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

Medical Institute

(name of the main training unit (PMO)-developer of the EP HE)

WORK PROGRAM OF THE DISCIPLINE

Virology

(name of discipline/module)

Recommended by ISSS for the direction of training/specialty:

35.04.04. Agronomy of isr

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

The development of the discipline is carried out within the framework of the implementation of the main professional educational program of higher education (OP HE):

Agronomy

(name (profile/specialization) ep he)

1. THE PURPOSE OF MASTERING THE DISCIPLINE

The purpose of mastering the discipline "Virology" is to obtain basic knowledge about the ways and means of spreading a viral infection, measures to prevent infection of plants and methods of localization of lesions, familiarization with modern methods of identification and diagnosis of viruses.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

Mastering the discipline "Virology" is aimed at the formation of the following competencies among students: OPK-1.2; OPK-4.2; OPK-4.3; PC-4.5; PC-4.6; PC-7.1; PC-7.2

Table 2.1. List of competencies formed in students during the development of the discipline (results of mastering the discipline)

Code	Competence	Competency Achievement Indicators (within the framework of this discipline)
OPK – 1.2	Uses methods of solving problems in the development of agronomy based on the search and analysis of modern achievements of science and production	OPK-1.2.1 Uses in professional activities the representation of the biological characteristics of viruses, diagnostic methods OPK-1.2.2 Applies in professional activities knowledge about measures to combat viruses, their localization and elimination of epiphytotics
OPK – 4.2	Uses information resources, scientific, experimental and instrumental base for research in agronomy	OPK-4.2.1 Uses modern equipment in the laboratory OPK-4.2.2 Uses skills in sampling plant material to search for pathogens
OPK – 4.3	Formulates the results obtained in the course of solving research problems	OPK-4.3.1 Able to interpret the results of modern molecular genetic diagnostic methods for the detection of viruses
PC – 4.5	Carries out work on the protection of plants from harmful objects	PC – 4.5.1 Able to apply in practice knowledge about measures to combat viruses, viroids and phytoplasmas
PC – 4.6	Develops and improves measures to protect plants from harmful objects	PC – 4.6.1 Participates in the development of regulatory documents for the diagnosis of viruses, viroids and phytoplasmas PC – 4.6.2 Participates in the formation of rules to limit the spread of viral infections
PC – 7.1	Recognizes quarantine objects and identifies quarantine pests and pathogens	PC – 7.1.1 Owns methods of species identification and viruses, viroids and phytoplasmas PC – 7.1.2 Has knowledge of the symptoms, developmental responsibilities, spread of quarantine types of viruses that it uses in practice
PC – 7.2	Conducts examination of crops and crop	PC – 7.2.1 Owns methods and techniques

	products for the presence of quarantine facilities	for conducting phytosanitary research of plant material to search for quarantine species of viruses, viroids and phytoplasmas in it
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3. MESTO DISCIPLINE IN THE STRUCTURE OF THE OP VO

The discipline "**Virology**" refers to *the variable* part of the block B1.O.02.06. OP VO.

Within the framework of the EP HE, students also master other disciplines and / or practices that contribute to the achievement of the planned results of the development of the discipline "**Virology**".

Table 3.1. List of components of the EP HE that contribute to the achievement of the planned results of the discipline

Code	Competence	Previous disciplines/modules, practices*	Subsequent disciplines/modules, practices*
OPK – 1.2	Uses methods of solving problems in the development of agronomy based on the search and analysis of modern achievements of science and production	Phytopathology Biological method of plant protection Work with scientific literature Fundamentals of Scientific Communication Plant protection in organic farming Molecular methods for diagnosing phytopathogens Prognosis of pests and diseases Phytosanitary risk analysis	Instrumental research methods Instrumental research methods Plant quarantine Biotechnology in plant protection
OPK – 4.2	Uses information resources, scientific, experimental and instrumental base for research in agronomy	Phytopathology Biological method of plant protection Work with scientific literature Fundamentals of Scientific Communication Plant protection in organic farming Molecular methods for diagnosing phytopathogens Prognosis of pests and diseases Phytosanitary risk analysis	Instrumental research methods Instrumental research methods Plant quarantine Biotechnology in plant protection
OPK – 4.3	Formulates the results obtained in the course of solving research problems	Phytopathology Biological method of plant protection Work with scientific	Instrumental research methods Instrumental research methods

