МИНИСТЕРСТВО СЕЛЬСКОГО ХОЗЯЙСТВА РОССИЙСКОЙ ФЕДЕРАЦИИ
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высшего образования
«Санкт-Петербургский государственный аграрный университет»

Кафедра защиты и карантина растений

УТВЕРЖДАЮ
Директор института
агротехнологий и пищевых
производств
_____ Орлова А.Г.
«15» января 2025 г.

ПРОГРАММА

вступительного испытания

направления подготовки магистра
35.04.04 Агрономия

Направленность (профиль) основной профессиональной
образовательной программы

Integrated plant protection / Интегрированная защита растений

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Рассмотрена на заседании кафедры защиты и карантина растений от 21 ноября 2024 г., протокол № 5

Заведующий выпускающей кафедрой		Колесников Л.Е.

СОДЕРЖАНИЕ

MINISTRY OF AGRICULTURE OF THE RUSSIAN FEDERATION
federal state budgetary educational institution of higher education
«Saint Petersburg State Agrarian University»

Department of Plant protection and quarantine

APPROVED by
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«15» January 2025

PROGRAM

of the entrance examination

for the master's degree program
35.04.04 Agronomy

Specialization of the main professional educational program

Integrated plant protection / Интегрированная защита растений

Saint Petersburg
2025

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CONTENT

1 Basic concepts

This entrance examination program, conducted independently by the Federal State Budgetary Educational Institution of Higher Education "Saint Petersburg State Agrarian University" in accordance with the license for educational activities, is designed for applicants seeking admission to both state-funded places within the control figures for admission and to places under education agreements concluded for tuition paid by individuals and/or legal entities. It determines the ability of applicants to master the main professional educational programs of higher education (master's level) within the framework of federal state educational standards of higher education.

The entrance examination program for the specialization of the main professional educational program "Integrated Plant Protection" is developed based on the federal state educational standards for master's degree programs.

Individuals with a higher education level (specialist or bachelor's degree) are eligible to entrance in master's degree programs.

The list of questions for the entrance examination is formed based on the sections and topics listed in the content of the program.

The entrance examination will be based in English or Russian language, in written form, either through examination tickets or test assignments.

The results of the entrance examination are assessed on a 100-point scale.

The minimum score required to successfully pass the entrance examination for admission to master's degree programs is 55 points.

Retaking the entrance examination is not permitted. The results of the entrance examination are valid for one calendar year.

Grading scale for all entrance examinations for master's programs

Evaluation indicators	Scores	Evaluation criteria
Results of entrance tests	90-100	Complete and error-free answer with explanatory examples. The applicant must correctly define concepts and categories, and demonstrate a thorough understanding of theoretical and practical material.
Results of entrance tests	76-89	Sufficiently complete answer with examples, but with minor inaccuracies.
Results of entrance tests	56-75	Insufficiently complete answer, lack of examples, and some gaps in knowledge.
Results of entrance tests	0-55	Incomplete or missing answer, presence of errors, and significant gaps in knowledge.

