

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF
UKRAINE**

V.F. Peresyphkin Department of Phytopathology

"APPROVED"

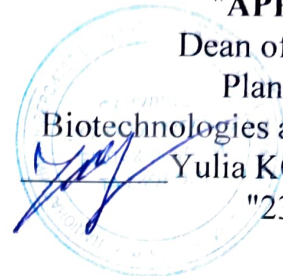
Dean of the Faculty

Plant Protection,

Biotechnologies and Ecology

Yulia KOLOMIETS

"23" may 2024



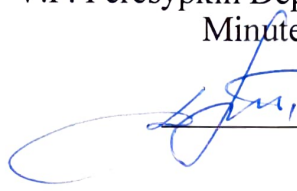
"APPROVED"

V.F. Peresyphkin Department of Phytopathology

Minutes № 13 of "10" may 2024

Head of the Department

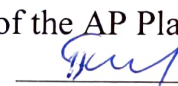
Dmytro GENTOSH



"REVIEWED"

Guarantor of the AP Plant Protection and Quarant

Myroslav PIKOVSKYI



**CURRICULUM OF ACADEMIC DISCIPLINE
"GENERAL PLANT PATHOLOGY"**

Field of knowledge 20 Agricultural sciences and food

Specialty 202 Plant Protection and Quarantine

Academic programme Plant Protection and Quarantine

Faculty Plant Protection, Biotechnologies and Ecology

Author(s): Bashta O.V., associate professor, Dr. PhD;

Havryliuk L., assistant, Dr. PhD

Kyiv – 2024

Description of the discipline “General Plant Pathology”

Academic degree, specialty, academic programme		
Academic degree	bachelor's	
Specialty	202 Plant Protection and Quarantine	
Academic programme	Plant Protection and Quarantine	
Characteristics of the discipline		
Type	compulsory	
Total number of hours	240	
Number of ECTS credits	8	
Number of modules	4	
Course project (work) (if any)	CW	
Form of assessment	exam / credit	
Indicators of the discipline for full-time and part-time forms of university study		
	Full-time	Part-time
Year of study	3	4
Semester	5,6	6,7
Lectures	60 h.	4 h.
Practical classes and seminars	-	-
Laboratory classes	90 h.	-
Self-study	90 h.	236 h.
Number of hours per week for full-time students	6 h.	

1. Aim, objectives, competences and expected learning outcomes of the discipline

"General plant pathology" is one of the main profiling disciplines in training a specialist in plant protection and quarantine. It has a close connection with many general biological and special disciplines: botany, plant physiology, microbiology, virology, biotechnology, soil science, general agriculture, plant breeding, selection and seed production, fruit growing, vegetable growing, agrochemistry, mycology, agricultural phytopathology, zoology, general and agricultural entomology, etc., due to common objects and research methods.

The goal of general phytopathology as a science is to study the pathological process of plants, the etiology of diseases, the role of biotic and abiotic factors in their appearance and development, and to find out the factors that restrain the spread of pathogens and the diseases they cause.

During the implementation of the program, students study various groups of microorganisms pathogenic to plants, their parasitic properties, specialization and systematic position.

The task of general phytopathology is:

- To acquaint students with the pathological process in a plant,
- To study the reasons for the regularity of the spread and development of plant diseases and to be able to establish the influence of environmental factors on these phenomena
- Master the classic and modern methods of diagnosing plant diseases with subsequent identification of their causative agents;
- Based on signs of manifestations on the plant, establish the etiology of the disease;
- Be able to plan and develop preventive and curative measures to prevent plant diseases and reduce crop losses from diseases

As a result of studying general phytopathology, the student should:

to know the diagnostic signs and types of diseases, methods of identification of pathogens, having mastered the theoretical issues of their biology, ecology, systematics and ways of spreading;

to be able to independently determine the types of diseases, establish their causative agents and taxonomic groups, justify measures that prevent the appearance of epiphytotia and limit the development of diseases caused by them.