		<p>literature</p> <p>Fundamentals of Scientific Communication</p> <p>Plant protection in organic farming</p> <p>Molecular methods for diagnosing phytopathogens</p> <p>Prognosis of pests and diseases</p> <p>Phytosanitary risk analysis</p>	<p>Plant quarantine</p> <p>Biotechnology in plant protection</p>
PC – 4.5	Carries out work on the protection of plants from harmful objects	<p>Phytopathology</p> <p>Biological method of plant protection</p> <p>Work with scientific literature</p> <p>Fundamentals of Scientific Communication</p> <p>Plant protection in organic farming</p> <p>Molecular methods for diagnosing phytopathogens</p> <p>Prognosis of pests and diseases</p> <p>Phytosanitary risk analysis</p>	<p>Instrumental research methods</p> <p>Instrumental research methods</p> <p>Plant quarantine</p> <p>Biotechnology in plant protection</p>
PC – 4.6	Develops and improves measures to protect plants from harmful objects	<p>Phytopathology</p> <p>Biological method of plant protection</p> <p>Work with scientific literature</p> <p>Fundamentals of Scientific Communication</p> <p>Plant protection in organic farming</p> <p>Molecular methods for diagnosing phytopathogens</p> <p>Prognosis of pests and diseases</p> <p>Phytosanitary risk analysis</p>	<p>Instrumental research methods</p> <p>Instrumental research methods</p> <p>Plant quarantine</p> <p>Biotechnology in plant protection</p>
PC – 7.1	Recognizes quarantine objects and identifies quarantine pests and pathogens	<p>Phytopathology</p> <p>Biological method of plant protection</p> <p>Work with scientific literature</p> <p>Fundamentals of Scientific Communication</p> <p>Plant protection in organic farming</p> <p>Molecular methods for diagnosing phytopathogens</p>	<p>Instrumental research methods</p> <p>Instrumental research methods</p> <p>Plant quarantine</p> <p>Biotechnology in plant protection</p>

		Prognosis of pests and diseases Phytopathology risk analysis	
PC – 7.2	Conducts examination of crops and crop products for the presence of quarantine facilities	Phytopathology Biological method of plant protection Work with scientific literature Fundamentals of Scientific Communication Plant protection in organic farming Molecular methods for diagnosing phytopathogens Prognosis of pests and diseases Phytopathology risk analysis	Instrumental research methods Instrumental research methods Plant quarantine Biotechnology in plant protection

* - is filled in accordance with the competence matrix and the SPMS OP VO

4. SCOPE OF DISCIPLINE AND TYPES OF EDUCATIONAL WORK

The total labor intensity of the discipline "**Virology**" is **4** credit units.

Table 4.1. Types of educational work by periods of mastering the EP HE for **full-time** education

Type of educational work		TOTAL, aca.hrs.	Semester(s)				
			4	5			
<i>Contact work, ac.ch.</i>		68	34	34			
Including:							
Lectures (LC)		34	16	18			
Laboratory works (LR)							
Practical/Seminar Classes (FPs)		34	14	20			
<i>Independent work of students, ac.ch.</i>		52	30	22			
<i>Control (exam /test with grade), ac.ch.</i>		24	10	14			
Overall labor intensity of the discipline		aca.hrs.	144	70	74		
		Hrs.ed.	4	2	2		

Table 4. 2. Types of educational work by periods of mastering the OP HE for **full-time and part-time** education

Type of educational work		TOTAL, aca.hrs..	Semester(s)			
			3	4		
<i>Contact work, ac.ch.</i>		34		34		
Including:						
Lectures (LC)		17		17		
Laboratory works (LR)						
Practical/Seminar Classes (FPs)		17		17		
<i>Independent work of students, ac.ch.</i>		83		83		
<i>Control (exam /test with grade), ac.ch.</i>		27		27		

Overall labor intensity of the discipline	aca.hrs..	144		144		
	Hrs.ed.	4		4		

Table 4. 3. Types of educational work by periods of mastering the EP HE for **part-time** education

