

*Federal State Autonomous Educational Institution of Higher Education "Peoples'
Friendship University of Russia"*

Agrarian and Technological Institute

Recommended by ISSC / ME

THE WORKING PROGRAM OF THE DISCIPLINE

The name of the discipline

GENETIC BASIS OF PLANT IMMUNITY

Recommended for direction of training/specialties

06.06.01 "Biological Sciences"

(the code and name of the direction of training / specialty are indicated)

Focus of the program (profile)

03.02.07 Genetics

(name of the educational program in accordance with the direction (profile))

1. Goals and objectives of the discipline:

The purpose of the discipline is to form the necessary ideas among graduate students about the main directions and methods of breeding work to increase the resistance of varieties and hybrids of agricultural crops to diseases and pests.

Objectives of mastering the discipline:

- to study the basics of plant phytoimmunity to harmful organisms and the mechanisms of plant protection from diseases and pests;
- to master the genetics of pathogenesis and genetics of plant resistance to diseases;
- master the field, laboratory and biotechnological methods for assessing the resistance of plants to harmful organisms

2. Place of discipline in the structure of EP VO:

"Genetic foundations of plant immunity", as a discipline, is included in the variable part of the OOP and the professional cycle of the direction 06.06.01 "Biological Sciences". Block 1 of the curriculum.

Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the competence matrix of EP HE.

Table No. 1

Prior and subsequent disciplines aimed at the formation of competencies

P / p No.	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
Universal competences			
1	Ability to critically analyze and evaluate modern scientific achievements, generate new ideas when solving research and practical problems, including in interdisciplinary fields (UC-1)	Plant genetics	Molecular and biochemical markers Plant breeding and biotechnology
General professional competencies			
1	the ability to independently carry out research activities in the relevant professional field using modern research methods and information and communication technologies (GPC-1);	Plant genetics	Molecular and biochemical markers Plant breeding and biotechnology
Professional competence			
1	PC-1: the ability to understand modern problems of biology and use fundamental biological concepts in the field of professional activity to formulate and solve new problems; PC-2: Ability to use basic theories, concepts and principles in the chosen field of activity, ability to think systems PC-3 :. the willingness to independently analyze the available information, set the goal and	Plant genetics	Russian language in sphere professional communications Molecular and biochemical markers Plant breeding and biotechnology

	objectives of the study and propose methods for their solution;		
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3. Requirements for the results of mastering the discipline:

The process of studying the discipline is aimed at the formation of the following competencies:

Universal Competencies (UC):

- UC-1: the ability to critically analyze and evaluate modern scientific achievements, generate new ideas when solving research and practical problems, including in interdisciplinary fields

General professional competencies

- the ability to independently carry out research activities in the relevant professional field using modern research methods and information and communication technologies (GPC-1);

Professional competence

- PC-1: the ability to understand modern problems of biology and use fundamental biological concepts in the field of professional activity to formulate and solve new problems;
- PC-2: Ability to use basic theories, concepts and principles in the chosen field of activity, ability to think systems
- PC-3 :. the willingness to independently analyze the available information, set the goal and objectives of the study and propose methods for their solution;

As a result of mastering the discipline, a graduate student must:

Know:

- genetic basis of selection for immunity to harmful organisms;
- ecology of cultivated plants;
- a variety of methods for creating infectious backgrounds for selection;
- the history of the emergence and development of the doctrine of plant immunity;
- the main directions of breeding for disease resistance.

Be able to:

- to determine the mechanisms of plant resistance to diseases and pests;
- to identify causative agents of diseases;
- to carry out artificial infection of plants;
- to determine the genotype of resistance of varieties;
- evaluate plants for disease resistance and pest damage;
- to analyze the food selectivity of insects;

Own:

- skills in assessing varieties for resistance to diseases and pests;
- principles and methods of identifying plant resistance to phytophages and phytopathogens;
- the skills of creating infectious and provocative backgrounds, assessing the source material in accordance with phytopathological scales

4. Scope of discipline and types of educational work

The total workload of the discipline is 4 credit units.

Type of educational work	Total hours	Semesters			
		3	4		
Classroom lessons (total)	80	40	40		
Including:	-	-	-	-	-

Lectures	40	20	20		
Laboratory workshop	40	20	20		
Independent work (total)	46	23	23		
knowledge control	18	9	9		
Total labor intensity hour	144	72	72		
credits units	4				

5. Content of the discipline

5.1. Contents of discipline sections

Name of the discipline	The genetic basis of plant immunity
Discipline scope	4 Credits / 144 hours
Discipline summary	
The name of the sections (topics) of the discipline	Summary of sections (topics) of the discipline
The immune system of plants. Characterization of immunity factors	Types of plant immunity. Congenital and acquired, passive and active immunity. Flora's theory "gene for gene". Specific immunity.
The role of plant physiology in the formation of immunity. Biochemical factors of resistance	Factors of active and passive immunity. Chemical compounds of plant cells involved in the formation of immunity against diseases and pests. Phenols, terpenoids. Saponins. Proteins-inhibitors of viruses.
Plant immunity genetics. The structure of resistance genes. Interactions between resistance genes.	Interaction between the host plant and new aggressive races of pathogens. Monogenic and polygenic resistance. Vertical and horizontal stability. Chromosomal organization of resistance genes. Phenotypic manifestation of resistance.
Genetic methods for creating resistant varieties. Identification of new resistance genes PCR diagnostics. Immunization.	Genome manipulation methods for plant immunization. Breeding programs to increase plant resistance. Tissue culture. Biochemical markers.

