V., 2019. 128 p.
3. Bioprospecting of Ethnomedicinal Plant Resources: Sustainable Utilization and Restoration / ed. by G. Shukla et al. CRC Press, 2024. 466 p.
4. Medicinal Plants: Bioprospecting and Pharmacognosy / ed. by A. B. Sharangi, K. V. Peter. Apple Academic Press, 2022. 602 p.
5. Van Wyk B. E., Wink M. Medicinal Plants of the World. 2nd ed. CABI, 2017.

5. Plan and organizational structure of classes

number	The basic stages of employment, their functions and content	Ouch. goals in development levels	training and controls	Methodological materials. ensuring and the control of knowledge	duration min., or %
one.	**Preparatory stage** Organizational measures. The wording of the objectives. Checking homework	II		Methodological developments; test items	1 minute. 2 minutes. 7 min.
2.	**The main stage.** *Location* - training room. Carrying out practical work	II-III	Maps, slides, herbaria, background and scientific literature	Methodical development - "Resursoznavstvo medicinal plants. Laboratory Journal "	130 min.
3.	**The final stage.** Location - training room. Check final level of knowledge. Inspection and assessment of practical skills. Checking and signing of the protocols in the laboratory journal. Scoring knowledge. Summing up the	II-III II-III			15 minutes. 10 min. 10 min. 5 minutes.

	lessons and homework wording.				

6. Materials of methodical maintenance of employment.

6.1. control materials for the preparatory phase of exercises

Test questions:

1. The main objectives of the study of natural resources of medicinal plant raw materials.
2. Methods for determining the RL resource
3. What is the sampling method for the determination of resources?
4. The main objectives of the expedition stage resursovedcheskih research
5. How to determine the area of a large array of natural vegetation? Area specific thicket?
6. Define the concepts: productivity (stock density), the stock of raw materials.
7. What kind of data are processed in the office period resursovedcheskih research?
8. The concept of biological and operational stocks of raw materials.

tests:

1. Life forms of the Republic of Lithuania is determined on the basis of:
A membership in a particular phytocenoses
B. Plant height
B. Breeding Method
G. Distribution Method
D. The life expectancy and level of the woodiness aboveground

2. Which form of life belongs to the St. John's wort?
A herbaceous perennials
B. Annual
B. biannual plant
G. Wood
D. Bush

3. What kind of life form has Rosa Canina?
A Tree
B. Bush
B. Semishrub
G. herbaceous perennials
D. Annual

4. The area of the projection of the aerial part of the plant to the ground is called

A. Tier
B. Yield
B. The projected coverage
G. Performance
The abundance of D.

5. Calculations error determination carried average yield
A. Before the beginning of field works
B. During expeditionary field work
B. Upon completion of the field works
G. The office period resursovedcheskih research
D. is not carried out at all

6. The greatest recovery period needed LR, in which raw materials are collected
A. Completely whole plant
B. Grass
V. Flowers
G. Leaves
D. Underground parts

7. The basic document provided to the customer at the end of the work is resursoznavskih
A. Information on the operational reserves the RL and the possible volumes of their annual blanks
B. Information on the operational reserves RL
B. Information on the possible scope of the annual herbal drug preparations
G. Inventory list LR thickets
D. Conclusion on the presence or absence of the raw material base of wild LR

8. The maximum duration of use of the results of evaluation of resources of wild herbal drugs
A. 2 years
B. 3 years
B. 5-7 years
G. 10 years
D. 20 years

6.2. Materials of methodical maintenance of the main phase of occupation

Methods of operation, performing the steps of:

A) Specification of terms: transects; Trial account platform; model instance; age of commercial plants; shrinkage ratio of raw materials; % Yield of dry material; possible annual volume preform; periodicity preform; the period of recovery of the population (the completion of its own glossary of terms students). To emphasize the difference between the speed of recovery and thickets periodicity raw preform (!);

B) Introducing to the specific timber and meadow thickets plants (lily of the valley, elecampane high) via circuits - the plates, determining the specific area considering bush circuit scale (in Scheme 1 cm = 1 m thickets)

B) Selection of the direction of block moves (MH intervals) to determine the yield of each plant species, "Bookmarks" sample plots of 1 m2

D) Selection of a method for determining yield of lily of the valley (1 Universal: from the ground and the weighing feed with trial plots on 1 m2 of the projective cover 2). Retabulating results determine the mass of each raw material in two ways. To determine the mass of raw material to assume that 1 plant lily of the valley, indicated on a plate below, it has 1g fresh weight.

D) Determination of the basic formulas for the calculations (in the lab book entries).

