	CD 8.5.1 CURRICULUM DISCIPLINĂ PENTRU STUDII UNIVERSITARE	Redacția:	07
		Data:	15.04.2019
		Pag. 1/15	

FACULTY OF PHARMACY

STUDY PROGRAM 0916.1 PHARMACY

CHAIR OF PHARMACOGNOSY AND PHARMACEUTICAL BOTANY

APPROVED
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum faculty of Pharmacy
Minutes No. 1 of 04.09.2019
Chairman, PhD pharmacy, associate professor
UNCU Livia _____
(signature)

APPROVED
at the Council meeting of the Faculty of Pharmacy
Minutes No. 1 of 05.09.2019
Dean of Faculty, PhD pharmacy, associate professor
CIOBANU Nicolae _____
(signature)

APPROVED
approved at the meeting of the chair of Pharmacognosy and pharmaceutical botany
Minutes No.1 of 30.08.2019
Head of chair, Dr. hab. biology, university professor
CALALB Tatiana _____
(signature)

SYLLABUS

DISCIPLINE **PHARMACOGNOSY**

Integrated studies

Type of course: **Compulsory discipline**

Chisinau, 2019

I. INTRODUCTION

- **General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional training program**
  The discipline of Pharmacognosy is an important component of pharmaceutical education focused on the macro-, microscopical and phytochemical study of vegetable products, which can serve as a source of raw material for vegetable medicinal species and phytodrugs. The theoretical knowledge and the practical skills of pharmacognostical analysis of the vegetable products will contribute to the skills training of the specialist pharmacist: correct and efficient use of natural vegetable resources; advising the patient on the use of phytopreparations; biological and phytochemical studies for the valorization of the local flora.
  Knowledge gained during the course of pharmacognosy are necessary for the subsequent assimilation of the disciplines: Pharmacology, Pharmacotherapy, Pharmaceutical chemistry, Toxic plants, thus contributing to the multilateral training of the specialist pharmacist.

- **Mission of the curriculum in professional training**
  Pharmacognostic study (macro-, microscopical, phytochemical) of vegetable products containing natural compounds of different chemical classes, according to the Analitical Normative Documentation and familiarization with the sources and rules for the valorification of raw material for different pharmaceutical forms.
  The developed skills during the course of pharmacognosy will serve as a landmark in the developing of professional attitudes towards the valorification of vegetable products and medicinal plants with their use in the pharmaceutical industry. Acquired knowledge will contribute to the development of critical thinking in addressing basic issues regarding the rational use of vegetable products and phytodrugs.
- **Languages of the course**: Romanian, English;
- **Beneficiaries:** students of the III rd year, faculty of Pharmacy

I. MANAGEMENT OF THE DISCIPLINE

Code of discipline		**S05O053, S06O062**	
Name of the discipline		**Pharmacognosy**	
Person in charge of the discipline		PhD, associate professor, **Cojocaru-Toma Maria**	
Year	**III**	Semesters	**V-VI**
Total number of hours, including:			**240**
Lectures	**34**	Practical/laboratory hours	**119**
Seminars		Self-training	**87**
Clinical internship			
Form of assessment	**C** **E**	Number of credits	4 (I sem.); 4 (II sem.).

II. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the discipline study the student will be able to:

- ***at the level of knowledge and understanding:***
  - medicinal plants - source of vegetable products;
  - biosynthesis scheme for different groups of pharmacologically active chemical compounds;
  - macro- and microscopical characters of the vegetable products, numerical indices that regulate their quality;
  - methods of chemical analysis of vegetable products containing: polyholosides, vitamins, volatile oils, alkaloids, cardiotonic heterosides, saponosides, anthracene derivatives, phenolic compounds, flavonoids, coumarins, tanning substances;
  - pharmacological action, therapeutic indications, particularities in the administration of vegetable products and phytodrugs.
- ***at the application level:***
  - identification of vegetable products by macroscopical, microscopical, histochemical characters;
  - determination of impurities specific for the vegetable products;
  - collecting, drying, primary processing of the vegetable products;
  - packaging, marking, storage of the vegetable products;
  - pharmacognostical analysis of the vegetable products in accordance with the requirements of the analitical normative documentation and the pharmacopoeias reference;
  - the pharmaco-therapeutic action of the active principles of vegetable origin and medicinal products obtained from them;
  - informing of patients, doctors, pharmacists about the rational use of vegetable products and phytodrugs.
- ***at the integration level:***
  - determination of the position and importance of Pharmacognosy in the disciplines set provided by the study plan;
  - applying and integrating of knowledge for the subsequent acquisition of Phytotherapy and Toxic plants cours.

