

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRARIAN UNIVERSITY
Faculty of Agrotechnologies and Natural Resource Management
Department of Biotechnology and Phytopharmacology**


**MODULE SYLLABUS
EC 5. Plant in the Experiment**


(compulsory)

Implemented in the “Ecology” Academic Program

Area of specialization 101 “Ecology”

at the third (educational and scientific) level of higher education

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Phytopharmacology Department Podgaetsky A. A.

Module syllabus viewed and agreed at the Biotechnology and Phytopharmacology Department meeting	Minutes № 42 dated July 5, 2021
	Head of Biotechnology and Phytopharmacology Department  _____ (signature) _____ <u>Prof.Podgaetsky.A.A.</u> (surname, initials)

Approved by:

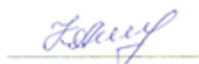
Guarantor of the Academic program

Kovalenko I.M.

Dean of the Faculty

Kovalenko I.M.

Syllabus review (attached) is provided by :

V. G. SkliarG.O. Klymenko

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Syllabus review data:

The academic year in which changes are made	The Academic program attachment number with changes description	Changes revised and approved		
		Minutes No and date of the department meeting	Head of Department	Guarantor of the Academic program

Dear graduates !

The success of your dissertation depends on many factors. Last but not least in this regard is a deep knowledge of the specificity of the object of study – the plants. Despite the fact that plants belong to the eukaryotic superkingdom, they are distinguished from other objects: humans, animals, fungi and lichens by a large number of features – cytological, genetic, physiological, biochemical, morphological and others. Only a deep knowledge of them will allow to hold methodically correct experiments, get answers and solve the purpose of the study, as well as tasks. The specificity of plant objects as an ecological component requires original approaches to all types of experiments, especially field ones. After all, among other things, the growth and development of plants in the field are greatly influenced by meteorological conditions, and therefore knowledge of the basic laws of the relationship between plants, soil, external conditions, including phytopathogenic situation, will competently perform your research. Good luck in mastering the knowledge of the discipline, which is the basis for successful completion of tasks, among them solving environmental situations that have changed very often in recent times.

1. MODULE OVERVIEW

1.	Title	Plant in the Experiment		
2.	Faculty/Department	Faculty of Agrotechnologies and Natural Resource Management Department of Biotechnology and Phytopharmacology		
3.	Type (compulsory or optional)	compulsory		
4.	Program(s) to which module is attached	Academic program “ Ecology ” Area of specialization 101 “ Ecology ”		
5.	Module can be suggested for (to be filled in for optional types)	-		
6.	Level of the National Qualifications Framework	8 level		
7.	Semester and duration of module	1 semester, 5 weeks		
8.	ECTS credits number	3,0 credits (90 hours)		
9.	Total workload and time allotment	Directed study		Self-directed study
		Lectures	Practicals	
		24	-	16
10.	Language of instruction	Ukrainian, English		
11.	Module leader	Doctor of Agr.Sciences, Professor, Podgaetsky A.A.		
11.1.	Module leader contact information	Podgaetsky A.A., podgaje@ukr.net , room C 22		
12.	Module description	<p>The discipline is based on the tasks and principles of recommendations for educational and methodological support (Letter of the Ministry of Education and Science of Ukraine dated 07/09/2018 No. 1 / 9-434) and approaches that provide for a combination of theoretical teaching, practical improvement and training.</p> <p>The PhD student is obliged to master the main laws and rules for conducting research with plants. Use the latest scientific developments to understand the deep, primarily ecological processes occurring with plants during research.</p>		
13.	Module aim	Not a simple study of the phenomena of simulated processes, but the improvement of the obtained data for their management, the creation of optimal conditions for the implementation of the characteristics of plant organisms in different environmental situations.		
14.	Module Dependencies (prerequisites, co-requisites, incompatible modules)	The basis for studying the reaction of plants to environmental research should be a good knowledge of general biological provisions, as well as related sciences of chemistry, physics, mathematics and more. After mastering the course, the PhD student will be able to explain much		

		more deeply the processes that occur with plants in the experiment, including from the standpoint of the relationship between plants and their environment
15.	The policy of academic integrity	A priori, the tasks set for PhD students must be performed by them independently. In case of rewriting detection, the papers submitted for verification returned for revision or canceled.
16.	Link in Moodle	https://cdn.snau.edu.ua/moodle/course/view.php?id=4813