5.2. Sections of disciplines and types of classes

P / p No.	The name of the discipline section	Lecture.	Laboratory workshop	knowledge control	Ind/ work	Total hour.
one.	The immune system of plants. Characterization of immunity factors	10	10	5	12	
2.	The role of plant physiology in the formation of immunity. Biochemical factors of resistance	10	10	5	12	
3.	Plant immunity genetics.	10	10	4	11	

	The structure of resistance genes. Interactions between resistance genes.					
4.	Genetic methods for creating resistant varieties. Identification of new resistance genes PCR diagnostics. Immunization.	10	10	4	11	
Total		40	40	18	46	144

6. Laboratory workshop

P / p No.	Practical training topics	Labor capacity (hour.)
1.	The immune system of plants. Characterization of immunity factors	10
2.	The role of plant physiology in the formation of immunity. Biochemical factors of resistance	10
3.	Plant immunity genetics. The structure of resistance genes. Interactions between resistance genes.	10
4.	Genetic methods for creating resistant varieties. Identification of new resistance genes PCR diagnostics. Immunization.	10
Total		40

7. Practical exercises (seminars) *(in the presence of)*

8. Material and technical support of the discipline:

Classroom with personal computer (laptop), multimedia projector, screen.
 Demonstration material on slides on discipline topics.
 Specialized equipment for general use

9. Information support of the discipline

a) software

Volume Licensing Program (Microsoft Subscription) Enrollment for Education Solutions (EES) No. 56278518 dated 04/23/2019 (renewed annually, the program is assigned a new number).

b) databases, reference and search systems

1. EBS of RUDN University and third-party EBS to which students have access on the basis of concluded agreements:

- Electronic library system RUDN - EBS RUDN <http://lib.rudn.ru/MegaPro/Web>
- EBS "University Library Online" <http://www.biblioclub.ru>
- EBS Yurayt <http://www.biblio-online.ru>
- EBS "Student Consultant" www.studentlibrary.ru
- EBS "Doe" <http://e.lanbook.com/>
- TUIS: <http://esystem.pfur.ru/course/view.php?id=46>

2. Database of biological publications:

- **Bulletin of RUDN University**: access mode from the territory of RUDN University and remotely <http://journals.rudn.ru/>

- **Scientific library Elibrary.ru**: access by IP-addresses of RUDN University at the address: <http://www.elibrary.ru/defaultx.asp>

- **ScienceDirect (ESD), "FreedomCollection", "Cell Press" ID "Elsevier"**. There is remote access to the database, access by IP-addresses of RUDN University (or remotely by individual login and password).

- **Google Academy (eng. Google Scholar)** - free search engine for full texts of scientific publications of all formats and disciplines. Indexes full texts of scientific publications. Access mode: <https://scholar.google.ru/>

- **Scopus** - scientometric database of publishing house "Elsevier". There is remote access to the database.

Access by IP-addresses of RUDN University and remotely by login and password (Grant of the Ministry of Education and Science). Access mode: <http://www.scopus.com/>

- **Web of Science**. There is remote access to the database. Access to the platform is carried out by IP-addresses of the RUDN University or remotely. Remote access to WOS is activated without administrator intervention after registering on the platform from RUDN University <http://login.webofknowledge.com/>

10. Educational and methodological support of the discipline:

a) Main literature:

1. Phytopathology: textbook / edited by O.O. Beloshapkina, 2018, Moscow: OOO Scientific Publishing Center INFRA-M, 2018. - 304 p.

2. Goncharov N. P., Goncharov P. L. Methodical bases of plant breeding. - LTD Academic publishing house Geo, Novosibirsk. 2018. 435 p.

3. Pylnev V.V. and other Private selection of field crops. - Publishing house "Lan", 2016. 544s.

b) Further reading:

1. Physiology of pathogenesis and disease resistance of plants: monograph / A.P. Volynets, V.P. Shukanov, N.V. Polyakova, N.P. Bashko. - Minsk: Belarusian Science, 2016. -- 252 p. - ISBN 978-985-08-1965-9. - Text: electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/90614>

2. Lobkov, V.T. Plant immunity in questions and answers: textbook / V.T. Lobkov, G.V. Napolova, V.V. Napolov. - Orel: OrelGAU, 2013. -- 80 p. - Text: electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/71322>

3. Genetic foundations of plant breeding: monograph: in 4 volumes. - Minsk: Belarusian Science, [b. year]. - Volume 1: General Plant Genetics. - 2008. -- 551 p. - ISBN 978-985-08-0989-6. - Text: electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/90639>.

