/Translated from Russian into English/

**MINISTRY OF SCIENCE, HIGHER EDUCATION AND INNOVATION OF THE KYRGYZ REPUBLIC**

**MINISTRY OF HEALTH OF THE KYRGYZ REPUBLIC**

**I.K. AKHUNBAEV KYRGYZ STATE MEDICAL ACADEMY**

Endorsed by
Rector of
I.K. Akhunbaev KSMA
Professor Kudaibergenova I.O.
/signed/
«10», June, 2025

# WORKING PROGRAM

## FOR THE ELECTIVE COURSE "RARE AND ENDEMIC PLANTS OF KYRGYZSTAN"

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| Faculty | Pharmacy |
| Course | 2 |
| Semester | 4 |
| Total hours | 60 |
| Lectures | 10 |
| Practical Classes | 20 |
| Individual work | 30 |
| Control | test |

**Bishkek–2025**

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| Compiled based on | State educational standard For higher professional education in the specialty "Pharmacy," No. 1578/1, approved on September 21, 2021 |
| developed | Staffs of Department of Pharmacognosy and Medicinal Chemistry:<br>Head of the Department, Candidate of Pharmaceutical Sciences, Associate Professor A. D. Muratalieva; teacher A. R. Namatpaeva; teacher Z. M. Muratbekova. |
| reviewed | by Zh.O. Soltobaeva, Candidate of Biological Sciences, Associate Professor at the Department of Medical Biology, Genetics, and Parasitology, I.K. Akhunbaev Kyrgyz State Medical Academy (KSMA) |
| discussed at the meeting | EMSC in speciality « »<br>(protocol № from_____2025) |
| confirmed at the meeting | MEME (protocol № from _____2025) |

## Annotation

The flora of Kyrgyzstan comprises over 4,500 species of higher plants. Approximately 1,600 of these species have economic or practical value, including 450 forage species, 300 honey-bearing species, 200 medicinal species, 62 essential-oil-bearing species, and 50 edible species. This diversity represents an exceptionally rich gene pool, which ensures the relative stability of the plant world amidst the sharply fluctuating conditions of a continental climate and the ongoing utilization of its resources.

In general, the republic possesses favorable natural conditions. However, the gradually intensifying pressure of human impact on the environment makes it difficult to preserve many animal and plant species in their natural, free-roaming state. The decline in their numbers has occurred primarily as a result of the intensification of livestock farming—a sector that was previously developed without any regard for the preservation of natural habitats.

Populations and their habitats also suffer significant damage due to the clearing of trees and shrubs, the plowing up of large areas of land, the drying up of water bodies, and poaching.

The conservation and rational use of economically valuable plant species involve proper, regulated harvesting that precludes the risk of depletion. Due to direct or indirect human impact, many plant species have become rare or endangered. Such species are listed in the Red Book. The Red Book of Kyrgyzstan includes 71 such species. Examples include Edward’s fritillary (*Fritillaria eduardii*), Kaufmann’s tulip (*Tulipa kaufmanniana*), the pink tulip (*Tulipa rosea*), Vvedensky’s sage (*Salvia vvedenskii*), Korzhinsky’s pear (*Pyrus korzhinskyi*), the orchid-like *Juno* (*Juno orchioides*), Litvinov’s rhodiola (*Rhodiola litvinovii*), and Semenov’s fir (*Abies semenovii*), among others.

The protection of rare and endangered plant species is carried out in several ways. The first approach is a complete ban on the collection of these species; the second involves protecting rare species within nature reserves and sanctuaries; and the third entails the creation of collection plots and reserves in botanical gardens and other scientific institutions. In these collection plots, plants are preserved over the long term and serve as a resource for their restoration in the wild.

Studying these topics is essential for the professional development of pharmacists, providing a foundation for the subsequent study of pharmacognosy. It introduces future specialists to rare and endemic plant species native to our country, fosters a sense of responsibility for the future of our homeland, and encourages a respectful, protective attitude toward nature. These issues are highly relevant to contemporary society.

According to the curriculum, the course includes 10 hours of lectures, 20 hours of practical sessions, and 30 hours of independent student work.