2. CORRELATION BETWEEN MODULE LEARNING OUTCOMES (MLOS) AND PROGRAM LEARNING OUTCOMES (PLOS)

101 – Ecology

MLOs: On successful completion of the module the PhD student will be able to:	PLOs (indicate the number according to the numbering given in the AP)					How assessed
	PLOs 2 Demonstrate mastery of general scientific concepts of modern natural science	PLOs 4 Formulate, research and solve problems of ecology, environmental protection and sustainable use of nature using the scientific method of cognition	PLOs 7 Independently use modern equipment for research in the field of ecology, environmental protection and sustainable use of nature	PLOs 13 Be able to carry out a comprehensive analysis of the state of populations and develop measures to ensure their protection and rational, inexhaustible use	PLOs 14 Be able to assess the degree, nature of the negative impact of agricultural production and other types of anthropoppression on humans, biodiversity, the environment, assess risks and propose measures for the greening of the agrosphere	
MLOs 1. Find a niche for the research in the field of modern nature management	X			X		Report, discussion, survey, test control.
MLOs 2. Use scientific methods of understanding the problems of ecology, environmental protection and sustainable use of nature	X	X				Report, discussion, survey, test control. Preparation of a report with a multimedia presentation. Checking and analysis of completed tasks.
MLOs 3. Use modern scientific equipment to conduct experiments in the field of ecology, environmental protection and sustainable use of nature	X		X			Report, discussion, survey, test control. Preparation of a report with a multimedia presentation. Checking and analysis of completed tasks.
MLOs 4. Conduct a comprehensive analysis of the state of populations and develop a research program to ensure environmental protection.		X		X		Report, discussion, survey, test control. Preparation of a report with a multimedia presentation. Checking and analysis of completed tasks. Mastering skills and abilities in observation.
MLOs 5. Determine the negative impact degree of anthropogenic factors on biodiversity conservation.		X			X	Report, discussion, survey, test control. Preparation of a report with a multimedia presentation. Checking and analysis of completed tasks. Observation of PhD students in the process of performing tasks.

3. MODULE INDICATIVE CONTENT

Topics.(List of issues to be addressed within the topic)	Distribution of hours			Learning resources
	Directed study		Self-directed study	
	Lectures	Labs		
Theme 1. The main provisions of a systematic approach to the plant organisms study.	2	2	4	1, 3, 6, 12, 15
Theme 2. The relationship between plants, soil, meteorological conditions, anthropological factors.	2	2	6	3, 5, 14, 16, 24
Theme 3. Modern conceptual foundations of experimental and statistical support of experiments with plants.	2	-	6	4, 7, 8, 18, 22, 25, 26
Theme 4. An ecological approach to determine the main factors of influence on plants. Zoning of research performance.	2	2	4	2, 10, 11, 17, 24
Theme 5. Types of adaptive response in plants.	2	2	4	1, 2, 19, 21
Theme 6. Plant resistance to stress factors.	2	2	4	1, 3, 9, 16, 20
Theme 7. Preliminary and anticipatory plant reactions.	2		6	1, 7, 8, 18, 23
Theme 8. Productivity and collection.	2	2	4	2, 3, 8, 16, 21
Theme 9. Modeling in research with plants and their populations.	2	-	4	1, 19, 22, 23, 25, 26
Theme 10. The purpose of the experiment and the selection of methods for its implementation.	2	2	2	1, 2, 3, 4, 15, 18
Theme 11. Types of experiments and their features.	2	2	2	1, 2, 3, 4, 15, 18
Theme 12. Integral characteristics of the state of plants.	2	-	4	4, 14, 16, 24
Total hours	24	16	50	

