

Systematic Composition and Analysis of the Biomorph of Medicinal Plants in the Flora of the Chechen Republic

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Abstract. It was extremely difficult for the deported peoples to adapt to new natural conditions, and to a new ethnic environment, and to a new humiliating situation. K.D. Ushinsky wrote that the influence of natural conditions on people is so powerful that the destruction of these conditions (and in this case separation) torments a person with painful homesickness. A number of government regulations established a cruel special regime. Settlers scattered in small groups from Kyrgyzstan to Kazakhstan did not have the opportunity to keep in touch with each other. In order to survive physically and morally, the settlers had to prove their innocence every minute of their existence. Adaptation in new geographic and climatic conditions, different from historical ones, had a dominating and depressing effect on the moral and psychological state of people.

1 Introduction

The vegetation covers of the Eastern Caucasus, along with the originality and richness of its flora, is characterised by a clearly defined belt-like distribution of vegetation. There are seven belts: semi-desert, steppe, forest, oreoxerophyte, subalpine, alpine and nival [1].

There are 327 medicinal plant species belonging to 97 families in the natural flora of the Chechen Republic.

The North Caucasus is rich in medicinal plants. Dense forests of the Caucasus are lined with lianas, among which grows Greek obovnik containing a cardiac glycoside. Poisonous medicinal plants can also be found in the forest zone; various species of foxglove, rose hips and orchids. [9].

Purpose and objectives of the study. The aim of this study is to conduct systematic and biomorphological analyses. The objectives of the study were as follows:

- Conducting a systematic analysis of the medicinal species,
- Conducting a biomorphological analysis.

2 Research Methodology

The material for this article is research in the Chechen Republic. These studies are based on the analysis of field studies and observations of the authors. The route-geobotanical and

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route-floristic methods were used. The Chechen Republic is known for its floristic diversity of plants. The present study is devoted to the analysis of the potential of medicinal plants of the Chechen Republic.

In the course of the work, more than 300 geobotanical descriptions were made and an equal number of herbarium specimens were collected, which are stored in the herbarium collection of the A.A. Kadyrov Chechen State University. The collected herbarium was specified according to the identifier of A.I. Galushko, a brief description of each species was given, and its characteristic features were highlighted.

3 Results and Discussions

According to the results of the research, 327 medicinal plant species belonging to 96 families grow in the natural flora of the Chechen Republic [10].

Table 1. The systematic range of medicinal plants in the Chechen Republic

№	Family	Number of species	%
1.	Asteraceae (Compositae)	42	12.84
2.	Rosaceae	25	7.65
3.	Lamiaceae	21	6.42
4.	Orchidaceae	19	5.81
5.	Fabaceae	16	4.89
6.	Brassicaceae	12	3.67
7.	Apiaceae	12	3.67
8.	Caryophyllaceae	10	3.06
9.	Ranunculaceae	9	2.75
10.	Boraginaceae	7	2.14
11.	Chenopodiaceae	7	2.14
12.	Polygonaceae	7	2.14
13.	Scrophulariaceae	7	2.14
14.	Solanaceae	6	1.83
15.	Rubiaceae	5	1.53
16.	Poaceae	4	1.22
17.	Betulaceae	4	1.22
18.	Salicaceae	4	1.22
19.	Dryopteridaceae	3	0.92
20.	Cucurbitaceae	3	0.92
21.	Gentianaceae	3	0.92
22.	Malvaceae	3	0.92
23.	Moraceae	3	0.92
24.	Primulaceae	3	0.92
25.	Rhamnaceae	3	0.92
26.	Violaceae	3	0.92
27.	Ephedraceae	2	0.61
28.	Cupressaceae	2	0.61
29.	Amaryllidaceae	2	0.61
30.	Potamogetonaceae	2	0.61
31.	Aristolochiaceae	2	0.61
32.	Convolvulaceae	2	0.61
33.	Elaeagnaceae	2	0.61
34.	Ericaceae	2	0.61
35.	Fagaceae	2	0.61
36.	Geraniaceae	2	0.61
37.	Oleaceae	2	0.61
38.	Onagraceae	2	0.61
39.	Plantaginaceae	2	0.61
40.	Tamaricaceae	2	0.61
41.	Sambucaceae	2	0.61
42.	Tiliaceae	2	0.61
43.	Urticaceae	2	0.61

