



SYLLABUS OF THE ACADEMIC DISCIPLINE «Plant Physiology with basics of biochemistry»

Degree of higher education - Bachelor
Specialization **202 Plant protection and quarantine**
Educational programme «Plant protection and quarantine»
Academic year 2, semester 4
Form of higher education: full-time
Number of ECTS credits 4
Language of instruction English

Lecturer of the discipline

Lecturer contact
information (e-mail)
URL of the ESC on the
educational portal of
NULES of Ukraine

Candidate of Biological Sciences, Associate Professor
Babytskiy Andriy
ph. 0967774413
andriybabytskiy@gmail.com
<https://elearn.nubip.edu.ua/course/view.php?id=1118>

DESCRIPTION OF THE DISCIPLINE

(up to 1000 characters)

The mechanisms of the main life processes in plants are described, the structural and functional organization of plant systems of different levels of organization is revealed, and the ways of plant organism management for optimization of crop cultivation, plant protection and protection of natural phytocenoses are substantiated.

The purpose of teaching the discipline "Plant Physiology with basics of biochemistry" is to learn the laws of vital functions of plants, the disclosure of their mechanisms, the formation of ideas about the structural and functional organization of plant systems at different levels and the development of ways to control the plant organism.

The main tasks of the discipline "Plant Physiology with basics of biochemistry" are the study by students of the laws of vital functions, the disclosure of their mechanisms, the formation of ideas about the structural and functional organization of plant systems at different levels; obtaining and generalizing new knowledge about the physiological functions of the plant organism and the ability to control the production process of phytocenoses to create a theoretical basis for the rational use and protection of flora, the acquisition of practical skills in the laboratory of plant physiology.

Competencies of the discipline:

Integral competence (IC): Ability to solve complex specialised tasks and practical problems of professional activity in plant protection and quarantine and apply theoretical knowledge and methods of phytosanitary monitoring, inspection, analysis, examination, characterised by complexity and uncertainty of conditions.

General competencies (GC):

GC3. Knowledge and understanding of the subject area and understanding of professional activities.

GC6. Skills in using information and communication technologies for professional activities.

Program learning outcomes (PLOs):

PLOs4. Know and understand mathematics and natural sciences to the extent necessary for professional activities in plant protection and quarantine.

PLOs6. Correctly use appropriate methods of observation, description, identification, classification, cultivation of agrobiocenoses and maintenance of their stability to preserve natural diversity.

PLOs16. Know the main historical stages of development of the subject area.

STRUCTURE OF THE ACADEMIC DISCIPLINE

Topic	Hours (lec./lab.)	Learning outcomes	Tasks	Evaluation
4 semester				
Module 1. «Plant cell physiology and patterns of water exchange»				
<p>Topic 1. «Introduction. Subject, purpose and tasks, directions and methods of modern plant physiology. History of the formation of plant physiology as a science»</p>	1/2	<p>Master the subject, purpose and direction of plant physiology. History of formation of plant physiology and contribution of domestic scientists to its development; methods and directions of research in plant physiology; connection of plant physiology with other sciences; main directions of development of modern plant physiology; the role of plant physiology in plant productivity programming, forecasting the state of ecological systems and nature protection; the role of discipline in the formation of agrobiologists.</p> <p>Get acquainted with the rules of work in the laboratory of plant physiology and the structure of the light microscope.</p>	<p>Choose one of the personalities listed in the e-course according to your serial number in the journal and prepare an essay on the life and scientific achievements of the scientist.</p>	<p>Completion and submission of laboratory and independent work, as well as Module Control in the form of tests (on eLearn) and oral/written questioning - according to the gradebook in eLearn</p>
<p>Topic 2. «Plant cell physiology».</p>	1/2	<p>Study: General ideas about the plant cell. Structural and functional organization of a plant cell. Modern ideas about the eukaryotic cell of plant organisms and the theory of endosymbiogenesis. The concept of compartmentalization. The main compartments of the plant cell. Cell membrane, its structure, properties and functions.</p>	<p>Solve the problems and design the solution according to the sample given in the e-course.</p>	<p>Completion and submission of laboratory and independent work, as well as Module Control in the form of tests (on eLearn) and oral/written questioning - according to the</p>