E) Calculation: average mass per unit area (yield) of the operating stock raw materials (K considering shrinkage raw lily, which is found in the look-up tables - 0.2)

F) Selection a method for determining yield elecampane high (on model instances). Retabulating results determine the number of copies of Elecampane of gradations (small, medium, large) count units within the segments 2 turn route

C) Calculations: average weight of roots and rhizomes elecampane per unit area (for converting the number of copies in the mass per unit area, i.e. the yield - assume a raw mass with small plants - to 50 g, the average -60-100 g, large -110- 150 g); operating raw stock (subject K shrinkage raw elecampane, which is found in the look-up tables - 0.30).

Ii) homework: hold definition yields: strawberry timber as well as the lily of the valley - both methods fill tables (initial data for of calculations: one point on the tablet is 1 specimen weighing 0.5 g wet weight, as well as Rosa Canina same as elecampane high - from specimens within 4 stroke route segments (original data for calculations: mass fruit per small bush - up to 100 g, the average -100-300 g, large - 310-500 g) Fill the table..

A list of recommended sites for the study:

Rosa Canina, fruit; strawberry timber, leaves; lily of the valley, the leaves; plantain leaves; dandelion roots; elfwort, rhizomes and roots.

List of educational and practical tasks to be carried out during the practical sessions:

Exercise 1. Using the recommended educational literature conclude own vocabulary of terms (concepts) of the subject (Table fill. 6)

Table 16.

Accounting resources of wild herbal drugs

The term (concept)	Definition (content)
one	2

Task 2. Determine area LR bush (lily of the valley; Elecampane) in specific plant communities to select a method of accounting for the yields of raw materials of each kind, the direction of block moves. Set width transects laying credentials sample plots of 1 m2.

Task 3. Perform calculations conditioned feedstock at each site within the allocated transect. Results - recorded in the Table. 17, 18, 19.

Conditional weight values 1 lily plant (dash 1) weighing 1 g of the roots and rhizomes elecampane with one malenkogorasteniya - 50 g, average -60-100 g, large - 110-150 g

Task 4. Preview of the method of statistical processing to determine the yield of native RL data written formula for determining the average data.

The formula for calculating the average yield:

$M \pm m = M \pm \sqrt{\Sigma}$ (M-xi n (n-1)) 2 where M - sr.arifm;. m is the deviation Wed; xi - each weight value from the site; n - the number of pledged land.

Task 5. Determine the raw material yield by lily of the valley count units. The results are recorded in the Table. 17.

Task 6. Determine the yield of the raw material on lily proektivnymu coating. The results are recorded in the Table. 18. Compare the own raw data LR yield by the method of cover 20. The reference table data to draw conclusions.

Task 7. Determine the yield of raw materials elecampane model instances. The results are recorded in the Table. nineteen.

Task 8. Become familiar with formulas and calculate biological, operational stocks of raw materials each LR at the respective sites, using the data obtained from the yield. The calculation results are recorded in the appropriate table (17-19).

To determine the shrinkage ratio RL use reference literature data (Rozhkovsky YV, Derevinskaya TI, Shevchenko IM, Fizor NS resursovedeniyu medicinal plants Ucheb.pos - Odessa:.. 2012. ONMedU C. 64-66) and the reference data on a thematic stand.

Task 9 (homemade). Carry out the definition of productivity:

a) forest strawberries - (as well as the lilies of the valley - both ways), fill in the table 21, 22.

Baseline data for calculations: one point on the tablet is 1 specimen weighing 0.5 g wet weight;

b) Rosa Canina - (like high and inula - with at instances) within the route segments 4 move to fill Table. 23. Baseline data for calculations: mass fruit per small bush - up to 100 g, the average -100-300 g, large -310-500 g).

6.3. Materials control the final phase of occupation

Questions for self-control:

1. What are some ways you can define the specific area of thickets LR?
2. What is the density of the stock LSR?
3. What methods of determining the density of the stock of wild medicinal plant raw materials?
4. Characterize versatile method for determining the stock density.
5. How can we determine the productivity of trees and shrubs?
6. How can I improve the accuracy of determining the yield, if it turned out to be insufficient?
7. What are the criteria chosen model instances.
8. Which plants is possible to determine raw stock density estimated coverage?
9. By what formula expect operating margin LR raw materials?
10. How is the rate of shrinkage of raw materials?
11. What is the rate (period) LR recovery?
12. As in the experiment to determine the rate of recovery coenopopulations LR?
13. What documents must be submitted to the customer at the end of resursovedcheskih work?
14. Explain the content requirements for the rational exploitation of the natural resources of the Republic of Lithuania.
15. Give examples introduction saving technologies in the pharmaceutical industry.