III. PROVISIONAL TERMS AND CONDITIONS

For the assimilation of discipline of Pharmacognosy are necessary knowledge in the field of Pharmaceutical botany, Organic and Analytical chemistry, Latin, Anatomy, Physiology, as well as communication skills ability, teamwork, skills in modern informational technologies, analytical and synthesis skills, generalization and skills of communication, etc.

IV. THE MESAND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

No.	THEME	Number of hours		
		Lectures	Practical hours	Self-training
1.	Introduction and generality. Methods of analysis of vegetable products. Polyholosides. Vegetable products containing polyholosides: *Althaeae herba, Althaeae radices, Farfarae folia, Laminariae stipites, Malvae flores, Malvae folia, Plantaginis majoris folia, Tiliae flores cum*	2	3	4

No.	THEME	Number of hours		
		Lectures	Practical hours	Self-training
	bracteis, Verbasci flores.			
2.	Learning of methods of pharmacognostical analysis of vegetable products from different morphological groups.	-	6	8
3.	Vitamins. Classification. Vegetable products containing vitamins: *Bidenstis herba, Bursae pastoris herba, Calendulae flores, Gnaphalii uliginosi herba, Hippophaes rhamnoides fructus, Maydis stigmata, Ribes nigri fructus, Rosae fructus, Sorbi fructus, Urticae folia, Viburni cortex, Viburni fructus.*	2	6	4
4.	Analysis of fragmented vegetable products.	-	3	4
5.	Terpenoids. Classification. Biosynthesis. Volatile oils. Generality. Vegetable products containing acyclic terpenoids: *Coriandri fructus, Lavandulae flores, Melissae herba, Rosae flores;* monocyclic terpenoids: *Carvi fructus, Citri exocarpia, Eucalypti folia, Menthae piperitae folia seu herba, Pyrethri cinerariaefolii flores, Salviae folia;* bicyclic monoterpenoids: *Hyssopi herba, Juniperi fructus, Tanaceti flores seu herba, Valerianae rhizomata cum radicibus.* Sources of camphor: *Pini sylvestris cormus.*	2	6	10
6.	Vegetable products containing sesquiterpenoids: *Arnicae flores, Betulae gemmae, Betulae folia, Calami rhizomata, Chamomillae flores, Inulae rhizomata et radices, Populi nigrae gemmae;* aromatic terpenoids: *Anisi vulgaris fructus, Asari folia, Asari rhizomata, Basilici herba, Foeniculi fructus, Origani vulgaris herba, Serpylli herba, Thymi vulgaris herba*. Resinous substances. Products containing resinous substances: turpentine, oil of turpentine, rosin. Vegetable products containing resins: *Convolvuli herba, Lupuli strobili.* Bitter substances Generality. Vegetable products containing bitter substances: *Absinthii folia, Absinthii herba, Cardui benedicti herba, Centaurii herba, Gentianae radices, Marrubii herba, Menyanthidis folia, Millefolii flores, Millefolii herba, Taraxaci folia, Taraxaci herba, Taraxaci radices.*	2	12 (6+6)	10
7.	Heterosides. Generality. Classification. Dynamics of accumulation. Collection and storage. Biological standardization. Vegetable products containing heterosides: *Amygdalari semina, Sambuci flores, Sinapis semina.* Vegetable products containing cardiac heterosides: *Adonidis vernalis herba, Convallariae flores, Convallariae folia, Convallariae herba, Digitalis lanatae folia, Digitalis purpureae folia, Erysimi diffusi herba, Strophanthi semina.*	2	6	4
8	Saponosides. Generality. Vegetable products containing saponosides: *Araliae mandshuricae radices, Dioscoreae rhizomata cum radicibus, Eryngii plani herba, Equiseti arvensis herba, Glycyrrhizae glabra radices, Herniariae herba, Hippocastani cortex, H. flores, H. folia, H. semina, Ginseng radices, Orthosiphonis folia, Polemonii rhizomata cum radicibus, Primulae veris folia, Primulae veris rhizomata cum*	2	6	4