4. Genetic foundations of plant breeding: monograph: in 4 volumes. - Minsk: Belarusian Science, [b. year]. - Volume 2: Private genetics of plants - 2010. -- 579 p. - ISBN 978-985-08-1127-1. - Text: electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/90638>

5. Genetic foundations of plant breeding: monograph: in 4 volumes. - Minsk: Belarusian Science, [b. year]. - Volume 3: Biotechnology in Plant Breeding. Cellular engineering - 2012. -- 489 p. -

ISBN 978-985-08-1392-3. - Text: electronic //Doe: Electronic Library System. - URL: <https://e.lanbook.com/book/90632>.

6. Genetic foundations of plant breeding: monograph: in 4 volumes. - Minsk: Belarusian Science, [b. year]. - Volume 4: Biotechnology in Plant Breeding. Genomics and genetic engineering - 2014 .-- 653 p. - ISBN 978-985-08-1791-4. - Text:electronic // Lan: electronic library system. - URL:<https://e.lanbook.com/book/90618>

7. Zhuchenko A.A. et al. Genetics - Moscow: KolosS, 2013 - [URL:http://www.studentlibrary.ru/book/ISBN5953200692](http://www.studentlibrary.ru/book/ISBN5953200692).html

8. Fundamentals of scientific research: Textbook for practical training and independent work of graduate students in the field of training 35.06.01 Rural farm / compiled by A. P. Avdeenko [and others]. - Persianovsky: Donskoy GAU,2018 .-- 184 p. - Text: electronic // Lan: electronic library system. -URL: <https://e.lanbook.com/book/133424>

9. Agroecological Atlas of Russia and Neighboring Countries: Economically Significant plants, their pests, diseases and weeds. - [Electron. resource]. – Mode access: <http://www.agroatlas.ru> FITOSAN » free access

10. Entomological electronic journal. - [Electron. resource]. - Access mode: <http://www.entomology.ru> FITOSAN »free access 6. Site of the Central Scientific Agricultural Library. - [Electron. resource]. -<http://www.cnsnb.ru> FITOSAN »free access

11. Methodical instructions for students on mastering the discipline (module)

Postgraduate students must observe discipline, come to class on time, submit homework for testing, prepare for the test and control work provided for in the course, be active in the classroom. An important place in the educational process is occupied by the independent work of graduate students. To organize independent work on the course, modern information technologies are used: online complexes of educational and teaching materials (program, list of recommended literature and information resources, tasks for self-control), free access to the Internet for working with databases.

Working with educational and scientific literature is the main form of independent work and is necessary in preparation for the current control of knowledge or intermediate certification. It includes the study of lecture material, as well as the study of recommended sources and literature on the subject of lectures. When self-studying a theoretical topic, a graduate student, using the literary sources and electronic resources recommended in the RAP, must answer control questions or complete tasks proposed by the teacher.

For practical training, before being admitted to work in a molecular biological laboratory, it is necessary to undergo safety instructions from a responsible person. At the beginning of each session, laboratory equipment should be checked for visible damage. If damage is found, inform the teacher. At the end of each lesson, the teacher summarizes the implementation of the practical lesson and gives a topic for study for the next lesson. After each PZ, the postgraduate student performs cleaning of his workplace.

Features of the implementation of discipline for people with disabilities and people with disabilities.

Training in the discipline of disabled people and persons with disabilities (hereinafter HIA) is carried out by the teacher, taking into account the characteristics of psychophysical development, individual capabilities and health status of such students.

For students with musculoskeletal disorders and hearing disabilities, lectures will be accompanied by multimedia tools and handouts.

For students with visual disabilities, the use of technical means for enhancing residual vision is provided, and the possibility of developing audio materials is also provided.

In this discipline, training of disabled people and persons with disabilities can be carried out both in the classroom and remotely using the capabilities of the electronic educational environment (TUIS) and e-mail.

In the course of classroom training, various means of interactive learning are used, including group discussions, brainstorming, business games, project work in small groups, which makes it possible to include all participants in the educational process in active work on mastering the discipline. Such teaching methods are aimed at joint work, discussion, group decision-making, contribute to group cohesion and provide opportunities for communication not only with the teacher, but also with other students, cooperation in the process of cognitive activity.

Training of disabled people and persons with disabilities can be carried out according to an approved individual schedule, taking into account the characteristics of their psychophysical development and health status, which implies the individualization of the content, methods, pace of the student's learning activity, the ability to follow the specific actions of the student when solving specific problems, making the need, the required adjustments in the training process.

It provides for individual consultations (including counseling via e-mail), the provision of additional educational and methodological materials (depending on the diagnosis).

12. Fund of assessment tools for intermediate certification of students in the discipline (module)


Materials for assessing the level of mastering the educational material of the discipline (evaluation materials), including a list of competencies indicating the stages of their formation, a description of indicators and criteria for assessing competencies at various stages of their formation, a description of the assessment scales, typical control tasks or other materials necessary for the assessment of knowledge, abilities, skills and (or) experience of activity, characterizing the stages of the formation of competencies in the process of mastering the educational program, methodological materials that determine the procedures for assessing knowledge, skills, skills and (or) experience of activities that characterize the stages of formation of competencies, developed in full and available for students on the discipline page at TUIS RUDN.

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