Tests and situational tasks:

1. Yields native raw grassy LR determined at

A. Trial count units of 1 m2
B. Trial area of 100 m2
B. transects
G. trial account sections 100 m2
D. The entire area is overgrown

2. A universal method for determining the yield RL is the method of

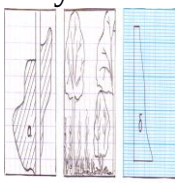
A. In the eyes
B. projective cover
V. with copies
G. from branches
D. trial count units by collecting and weighing the raw commodity

3. The usual method of determining the productivity of wild RL trees and shrubs

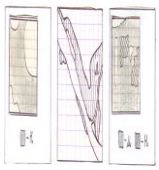
A. According to the degree of closeness CZK
BS copies (branches)
B. In the eyes
G. On test areas of 1 m2
D. On projective cover

4. The density of the stock, which can be studied by LR proektivnymu coating:
A. Lipa
B. Yarrow
The Rosehip
G. Lingonberry
Violet D. Field

5. In the scheme depicted arbitrarily overgrown lily of the valley (a) in one of the forestry. Select the optimum direction of travel route and its width to determine the density of the stock LSR of this plant.



6. Determine the projective cover periwinkle (k) within a square grid using a reduced schematic view.
A: 66-67%



7. Determination of periodicity preform RL is performed on the basis of data on
A. operational stocks of raw LR
B. Productivity RL
B. Ecological tsenotichnu HR affiliation
G. The prevalence of HR in the region
D. Recovery speed after coenopopulations drawn preform RL

8. The period of recovery thickets of Latvia, in which the RL are rhizomes, can be set according to age, which corresponds to most commodity plants, namely
A. Altitude above-ground shoots
B. The annual "rings" on the rhizome
V. The amounts of flowering shoots
The number of plants that bear fruit
D. The amounts of flowering plants

9. In what volume (t / year) are possible annual preform rosehips, if its industrial raw stock in the region of 500 m
A. 500
B. 250
B. 100
G. 50

D. 25

10. How often have to recommend harvesting grass lily of the valley in the Odessa region, if the period of recovery tcenopopuljatcij this species is 3-4 years?

A. Every year,

B. After 1 year

B. Every 3 years

G. Every 4 years

D. Every 5 years

11. For the manufacture of many sedating drugs used as cultivated or wild-growing raw valerian. Density wild stocks of raw materials is determined valerian

A geodetic methods

B. Method of model instances

B. Method of accounting dilnok

G. On projective cover

D. On Eye

12. Grass succession, which in the packaged form implement population grown in plantations and harvested in nature. When determining raw material reserves of this type of method is used

A. with copies

B. projective cover

B. Count Units

G. On Eye

D. Any of the above

13. motherwort herb native part of the domestic plant-hypotensive drugs sedative action. The preform of this raw material should be conducted

A. 1 time in 10 years

B. 1 time in 5 years, in response to a reference base of the CRIC-2

B.1 time in 3 years

G. 1 every 2 years (!) - the right answer

D. Every year

Explanation: view perennial, has no clear eco-coenotic confinement well able to form seeds and rhizomes multiplies.

14. Pharmacist points: the name of raw materials, mass, area of the workpiece, the workpiece date. This process is called:

A. LSR Billet

B. LSR Sort

B. Standardization of herbal drugs

G. Labeling RL

D. Packaging RL

15. Choose the best method of determining the density of raw material stocks - kornevisch Potentilla:

A. In the eyes

B. At the trial count units

B. By proektivnymu coating

G. The method of model instances

D. According to satellite imagery

16. Preparations adonis - cardiac popular herbal remedies. Determination of raw material stocks was carried out by Spring Adonis

A count units - the benchmark in response to the base of the CRIC-2

B. with copies

B. projective cover

G. geodesic

D. On Eye

An explanation that view is now harvested in nature and the study of its performance holds our department, using the combined method of model instances: projective cover.

17. It is necessary to determine the amounts of raw blanks coil (Polygonum snake). It should take into account the recommended rational frequency blanks of this type:

A. Every year,

B. 1 time in 2 years

B. 1 time in 5 years

G. 1 time in 7 years

D. 1 time in 20 years

18. Stocks raw underground organs wild LR determined by:

A count units

B projective cover

The model copies

D on the eye

A geodesic

19. In order to determine the stocks of wild LR two values need to know - the area of thickets and its yield. Yields herb thyme is determined by:

A method geodetic

B method of accounting areas

The eye

D modeling method copies

A method of coating a projective

20. Calculate the biological raw stock watch trifoliate 2 ha with a yield of freshly feedstock 20 g / m2.

Answer: 400 kg.

21. Calculate industrial raw stock watch trifoliate area of 0.8 m if its average density reserve here is 30.0 ± 1.0 g / m2. What the figure for the calculations missing?