No.	THEME	Number of hours		
		Lectures	Practical hours	Self-training
	radicibus, Saponariae radices.			
9.	Analysis of pulverized vegetable products	-	3	4
10.	Alkaloids. History. Classification. Biosynthesis of tropane alkaloids. Vegetable products containing pyrrolizidine alkaloids: *Senecionis platyphylloides herba, Symphyti radices;* derivatives of coniine: *Conii fructus;* derivatives of piperidine: *Lobeliae herba;* derivatives of nicotine: *Nicotianae folia;* tropane alkaloids: *Belladonnae folia, B. herba, B. radices, Daturae innoxiae herba, Daturae innoxiae semina, Hyoscyami folia, Scopoliae rhizomata, Stramonii folia.*	2	4	5
11.	Vegetable products containing quinolizidine alkaloids: *Nupharis lutei rhizomata, Sophorae pachycarpae herba, Thermopsidis lanceolatae herba*; isoquinoline: *Berberidis cortex, B. folia, B. fructus, B. radices, Chelidonii herba, Glauci flavi herba, Macleayae herba, Papaveris capita, Ungerniae victoris folia;* indole: *Catharanthi herba, Passiflorae incarnatae herba, Rauwolfiae radices, Secale cornutum, Strychni semina.*	2	8	5
12.	Vegetable products containing purine alkaloids: *Cacao semina, Coffeae semina, Colae semina, Theae folia;* terpenoids: *Aconiti tuber, Delphinii consolidae flores*; steroidal: *Solani laciniati herba, Veratri rhizomata cum radicibus;* acyclic alkaloids: *Capsici fructus, Colchici semina, Ephedrae herba.*	2	8	5
13.	Phenolic compounds**.** Classification. Biosynthesis. Simple phenols and their glycosides. Vegetable products containing phenolic-glycosides: *Vitis-idaeae cormus, Vitis-idaeae folia, Uvae-ursi folia*. Phloroglucins. Vegetable products containing phloroglucides: *Filicis maris rhizomata, Rhodiolae roseae rhizomata cum radicibus*. Lignans. Vegetable products containing lignans: *Podophylli peltati rhizomata cum radicibus, Schizandrae fructus, Schizandrae semina.*	2	4	2
14.	Anthracene derivatives and their heterosides**.** Generality. Vegetable products containing anthracene derivatives: *Aloe arborescens cormus, Aloe arborescens folia, Frangulae cortex, Hyperici herba, Rhamni catharticae fructus, Rhei radices, Rubiae rhizomata et radices, Rumicis radices, Sennae folia, Sennae fructus.*	2	8	2
15.	Flavonoids. Generality. Vegetable products containing flavonoids: *Centaureae cyani flores, Crataegi flores, Crataegi fructus, Fagopyri sagittati herba, Sophorae japonicae alabastra, Sophorae japonicae fructus, Leonuri herba, Polygoni avicularis herba, Polygoni hydropiperis herba, Polygoni persicariae herba.*	2	8	2
16.	Vegetable products containing flavonoids: *Aroniae fructus, Scutellariae baicalensis radices, Helichrysi arenarii flores, Ononidis radices.* Medicinal species. Pharmacognostical analysis of medicinal species. Nomenclature of the officinal species.	2	4	2

No.	THEME	Number of hours		
		Lectures	Practical hours	Self-training
17.	Coumarins and chromones**.** Generality. Vegetable products containing coumarins and chromones: *Ammi majoris fructus, Ammi visnagae fructus, Anethi graveolens fructus, Angelicae rhizomata cum radicibus, Meliloti herba, Pastinacae fructus.*	2	4	2
18.	Tannins. Classification. Vegetable products containing tannins: *Alni fructus, Bergeniae rhizomata, Bistortae rhizomata, Cotini coggygriae folia, Gei rhizomata cum radicibus, Hamamelidis cortex, Hamamelidis folia, Pruni padi fructus, Rhus coriariae folia, Quercus cortex, Sanguisorbae rhizomata et radices, Tormentillae rhizomata, Vaccinii myrtilli cormus, Vaccinii myrtilli fructus.*	2	8	2
19.	Vegetable products with different active principles: *Asperulae odoratae herba, Caricae folia, Caricae fructus, Cucurbitae semina, Fragariae folia, Kalanchoe cormus, Paeoniae herba, P. rhizomata et radices, Phaseoli fructus sine seminibus, Rubi idaei fructus, Silybi fructus, Ulmariae herba, Visci stipites.*	2	8	2
20.	Medicinal plants from the flora of the Republic of Moldova. Environmental protection of natural resources. Rational use of phytodrugs.	2	-	2
21.	Pharmacognostical analysis of vegetable products.	-	4	4
Total		**34**	**119**	**87**