Type of educational work	TOTAL, aca.hrs.	Semester(s)			
		Winters.	Years.		
<i>Contact work, ac.ch.</i>	30	30			
Including:					
Lectures (LC)	10	10			
Laboratory works (LR)					
Practical/Seminar Classes (FPs)	20	20			
<i>Independent work of students, ac.ch.</i>	105	105			
<i>Control (exam /test with grade), ac.ch.</i>	9	9			
Overall labor intensity of the discipline	aca.hrs..	144	144		
	Hrs.ed.	4	4		

5. CONTENT OF THE DISCIPLINE

Table 5.1. The content of the discipline (module) by types of educational work

Name of the discipline section	Contents	Type of educational work*
Section 1 Introduction to Virology	Topic 1.1. Subject and history of virology	LC, NW
Section 2 Morphological and biological features	Topic 2. 1. Classification of viruses, viroids and phytoplasmas	LC, NW
	Topic 2. 2. Morphological features of viruses	LC, NW
	Topic 2. 3. Morphological features of viroids	LC, NW
	Topic 2. 4. Morphological features of phytoplasmas	LC, NW
	Topic 2. 5. Biological features of viruses, viroids and phytoplasmas. Methods of replication	LC, NW
Section 3 Methods of diagnosis of viruses, viroids and phytoplasmas.	Topic 3. 1. Classical methods for detecting viral infections	LC, NW
	Topic 3. 2. Enzyme-linked immunosorbent assay	LC, NW
	Topic 3. 3. Molecular genetic diagnostic methods	LC, NW

Section 4 Viruses, viroids and phytoplasmas are the causative agents of diseases of nightshade crops. Diagnostics and control measures	Topic 4. 1. Especially dangerous in the stimuli of tomato diseases	LC, NW
	Topic 4. 2. Especially dangerous pathogens of potato diseases	LC, NW
Section 5 Viruses, viroids and phytoplasmas are the causative agents of diseases of cereals. Diagnostics and control measures	Topic 5.1. Especially dangerous pathogens of wheat diseases	LC, NW
	Topic 5.2. Especially dangerous pathogens of rice diseases	LC, NW
	Topic 5.3. Especially dangerous causative agents of corn diseases	LC, NW
Section 6 Viruses, viroids and phytoplasmas are the causative agents of diseases of fruit and berry crops. Diagnostics and control measures	Topic 6. 1. Especially dangerous pathogens of diseases of stone crops	LC, NW
	Topic 6. 2. Especially dangerous pathogens of diseases of pome crops	LC, NW
	Topic 6. 3. Especially dangerous pathogens of strawberry diseases	LC, NW
	Topic 6. 4. Especially dangerous pathogens of diseases of raspberries and other berry crops	LC, NW
	Topic 6. 5. Especially dangerous pathogens of grape diseases	LC, NW
	Topic 6. 6. Certification of planting material. International experience and rules	LC, NW
Section 7 Viruses, viroids and phytoplasmas are causative agents of diseases of economically significant crops. Control measures and diagnostics	Topic 7. 1. Especially dangerous pathogens of diseases of leguminous crops	LC, NW
	Topic 7. 2. Especially dangerous pathogens of diseases of pumpkin and root crops of x crops	LC, NW

* - is filled only in **full-time** forms of training: *LC* - lectures; *LR* - laboratory work; *SZ* - seminar classes.

6. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

Table 6.1. Logistics of discipline

Audience type	Equipping the classroom	Specialized educational/laboratory equipment, software and materials for mastering the discipline (if necessary)
Specialized audience	An auditorium for practical work, individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and	Comof specialized furniture Mobile Projector

Audience type	Equipping the classroom	Specialized educational/laboratory equipment, software and materials for mastering the discipline (if necessary)
	equipment. (audiences 310, 238)	
Educational and Scientific Laboratory	Laboratory of Molecular Genetic Diagnostic Methods (235, 439)	Amplifier for classical PCR Set of dispensers Solid-state thermostat Vortex Centrifuge
For independent work of students	Auditorium for independent work of students (can be used for lectures and consultations), equipped with a set of specialized furniture (room 310)	Set of specialized furniture Mobile Projector

* - the audience for independent work of students is indicated **NECESSARILY!**

7. EDUCATIONAL, METHODOLOGICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

Main literature:

Publications:

1. A. V. Pinevich A. K. Sirotkin O. V. Gavrilova A. A. Potekhin «Virologiya». Izd-vo S.-Peterb. un-ta, 2012. — 432 s.
2. Luria S., Darnell J. "General Virology". Ed. "Mir", 1981.
3. Matthews, R. «Plant Viruses». Ed. "The World". 1973.
4. Agol V.I., Atabekov I.G., Krylov V.N., Tikhonenko T.I. "Molecular biology of viruses". Ed. Nauka, 1971.
5. Virology. Ed. Mir, 1989.