Answer: 232 kg, or 232 × K shrinkage enough to the shrinkage, because the operating margin is calculated in units of weight of dry material.

22. The frequency of harvesting of medicinal plant raw materials of the above can be set at the average age of trade plants: a) marjoram; b) leaves mother and stepmother; c) rhizomes driopterisa male; d) d rosehips) grass field violet; e) The flax seed; g) The rhizomes of Rhodiola rosea?

Answer: c) and g).

23. When determining the yield of grass Oregano field within coenopopulations 10 standard accounting areas was laid. After statistical processing of the data obtained by such a result the average yield: 23,0 ± 7,0 (g / m2). Explain, you can use this result to further calculations cameral raw material stocks?

The answer is no because average yields determined with less certainty than prescribed procedure and is ± 30%.

6. 7. Literature Basic literature

7. Фармакогностичне ресурсознавство з основами інтродукції лікарських рослин / Навчальний посібник. – Полтава: ПДМУ, 2021.
8. Державна Фармакопея України : в 3 т. / ДП «Український науковий фармакопейний центр якості лікарських засобів». 2-е вид. Харків : Науковий фармакопейний центр, 2015. Т. 1. 1128 с.
9. Ресурсознавство лікарських рослин: Практикум / Тржецинський С. Д. та ін. – Запоріжжя: ЗДМУ, 2021.
10. Фармакогнозія: підручник для студентів фармацевтичних факультетів / Посилкіна О. В. та ін. – Харків: НФаУ, 2015–2018 (розділи, присвячені сировинній базі).
11. Тржецинський С. Д., Доля В. С., Денисенко О. М. Ресурсознавство лікарських рослин : навч.-метод. посіб. Запоріжжя : ЗДМУ, 2015. 115 с.
12. Грицик А. Р., Водославський В. М., Мельник М. В. Фармакогнозія. Ресурсознавство лікарських рослин : навч. посіб. Івано-Франківськ : ПП Голіней О. М., 2019. 248 с.
13. Зузук Б. М. Ресурсознавство лікарських рослин : навч. посіб. для студ. вищ. фармац. навч. закл. Вінниця : Нова Книга, 2015. 232 с.
14. Heinrich M., Barnes J., Prieto-Garcia J., Gibbons S., Williamson E. M. Fundamentals of Pharmacognosy and Phytotherapy. 3rd ed. Elsevier, 2023. 282 p.
15. Medicinal Plant Resources : textbook / V. M. Minarchenko et al. Kyiv : Palyvoda A. V., 2019. 128 p.

16. Bioprospecting of Ethnomedicinal Plant Resources: Sustainable Utilization and Restoration / ed. by G. Shukla et al. CRC Press, 2024. 466 p.
17. Medicinal Plants: Bioprospecting and Pharmacognosy / ed. by A. B. Sharangi, K. V. Peter. Apple Academic Press, 2022. 602 p.
18. Van Wyk B. E., Wink M. Medicinal Plants of the World. 2nd ed. CABI, 2017.

Additional literature:

19. Лікарські рослини: Рекомендаційний список літератури (актуальні видання 2024 року) / Уманський НУС.
20. Малопоширені ароматичні види лікарських рослин / Наукове видання. – Берегове: ЗУІ ім. Ф. Ракоці ІІ, 2025.
21. Лабораторний журнал з ресурсознавства лікарських рослин : [посібник] / В. М. Мінарченко та ін. Київ : Паливода А. В., 2018. 94 с.
22. Фармакогнозія : підручник для студ. вищ. навч. закл. / В. С. Кисличенко та ін. ; за ред. В. С. Кисличенко. Харків : НФаУ : Золоті сторінки, 2015. 736 с.
23. Державна Фармакопея України : в 3 т. / ДП «Український науковий фармакопейний центр якості лікарських засобів». 2-е вид. Харків : Науковий фармакопейний центр, 2015. Т. 1. 1128 с.
520 p.

electronic resources

24. Medicinal Plant Names Services (MPNS) Resource. Kew Royal Botanic Gardens. URL: kew.org (дата звернення: 22.03.2026).
25. Ресурсознавство лікарських рослин : презентація лекції. Нац. фармац. ун-т. URL: https://cnc.nuph.edu.ua/wp-content/uploads/2023/09/prezentatsiia_resursoznavstvo-lr.pdf (дата звернення: 22.03.2026).

9.Tema following classes: Accounting for medicinal plant resources, the principles of their management and protection. Resource group LR Ukraine. The principles of the protection of wild LR. LR Green and Red Book of Ukraine, the Red List of the International Union for Conservation of Nature. (4 hrs.)

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