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| **The purpose of the training:** | To develop systematic knowledge about rare and endemic species of flora in Kyrgyzstan, which is necessary for the professional activities of a pharmacist. |
| **Learning objectives:** | to learn how to identify rare and endemic plants of Kyrgyzstan. |
| **The place of discipline in the structure of the Educational and Professional Program** | Prerequisites: botany, geography of Kyrgyzstan:<br>Botany: basic information about the morphology, anatomy, taxonomy, and ecology of plants; patterns of development and distribution of the plant world; skills in identifying plants based on morphological characteristics and using plant identification guides.<br>Geography of Kyrgyzstan: knowledge of the physical and geographical features of the Kyrgyz territory, natural and climatic conditions, relief, soils, altitudinal zonation, and natural zones; understanding of the factors influencing the distribution of vegetation and the formation of endemic flora species. |
| **Postrequisites:** | ecology, resource science, pharmacognosy |

The student's competencies formed as a result of mastering the discipline:

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| **General scientific competencies** | 1,3 |
| **Socio-personal and general cultural competencies.** | 3 |
| **Instrumental competencies.** | 1,2 |
| **Professional competencies.** | 27 |

The list of planned learning outcomes in the discipline, correlated with the planned results of mastering the educational program

The study of this academic discipline is aimed at the formation of the following general scientific (GSC), instrumental (IC), social and personal (SLC) and professional (PC) competencies among students

| № | CODE | Competence content | As a result of studying the academic discipline, students should: | | |
|---|---|---|---|---|---|
| | | | khow | be able to | have the skills to |
| 1 | **General Scientific Competencies -1** | Able to analyze socially significant problems and processes, to use in practice the methods of the humanities, natural sciences, biomedical and clinical sciences in various types of professional and social activities. | • the main rare and endemic plants of Kyrgyzstan;<br>• their morphological features, distribution and significance;<br>• Basic principles of flora protection. | • identify rare and endemic plants by their appearance;<br>• use definitions and reference literature;<br>• Assess the need to protect rare plant species. | • identify plants;<br>• kills of working with scientific and reference literature;<br>• fundamentals of rational use and protection of plant resources. |
| 2 | **General scientific competencies -3** | Capable and willing to collect, process and interpret the data necessary to form judgments on current social, scientific and ethical issues using modern information technology. | • modern information resources on studying the flora of Kyrgyzstan;<br>• Sources of scientific information about rare and endemic plants | • to search, collect and analyze information about rare and endemic plants;<br>• use information technology to process the received data. | • Skills in working with electronic databases and scientific sources;<br>• Skills in interpreting and presenting information about rare and endemic plants. |
| 3 | **Instrumental competencies-1** | Capable and ready to work with computer equipment and software for system and application purposes to solve professional tasks | • basic information technologies used in the study and protection of rare and endemic plants;<br>• Electronic | • use computer programs to search, process, and store information about rare and | • Computer technology and application software skills;<br>• Skills in searching and |

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| | | | resources and databases on the flora of Kyrgyzstan | endemic plants;<br>• work with electronic catalogs and reference systems. | systematizing scientific information about rare and endemic plants. |
| 4 | **Instrumental competencies-2** | Capable and ready to use information, bibliographic resources, information and communication technologies, taking into account the basic requirements of information security | • basic information and bibliographic resources on the study of rare and endemic plants;<br>• Rules for the search and use of scientific information. | • search and analyze scientific literature and electronic resources;<br>• Use information and communication technologies to study rare and endemic plants. | • skills of working with electronic libraries and databases;<br>• Information retrieval, processing, and storage skills in compliance with information security requirements. |
| 5 | **Socio-personal and general cultural competencies-3** | Capable and ready for continuous professional development, self-knowledge, self-development, self-actualization; manage your time, plan and organize your activities, build a strategy for personal and professional development and training | • the importance of self-education and professional development in studying the plant resources of Kyrgyzstan;<br>• the main sources of new knowledge about rare and endemic plants | • independently plan and organize educational activities;<br>• Use scientific literature to expand knowledge about rare and endemic plants | • skills of independent search and study of scientific information;<br>• Self-education and professional development skills. |

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| 6 | **Professional competencies-27** | capable and ready to analyze and publicly present scientific pharmaceutical information | • scientific information about rare and endemic plants of Kyrgyzstan and their pharmaceutical value;<br>• the main sources of scientific information. | • analyze scientific literature on rare and endemic plants;<br>• Present the results of the analysis in oral and written form. | • Scientific information retrieval and processing skills;<br>• Skills in preparing reports, presentations, and communications on the protection and use of rare and endemic plants. |