		Protoplast or cytoplasm as the living contents of a plant cell. Cytoplasmic conditions and its main components. Biological membranes, their structure and functions. Determine the permeability of the protoplast of beetroot cells under the action of temperature and chemicals.		gradebook in eLearn
Topic 3. «Water exchange of plants».	1/2	Study: The flow of water into the plant cell. Diffusion. Osmosis. The cell as an osmotic system. Phenomena of plasmolysis and deplasmolysis. Absorption mechanisms, symplastic and apoplastic pathways of water transport. Ways and driving forces of water transport. The mechanism of root pressure. Guttation and "crying" of plants. Adhesion and cohesion. Transpiration. Features of the water regime of plants of different ecological groups. Determine the suction force, osmotic pressure and degree of turgor of plant tissue cells of potatoes and table beets.	Solve the problems and design the solution according to the sample given in the e-course.	Completion and submission of laboratory and independent work, as well as Module Control in the form of tests (on eLearn) and oral/written questioning - according to the gradebook in eLearn
Module 2 «Energy processes of the plant organism and physiology of nutrition, growth and development of plants»				
Topic 4. «Photosynthesis»	1/2	Study: Photosynthesis. History of discovery and study of photosynthesis. The value of photosynthesis in nature, its cosmic role. Characteristics of the main indicators of photosynthesis, methods and units of	Select plant species with different pathways of photosynthesis, establish their biological and ecological properties, analyze the	Completion and submission of laboratory and independent work, as well as Module

		<p>their measurement. Leaf structure due to photosynthesis. Chloroplasts, their structure, chemical composition and functions. Photosynthetic pigments (chlorophyll, carotenoids, phycobilins). To determine the condition of plant stomata from different ecological conditions of growth by infiltration.</p>	<p>relationship of morphological and physiological characteristics of plants of different photosynthetic types with their physiological processes. Prepare a report on the requirements of the e-course.</p>	<p>Control in the form of tests (on eLearn) and oral/written questioning - according to the gradebook in eLearn</p>
<p>Topic 5. «Plant respiration».</p>	1/2	<p>Study: The concept of plant respiration. History of study and physiological role of respiration. Aerobic and anaerobic respiration. General equation of respiration. The relationship between respiration and fermentation. Primary stages of respiration. Glycolysis (Embden-Meyerhof-Parnassus path). The tricarboxylic acid cycle, or Krebs cycle. Chemistry and significance. Respiratory electron transport chain and oxidative phosphorylation. Respiratory energy. Master the method of one-dimensional paper ascending chromatography and use it to separate a mixture of photosynthetic pigments from the leaves of tradescantia.</p>	<p>Solve the problems and design the solution according to the sample given in the e-course.</p>	<p>Completion and submission of laboratory and independent work, as well as Module Control in the form of tests (on eLearn) and oral/written questioning - according to the gradebook in eLearn</p>
<p>Topic 6. «Mineral nutrition of plants».</p>	1/2	<p>Study: Physiological role of batteries. The concept of organogens. Macronutrients. Trace elements.</p>	<p>Solve the problems and design the solution according to the sample given in the e-</p>	<p>Completion and submission of laboratory and</p>

		<p>Ultramicroelements. Ways of absorption of mineral elements by a plant. Nitrogen metabolism. Compare the activity of dehydrogenase, polyphenol oxidase, peroxidase and catalase in different plant species.</p>	course.	independent work, as well as Module Control in the form of tests (on eLearn) and oral/written questioning - according to the gradebook in eLearn
<p>Topic 7. «Plant growth and development, adaptation of plants to environmental conditions».</p>	1/2	<p>Study: The concept of plant development. The relationship between growth and development. Physiology of plant aging. Aging and rejuvenation of plants and organs in ontogenesis. Photoperiodism. Hormonal theory M.Kh. Chailakhian. Thermoperiodism and vernalization. The theory of cyclic aging and rejuvenation PM Krenke. The concept of ontogenesis and its stages. Cytogenesis. Cell differentiation and histogenesis. Plant growth and dormancy. Investigate the dynamics of growth of shoots of woody plants on the example of hibiscus.</p>	Solve the problems and design the solution according to the sample given in the e-course.	Completion and submission of laboratory and independent work, as well as Module Control in the form of tests (on eLearn) and oral/written questioning - according to the gradebook in eLearn
Total for 4th semester				70
Exam				30
Total for the course				100