2 Program content

Section number	Section name	Section content
1.	The main groups of diseases and pests of agricultural crops	Phytopathology. Parasitic systems of plant infectious disease pathogens. The concept of trophic relationships. General biological evolutionary criteria of parasitic systems. Epiphytotics. Classification of the main sources of infection and transmission factors of plant infectious disease pathogens. Soil (root) infections. Seed infections. Airborne (leaf-stem) infections. Transmissible infections. Dynamics of epiphytotics (polycyclic and monocyclic). Diseases of cereal crops and grasses. Diseases of leguminous crops. Diseases of potatoes. Diseases of industrial crops (flax, sunflower, sugar beet, hemp, castor bean, rapeseed, tobacco and shag). Diseases of vegetable crops. Diseases of fruit and berry crops. Entomology. General principles of the structure of the main species of insects, mites, and nematodes causing damage to agricultural plants. Features of biology and specialization of phytophages. External structure of insects. Developmental stages of insects. Modern fundamentals of insect taxonomy. Study of types of insect damage to plants. Polyphagous pests. Pests of cereal crops. Pests of corn. Pests of leguminous crops. Pests of sunflower. Pests of cruciferous crops. Pests of potatoes. Pests of tomatoes. Pests of cucurbit crops. Pests of fruit and berry crops.
2	Plant protection methods	Plant Quarantine. Goals and objectives of state quarantine phytosanitary control. The Law "On Plant Quarantine." International cooperation on plant quarantine. Rules for state phytosanitary control at checkpoints across the state border of the Russian Federation. Quarantine organisms – pests and plant pathogens not registered in the territory of the Russian Federation and measures to prevent their introduction. Quarantine organisms – pests and plant pathogens with limited spread in the territory of the Russian Federation and measures for their detection and eradication. Selection and Genetic Method. The doctrine of plant immunity to diseases as a theoretical basis for creating agricultural crop cultivars resistant to harmful organisms. Main factors and categories of plant immunity to diseases. Factors of plant resistance to pests identified by R. Painter. The system of immunogenetic barriers in plants. Breeding and biotechnological methods used to produce agricultural crops with high resistance to harmful organisms. Organizational, Agricultural, and Physical-

		Mechanical Methods of Plant Protection. Optimization of the structure of sown areas and plantings. Crop rotation. Spatial isolation. Use of resistant cultivars and hybrids. Land reclamation. Fall plowing. Stubble cultivation. Soil loosening. Fertilizer application. Weed control. Sowing and harvesting dates. Light traps, effects of high and low temperatures, refrigeration, radioactive radiation. Collection, trapping, shaking off pests, use of covering materials, pruning branches, bark cleaning. Chemical method of plant protection. Advantages and disadvantages. Pesticides and their formulations. Classification of chemical plant protection products. Selection of formulations and application methods of preparations. Mechanization of plant protection. Sanitary and hygienic principles of pesticide use. Regulations for pesticide use. Pesticide resistance. Pesticides and environmental protection. Personal protective equipment when working with pesticides. Limits of economic harmfulness. The expediency of implementing chemical measures. Biological Method of Plant Protection. Modern concept of biological plant protection. Use of biological regulators of pest, weed, and pathogen populations. Use of biologically active substances. The biological system of plant – phytophage – entomophage (plant – phytopathogen – natural antagonist). Effectiveness level of natural enemies. Entomopathogenic microorganisms and their byproducts.
3.	Phytosanitary monitoring of agrocenoses	Main methods and methodologies for monitoring the development and prevalence of diseases in major agricultural crops. Main prerequisites for the emergence of fungal epiphytotics. General information about the methods of disease detection and accounting. Visual and laboratory assessment of the intensity of plant infection by pathogens. Scales and methods for monitoring the development of pathogens in major agricultural crops. Main methods of monitoring and forecasting the development and harmfulness of plant diseases. Methods of pests' number accounting on major agricultural crops. Methodological bases for assessing plants based on damage and infestation levels by the most harmful phytophages. Main methods of observation and monitoring of agricultural pests (mowing with a net, number accounting, damage intensity assessment). Types of advance forecasts and their tasks. Errors in forecasts. The sum of effective temperatures, its use in forecasting, positive and negative aspects.