## Scope of discipline, types of educational work and control forms.

| № | Name of the discipline | Hours | | | | Control forms |
|---|---|---|---|---|---|---|
| | | lectures | practice | IW | Total | |
| 1. | **Rare and endemic plants of Kyrgyz Republic** | 10 | 20 | 30 | 60 | test |

## Thematic lecture plan

| № п/п | Topic of the lecture | Number of hours |
|---|---|---|
| 1. | Rare and endemic plant species and their classification. The main types of rare and endemic plants growing on the territory of the Kyrgyz Republic. | 2 |
| 2 | The regulatory framework governing the protection and use of plant resources in the Kyrgyz Republic.<br>The Red Book of Kyrgyzstan. | 2 |
| 3 | Rare and endemic lower and higher spore plants of the Kyrgyz Republic. | 2 |
| 4. | Rare and endemic gymnosperms of KR. | 2 |
| 5. | Rare and endemic angiosperms of KR. | 2 |
| | **Total** | **10h.** |

## The thematic plan of practical exercises

| № п/п | The topic of practical exercises | Number of hours |
|---|---|---|
| 1. | The regulatory framework governing the protection and use of plant resources in the Kyrgyz Republic. The Red Book of Kyrgyzstan. | 3 |
| 2. | Spore and gymnosperm plants of KR. The classes are coniferous and oppressive. Rare and endemic species: Semenov fir, Schrenka spruce, juniper, medium ephedra and horsetail ephedra, etc. | 3 |
| 3. | Angiosperms of KR. Class Dicotyledons, Orders: buttercup, barberry, poppy, peony.<br>Rare and endemic species: Kashgar barberry, etc. | 3 |
| 4. | Angiosperms KR. Dicotyledonous class, Orders: buckwheat, walnut, primrose, cruciferous,<br>saxifrage. Rare and endemic species. Iskandera alaiskaya and others. | 3 |

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| 5. | Angiosperms of KR. Dicotyledonous class, Orders: Rosaceae, legumes, buckthorn, loch, Labiaceae, dymyankovye, norichnikovye, aster. Rare and endemic species. Olga's Inkarvillea and others. | 3 |
| 6. | Angiosperms KR. The Monocotyledonous class. Orders: lily, iris, orchid. Rare and endemic species. Edward's grouse. | 3 |
| 7. | Angiosperms KR. The Monocotyledonous class. Orders: amaryllis, asparagus, cereals. Rare and endemic species. Viktor's Ungernia and Severtsov's Ungernia, Zoya's Eremurus, and others. | 2 |
| | **Total** | **20h.** |

**The thematic plan of the student's independent work**

| **№ п/п** | **Themes** | **Number of hours** |
|---|---|---|
| 1. | The Law of the Kyrgyz Republic "On the Protection and use of Flora" dated June 20, 2001, No. 53. | 4 |
| 2. | The Law of the Kyrgyz Republic on the rates of payment for the use of natural objects of the animal and plant world in the Kyrgyz Republic, dated August 11, 2008, No. 200 | 4 |
| 3. | Rules for collecting (harvesting) medicinal plants and fungi in the Kyrgyz Republic dated June 6, 2011, No. 288 | 4 |
| 4. | Mushrooms of different species found in Kyrgyzstan. | 4 |
| 5. | Spore and Gymnosperm plants of Kyrgyzstan. | 4 |
| 6. | Angiosperms. The class is dicotyledonous. Endemics and rare species. | 3 |
| 7. | Angiosperms.The Monocotyledonous class. Endemics and rare species. | 3 |
| 8. | Guidelines for the application of the rules of harvesting. | 4 |
| | **Total** | **30h.** |

**The content of the discipline.**

**Topic:** The regulatory framework governing the protection and use of plant resources in the Kyrgyz Republic. The Red Book of Kyrgyzstan.
The Law of the Kyrgyz Republic "On Protection and use of flora" dated June 20, 2001, No. 53.
The Law of the Kyrgyz Republic on the rates of payment for the use of natural objects in the Domestic and Kyrgyz Republic, dated August 11, 2008, No. 200.
Rules for collecting (harvesting) medicinal, food plants and fungi in the Kyrgyz Republic dated June 6, 2011, No. 288.

**Topic:** Spore and Gymnosperm plants of the KR. The classes are Coniferous and Oppressive. Rare and endemic species.
Spore and Gymnosperm plants KR. The classes are Coniferous and Oppressive. Rare and endemic species: Semenov fir, Schrenka spruce, Juniper (Juniper), Medium ephedra and horsetail ephedra, etc.