Electronic and printed full-text materials:

Further reading:

Electronic and printed full-text materials:

1. "Molecular Biology (Structure and Biosynthesis of Nucleic Acids)", "Graduate School", 1990.
2. Lewin B. "Genes", Publishing House "The World", 1987
3. Mamontov S.G., Zakharov V.B. Obschchaya biologiya. M.; Ed. "Higher School", 1996
4. Zhdanova V. M., Gaydamovich S. Ya. General and private virology, M.; Ed. - The Young Guard (1982)

Resources of the information and telecommunication network "Internet":

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

- Electronic library system RUDN University – EBS RUDN university
<http://lib.rudn.ru/MegaPro/Web>

- EBS "University Library Online" <http://www.biblioclub.ru>

2. Databases and search engines:

- NCBI: <https://p.360pubmed.com/pubmed/>
- RUDN University Bulletin: 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>
 - Electronic resource: EPPPO global database URL <https://gd.eppo.int/>
 - Electronic resource: Crop Protection Compendium URL <https://www.cabi.org/cpc>
 - Electronic resource: PlantwisePlus URL <https://www.plantwise.org/>

Educational and methodical materials for independent work of students when mastering the discipline / module:*

* - all educational and methodological materials for independent work of students are placed in accordance with the current procedure on the page of **the discipline in TUIS!**

8. EVALUATION MATERIALS AND POINT-RATING SYSTEM FOR ASSESSING THE LEVEL OF FORMATION OF COMPETENCIES IN THE DISCIPLINE

Evaluation materials and a point-rating system* for assessing the level of formation of competencies (part of competencies) based on the results of mastering the discipline "**Virology**" are presented in the Appendix to this Work Program of the discipline.

* - OM and BRS are formed on the basis of the requirements of the relevant local regulatory act of RUDN University.

DEVELOPERS:

Senior Lecturer at the
Agrobiotechnology Department

Position, BCD

G.N. Bondarenko

Signature

Surname F.I.

HEAD OF BUP:

Director of Agrobiotechnology
Department

Name of BCD

E.N. Pakina

Signature

Surname F.I.

HEAD OF OP VO:

Director of Agrobiotechnology
Department

Position, BCD

E.N. Pakina

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Federal State Autonomous Educational Institution
Higher education
"PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA"
Agrarian-Technological Institute

VALUATION FUND

BY DISCIPLINE

Virology

Direction of training
35.04.04 AGRONOMY

2022

Indicative list of evaluation tools.

p/n	Name of the appraisal tool	Brief description of the evaluation tool	Submission of the evaluation tool to the fund
<i>Classroom work</i>			
1.	Test	A system of standardized tasks that allows you to automate the procedure for measuring the level of knowledge and skills Student.	Database of test tasks
2.	Presentation (defense) Report	A tool for monitoring the ability of students to present the results of the work done to the audience	Topics of reports
3.	Exam	Evaluation of the student's work during the semester (year, entire period of study, etc.) and is designed to reveal the level, strength and systematicity of the theoretical and practical knowledge gained by him, the acquisition of independent work skills, the development of creative thinking, the ability to synthesize the obtained knowledge and apply them in solving practical problems.	Examples assignments/ questions, example of an exam card
<i>Independent work</i>			
1.	Report	The product of the student's independent work, which is a brief summary in writing of the results of the theoretical analysis of a certain scientific (educational and research) topic, where the author reveals the essence of the problem under study, gives various points of view, as well as his own views on it.	Topics of reports

Evaluation criteria:

(in accordance with the current regulatory framework)

Compliance of grading systems (previously used grades of final academic performance, ECTS grades and the point-rating system (BRS) of assessments of current academic performance).

