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**MINISTRY OF HEALTH OF UKRAINE
NATIONAL UNIVERSITY OF PHARMACY
Faculty of Pharmacy
Department of Pharmacognosy and Nutriciology**

INDUSTRIAL PHARMACEUTICAL PRACTICE IN PHARMACOGNOSY

**WORK PROGRAM
of educational component**

training for _____ **the second (master's) level** _____
(Higher Educational Level Name)
specialty _____ **«226 Pharmacy, Industrial Pharmacy»** _____
(Code and Specialty Name)
knowledge industry _____ **«22 Healthcare»** _____
(Code and Knowledge Field Name)
of educational program _____ **«Pharmacy»** _____
(Educational Program Name)

Kharkiv-2023

The work program of the educational component " Industrial pharmaceutical practice in pharmacognosy" in specialty 226 «Pharmacy, Industrial pharmacy» educational program «Pharmacy» (4.10д)*англ for applicants for higher education 5 year of study.

EDUCATIONAL COURSE TEAM:

KYSLYCHENKO Viktoriia, head of the Department of Pharmacognosy and Nutriciology, doctor of pharmaceutical sciences, professor; KRIVORUCHKO Olena, professor of the higher education institution of the Department of Pharmacognosy and Nutriciology of the National University of Pharmacy, Doctor of Pharmacy. Sciences, professor; NOVOSEL Olena, associate professor of the institution of higher education of the Department of Pharmacognosy and Nutriciology of the National University of Pharmacy, candidate of pharmacology. Science, associate professor; POPYK Andrii associate professor of the institution of higher education of the Department of Pharmacognosy and Nutriciology of the National University of Pharmacy, candidate of pharmacology. Science, associate professor.

Work program were reviewed at the Department of Pharmacognosy and Nutriciology meeting

Record from « 1 » of September 2023 № 1

Head of the Department  Prof. Viktoriia KYSLYCHENKO

Work program has been approved at the meeting of the Methodical Commission of chemical disciplines session

Record from « 5 » of September 2023 № 1

Head of the Specialized Committee  Prof. Viktoriya GEORGIYANTS

1. Description of the educational component

Language of instruction: *English*

Status of the component: *selective*

Prerequisites for studying the educational component:

- a) is based on the knowledge gained by higher education students in the study of pharmacognosy;
- b) lays the foundations for higher education students to study pharmacognostic bases of phytotherapy, standardization of medicines, which involves the integration of teaching with these educational components and the development of skills to apply knowledge of pharmacognosy with the basics of resource science in the process of further education and professional activity.

The subject of study of the educational component «Industrial pharmaceutical practice in pharmacognosy» is medicinal plant raw materials, less often - objects of animal origin as sources of medicinal raw materials; it includes the study of data on the procurement, storage and processing of medicinal plants and medicinal products used in pharmaceutical practice, care of cultivated medicinal plants, as well as the identification of wild medicinal plants, taking into account the rational use, protection and reproduction of medicinal plant resources.

Information volume of the educational component. The educational component is allocated 90 hours 3 ECTS credits.

2. Objectives and tasks of the educational component

The purpose of teaching the educational component «Industrial pharmaceutical practice in pharmacognosy» is to teach higher education students to identify the medicinal products and morphologically similar species, to prepare the medicinal products, to carry out primary processing, drying, commodity analysis of medicinal products, which is necessary in the practical activities of a pharmacist; to provide practical skills in cultivation of medicinal plants, detection of wild plants, familiarization with the methods of studying the reserves of medicinal plants and providing recommendations for the rational use of natural resources.

The main tasks of the educational component «Industrial pharmaceutical practice in pharmacognosy» are:

- to get acquainted with the history of the organization or enterprise on the basis of which the practical work is performed;
- identify medicinal plants and morphologically similar species in nature;
- to study the range of cultivated medicinal plants, methods of introduction and selection of individual crops, basic agrotechnical methods of cultivation of medicinal plants; to learn the principles of cultivation of medicinal plants based on good GACP practice;
- to study the organization of harvesting of forestry products using knowledge of the timing of harvesting, taking into account the vegetation phase of the plant, documentation on the acceptance of forestry products from harvesters, conditions for drying forestry products (in accordance with the physical and chemical properties of its biologically active substances) and storage of forestry products; to organize the harvesting of forestry products;
- to get acquainted with wild medicinal plants, which are a source for obtaining biologically active substances that form the basis of herbal remedies;
- to master the concepts of identity and benignity of the MPM;
- to apply knowledge of the chemical composition of medicinal products in the collection, storage and analysis of raw materials of plant and animal origin and preparations.
- to identify thickets, conduct stock accounting, mapping and determining possible volumes of raw materials harvesting; implementation of measures to restore natural resources of the most valuable species.