Competence acquisition:

Integral competence (IC):

The ability to solve complex specialized tasks and practical problems of professional activity in plant protection and quarantine and to apply theoretical knowledge and methods of phytosanitary monitoring, inspection, analysis, expertise characterized by complexity and uncertainty of conditions.

General competences (GC)

GC 2. Ability to apply knowledge in practical situations.

GC 3. Knowledge and understanding of the subject area and understanding of professional activity.

Program Learning Outcomes (PLO)

PLO 6. Correctly use appropriate methods of observation, description, identification, classification, cultivation of objects of agrobiocenoses and maintenance of their stability in order to preserve natural diversity.

PLO 16. Know the main historical stages of development of the subject area.

4.2.1. Compliance with agrotechnical requirements for growing plants	7	1		2		4	7				7
4.2.2. Immunological method of plant protection	5	1		2		2	5				5
4.2.3. Biological method	10	2		4		4	10				10
4.2.4. Physico-mechanical method	5	1		2		2	5				5
4.2.5. Chemical method	8	2		2		4	8				8
4.2.6. Quarantine measures	7	1		2		4	7				7
Together according to the content module 4	56	10		22		24	56	1			55
Total hours	240	60		90		90	240	4			236
Course project (work) on <u>General Plant Pathology</u>		-	-	-		-		-	-	-	-
Total hours		-	-	-		-		-	-	-	-

3. Topics of laboratory classes

№	Topic name	Hours
1	Discoloration of the material, coloring and fixation of preparations. Infection of plants with pathogens. Observation of the development of a living object and pathological changes in a plant.	4
2	Determining the harmfulness of diseases by their symptoms and distribution.	2
3	Acquaintance with visual signs of diseases according to their classification.	4
4	Symptoms of diseases. Types, their manifestation	4
5	Acquaintance with the symptoms of diseases arising under the influence of abiotic factors.	4
6	External signs of damage to plant organs by pathogens belonging to different groups of parasitism.	2
7	The ability of pathogens to infect certain types of plants. The role of minimal infectious load in the occurrence of infection.	2
8	Morphological features of phytopathogenic bacteria. Types of bacterial plant diseases. Staining of phytopathogenic bacteria, fixation, artificial infection of plants.	4
9	Morphological properties of actinomycetes, rickettsial mycoplasmas.	2
10	Symptoms of viral plant diseases. Determining whether the latter belong to the groups of mosaics and yellows. Artificial infection of healthy plants with viral pathogens as evidence of disease infectivity. Diagnosis of plant viral diseases.	2
11	Morphological features of viroids.	2
12	Symptoms of mistletoe, coryza and lupus. Mechanism of plant infection.	2
13	Sensitivity of lower fungi to abiotic factors. Antagonism of fungi within the species and relative to other organisms. Fundamentals of mushroom taxonomy. The principles of dividing them into taxonomic groups. Class Plasmodiophoramycetes.	2
14	Principles of dividing them into taxonomic groups Class Chytridiomycetes.	6
15	The principles of dividing them into taxonomic groups Class Oomycetes.	2
16	The principles of dividing them into taxonomic groups Class Zygomycetes.	2

17	Signs of mycelium according to which mushrooms belong to higher ones. Penetration into the plant.	6
18	Systematics of higher fungi. Class Ascomycetes	6
19	Systematics of higher fungi. Class Basidiomycetes	4
20	Systematics of higher fungi. Mitosporous fungi	2
21	Infection of plants with pathogens under different regimes of temperature, moisture and presence of light.	2
22	Direct and passive transmission of pathogens from diseased plants or their individual organs to healthy ones.	2
23	Emergence of epiphytota under different conditions of meteorological condition, pathogen and resistance of varieties (simulate these factors and predict epiphytota).	6
24	Methods of diagnosing plant diseases. Laboratory methods of diagnosis	4
25	Molecular diagnostic methods	2
26	Simulate various agrotechnical backgrounds affecting the development of certain groups of diseases.	2
27	The role of the variety in the development of plant diseases. Specify the varieties with increased resistance of various agricultural crops against diseases.	2
28	The influence of fungi of the second order and their producers on the growth and development of phytopathogenic fungi.	2
29	Determining the quality of infected and healthy seeds as proof of the need to clean them. Methods of thermal disinfection of seeds.	2
30	The influence of chemical plant protection agents on the germination of spores and the development of mycelia of pathogens.	2
Total		90