V. REFERENCE OBJECTIVES OF CONTENT UNITS

Objectives	Content units
Chapter 1. The analysis of vegetal products	
• to define the content of pharmacognosy and its tasks; • to acquire methods of pharmacognostical analysis of vegetable products; • to know how to work with the Analitical Normative Documentation and pharmacopoeias reference • to be able to apply techniques of pharmacognostical analysis for different types of vegetable products and active principles.	The concept of interdependence of pharmacognosy with other disciplines. The principles of classification of medicinal plants and vegetable products. Methods of pharmacognostical analysis of vegetable products from different morphological groups: macroscopic, microscopic and phytochemical. Standardization of vegetable products. Analytical Normative Documentation.
Chapter 2. Polyholosides. Vegetable products containing polyholosides	
• to know the classification of polyholosides according to their chemical structure;	Polyholosides. Classification of polyholosides according to their chemical structure. Vegetable products containing polyholosides: *Althaeae herba,*

Objectives	Content units
• to be able to highlight macroscopically and microscopically the vegetable products containing polyholosides; • to know the action of vegetable products containing polyholosides according on their chemical composition.	*Althaeae radices, Farfarae folia, Laminariae stipites, Malvae flores, Malvae folia, Plantaginis majoris folia, Tiliae flores cum bracteis, Verbasci flores.* Macro-, microscopic analysis of vegetable products with polyholosides. Vegetable products and phytodrugs containing polyholosides.
Chapter 3. Vitamins. Vegetable products containing vitamins	
• to define vitamins according to chemical structure, physiological role and degree of solubility; • to describe macroscopically and microscopically the vegetable products with vitamins; • to know vegetable products containing vitamins, phytodrugs and their uses.	Vegetable products containing vitamins: *Bidenstis herba, Bursae pastoris herba, Calendulae flores, Gnaphalii uliginosi herba, Hippophaes rhamnoides fructus, Maydis stigmata, Ribes nigri fructus, Rosae fructus, Sorbi fructus, Urticae folia, Viburni cortex, Viburni fructus.* Macro- and microscopic analysis of vegetable products containing vitamins. Chemical analysis of vitamins in vegetable products. Identification and dosage of ascorbic acid in fruit of rose (*Rosae fructus*).
Chapter 4. Terpenoids. Vegetable products containing volatile oils	
• to know the biosynthesis of terpenoids; • to define volatile oils after their chemical classification; • to know methods of obtaining of volatile oils; • to identify organoleptic volatile oils and by numerical indices; • to quantify volatile oils in vegetable products; • to describe macroscopically and microscopically vegetable products containing volatile oils; • to know the action and particularities in the administration of products containing volatile oils; • to define the use of volatile oils in the pharmaceutical and cosmetic industry.	Vegetable products containing: - acyclic monoterpenoids: *Coriandri fructus, Lavandulae flores, Melissae herba, Rosae flores;* - monoterpenoids: *Carvi fructus, Citri exocarpia, Eucalypti folia, Menthae piperitae folia seu herba, Pyrethri cinerariaefolii flores, Salviae folia;* - bicyclic monoterpenoids: *Hyssopi herba, Juniperi fructus, Tanaceti flores seu herba, Valerianae rhizomata cum radicibus.* Camphorus sources*: Pini silvestris cormus;* - sesquiterpenoids*: Arnicae flores, Betulae gemmae, Betulae folia, Calami rhizomata, Chamomillae flores, Inulae rhizomata et radices, Populi nigrae gemmae;* - aromatic terpenoids: *Anisi vulgaris fructus, Asari folia, Asari rhizomata, Basilici herba, Foeniculi fructus, Origani vulgaris herba, Serpylli herba, Thymi vulgaris herba.* Structure formulas by groups of active principles. Macroscopic, microscopic and chemical analysis of vegetable products containing volatile oils. Medicinal products containing volatile oils and their pharmaco-therapeutic action.
Chapter 5. Vegetable products containing resins and bitter substances	
• to know the resins, bitter and their role: • to define macroscopically and microscopically vegetable products	Vegetable products containing resind and bitter substances. Macroscopic and microscopic analysis of vegetal products containing bitter substances: *Absinthii*