4. TEACHING AND LEARNING METHODS

MLOs	Teaching methods (directed study)	Hours	Learning methods (self-directed study)	Hours
MLOs 1. Find a niche for the research in the field of modern nature management	Conducting lectures with multimedia presentations on each of the topics.	8	Preparation of materials for reports, their discussion, discussion	10
MLOs 2. Use scientific methods of understanding the problems of ecology, environmental protection and sustainable use of nature	Moderation of the discussion based on the results of the reports	8	Elaboration of theoretical material. Mutual learning. Work in small groups (formation of an idea, project, formation of a logical model)	12
MLOs 3. Use modern scientific equipment to conduct experiments in the field of ecology, environmental protection and sustainable use of nature	Conducting a quiz. Positively oriented research.	10	Підготовка вікторини	14
MLOs 4. Conduct a comprehensive analysis of the state of populations and	Making the reports of separate sections of PhD	6	Elaboration of additional material on	8

develop a research program to ensure environmental protection.	thesis		topics	
MLOs 5. Determine the negative impact degree of anthropogenic factors on biodiversity conservation.	Moderation of the discussion based on the results of the reports	8	Preparation of materials for reports, their discussion	6

ASSESSMENT

5.1. Summative assessment

5.1.1. To assess the expected learning outcomes provided

№	Summative assessment methods	Grades	Deadline
1.	Module 1 Practical work 1.1. Basic requirements for research with plant organisms.	3 grades /3%	Up to 3 week
2.	Practical work 1.2. Relationship between plants, soil, meteorological conditions, anthropological factors.	3 grades /3%	Up to 3 week
3.	Practical work 1.3. Ecological approach to determining the main factors influencing plants.	3 grades /3%	Up to 3 week
4.	Practical work 1.4. Levels of organization of processes in plants and the adaptability of the latter to external conditions.	3 grades /3%	Up to 3 week
5.	Practical work 1.5. Plants energy losses depending on external factors.	3 grades /3%	Up to 3 week
6.	Module control	5 grades /5%	Up to 3 week
7.	Attestation (multiple choice test)	15 grades /15%	Up to 3 week
Module 2			
8.	Practical work 2.1. Dependence of manifestation of resistance to stress factors depending on plant species.	4 grades /4%	Up to 5 week
9.	Practical work 2.2. Statistical support feature of ECOLOGICAL experiments performance.	4 grades /4%	Up to 5 week
10.	Practical work 2.3. The main approaches in choosing a model object in research with plants	4 grades /4%	Up to 5 week
11.	Module control	15 grades /15%	Up to 5 week
12.	Exam	30 grades /30%	Examination period

5.1.2. ASSESSMENT CRITERIA

Component	Unsatisfactory	Satisfactory	Good	Excellent
Module 1				
Practical work 1.1. Basic requirements for research with plant organisms.	<i>0 grades</i>	<i>1 grade</i>	<i>2 grades</i>	<i>3 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not sufficiently versed in the theoretical material	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the opinion and the vision of a certain problem are formed.