BRS Scores	Traditional Assessments of the Russian Federation	Evaluation ECTS
95 - 100	5	A

86 - 94		B
69 - 85	4	C
61 - 68	3	D
51 - 60		E
31 - 50	2	FX
0 - 30		F
51-100	Credit	Passed

Explanation of the rating table:

Description of ECTS ratings

A	"Excellent" - the theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are formed, all the educational tasks provided for by the training program are completed, the quality of their implementation is estimated by the number of points close to the maximum.
B	"Very good" - the theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are mainly formed, all the educational tasks provided for by the training program are completed, the quality of most of them is estimated by the number of points close to the maximum.
C	"Good" - the theoretical content of the course is mastered completely, without gaps, some practical skills of working with the mastered material are not sufficiently formed, all the educational tasks provided for by the training program are fulfilled, the quality of none of them is assessed by a minimum number of points, some types of tasks are performed with errors.
D	"Satisfactory" - the theoretical content of the course is partially mastered, but the gaps are not significant, the necessary practical skills of working with the mastered material are mainly formed, most of the educational tasks provided for by the training program have been completed, some of the completed tasks may contain errors.
E	"Mediocre" - the theoretical content of the course is partially mastered, some practical skills are not formed, many of the training tasks provided for by the training program have not been completed, or the quality of some of them is estimated by the number of points close to the minimum.
FX	"Conditionally unsatisfactory" - the theoretical content of the course is partially mastered, the necessary practical skills of work are not formed, most of the training tasks provided for by the training program have not been completed, or the quality of their implementation is estimated by a number of points close to the minimum; with additional independent work on the course material it is possible to improve the quality of educational tasks.
F	"Certainly unsatisfactory" - the theoretical content of the course has not been mastered, the necessary practical skills of work have not been formed, the all-completed training tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the performance of educational tasks.

Positive grades, in which the course is counted as completed by the student, are grades A, B, C, D and E.

A student who has received an **FX** grade in the discipline of the educational program is obliged, after consultation with the appropriate teacher, to successfully complete the required minimum amount of training work provided for in the training program within the time limits established by the training part, and to submit the results of these works to this teacher. If the quality of the work is considered satisfactory, the final FX score is increased to E and the trainee is allowed for further training.

In the event that the quality of the training work remains unsatisfactory, the final grade is reduced to F and the trainee is submitted for expulsion. In the event of receiving an F or FX grade, the trainee is submitted for deduction regardless of whether he has any other debts in other disciplines.

(Order of the Rector of RUDN University No. 996 of 27.12.2006)

Evaluation criteria:

(in accordance with the current regulatory framework)

№ p/n	Indicators / Evaluation Criteria	<i>It's cool</i>	<i>Ok</i>	<i>satisfactorily</i>	<i>unsatisfactorily</i>
1.	Completeness of the reflection of the necessary information in each question	Fully	Sufficiently	Partly	Not available
2.	Having the student's own comments in those sections where necessary.	Fully	Sufficiently	Partly	Missing
3.	Completeness and validity of the conclusion and conclusions	Fully substantiated	Sufficiently substantiated	Insufficiently substantiated	Not justified

Note:

1. An "excellent" grade is given if all the criteria are "excellent" and no more than one "good" criterion.
2. A rating of "good" is given if all the criteria are "good" and "excellent", no more than one criterion "satisfactory".
3. A rating of "satisfactory" is given if all evaluation criteria are positive, no more than one criterion is "unsatisfactory".
4. A rating of "unsatisfactory" is obtained against the criteria of more than one unsatisfactory rating.
- 5.

Number of points	Final score
<5	Unsatisfactorily
5-10	Satisfactorily
10-15	Ok
15-20	It's cool

Questions for final attestation (example)

1. Modern virus classification systems.
2. Existing criteria used in the classification of viruses.
3. Estimation of the infectious load based on the determination of the number of infected plants
4. Chemical methods used when working with purified viruses.
5. Virus extraction medium, pH and buffer system.