ASSESSMENT POLICY

<i>Policy regarding deadlines and resits:</i>	Assignments submitted after the deadline without valid reasons will be graded lower. Resitting of modules will be allowed with the permission from the lecturer and in the presence of valid reasons (e.g. medical reasons).
<i>Academic honesty policy:</i>	Cheating during tests and exams is strictly prohibited (including the use of mobile devices). Coursework and research papers must contain correct citations for all sources used.

Attendance policy:	Class attendance is mandatory. In case of objective reasons (such as illness or international internships), individual learning may be allowed (in online format by the approval of the dean of the faculty).
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SCALE OF ASSESSMENT OF STUDENT KNOWLEDGE

Student rating, points	National grade based on exam results	
	exams	credits
90-100	excellent	passed
74-89	good	
60-73	satisfactory	
0-59	unsatisfactory	not passed

Recommended sources of information

Main literature

1. Plant physiology: a textbook / S.V. Prylutska, A.I. Babytskyi, N.H. Nesterova, T.A. Tkachenko, P.Y. Drozd - Kyiv: NUBiP of Ukraine, 2023. 224 p.
2. Musienko M.M. Plant Physiology: Textbook (for students of higher educational institutions) - K.: Lybid, 2005. - 808 p.
3. Musienko M.M. Plant Physiology: Textbook - K.: Phytosociocenter, 2001. - 392 p.
4. Makrushyn M.M., Makrushyna E.M., Peterson N.V. et al. Physiology of agricultural plants with the basics of biochemistry - K.: Urozhay, 1995. - 352 p.
5. Makrushyn M.M., Makrushyna E.M., Petersen N.V., Menshikov M.M. Plant Physiology - Vinnytsia: "New Book", 2006. - 416 p.
6. Samoilenko T.G., Samoilenko M.O., Rozhok O.F. Workshop on plant physiology: Study guide. - Mykolaiv: MNAU, 2013. - 431 p.
7. Romaniuk N.D., Tsvilynyuk O.M., Mykievych I.M., Terek O.I. Plant Physiology: A textbook for students of biological faculties of higher educational institutions: Pyramid, 2005. 160 p.
8. Nikolaychuk V.I., Belchgazi V.Y. Physiology and biochemistry of plants: Study guide for students of biological specialties of higher educational institutions - Uzhhorod: UzhNU, 192 p.
9. Bryon O.V., Chykalenko V.G., Slavnyi P.S., Merezhynskyi Y.Y., Bilanovskyi M.F. Plant Physiology: Workshop. - K.: Higher School, 1995. - 191 p.
10. Kozhukalo V.E., Marchenko O.M., Suray O.O. Methodical instructions for laboratory and practical classes for students of agrobiological faculties. - K.: NAU Publishing Center, 2006. - 46 p.
11. Methodical recommendations for laboratory classes in the discipline "Plant Physiology" for students of agrarian universities of agronomic specialties. - K.: Phytosociocenter, 2000. - 64 p.
12. Kazakov E.O. Methodological bases of setting up an experiment in plant physiology. - Kyiv: Phytosociocenter, 2000. - 272 p.
13. Musienko M.M. Photosynthesis. - K.: Higher School, 1995. - 247 p.

Supporting literature

1. Hrytsayenko Z.M., Hrytsayenko O.A., Karpenko V.P. Methods of biological and agrochemical research of plants and soils. - K.: CJSC "Nichlava", 2003. - 320 p.
2. Kostylov O.V., Romanenko O.V. Biology and ecology of autotrophic organisms. - K.: Phytosociocenter, 1999. - 192 p.
3. Musienko M.M., Parshikova T.V., Slavnyi P.S. Spectrophotometric methods in the practice of physiology, biochemistry and plant ecology. - Kyiv: Phytosociocenter, 2001. - 200 p.
4. Rudyshyn S.D. Fundamentals of plant biotechnology. Textbook for higher agricultural institutions. - Vinnytsia, 1998. - 234 p.