Practical work 1.2. Relationship between plants, soil, meteorological conditions, anthropological factors.	<i>0 grades</i>	<i>1 grade</i>	<i>2 grades</i>	<i>3 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not sufficiently versed in the theoretical material	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the opinion and the vision of a certain problem are formed.
Practical work 1.3. Ecological approach to determining the main factors influencing plants.	<i>0 grades</i>	<i>1 grade</i>	<i>2 grades</i>	<i>3 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not sufficiently versed in the theoretical material	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the opinion and the vision of a certain problem are formed.
Practical work 1.4. Levels of organization of processes in plants and the adaptability of the latter to external conditions.	<i>0 grades</i>	<i>1 grade</i>	<i>2 grades</i>	<i>3 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not sufficiently versed in the theoretical material	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the opinion and the vision of a certain problem are formed.
Practical work 1.5. Plants energy losses depending on external factors.	<i>0 grades</i>	<i>1 grade</i>	<i>2 grades</i>	<i>3 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not sufficiently versed in the theoretical material	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the opinion and the vision of a certain problem are formed.
Module control : test, oral questioning, written test (at the discretion of the module leader)	<i>0-5 grades</i>			
	Assessed based on the number of correct answers			
Attestation (multiple choice test)	<i>0-3 grades</i>	<i>3-7 grades</i>	<i>7-13 grades</i>	<i>13-15 grades</i>
	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test	Depends on the number of correct answers to the test
Module 2				
Practical work 2.1. Dependence of manifestation of resistance to stress factors depending on plant species.	<i>0-1 grades</i>	<i>2 grades</i>	<i>3 grades</i>	<i>4 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not sufficiently versed in the theoretical material	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the opinion and the vision of a certain problem are formed.
Practical work 2.2. Statistical support feature of ECOLOGICAL experiments	<i>0-1 grades</i>	<i>2 grades</i>	<i>3 grades</i>	<i>4 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the

performance.			sufficiently versed in the theoretical material	opinion and the vision of a certain problem are formed.
Practical work 2.3. The main approaches in choosing a model object in research with plants.	<i>0-1 grades</i>	<i>2 grades</i>	<i>3 grades</i>	<i>4 grades</i>
	Practical work is not done or done improperly	Not all tasks are calculated	All requirements and tasks are fulfilled, but the PhD student is not sufficiently versed in the theoretical material	All requirements and tasks are fulfilled, the obtained results are clearly interpreted, the opinion and the vision of a certain problem are formed.
Module control: test, oral questioning, written test (at the discretion of the module leader)	<i>0-15 grades</i>			
	Assessed based on the number of correct answers.			
Exam	<i>0-5 grades</i>	<i>5-15 grades</i>	<i>15-27 grades</i>	<i>30 grades</i>
	The PhD student is not sufficiently versed in the theoretical material, the tasks are not completed	The PhD student is not sufficiently versed in the theoretical material, the tasks are done with mistakes	The PhD student is sufficiently versed in the theoretical material, the tasks are completed	The PhD student is well versed in the theoretical material, all tasks are completed

5.2. Formative Assessment

№	Formative Assessment elements	Date
1	Oral questioning after studying each topic	After completing the study of the topic
2	Oral answers to individual questions during lectures and practicals	Throughout the semester
3	Analysis of texts on the topics of the course worked out by the PhD student individually	Throughout the semester
4	Defence of practical work	After completing of work
5	Oral feedback from the tutor when working on practicals.	Throughout the semester

6. LEARNING RESOURCES

Key resources

- Podhaietskyi A. Ad., Kravchenko N. V., Kriuchko L. V., Gorbas S.M., Podhaietskyi A.An. Simulation of nature of *Solanum L. sect. Petota Dumort. species* towards late blight resistance. *Ukrainian Journal of Ecology*, 2018, 8(1), 324–334. Doi: 10.15421/2018_218. (Web of Science).
- Podhaietskyi A.A., Kravchenko N.V., Kovalenko V.M., Bondus R.O., Hordienko V.V., Cherednichenko L.M., Sobran V.M. Ecological Testing of potatoes. *Ukrainian journal of ecology*. 2018. 8 (4) . С. 17-25. (Web of Science).
- Кущенко О. М., Писаренко В. М. Агроекологія. Київ: Урожай. 1995. 254 с.
- Гурова Т. Ф., Назаренко Л. В. Экология и рациональное природопользование. М. : Юрайт. 2019. 188 с.
- Жиров А. И, Дмитриев В. В., Ласточкин Н. Л. Прикладная экология. В 2 т. Том 2 : М. : Юрайт, 2019. — 311 с.
- Корытний Л. М., Потапова Е. В. Экологические основы природопользования М. : Юрайт. 2019. 374 с.