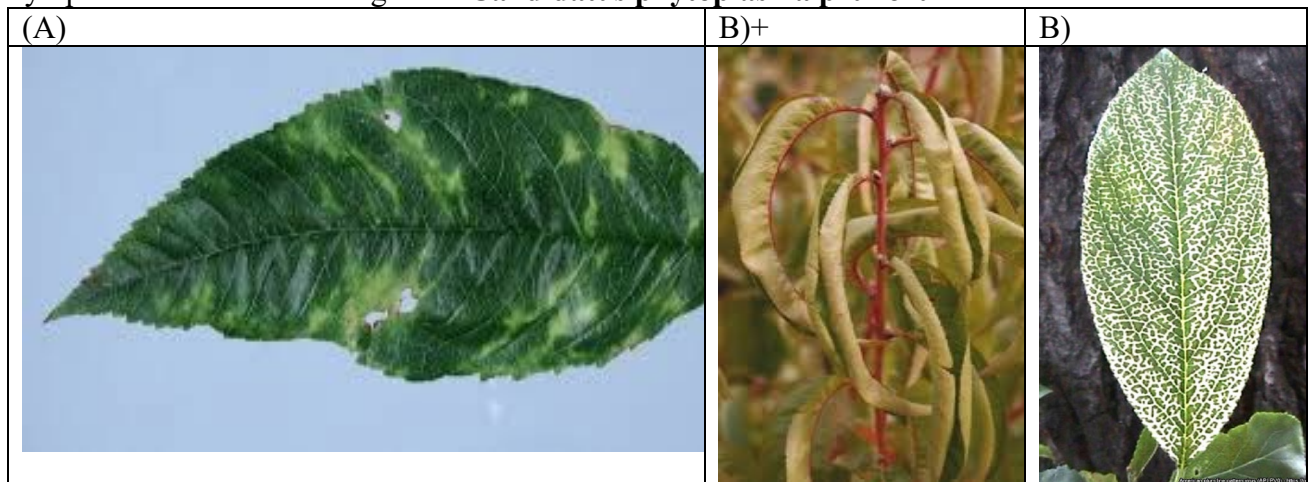
6. Protein isolation from viral preparations, amino acid composition, sequence of amino acids in structural proteins.
7. Direct transmission of the virus.
8. Transmission of viruses by means of seeds.
9. Transmission of the virus in the process of vegetative reproduction of plants (v. when vaccinated).
10. Possible role of host plant DNA.
11. Double-stranded viral RNAs.
12. The nature and localization of RNA and protein synthesis in the early stages of viral infection.
13. The role of virus strains in determining the nature of the disease
14. Properties of the virus and host plant.
15. Criteria for the identification of viral strains.
16. Aging of viruses *in vitro* and *in vivo*.
17. Protective measures and their economic importance in the fight against viruses.

Tests in the discipline "Virology" (example)

1 The most common corn virus infection:

- a) Maize chlorotic dwarf virus
- b) Maize dwarf mosaic virus
- c) Maize White Line Mosaic Virus