3. Competence and planned educational outcomes

The educational component «Industrial pharmaceutical practice in pharmacognosy» ensures the acquisition of competencies by students:

- **integral:** Ability to solve typical and complex specialized problems and critically comprehend and solve practical problems in professional pharmaceutical and/or research and innovation activities using the provisions, theories and methods of basic, chemical, technological, biomedical and socio-economic sciences; integrate knowledge and solve complex problems, formulate judgments with insufficient or limited information; understand and unambiguously communicate their own knowledge, conclusions and their validity to professional and lay audiences.

- **general:**

GC 6. Knowledge and understanding of the subject area and understanding of professional activity.

- **professional:**

PC 16. Ability to organize and conduct the procurement of medicinal plant raw materials in accordance with the rules of good practice of cultivation and collection of raw materials of plant origin (GACP), as a guarantee of the quality of medicinal plant raw materials and medications based on it. Ability to predict and calculate ways to solve the problem of conservation and protection of thickets of wild medicinal plants, in accordance with current legislation.

PC 20. Ability to develop methods for quality control of medications, including active pharmaceutical ingredients, medicinal plant raw materials and excipients using physical, chemical, physicochemical, biological, microbiological, pharmacotechnological and pharmacoeconomic control methods.

Integrative final **programmatic learning outcomes** (PLO), the formation of which is facilitated by the educational component:

PLO 1. To carry out professional activities in social interaction based on humanistic and ethical principles; to identify future professional activities as socially significant for human health.

PLO 2. To apply knowledge of general and professional disciplines in professional activities.

PLO 3. To adhere to the norms of sanitary and hygienic regime and safety requirements in carrying out professional activities.

PLO 4. To demonstrate the ability to independently search, analyze and synthesize information from various sources and use these results to solve typical and complex specialized tasks of professional activity.

PLO 12. To analyze the information obtained as a result of scientific re-search, summarize, systematize and use it in professional activities.

PLO 28. To organize and conduct rational procurement of medicinal plant raw materials. To develop and implement measures for the protection, reproduction and rational use of wild species of medicinal plants.

As a result of studying the educational component, the student should

know:

- characteristics of the raw material base of medicinal plants (wild and cultivated);
- regulatory and legal framework for the use of wild-growing resources of medicinal plants at the present stage;
- nomenclature of medicinal products, medicinal products of plant and animal origin, which are approved for use in pharmacy;
- basic information on the distribution and places of growth of medicinal products used in pharmacy;
- the influence of geographical and environmental factors on the productivity of drugs; variability of the chemical composition of drugs;
- macroscopic and microscopic methods of analysis of whole, crushed and briquetted medicinal plant materials;
- morphological and anatomical features of the MPM approved for use in medical practice; possible impurities;
- the main differences between the official MPM and possible impurities;
- optimal terms of preparation of medicinal products;
- organization of harvesting of medicinal products;
- methods of harvesting different morphological groups of forestry products;
- system of rational use of natural resources, protection and reproduction of forest resources;
- general rules of harvesting of forest resources and measures to protect natural exploitation thickets of forest resources;
- the basics of industrial cultivation of forests;
- primary processing, drying, bringing to the standard state of the MPM;
- requirements for packaging, labeling, transportation and storage of forest products in accordance with the QSM;
- the system of standardization and certification of herbal medicines and phytopreparations in Ukraine; documentation of the results of the analysis of herbal medicines; legal significance of the certificate;
- main areas of application of medicinal products of plant and animal origin in medicine;
- safety rules for working with MP and MPM.

be able to:

- to determine the morphological characteristics of live and preserved plant life;
- identify LR on the basis of microscopic analysis;
- be able to detect thickets of forest resources in nature;

- to establish the optimal timing of harvesting of forest resources;
 - to carry out harvesting and drying, primary processing and storage of forest products;
 - to herbarize FF and morphologically similar species,
 - recognize impurities of morphologically similar plant species during harvesting, acceptance and certification of raw materials;
 - apply basic techniques for growing cultivated plant species;
 - provide recommendations on the rational use of specific thickets of medicinal plants;
 - to bring the MPM to a standard state;
 - to carry out the acceptance of medicinal products and take samples necessary for its analysis in accordance with the GMP;
 - carry out commodity analysis;
 - to perform statistical processing and documentation of analysis results;
 - assess the stocks of medicinal raw materials in specific thickets;
 - develop measures and predict the effectiveness of the rational use and restoration of plant resources;
 - to carry out a set of measures aimed at preservation and multiplication of the thickets of medicinal plants and plants listed in the "Red book of Ukraine";
 - calculate the yield, operational reserves and annual possible harvesting of wild-growing medicinal plants.
- to have:
- a higher education degree (master's degree) applicant must have general (GC 06) and special (professional) (PC 16, 20) competencies (expected learning outcomes).