Objectives	Content units
containing resins and bitter substances; • to know vegetable products, phytodrugs with resins and bitter substances, as well as particularities and restrictions in their administration.	*folia, Absinthii herba, Cardui benedicti herba, Centaurii herba, Gentianae radices, Marrubii herba, Menyanthidis folia, Millefolii flores, Millefolii herba, Taraxaci folia, Taraxaci herba, Taraxaci radice;* and resins: *Convolvuli herba, Lupuli strobuli.* Particularities in the administration of vegetable products and phytodrugs containing bitter substances.
Chapter 6. Vegetable products containing heterosides	
• to define heterosides, including cardiotonic, according to their chemical structure; • to know the particularities of the dynamics of the accumulation, the conditions of harvesting, conditioning and storing of the vegetable products containing heterosides; • to describe macroscopically and microscopically the vegetable products containing heterosides and their preparations; • to know methods of chemical and biological analysis specific to cardiotonic heterosides.	Classification of heterosides according to their chemical structure. Vegetable products containing heterosides: *Amygdalari semina, Sambuci flores, Sinapis semina.* Vegetable products containing cardiotonic heterosides: *Adonidis vernalis herba, Convallariae flores, Convallariae folia, Convallariae herba, Digitalis lanatae folia, Digitalis purpureae folia, Erysimi diffusi herba, Strophanthi semina.* .Macroscopic and microscopic analysis of vegetable products containing cardiotonic heterosides. Chemical analysis and biological standardization of cardiotonic heterosides. Particularities in the administration of medicinal products containing cardiotonic heterosides.
Chapter 7. Vegetable products containing saponosides	
• to know the conditions of harvesting, conditioning and storing of vegetable products containing saponosides; • to describe macroscopically and microscopically vegetable products containing saponosides; • to know methods of physical, chemical and biological analysis specific of saponosides; • to know the action of products with saponosides; • to define warnings and contraindications in the administration of products containing saponoside	Triterpenic and steroidal saponosides, spreading, harvesting, conditioning. Vegetable products containing: saponosides: *Araliae mandshuricae radices, Dioscoreae rhizomata cum radicibus, Eryngii plani herba, Equiseti arvensis herba, Glycyrrhizae glabra radices, Herniariae herba, Hippocastani cortex, Hippocastani flores, Hippocastani folia, Hippocastani semina, Ginseng radices, Orthosiphonis folia, Polemonii rhizomata cum radicibus, Primulae veris folia, Primulae veris rhizomata cum radicibus, Saponariae radices.* Macroscopic, microscopic analysis of vegetable products containing saponosides. Chemical analysis and biological standardization of saponosides. Particularities in the administration of medicinal products containing saponosides.
Chapter 8. Vegetable products containing alkaloids	
• to know the biosynthesis of tropane alkaloids; • to define the alkaloids according to their chemical structure;	Alkaloids. Classification. The biosynthesis of tropane alkaloids, the way of collecting, conditioning and storing of vegetable products containing alkaloids. Vegetable products containing alkaloids:

Objectives	Content units
• to know the particularities of the collection and conditioning of vegetable products with alkaloids; • to describe macroscopically and microscopically the vegetable products containing alkaloids; • to devise qualitative and quantitative analysis methods for the identification and dosing of alkaloids in vegetable products; • to define the pharmaco-therapeutic actions and the degree of toxicity of products with alkaloids according to their structural variety; • to know vegetable products and medicines products containing, alkaloids, contraindications and warnings in their administration.	- pyrrolidines: *Senecionis platyphylloides herba, Symphyti radices;* - derivatives of coniine: *Conii fructus;* - derivatives of piperidine: *Lobeliae herba;* - derivatives of nicotine: *Nicotianae folia;* - tropane alkaloids: *Belladonnae folia, B. herba, B. radices, Daturae innoxiae herba, Daturae innoxiae semina, Hyoscyami folia, Scopoliae rhizomata, Stramonii folia;* - quinolizidine alkaloids: *Nupharis lutei rhizomata, Sophorae pachycarpae herba, Thermopsidis lanceolatae herba*; - isoquinoline: *Berberidis cortex, B. folia, B. fructus, B. radices, Chelidonii herba, Glauci flavi herba, Macleayae herba, Papaveris capita, Ungerniae victoris folia;* - indole: *Catharanthi herba, Passiflorae incarnatae herba, Rauwolfiae radices, Secale cornutum, Strychni semina;* - purine: *Cacao semina, Coffeae semina, Colae semina, Theae folia;* - terpenoids: *Aconiti tuber, Delphinii consolidae flores*; - steroidal: *Solani laciniati herba, Veratri rhizomata cum radicibus;* - acyclic alkaloids: *Capsici fructus, Colchici semina, Ephedrae herba.* Macroscopic, microscopic and chemical analysis of vegetable products containing alkaloids. Particularities in the administration of medicinal products. containing alkaloids.
Chapter 9. Vegetable products containing phenolic compounds	
• to know the classification and biosynthesis of phenolic compounds; • to describe macroscopically and microscopically the vegetable products containing simple phenols, floroglucides, lignans and their phytopreparations.	Phenolic compounds. Classification and biosynthesis. Vegetable products containing: - simple phenols and their heterosides: *Vitis-idaeae cormus, Vitis-idaeae folia, Uvae-ursi folia*; - phloroglucides: *Filicis maris rhizomata, Rhodiolae roseae rhizomata cum radicibus*; -lignans: *Podophylli peltati rhizomata cum radicibus, Schizandrae fructus, Schizandrae semina.* Macroscopic and microscopic analysis of vegetable products containing phenolic compounds. Action and uses.
Chapter10. Vegetable products containing anthracene derivatives	
• to define anthracene derivatives after their chemical classification;	Classification of anthracene derivatives and their heterosides. Vegetable products containing anthracene