Symptom of the causative agent of **Candidatus phytoplasma prunorum**

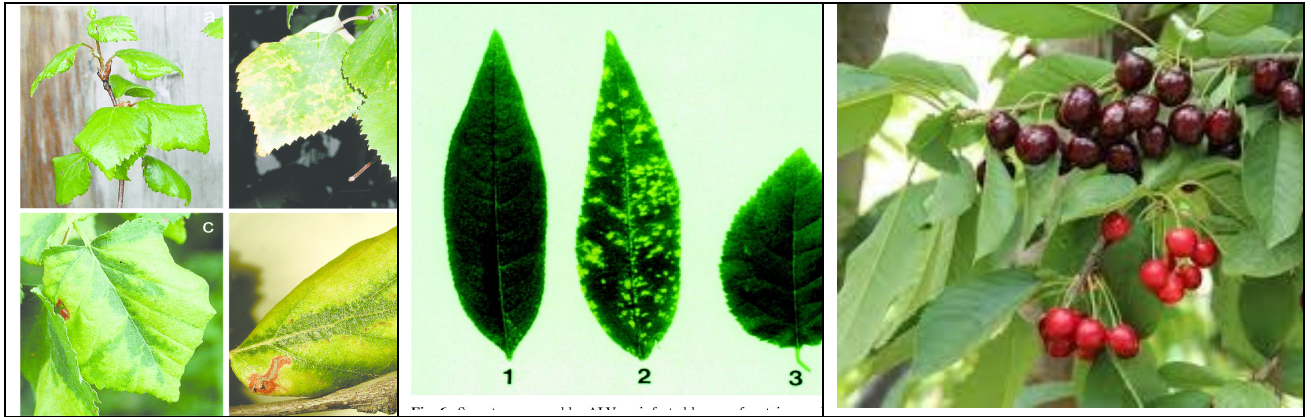


3 Maize White Line Mosaic Virus is transmitted via /pathway is:

- a) seeds
- b) soil
- c) insects

4 Symptom of **Little cherry virus-1**

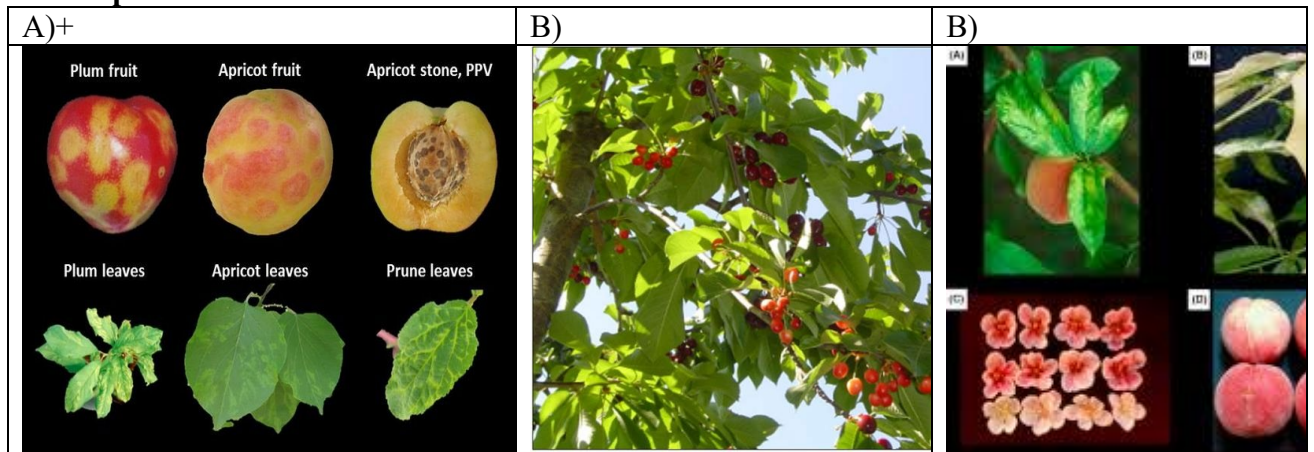
(A)	B)	B) +
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5 distinctive symptom of Tomato spotted wilt virus is / Exclusive symptom for Tomato spotted wilt virus is:

- a) dwarfism of the plant / plant dwarf
- b) characteristic pattern on fruits
- c) "oak leaf" pattern

6 Plum pox virus



Object of internal and external quarantine control on tomatoes in Russia:

- a) Tomato yellow dwarf virus
- b) Pepino mosaic virus
- c) Tomato spotted wilt virus

8 Tomato's seed pathway virus:

- a) Tomato mosaic virus
- b) Tomato spotted wilt virus
- c) Tomato black ring virus

9 Tomato virus control measures:

- (a) Tillage with nematicides and fungicides
- b) seed treatment with insecticides
- c) treatment of working equipment with disinfectant solutions

10 . Quarantine control object:

- a) Peach yellows phytoplasma
- b) Peach rosette mosaic virus
- c) Apricot latent virus

11. Characteristic symptom cherry rasp leaf virus / characteristic symptom Cherry rasp leaf virus:

- (a) Increased branchiness of young shoots
- b) concentric spots on the fruit
- c) twisting the leaf plate upwards

12 Characteristic symptom American plum line pattern virus / characteristic symptom American plum line pattern virus

- a) concentric circles on fruits
- b) dwarf of trees
- c) oak leaf pattern

13 Plum pox virus – object / object:

- a) internal and external quarantine in Russia
- b) external quarantine in Russia
- c) regulated non-quarantine species

14 Characteristic symptom of Prune dwarf virus / characteristic symptom Prune dwarf virus:

- a) dwarf trees / low tree growth
- b) phyllody of shoots
- c) leaf mosaic and leaf plate deformation

15 Species identification of viruses is carried out using:

- a) PCR, ELISA / PCR and ELISA methods
- b) Electron microscopy methods
- c) Visual method and microscopy

16 Ways to spread Chrysanthemum spot virus / Pathways of Chrysanthemum spot virus:

- a) juice and equipment
- b) seeds and plant debris
- c) grafting and insects

17 The main way of spreading Rose Spring Dwarf virus / general pathway for Rose Spring Dwarf virus

- a) seeds
- b) insects
- c) work inventory / equipment