4. Topics of independent studies

From Module № 1 "Concepts about plant diseases"

№	Topic name	Hours
1	Determination of harmfulness of diseases	5
2	Symptoms of diseases by etiology	5
3	Types of disease manifestations	5
4	Acquaintance with the symptoms of diseases arising under the influence of abiotic factors	5
5	External signs of damage to plant organs by pathogens belonging to different groups of parasitism	6
Total		26

From Module №2 "Pathogens of plant diseases"

№	Topic name	Hours
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1	The ability of pathogens to infect certain types of plants. The role of minimal infectious load in the occurrence of infection.	4
2	Morphological features of phytopathogenic bacteria. Types of bacterial plant diseases. Staining of phytopathogenic bacteria, fixation, artificial infection of plants. Morphological properties of actinomycetes, rickettsial mycoplasmas.	4
3	Symptoms of viral plant diseases. Determining whether the latter belong to the groups of mosaics and yellows. Artificial infection of healthy plants with viral pathogens as evidence of disease infectivity. Diagnosis of plant viral diseases.	4
4	Morphological features of viroids.	4
5	Floral parasites of plants. Mechanism of plant infection.	4
Total		20

From Module № 3 "Dynamics of Development and Spread of Infectious Plant Diseases"

№	Topic name	Hours
1	Signs of mycelium according to which mushrooms belong to higher ones. Penetration into the plant.	2
2	Systematics of higher fungi. Class Ascomycetes	2
3	Systematics of higher fungi. Class Basidiomycetes	2
4	Systematics of higher fungi. Mitosporous fungi	2
5	Infection of plants with pathogens under different regimes of temperature, moisture and presence of light.	2
6	Direct and passive transmission of pathogens from diseased plants or their individual organs to healthy ones.	5
7	Emergence of epiphytotia under different conditions of meteorological condition, pathogen and resistance of varieties (simulate these factors and predict epiphytotia).	5
Total		20

From Module № 4 "Diagnosis of plant diseases. Principles of construction of protective measures"

№	Topic name	Hours
1	Methods of diagnosing plant diseases. Laboratory methods of diagnosis	10
2	Molecular diagnostic methods	8
3	Methods and means of protecting plants from diseases	6
Total		24

**5. Tools for assessing expected learning outcomes:
(select necessary or add)**

- exam;
- credit;
- module tests;
- abstracts;
- presentation of laboratory and practical works;
- other types.

6. Teaching methods:

- verbal method (lecture, discussion);
- practical method (laboratory, practical classes);
 - visual method (illustration, demonstration);
 - processing learning resources (note-taking, summarising, reviewing, writing an abstract);
- video method (remote, multimedia, web-based, etc.);
- self-study (completing assignments);
- individual research work;
- other types.

7. Assessment methods:

(select necessary or add)

- exam;
- credit;
- oral or written assessment;
- module tests;
- team projects;
- presentation of laboratory and practical works;
- presentations at academic events
- other types.

8. Distribution of points received by students

The assessment of students' knowledge and skills is conducted by means of a 100-point scale and is converted into national grades according to Table 1 of the current *Exam and Credit Regulations at NULES of Ukraine*.

Student's rating, points	National grading of exams and credits	
	exams	credits
90-100	excellent	pass
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	fail

To determine a student's rating in the discipline R_{DIS} (up to 100 points), the received assessment rating R_A (up to 30 points) is added to the academic performance rating R_{AP} (up to 70 points): $R_{DIS} = R_{AP} + R_A$.

9. Teaching and learning aids

- e-learning course of the discipline
(<https://elearn.nubip.edu.ua/course/view.php?id=3039>);
- lectures and presentations (in electronic form);
- textbooks, manuals, tutorials;
- guidelines for studying a discipline by full-time and part-time students;
- internship programmes of the discipline (if included in the curriculum).