Subject: Angiosperms of the KR. The class is dicotyledonous. Orders: buttercup, barberry, poppy, peony. Rare and endemic species.
Angiosperms KR. The class is dicotyledonous. Orders: buttercup, barberry, poppy, peony. Rare and endemic species: Kashgar barberry, etc.
Subject: Angiosperms of the KR. The class is dicotyledonous. Orders: buckwheat, walnut, primrose, cruciferous, saxifrage. Rare and endemic species.
Angiosperms KR. The class is dicotyledonous. Orders: buckwheat, walnut, primrose, cruciferous, saxifrage. Rare and endemic species. Iskandera alaiskaya and others.

Subject: Angiosperms of the KR. The class is dicotyledonous. Orders: Rosaceae, legumes, buckthorn, loch, labiaceous, dymyankovye, norichnikovye, aster. Rare and endemic species.
Angiosperms KR. The class is dicotyledonous. Orders: Rosaceae, legumes, buckthorn, loch, labiaceous, dymyankovye, norichnikovye, aster. Rare and endemic species. Olga's Inkarvillea, Nedzvetsky's Apple tree, Korzhinsky's Pear, Sievers' Apple tree.

Subject: Angiosperms of the KR. The Monocotyledonous class. Orders: lily, iris, orchid. Rare and endemic species.
Angiosperms KR. The Monocotyledonous class. Orders: lily, iris, orchid, and aroid. Rare and endemic species. Edward's grouse. Greig's tulip. Glistening tulip, Kaufman's tulip, Pink tulip, Four-leaved tulip, Kolpakovsky's Tulip, Ostrovsky's Tulip, Zinaida's Tulip, Regel's Eminium, Semenov's Onion, Pskemsky Onion, etc.
Subject: Angiosperms of the KR. The Monocotyledonous class. Orders: amaryllis, asparagus, cereals. Rare and endemic species.
Angiosperms KR. The Monocotyledonous class. Orders: amaryllis, asparagus, cereals. Rare and endemic species. Viktor's Ungernia and Severtsov's Ungernia, Zoya's Eremurus, and others.

Topic: Protection of rare and endemic plants of Kyrgyzstan.
Guidelines for the application of the rules of harvesting

## Logistical support of discipline

lecture hall with sufficient number of seats;
classrooms equipped with an assistant room and an aseptic pharmacy unit or an educational and production pharmacy with a sufficient number of places;
 medicinal and auxiliary substances corresponding to the topic of the lesson in the required quantities;
, a computer classroom with an Internet-connected computer network;
 tables, chairs, wall-mounted and interactive whiteboards;
 reference literature–textbooks, manuals;
 Multimedia projector and laptop;

 multiplying equipment (scanner, printer, copier) and consumables;
 account books and journals of academic performance and attendance;
Stationery: chalk, ballpoint pens, A4 paper, A4 folders;
 educational stands, diagrams and posters;
Computer programs (system, educational, test, office, antivirus);
 educational films (multimedia).
Educational, methodological and informational support of the discipline

**Main sources of literature:**

1. The Life of Plants, Volumes 1–6. Edited by Prof. N. Laureate of the V. N. Grushvitsky Award, Candidate of Biological Sciences. According to S. N. According to G. N. Zhilin. Moscow, “Prosveshchenie”. 1978: ill.
2. Uleman, N. A. Rogova. “Medicinal Plants of Kyrgyzstan.”The rules of preparation " - B. N. 2014.-96 p .
3. A. Altymyshev. "Medicinal wealth of Kyrgyzstan (of natural origin". 2nd ed., dop. F., N. M., "Kyrgyzstan", 1976

**Additional sources of literature:**

1. Alekseev B.D. Giants and Dwarfs of the Plant World – 2nd ed., revised and expanded. – Moscow: Agropromizdat, 1987. – 192 p.: ill.
2. Pharmacognosy. Medicinal raw materials of plant and animal origin: a textbook / edited by G.P. Yakovlev. – 3rd ed., revised. And additional – St. Petersburg: Spets. Lit., 2013. – 848 p.: ill.
3. Yakovlev G.P., Chelombikko V.A., Dorofeev V.I. Botany: a textbook for universities / edited by R.V. Kamelin. – 3rd ed., revised and supplemented – St. Petersburg: Spets. Lit., 2008.