7. Третьякова Н. А. Основы экологии М.: Юрайт, 2019. 111 с.
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13. Чернова Н.М., Былова А. М. Общая экология. М.: Дрофа. 2018. 416 с.
14. Экология. Под ред. проф. В. В. Денисова. Ростов на Дону.: ИКЦ «МарТ». 2016. 678 с.
15. Актуальные проблемы экологии / коллект. автор, гл. ред. В.Н. Бурдь. - Гродно : ГрГУ им. Я. Купалы. - 2014.- Ч.1. - 171 с.
16. Актуальные проблемы экологии / коллект. автор, гл. ред. В.Н Бурдь. - Гродно : ГрГУ им. Я. Купалы. – 2014.- Ч.2. - 211 с.
17. Основы экологии [Электронный ресурс] : учебно-методический комплекс для студентов всех специальностей / Белорусский национальный технический университет, Кафедра "Экология" ; сост.: В. А. Левданская, Г. В. Бельская, Е. В. Карпинская. – Минск : БНТУ, 2013.
18. Христофорова Н. К. Основы экологии : учебник : для студентов высших учебных заведений. М.: Магистр : ИНФРА-М. 2014. – 638с.

Other sources

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25. Злобин Ю. А. Популяции редких видов растений: теоретические основы и методика изучения / Ю. А. Злобин, В. Г. Скляр, А. А. Клименко. – Сумы: Унив. книга, 2013. – 439 с.
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Information resources

- ✓ ЗУ «Про охорону навколишнього середовища» - <https://zakon.rada.gov.ua/laws/show/1264-12#Text>
- ✓ ЗУ «Про екологічну експертизу» - <https://zakon.rada.gov.ua/laws/show/45/95-%D0%B2%D1%80#Text>

Academic Program (Syllabus) Review
Plant in the Experiment

Parameter by which the educational program (syllabus) of the educational component is assessed by the guarantor or a member of the project team	Yes	No	Comment
Learning outcomes according the educational component (MLOs) correspond to the NQF	+		
Learning outcomes according the educational component (MLOs) correspond to the stipulated PLOs (for compulsory EC)	+		
The results of training in the educational component provide an opportunity to measure and assess the level of their achievement	+		

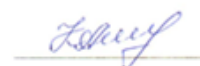
Member of AP "Ecology" project group



V. G. Skliar
(full name)

Parameter by which the educational program (syllabus) of the educational component is assessed by the teacher of the relevant department	Yes	No	Comment
General information about the educational component is sufficient	+		
Learning outcomes for the educational component (MLOs) correspond to the NQF The list of training resources contains the necessary software products to achieve DRN	+		
Learning outcomes for the educational component (MLOs) provide an opportunity to measure and assess the level of their achievement	+		
Learning outcomes (MLOs) relate to the students competencies, not the content of the discipline (contain knowledge, skills, abilities, not topics of the curriculum of the discipline)	+		
The content of the EC is formed in accordance with the structural and logical scheme	+		
Learning activity (teaching and learning methods) allows students to achieve expected learning outcomes (MLOs)	+		
The educational component involves learning through research that is appropriate and sufficient for the corresponding level of higher education	+		
The assessment strategy within the educational component is in line with the policy of the University / faculty	+		
The provided assessment methods allow to assess the degree of achievement of learning outcomes in the educational component	+		
The workload of students is adequate to the volume of the educational component	+		
Recommended learning resources are sufficient to achieve learning outcomes (MLOs)	+		
The literature is relevant	+		
The list of training resources contains the necessary software products to achieve MLOs	+		

Reviewer (Ecology and Botany Department member)



G.O. Klymenko

