Lesson 5

Topic: «Angiosperm Plants of the Kyrgyz Republic. Class Dicotyledons. Orders Rosales, Fabales, Rhamnales, Elaeagnales, Lamiales, Fumariales, Scrophulariales, Asterales. Rare and Endemic Species (Olga's Incarvillea and others)».

Aim of the lesson: To study the systematic position, morphological features and distribution of representatives of the families Rosaceae, Fabaceae, Rhamnaceae, Elaeagnaceae, Lamiaceae, Fumariaceae, Scrophulariaceae s.l. and Asteraceae in the flora of the Kyrgyz Republic; to become familiar with rare and endemic species (including Olga's incarvillea) and measures for their conservation.

Learning objectives:

1. To study the theoretical aspects of systematics and morphology of the indicated families of the flora of the KR.
2. To understand the importance of rare and endemic species, the reasons for their vulnerability and the principles of biodiversity conservation.

The student should know:

1. The systematic position and diagnostic characters of the families Rosaceae, Fabaceae, Rhamnaceae, Elaeagnaceae, Lamiaceae, Fumariaceae, Scrophulariaceae s.l., Asteraceae.
2. The main genera and species of these families in the territory of Kyrgyzstan; their ecology and economic importance.
3. The characteristics of rare and endemic species (including Incarvillea olgae), their status in the Red Data Book of the KR and conservation measures.

The student should be able to:

Identify plants by morphological characters, analyse ranges and draw conclusions about the degree of rarity and endemism of species.

INFORMATION BLOCK

Family Rosaceae (Rose family)

Trees, shrubs and herbs. Leaves are alternate, often with stipules. Flowers are usually actinomorphic, pentamerous. Fruits are diverse: multiple achenes, drupes, pomes, multiple drupelets. In the flora of Kyrgyzstan — one of the leading families (about 140 species). Important genera: Rosa, Crataegus, Sorbus, Malus, Prunus, Potentilla, Alchemilla. Many species are fruit-bearing, medicinal, ornamental. There are rare and endemic species (Petunnikov's almond, Niedzwetzky's apple, Persian mountain-ash, etc.).

Family Fabaceae (Legume family)

Herbs, shrubs, trees. Leaves are usually compound with stipules. Flowers are zygomorphic (papilionaceous) or actinomorphic. The fruit is a legume (pod). One of the richest families of the flora of Kyrgyzstan (about 400 species). Genera: Astragalus, Oxytropis, Hedysarum, Onobrychis, Trifolium, Medicago and others. Many species are forage, medicinal, nectariferous. High level of endemism (especially in astragali and oxytropes).

Families Rhamnaceae (Buckthorn family) and Elaeagnaceae (Oleaster family)

Rhamnaceae — shrubs and small trees with simple leaves; fruit a drupe or capsule. Elaeagnaceae — shrubs and trees, often with silvery pubescence; fruit a drupe. In the flora of the KR: Rhamnus, Ziziphus; Elaeagnus, Hippophae (sea-buckthorn). Sea-buckthorn is of major food and medicinal importance.

Family Lamiaceae (Mint family)

Herbs and subshrubs with four-angled stems and opposite leaves. Flowers are zygomorphic, bilabiate. The fruit is a schizocarp of four nutlets. In the flora of the KR about 180 species. Genera: Salvia, Nepeta, Phlomoides, Scutellaria, Thymus, Mentha and others. Many species are essential-oil-bearing, medicinal, nectariferous. There are endemics.

Families Fumariaceae and Scrophulariaceae s.l.

Fumariaceae — herbs with zygomorphic flowers; fruit a capsule or nutlet. Genera Corydalis, Fumaria; endemic genus Fumariola. Scrophulariaceae s.l. — herbs with zygomorphic flowers; fruit a capsule. Genera Scrophularia, Veronica, Pedicularis and others; endemic genus Nathaliella. Many species are high-mountain.

Family Asteraceae (Daisy family)

The largest family of the flora of Kyrgyzstan (about 580 species). Herbs, subshrubs, shrubs. Flowers are aggregated in capitula (heads). The fruit is an achene (cypsela). Genera: Artemisia, Cousinia, Saussurea, Aster, Taraxacum, Centaurea and many others. High endemism, especially in the genera Cousinia and Saussurea. Many species are medicinal, forage or weedy.

Olga’s incarvillea (Incarvillea olgae Regel)

A relict ornamental perennial (family Bignoniaceae; in traditional systems often associated with Scrophulariaceae). Height up to 1 m. Leaves pinnately dissected. Flowers funnel-shaped, brightly coloured. Status in the Red Data Book of the KR — CR (critically endangered). A narrow local endemic of the north-western spurs of the Alai Range (interfluve of the Sokh and Shakhimardan rivers, Katrang-Too Range). Grows on pebble beds, stony and clayey slopes at 700–2500 m. Population numbers are extremely low. It is protected in the Khaidarken botanical sanctuary. Inventory of populations, establishment of additional sanctuaries and resumption of cultivation in botanical gardens are recommended.