Objectives	Content units
• to describe macroscopically and microscopically the vehetable products containing anthracene derivatives; • to know methods of analysis in the identification and dosing of anthracene derivatives in vegetable products; • to describe the particularities of administration of products with anthracene derivatives.	derivatives: *Aloe arborescens cormus, Aloe arborescens folia, Frangulae cortex, Hyperici herba, Rhamni catharticae fructus, Rhei radices, Rubiae rhizomata et radices, Rumicis radices, Sennae folia, Sennae fructus.* Macroscopic, microscopic and chemical analysis of vegetable products with anthracene derivatives. Particularities and contraindications in the administration of medicinal products containing anthracene derivatives.
Chapter 11. Vegetable products containing flavonoids	
• to know the classification of flavonoids; • to describe macroscopically and microscopically of vegetable products containing flavonoids; • to apply methods of analysis in the identification and dosing of flavonoids; • to know vegetable products and phytodrugs containing flavonoids.	Flavonoids. Classification. Generality. Vegetable products containing flavonoids: *Aroniae fructus, Centaureae cyani flores, Crataegi flores, Crataegi fructus, Fagopyri sagittati herba, Helichrysi arenarii flores, Leonuri herba, Ononidis radices, Polygoni avicularis herba, Polygoni hydropiperis herba, Polygoni persicariae herba, Sophorae japonicae alabastra, Sophorae japonicae fructus, Scutellariae baicalensis radices.* Macroscopic and microscopic analysis of vegetable products containing flavonoids. Methods of identification and dosing of flavonoids in vegetable products. Action and uses.
Chapter 12. Vegetable products containing coumarins and chromones	
• to know the classification of coumarins and chromones; • to describe macroscopically and microscopically the vegetable products containing coumarins and chromones; • to apply methods of analysis in the identification and dosing of • coumarins and chromones: • to define the particularities in the • administration of products containing coumarins and chromones.	Pharmacognostic study of vegetable products containing coumarins and chromones: *Ammi majoris fructus, Ammi visnagae fructus, Anethi graveolens fructus, Angelicae rhizomata cum radicibus, Meliloti herba, Pastinacae fructus.* Macroscopic, microscopic and chemical analysis of vegetable products containing coumarins and chromones. The pharmaco-therapeutic action of vegetable products and phytodrugs containing coumarins and chromones. Particularities in their administration.
Chapter 13. Medicinal species	
• to define the medicinal species; • to know medicinal species according to the State Medicines Nomenclature; • to acquire the pharmacognostical analysis of the medicinal species.	Medicinal species. Generality. Pharmacognostical analysis of medicinal species by macroscopic, miscoscopic and phytochemical identification of vegetable products and their standardization according to pharmacopoeial methods. Nomenclature of medicinal species and knowledge of the active principles of their composition.
Chapter14. Vegetable products containing tannins	

Objectives	Content units
• to know the classification of tannins; • to describe macroscopically and microscopically vegetable products containing tannins; • to know methods of analysis in the identification and dosing of tannins; • to know the pharmaco-therapeutic action of tannins products and their phytodrugs.	Vegetable products containing tannins: *Alni fructus, Bergeniae rhizomata, Bistortae rhizomata, Cotini coggygriae folia, Gei rhizomata cum radicibus, Hamamelidis cortex, Hamamelidis folia, Pruni padi fructus, Rhus coriariae folia, Quercus cortex, Sanguisorbae rhizomata et radices, Tormentillae rhizomata, Vaccinii myrtilli cormus, Vaccinii myrtilli fructus.* Macroscopic and microscopic analysis of vegetable products with tannins. Methods of identification and dosing of tannins in vegetable products. Particularities in the administration of medicinal products containing tannins.
Chapter 15. Vegetable products with various active principle	
• to define vegetable products containing various active principles; • to know their active principles and pharmacotherapeutic profile.	Pharmacognostic study of vegetable products with various active principle: *Asperulae odoratae herba, Caricae folia, Caricae fructus, Cucurbitae semina, Fragariae folia, Kalanchoe cormus, Paeoniae herba, Paeoniae rhizomata et radices, Phaseoli fructus sine seminibus, Rubi-idaei fructus, Silybi fructus, Ulmariae herba, Visci stipites*. Action and uses.
Chapter 16. Study of medicinal plants in the Republic of Moldova	
• to know medicinal plants that have served as a scientific study in the Republic of Moldova and "Nicolae Testemitanu" SUMPh; • to define the protection of the environment and natural resources; • to know the rational use of vegetable products and phytopreparations.	History of the study and use of medicinal plants in the Republic of Moldova. Protection of the environment and rational use of natural resources. Ecological aspects of the collection of vegetable products, depending on the nature of the active principles. Rational use of vegetable products and phytopreparations.