10. Recommended sources of information

1. Bashta O.V., Voloshchuk N.M., Vuyek A.O., Gentosh D.T., Pikovsky M.Y., Artemchuk I.P. Methodological recommendations for educational practice in phytopathology for applicants of the first (bachelor) level of higher education, specialty 202 Protection and quarantine of plants Kyiv: Editorial and publishing department of NUBiP of Ukraine. 2023. 78 pages.

2. Bashta O.V., Vuyek A.O. Workbook for performing laboratory work in General Phytopathology for students of the first (bachelor) level of higher education, specialty 202 Protection and quarantine of plants. Kyiv: Editorial and publishing department of NUBiP of Ukraine. 2023. 128 pages.

3. Bashta O.V., Voloshchuk N.M. Methodical guidelines for writing a coursework on general phytopathology for students of the BA "Bachelor" specialty 202 "Protection and Quarantine of Plants". Kyiv: Editorial and publishing department of NUBiP of Ukraine. 2022. 12 p.

4. Bashta O.V., Voloshchuk N.M., Vuyek A.O. Methodical instructions for laboratory work on general phytopathology for students of the BA "Bachelor" specialty 202 "Protection and Quarantine of Plants". Kyiv: Editorial and publishing department of NUBiP of Ukraine. 2022. 95 p.

5. Bhunjun C.S.; Phillips A.J.L.; Jayawardena R.S.; Promputtha I.; Hyde K.D. Importance of Molecular Data to Identify Fungal Plant Pathogens and Guidelines for Pathogenicity Testing Based on Koch's Postulates. *Pathogens* 2021. 10. 1096. <https://doi.org/10.3390/pathogens10091096>

6. Mapuranga J, Zhang N, Zhang L, Chang J, Yang W. Infection Strategies and Pathogenicity of Biotrophic Plant Fungal Pathogens. *Front Microbiol.* 2022 Jun 2;13:799396. doi: 10.3389/fmicb.2022.799396.

7. Modern Approaches in Plant Pathology. Elite Publishing House. 2023. 321 pp. Principles of Plant Pathology. Mishra R. C. & Singh R. (eds.). 2023. 19 pp. <https://www.researchgate.net/publication/370025309>

8. Plant Pathology Concepts and Laboratory Exercises Third edition. – CRC Press. – 2016. – 598 p.

9. The Study of Plant Disease Epidemics. [Laurence V. Madden](#), [Gareth Hughes](#), and [Frank van den Bosch](#), 2017 <https://doi.org/10.1094/9780890545058>

10. Venbrux M, Crauwels S and Rediers H. Current and emerging trends in techniques for plant pathogen detection. *Front. Plant Sci.* 2023. 14:1120968. doi: 10.3389/fpls.2023.1120968

11. *Phytopathology: Textbook* [I.L. Markov, O.V. Bashta, D.T. Gentosh, V. A. Glymyazny, O.P. Dermenko, E. P. Chernenko]; under the editorship I.L. Markov. K., 2016. 548 p. 2.

12. *General phytopathology: Education. manual* / Under the editorship N.V. Pinchuk: -. Vinnytsia, 2018. – 272 p.

Internet resources:

1. European Journal of Plant Pathology
<https://www.springer.com/journal/10658/>

2. Atlas of ornamental plant diseases. Access:

<https://naurok.com.ua/atlas-hvorob-dekorativnih-roslin-320421.html>

3. Identifier of plant pests and diseases. KWS. Access:
www.kws.com/ua/uk/agroservis/vyroshchuvannya-roslyn/zahyst-roslyn/vyznachnyk-shkidnykiv-ta-hvorob/

4. TOP-5 applications for diagnosing plant diseases. Access:
<https://superagronom.com/news/5925-top-5-dodatkov-dlya-diagnostiki-hvorob-roslin>

5. Diseases and pests of indoor plants. Access:

<https://asterias.od.ua/860-khvorobi-ta-shkidniki-kimnatnikh-roslin-zakhist-i-likuvannya.html>