3 List of questions

Main groups of diseases and pests of agricultural crops (phytopathology, entomology)

1. Diseases of cereal crops and the system of measures to control them.
2. Fusarium diseases of cereal crops and the system of measures to control them.
3. Diseases of leguminous crops and the system of measures to control them.
4. The most important fungal and bacterial diseases of potatoes and the system of measures to control them.
5. The most important diseases of potatoes during storage and the system of measures to control them.
6. Diseases of cabbage in field conditions and during storage, and the system of measures to control them.
7. The most important diseases of carrots and the system of measures to control them.
8. The most important diseases of cucumbers in protected ground and the system of measures to control them.
9. The most important fungal and bacterial diseases of tomatoes and the system of measures to control them.
10. The most important phytoplasmal and viral diseases of agricultural crops and the system of measures to control them.
11. Diseases of the leaves and fruits of apple and pear trees and the system of measures to control them.
12. The most important diseases of berry crops and the system of measures to control them.
13. Polyphagous insects damaging cultivated plants. Systematic position, biology, harmfulness. Integrated crop protection.
14. Pests of the generative organs of cereal crops. Systematic position, biology, harmfulness. Integrated protection of cereal crops.
15. Dipteran and hymenopteran pests of cereal crops. Systematic position, biology, harmfulness. Integrated protection of cereal crops.
16. Pests of leguminous crops. Systematic position, biology, harmfulness. Integrated crop protection.
17. Specialized and polyphagous pests of potatoes. Systematic position, biology, harmfulness. Integrated potato protection.
18. Main pests of cabbage crops. Systematic position, biology, harmfulness. Integrated crop protection.
19. Main pests of protected ground crops. Use of entomophages to reduce the population of harmful arthropods
20. Sucking pests and leaf-eating caterpillars damaging fruit crops. Systematic position, biology, harmfulness. Integrated crop protection.
21. Pests of the generative organs of fruit crops. Systematic position, biology, harmfulness. Integrated crop protection.

22. Main pests of berry crops. Systematic position, biology, harmfulness. Integrated crop protection.

Plant protection methods

23. Goals and objectives of state quarantine phytosanitary control.
24. Structure of the Federal Service for Veterinary and Phytosanitary Surveillance (Rosselkhoznadzor) in the field of plant quarantine.
25. The Law "On Plant Quarantine."
26. Quarantine pests with limited distribution on the territory of the Russian Federation.
27. Quarantine pests absent on the territory of the Russian Federation.
28. Quarantine pathogens with limited distribution on the territory of the Russian Federation.
29. Quarantine pathogens absent on the territory of the Russian Federation.

Selection and genetic method

30. N. I. Vavilov - the founder of the doctrine of plant immunity to infectious diseases.
31. Categories and factors of immunity. Innate (natural) immunity, hereditary immunity, acquired (induced) or non-hereditary immunity.
32. Methods of breeding for immunity. Selection, hybridization, backcrosses, mutagenesis, breeding of multiline and convergent varieties, biotechnology, genetic engineering, etc.
33. The role of resistant varieties in integrated plant protection.
34. Factors of plant resistance to insects (R. Painter).
35. Characteristics of constitutional barriers to plant resistance against pests.
36. Characteristics of induced barriers to plant resistance against pests.

Organizational and economic, agrotechnical measures, physical and mechanical methods of plant protection

37. Integrated plant protection. The concept of EIL (Economic Injury Level).
38. Organizational and agricultural measures to reduce the number of harmful organisms.
39. Agrotechnical method of plant protection.
40. Physical and mechanical methods of plant protection.

The chemical method

41. Classification of chemical plant protection products.
42. Ways to overcome the emergence of resistance in harmful organisms.
43. Regulations for the use of pesticides.
44. Personal safety measures when using pesticides. Personal protective equipment.
45. The impact of pesticides on the environment.
46. Spraying. Advantages and disadvantages. Ways to improve the method.
47. Formulations of pesticides. Ways to improve the range.
48. Pre-sowing seed treatment. Types of seed dressing.
49. General characteristics of the properties of organophosphate insecto-acaricides.
50. Modern range of pyrethroids.
51. Characteristics of the mechanism of action and features of the use of neonicotinoids.
52. Classification of fungicides depending on their intended purpose, mode of action on the pathogen, and distribution in the plant.
53. Contact fungicides. Range, features of action, and application.
54. Features of the action and application of systemic fungicides.
55. Classification of herbicides by chemical structure, mode and site of action on plants, timing, and methods of application.