VI. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

✓ **Professional (specific) (SC) competences**

- PC1. Knowledge, understanding and use of pharmacognostical specific terms, general principles in the pharmacognostical evaluation of vegetable products.
- PC2. Application of methods of pharmacognostical analysis: macroscopic and microscopic of vegetable products from different morphological groups. Developing skills in acquiring methods of analysis for the identification and dosing of active principles in vegetable products. Knowledge of phytodrugs in terms of action, indications, contraindications, adverse effects, mode of administration and their interactions.
- PC3. Use and adaptation of theoretical knowledge of pharmacognosy to the situations of practical activity, application of the pharmacopoeial requirements in the practical activity by carrying out the pharmacognostical analysis of the vegetable products.
- PC4. Knowledge of vegetable products and active principles responsible for their pharmaco-

therapeutic action, by actively engaging in laboratory practice and demonstrating the ability to make decisions aimed at continuous improvement.

- PC5. Knowledge of particularities in the administration of medicinal products depending on the nature of the active principles, their rational use. Knowledge of the methodology of scientific research in laboratory practice through the pharmacognostical analyzes.
- PC6. Using the capacity to solve situation problems through good collaboration, promoting the principles of tolerance and compassion towards the consumer of phytodrugs, using of information technologies and multilingual communication.

✓ **Transversal competences (TC)**

- TC1. Forming the personal attitude by promoting of logical reasoning and compliance with pharmaceutical ethics and deontology rules at the release of phytodrugs.
- TC2. Ability to social interaction and group work, prioritization of vocational training.
- TC3. Fitting in interdisciplinary projects, extracurricular activities, performing activities and exercising the specific roles to the team activities. Promoting the spirit of initiative, dialogue, cooperation, positive attitude and respect for colleagues.

✓ **Study outcomes**

- to be able to apply the methods of collecting, conditioning of vegetable products depending on the nature of the vegetable product and the particularities of the accumulation of active principles;
- to know vegetable products, active principles and their pharmacotherapeutic profile;
- to be able to identify vegetable products by macroscopic, microscopic characters and literature;
- to be able to identify the dose the active principles from different vegetable products using the analysis methods according to the pharmacopoeias reference;
- to be competent in the rational use of phytodrugs by knowing their active principles and actions;
- to be able to inform the population, doctors, pharmacists about authorized vegetable products and phytopreparations authorized in the Republic of Moldova;
- to be able to implement the knowledge gained in the research activity.

Note. Study outcomes(are deduced from the professional competencies and formative valences of the informational content of the discipline).

VII. STUDENT'S SELF-TRAINING

No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Working with information sources	Evaluation and acquisition of the provided information at the practical training of pharmacognosy; Selection of compulsory and additional sources according to the respective themes; Analyzing and evaluation of the relevant questions; Define conclusions regarding to subjects importance.	Interpretative skills; The ability to select the essentials; The ability to define the conclusions.	During the semesters
2.	Preparing and supporting of the presentations	Selection of the theme and establishment of the components of thematic project; Establishing the terms of the	The degree of penetration in the essence of the project theme; The level of scientific	During the semesters

	Power point	realization and the requirements; Mentioning of practical applications, creativity elements, conclusions and sources of bibliography.	argumentation of necessity; Formation of the personal attitude, coherence of exposure and scientific correctness; Presentation method; Student and teacher reviews.	
3.	Case studies	Informing of students with possible case scenarios for the respective subjects; Description of the case situation; Developing of operative capabilities as appropriate; Ability to resolve similar cases.	Assessing the application of knowledge in case studies; The ability to apply the gained knowledge in the rational use of vegetable products.	During the semesters
	Portfolio (plants used in traditional medicine, evaluation of phytochemical research methods, elucidation of mechanisms of action of active principles)	The strategies in the realization of portfolio: 1) electronic format; 2) paper format with informative materials, schemes, images; 3) informative, video, audio. Exploring bibliographic, electronic sources; Mentioning the practical applications of the material presented in the portfolio.	Using the portfolio to assess the level of student competency development; Capacity to apply the portfolio materials to the proper training of the pharmacist specialist; The appreciation will consist in the evaluation of the content, the correctness of the fulfillment, the accuracy, the value of the presented information, the veracity of the bibliographic sources.	During the semesters