Rare and endemic species. Conservation

The families under consideration include a substantial proportion of the endemics of the flora of Kyrgyzstan. Legumes, composites and mints are especially rich in endemics. The main threats are overgrazing, ploughing, plant collection and habitat fragmentation. Conservation is carried out through the Red Data Book of the KR, protected areas, monitoring and introduction.

Self-check tests

Choose one or more correct answers:

1. The largest family of the flora of Kyrgyzstan is:
   A. Fabaceae;
   B. Asteraceae;
   C. Rosaceae;
   D. Lamiaceae.
2. The status of Olga’s incarvillea in the Red Data Book of the KR is:
   A. VU;
   B. EN;
   C. CR;
   D. LC.
3. A characteristic feature of the family Fabaceae is:
   A. fruit — a legume;
   B. fruit — an achene;
   C. flowers in capitula;
   D. four-angled stem.
4. Olga’s incarvillea grows:
   A. in the Chui Valley;

B. in the interfluve of the Sokh and Shakhimardan (Alai Range);
C. around Issyk-Kul;
D. everywhere.

5. The family Lamiaceae is characterised by:

A. four-angled stem and bilabiate corolla;
B. milky sap;
C. flowers in catkins;
D. simple perianth.

6. Sea-buckthorn belongs to the family:

A. Rhamnaceae;
B. Elaeagnaceae;
C. Rosaceae;
D. Fabaceae.

7. High endemism is characteristic of the genera:

A. Astragalus and Cousinia;
B. Rosa and Mentha;
C. Taraxacum and Trifolium;
D. all of the above equally.

8. The fruit of composites is:

A. a legume;
B. an achene;
C. a drupe;
D. a capsule.

9. Conservation measures for Olga’s incarvillea include:

A. protection in the Khaidarken sanctuary;
B. inventory of populations;
C. cultivation in botanical gardens;
D. all of the above.

Self-check questions

1. Characterise the family Rosaceae. What economically important species occur in Kyrgyzstan?

2. Why is the family Fabaceae one of the leading families in the flora of the KR? Give examples of endemic genera/species.

3. Describe Olga’s incarvillea: morphology, range, conservation status, threats.

4. List the diagnostic characters of the families Lamiaceae and Asteraceae.

5. What measures for the conservation of rare species of the families under consideration are applied in Kyrgyzstan?

6. Briefly characterise the families Rhamnaceae, Elaeagnaceae, Fumariaceae and Scrophulariaceae s.l.

Situational tasks

Task 1

During a survey of the interfluve of the Sokh and Shakhimardan a perennial with pinnately dissected leaves and brightly coloured funnel-shaped flowers was found. The number of individuals is extremely low.

Question: To which species does the plant belong? What is its conservation status and what protection measures are needed?

Task 2

Students are comparing specimens of legumes and composites — the two richest families of the flora of the KR.

Question: What characters allow these families to be reliably distinguished? Why is the level of endemism high in both?

Task 3

Olga’s incarvillea has the status CR and is known from a very limited area.

Questions:
1. How does a critically endangered narrow local endemic differ from a species with status VU?
2. What population parameters need to be monitored?
3. Propose additional protection measures.

Task 4

Sea-buckthorn and species of Rosaceae are widely used as food and medicinal plants.

Question: What risks does unregulated collection of fruits and raw material create? How can economic use be combined with population conservation?

Task 5

During a study of the high-mountain flora specimens of mints and figworts were collected.

Question: What ecological conditions do high-mountain representatives of these families prefer? Are there endemics of Kyrgyzstan among them?

Laboratory practical work

“Study of morphological features of representatives of the families Rosaceae, Fabaceae, Lamiaceae, Asteraceae and others of the flora of Kyrgyzstan. Identification of rare and endemic species”

Assignment

1. Study herbarium specimens of representatives of the families Rosaceae, Fabaceae, Lamiaceae, Asteraceae and others.
2. Compile morphological descriptions of 4–5 species from different families, including Olga’s incarvillea (from the description).
3. Determine the systematic position of Olga’s incarvillea; indicate its conservation status and range in the KR.
4. Compare the characters of the families and draw conclusions about the causes of high endemism.

Procedure

1. Using a key establish the specific identity of the specimens.
2. Fill in the comparative table of family characters.
3. On a contour map of Kyrgyzstan mark the known localities of Olga’s incarvillea.
4. Formulate conclusions about the importance of the families and the priorities of conservation.

Recommended literature: Flora of the Kirghiz SSR; Red Data Book of the Kyrgyz Republic. — Bishkek, 2007; Lazkov G.A., Umralina A.R. Endemic and rare plant species of Kyrgyzstan (Atlas).