Biological Method

56. The importance of the biological method of plant protection for regulating the number of harmful organisms.
57. Methods of using beneficial organisms in the biological protection of plants from pests and diseases.
58. Microbiological preparations and their use in plant protection.
59. Entomopathogenic microorganisms and their use in plant protection.
60. The role of parasitic insects in regulating the number of harmful organisms.
61. The role of predatory insects in regulating the number of harmful organisms.

Phytosanitary Monitoring

62. Types of advance forecasts and their tasks Errors in forecasts.
63. The sum of effective temperatures, its use in forecasting, positive and negative aspects.
64. Main methods of monitoring and forecasting the development and harmfulness of plant diseases.

4. Exam preparation books

Books in English for exam preparation

1. **Abrol D. P., Shankar U.** Integrated Pest Management: Principles and Practice. – CABI, 2012. – 576 p.
2. **Agrios G. N.** Plant Pathology. – 5th ed. – Academic Press, 2005. – 922 p.
3. **Singh R. S.** The Fundamentals of Plant Pathology. – CRC Press, 2018. – 704 p.
4. **Dent D.** Insect Pest Management. – 2nd ed. – CABI, 2000. – 410 p.
5. **Baker K. F., Cook R. J.** Biological Control of Plant Pathogens. – W.H. Freeman, 1974. – 433 p.
6. **Fry W. E.** Principles of Plant Disease Management. – Academic Press, 1982. – 378 p.
7. **Dhawan A. K.** Plant Protection: Managing Agricultural Pests and Diseases. – Scientific Publishers, 2017. – 456 p.
8. **Koul O., Dhaliwal G. S.** Modern Crop Protection: Developments and Perspectives. – CRC Press, 2002. – 512 p.
9. **Parker C. A., Rovira A. D., Moore K. J., Wong P. T. W.** Ecology and Management of Soilborne Plant Pathogens. – American Phytopathological Society, 1985. – 372 p.
10. **Kranz J.** Plant Disease Epidemiology. – Springer, 1990. – 268 p.
11. **Ware, G. W., Whitacre, D. M.** The Pesticide Book. 6th ed. Willoughby: MeisterPro Information Resources, 2004. 496 p.
12. **Matthews, G. A.** Pesticides: Health, Safety and the Environment. 2nd ed. Chichester: Wiley-Blackwell, 2015. 296 p.

Books in Russian for exam preparation

1. **Zakharenko, V. A., Grichanov, I. Ya.** Methods of Monitoring and Forecasting the Development of Harmful Organisms. Moscow – St. Petersburg: LLC "Innovative Plant Protection Center" VIZR, 2002. 96 p.

2. **Protection of Vegetable Crops and Potatoes from Diseases** / ed. by A. K. Akhatov, F. S. Dzhalilov. Moscow, 2007.
3. **Zinchenko, V. A.** Chemical Plant Protection: Means, Technology, and Environmental Safety: textbook. Moscow: KolosS, 2012. 247 p.
4. **Bazdyrev, G. I., Tretyakov, N. N., Beloshapkina, O. O.** Integrated Plant Protection from Harmful Organisms. Moscow: RGAU MSHA named after K. A. Timiryazev, 2011. 352 p.
5. **Bei-Bienko, G. Ya.** General Entomology. St. Petersburg: Prospect Nauki, 2008. 485 p.
6. **Bondarenko, N. V.** Practical Course on Biological Plant Protection. Moscow, 1986. 271 p.
7. **Shkalikov, V. A., Dyakov, Yu. T.** Plant Immunity: A Textbook for Universities. Moscow: Kolos, 2005. 190 p.
8. **Sternshis, M. V.** Biological Plant Protection. Moscow: Kolos, 2004.
9. **Sternshis, M. V., Dzhalilov, F. S., Andreeva, I. V., Tomilova, O. G.** Biopreparations in Plant Protection. Novosibirsk, 2003.