4. Structure of the training component

Names of content modules and topics	The amount of hours			
	full time study (4,10д)*			
	the whole amount	including		
		l.	pract.	self-study
Module 1: Acquisition of skills in the procurement, storage and processing of medicinal plant raw materials and raw materials used in pharmacy, care of cultivated medicinal plants and plants used in pharmacy. Determination of stocks of medicinal plants, rational use of natural resources.				
Content module №. 1. Harvesting, storage and processing of medicinal plant materials and raw materials used in pharmacy.				
Topic 1: Acquaintance with the program, calendar, tasks and practice base.	10,0	-	-	105,0
Topic 2. Acquaintance with wild medicinal plants in various phytocenoses. Morphological description and definition of medicinal plants. Herbalization of medicinal plants.	20,0	-	-	20,0
Topic 3. Acquaintance with the organization of procurement of MPM. Mastering the methods of harvesting, drying, bringing MPM to a standard state, packing and labeling MPM.	10,0	-	-	10,0
Topic 4. Mastering the express method of phytochemical analysis. Commodity analysis of a sample of MPM prepared individually.	20,0	-	-	20,0
Control of the content module 1	60,0	-	-	60,0
Content module № 2. Care of cultivated medicinal plants and detection of thickets of wild medicinal plants				
Topic 5. Acquaintance with the main cultivated medicinal plants and methods of their cultivation.	20,0	-	-	20,0
Topic 6. Getting to know the basics of studying stocks of wild medicinal plants with the aim rational use of natural resources of Medicinal plants and their protection.	10,0	-	-	10,0
Control of the content module 2	30,0	-	-	30,0
Semester differential credit for module 1	1	—	1	—
Total for Module 1	90,0	-	-	89,0

5. Content of the program of the educational component

Module 1: Acquisition of skills in the procurement, storage and processing of medicinal plant raw materials and raw materials used in pharmacy, care of cultivated medicinal plants and plants used in pharmacy. Determination of stocks of medicinal plants, rational use of natural resources.

Content module № 1. Procurement, storage and processing of medicinal plant materials and raw materials used in pharmacy.

Topic 1. Acquaintance with the program, calendar, tasks and practice base.

Topic 2. Acquaintance with wild medicinal plants in various phytocenoses. Morphological description and definition of medicinal plants. Herbalization of medicinal plants.

Topic 3. Acquaintance with the organization of procurement of MPM. Mastering the methods of harvesting, drying, bringing MPM to a standard state, packing and labeling MPM.

Topic 4. Mastering the express method of phytochemical analysis. Commodity analysis of a sample of MPM prepared individually.

Content module № 2. Care of cultivated medicinal plants and detection of thickets of wild medicinal plants

Topic 5. Acquaintance with the main cultivated medicinal plants and methods of their cultivation.

Topic 6. Getting to know the basics of studying stocks of wild medicinal plants with the aim rational use of natural resources of Medicinal plants and their protection.

6. Topics of lectures

Not provided for in the working curriculum.

7. Topics of seminars

Not provided for in the working curriculum.

8. Themes of practical occupations

№	Name of topic	The amount of hours
1	Introduction with the program, calendar, tasks and practice base	—
2	Introduction to wild medicinal plants in different phytocenoses. Morphological description and identification of medicinal plants. Herbarization of medicinal plants	—
3	Introduction with the organization of harvesting of wood products. Mastering the methods of harvesting, drying, bringing the MPM to a standard state, packaging and labeling of MPM	—
4	Mastering the express method of phytochemical analysis. Commodity analysis of a sample of individually harvested forest products	—
5	Acquaintance with the main cultivated medicinal plants and methods of their cultivation.	—
6	Getting to know the basics of studying stocks of wild medicinal plants with the aim rational use of natural resources of Medicinal plants and their protection.	—
Semester differential credit for module 1		1
The whole amount of hours		90,0

9. Topics of laboratory classes

Not provided for in the working curriculum.

10. Independent work

№	Name of topic	The amount of hours
1	Introduction with the program, calendar, tasks and practice base	10
2	Introduction to wild medicinal plants in different phytocoenoses. Morphological description and identification of medicinal plants. Herbarization of medicinal plants	20
3	Introduction with the organization of harvesting of wood products. Mastering the methods of harvesting, drying, bringing the MPM to a standard state, packaging and labeling of MPM	10
4	Mastering the express method of phytochemical analysis. Commodity analysis of a sample of individually harvested forest products	20
5	Acquaintance with the main cultivated medicinal plants and methods of their cultivation.	20
6	Getting to know the basics of studying stocks of wild medicinal plants with the aim rational use of natural resources of Medicinal plants and their protection.	9
The whole amount of hours		90,0

Tasks for independent work

1. Familiarize yourself with the data from the main and auxiliary literature on the characteristics of the studied drugs and plants used in pharmacy.
2. Prepare the MP and carry out their herbarization.
3. Bring the harvested MP to a standard state according to the GMP.
4. Draw up a diary of production practice, providing, according to the above description, the characteristics of the MP containing a certain group of BAS.
5. Indicate in the diary the method of determining the yield of MPM.
6. Familiarize yourself with the regulatory materials (Orders of the Ministry of Health, monographs of the State Financial Institution, TUU, SSTU, etc.) on MPM.