VIII. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

- ***Teaching and learning methods used***

The teaching of Pharmacognosy discipline uses different methods and classical didactic methods, oriented towards the efficient acquisition and achievement of the objectives of the didactic process. In the course of the Pharmacognosy, along with the traditional methods (lesson-exposure), are used the modern methods with the information technologies. During the laboratory works are used individual forms, group activity, or phytochemical laboratory works. For the deeper learning of the material are used different systems (scientific language, graphical and computerized language) and teaching materials (tables, schemes, herbaria, vegetable products, phytodrugs, etc.). In the lectures and laboratory works are applied information communication technologies: PowerPoint presentations. At the end of the laboratory work is presented the protocol, according to the requirements.

- ***Applied teaching strategies / technologies****(specific to the discipline)*

In the process of studying pharmacognosy, the students acquire new methods and practical skills: they systematically learn to work, to think scientifically, to analyze, to recapitulate, to find the

connection between theory and practice. Particular attention is paid to the student's individual work, content and organization. Individual work leads to the development of creative attitudes and offers the opportunity to gain self-knowledge. Among the applied teaching technologies are: "Group interview"; "Case study".

Recommended learning methods for pharmacognosy

- in the auditorium (macroscopic and microscopic study of vegetable products, phytochemical analysis of vegetable product, analysis of medicinal species and phytodrugs);
- outside of the auditorium (preparation for practical work, learning the lecture material, preparation for totalizations, and presentation of individual work (papers, analysis schemes, PowerPoint presentations).

- ***Methods of assessment*** *(including the method of final mark calculation)*

Current*:*

5 evaluation theoretical knowledge (2– through test, 1– oral, 2 – written on topics);

1 – practical skills (identification of 10 vegetable products, medicinal plants, pharmacological actions and their phytodrugs);

1– individual work (presentation of the thematic project PowerPoint or thematic portfolium).

Final*:* Exam

Final mark will be made up of the average annual grade of the theoretical and individual knowledge evaluations, practical skills, computerized SIMU test, and oral.

Method of mark rounding at different assessment stages

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	**2**	**F**
3,01-4,99	**4**	**FX**
5,00	**5**	**E**
5,01-5,50	**5,5**	
5,51-6,0	**6**	
6,01-6,50	**6,5**	**D**
6,51-7,00	**7**	
7,01-7,50	**7,5**	**C**
7,51-8,00	**8**	
8,01-8,50	**8,5**	**B**
8,51-8,00	**9**	
9,01-9,50	**9,5**	**A**
9,51-10,0	**10**	

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations.

IX. RECOMMENDED LITERATURE:

A. Compulsory:

1. Suport de curs/Course support intormation on Department web-site.
2. Evans W. Trease and Evans Pharmacognosy. Saunders Company Ltd. 1989
3. Nistreanu A. Farmacognozie. Chişinău, 2000.
4. Nistreanu A., Calalb T. Analiza farmacognostică a produselor vegetale medicinale. Compendiu. Chişinău, 2016.
5. Cojocaru-Toma M. Produse vegetale și fitopreparate din Republica Moldova. Compendiu pentru lucrări de laborator la farmacognozie. Chișinău, 2017.
6. Istudor V. Farmacognozie. Fitochimie. Fitoterapie. Vol. I, II, III. Editura Medicală, Bucureşti, 1998, 2001, 2005.
7. Муравьева Д. Фармакогнозия. Москва, «Медицина»,1991.

B. Additional

1. European Pharmacopoeia, vol. I, II, 2016.
2. Farmacopeea română, ediţia X. Editura medicală, Bucureşti, 1993.
3. Государственная Фармакопея. XI издание. Москва. «Медицина», том 1, 1987 и том 2, 1990.
4. Государственная Фармакопея Республики Беларусь. Том II, 2007, Том III, 2009.
5. Matcovschi C., Safta V.Ghid farmacoterapeutic. Editura „Vector". Chişinău, 2010.
6. Miron A., Hancianu M., Aprotosoaie C. Stanescu U., Plante medicinale de la A la Z. monografii ale produselor de interes terapeutic. Vol. I, Iasi, Editura "Gr.T.Popa", 2004.
7. Машковский М. Лекарственные средства. Москва. «Новая волна», 2005.