11. Criteria and evaluation order of educational outcomes.

The criteria for assessing the knowledge and skills of higher education students in the educational component «Industrial pharmaceutical practice in pharmacognosy» are developed in accordance with the «Regulations on the procedure for assessing the results of training of higher education students at the National University of Pharmacy».

The results of the semester control are evaluated according to the ECTS scale, 100-point and four-point scale («excellent», «good», «satisfactory», «unsatisfactory»).

Scoring scheme and distribution of points for higher education students

Current control Module 1		Total
Content module 1	Content module 2	60-100
<i>T 1-4, CCM 1</i>	<i>T 5-6, CCM 2</i>	
30-50	30-50	

T 1 - T 6 - topics of content modules.

Criteria for assessing the academic achievements of a higher education student

Sum of points for all types of learning activities	Assessment. ECTS	Score on the national scale	
		Assessment.	offset
90-100	A	excellent	credited
82-89	B	good	
74-81	C		
64-73	D	satisfactorily	
60-63	E		
35-59	FX	Unsatisfactory with the possibility of retake	not credited
0-34	F	Unsatisfactory with mandatory re-study of the discipline	

12. Forms of current and final control of learning progress

Control of content modules – control of theoretical and practical knowledge in the form of written and test questioning of higher education applicants. The control concerns the knowledge and skills, both acquired in practice and independently developed by higher education students.

The form of control is a semester differentiated test.

13. Methodological support

1. Curriculum and work program of the educational component.
2. Silhouette of the educational component.
3. Diary of practical training.
4. Defects of herbarium specimens of the MP.
5. Defects of medicinal plant raw materials, medicinal products.

14. Reading suggestions

The main reading suggestions

1. Pharmacognosy: textbook for higher school students / V.S. Kyslychenko, L.V. Upyr, Ya.V. Dyakonova, V.Yu. Kuznetsova, I.G. Zinchenko, O.A. Kyslychenko; ed. by V.S. Kyslychenko. – Kharkiv : NUPh : GoldenPages, 2011. – 552 p.; il.
2. Pharmacognosy: textbook for students of higher / V.S. Kyslychenko, L.V. Lenchyk, I.G. Gurieva et al.; ed. by V.S. Kyslychenko. – Kharkiv : NUPh : Golden Pages, 2019. – 584 p.
3. Medicinal plants resource science : handbook for students of higher schools / V.S. Kyslychenko, L.V. Upyr, I.G. Zinchenko, O.A. Kyslychenko, S.I. Stepanova; ed. by V.S. Kyslychenko. – Kharkiv : NUPh : Golden Pages, 2012. – 168 p.

Supplementary reading suggestions

1. Text book of Pharmacognosy and Phytochemistry / A. Dhole, V. Dhole, V. Yeligar, Ch. Magdum. Pharma Career Publication, 2019. – 778 p.
2. Gokhale S. B., Kokate C. K., Purohit A. P. A textbook of Pharmacognosy. 29th Edition. 2017. 284 p.
3. Kumar N. A Textbook Of Pharmacognosy. A.I.T.B.S. Publishers, India. 2010. 502 p.
4. Shah B. N., Seth A.K. Textbook of Pharmacognosy and Phytochemistry. Elsevier. 2010. 587 p.
5. Singh A. A Textbook of Pharmacognosy. Pharma Book Syndicate. 2013. 836 p.
6. British Pharmacopoeia Commission, 2016. British Pharmacopoeia. London: TSO.
7. European Pharmacopoeia. 8th ed including supplements 1 (2014), 2 (2014), 3 (15), 4 (15), 5(2015). Council of Europe, Strasbourg, France. 2014.
8. Textbook of Pharmacognosy and Phytochemistry - E-Book / Shah B., Seth A. – Elsevier Health Sciences, 2012. – 620 p.

15. Electronic resources, including the Internet

1. Website of the Department of Pharmacognosy and Nutriciology – www.cnc.nuph.edu.ua
2. Website of the NUPh library – <http://lib.nuph.edu.ua>
3. Electronic archive of the NUPh – <http://dspace.nuph.edu.ua>
4. Center for Distance Technologies of the National Academy of Sciences of Ukraine – pharmel.kharkiv.edu

5. NUPh. Online tests – <http://tests.nuph.edu.ua>
6. Vernadsky National Library of Ukraine – <http://www.nbuv.gov.ua>
7. V.G. Korolenko Kharkiv State Scientific Library – <http://korolenko.kharkov.com>