44.	Huperziaceae	1	0.31
45.	Lycopodiaceae	1	0.31
46.	Equisetaceae	1	0.31
47.	Athyriaceae	1	0.31
48.	Aspleniaceae	1	0.31
49.	Polypodiaceae	1	0.31
50.	Pinaceae	1	0.31
51.	Alliaceae	1	0.31
52.	Araceae	1	0.31
53.	Asparagaceae	1	0.31
54.	Butomaceae	1	0.31
55.	Colchicaceae	1	0.31
56.	Convallariaceae	1	0.31
57.	Dioscoreaceae	1	0.31
58.	Hydrocharitaceae	1	0.31
59.	Iridaceae	1	0.31
60.	Lemnaceae	1	0.31
61.	Liliaceae	1	0.31
62.	Melanthiaceae	1	0.31
63.	Trilliaceae	1	0.31
64.	Anacardiaceae	1	0.31
65.	Asclepiadaceae	1	0.31
66.	Berberidaceae	1	0.31
67.	Cannabaceae	1	0.31
68.	Capparaceae	1	0.31
69.	Caprifoliaceae	1	0.31
70.	Celastraceae	1	0.31
71.	Cornaceae	1	0.31
72.	Corylaceae	1	0.31
73.	Crassulaceae	1	0.31
74.	Cuscutaceae	1	0.31
75.	Dipsacaceae	1	0.31
76.	Droseraceae	1	0.31
77.	Fumariaceae	1	0.31
78.	Grossulariaceae	1	0.31
79.	Juglandaceae	1	0.31
80.	Limoniaceae	1	0.31
81.	Lythraceae	1	0.31
82.	Nymphaeaceae	1	0.31
83.	Orobanchaceae	1	0.31
84.	Papaveraceae	1	0.31
85.	Peganaceae	1	0.31
86.	Polemoniaceae	1	0.31
87.	Polygalaceae	1	0.31
88.	Pyrolaceae	1	0.31
89.	Resedaceae	1	0.31
90.	Rutaceae	1	0.31
91.	Saxifragaceae	1	0.31
92.	Thymelaeaceae	1	0.31
93.	Ulmaceae	1	0.31
94.	Viburnaceae	1	0.31
95.	Viscaceae	1	0.31
96.	Zygophyllaceae	1	0.31
Total:		327	100

Family Asteraceae (Compositae) comprises 42 species, accounting for 12.84 %. The second place is occupied by the family Rosaceae comprising 25 species, accounting for 7.65 %. In third place are representatives of the family Lamiaceae includes 21 species (6.42 %). Fourth place is occupied by the family Orchidaceae with 19 species, which amounts to 5.81 %. Representatives of the family Fabaceae occupy the fifth place (16 species, 4.89 %). Twelve species each belong to the families Brassicaceae and Apiaceae (3.67 %). The

seventh place is occupied by representatives of the family Caryophyllaceae, represented by 10 species (3.06 %). The family Ranunculaceae includes 9 species, representing 2.75%. Four families are represented by 7 species - Boraginaceae, Chenopodiaceae, Polygonaceae, Scrophulariaceae (2.14 %). Representatives of the family Solanaceae are represented by 6 species, which is 1.83 %. Family Rubiaceae is represented by 5 species (1.53 %). Three families have four species each, eight families are represented by three species, 17 families by two species, the remaining families are represented by one species.

Life forms, or biomorphs, are understood as a set of external features of a plant adapted to the whole complex of environmental factors [8.12]. The system of "biological types" by C. Raunckier (1934) is the most acceptable for biomorphological analysis. The biomorphological spectrum of medicinal plants of the Chechen Republic is presented in Table 2.

There are 5 species (1.52%) of megafanerophytes: *Pinus sosnowskyi* Nakai (*P. hamata* (Stev.) Sosn.; *P. kochiana* Klotzsch), *Fraxinus excelsior* L., *Populus tremula* L., *Tilia caucasica* Rupr., *T. cplatyphyllos* Scop. [10].

There are 14 species (4.27%) of mesophanerophytes: *Alnus glutinosa* (L.) Gaertn., *A. incana* (L.) Moench, *Betula pendula* Roth (*B. verrucosa* Ehrh.), *B. pubescens* Ehrh., *Quercus petraea* L. ex Liebl., *Q. robur* L. (*Q. pedunculata* Ehrh.), *Juglans regia* L., *Morus alba* L., *M. nigra* L., *Maclura pomifera* (Rafin.) Schneid. (*M. aurantiaca* Nutt.), *Malus orientalis* Uglitzk., *Sorbus aucuparia* L. (*S. caucasigena* Kom. et Gatsch.), *S. graeca* (Spach) Lodd.ex Schauer., *Populus nigra* L. [10].

Microphanerophytes 10 species (3.05%): *Cornus mas* L., *Rhamnus cathartica* L., *Crataegus curvisepala* Lindm. (*C. kyrtostyla* auct.), *C. monogyna* Jacq., *Mespilus germanica* L., *Padus avium* Mill. (*P. racemosus* (Lam.) Gilib.), *Prunus divaricata* Ledeb., *Salix alba* L., *S. caprea* L., *Ulmus minor* Mill. (*U. carpinifolia* Rupr. ex Suckow, *U. foliacea* Gilib.). [10].

There are 23 species (7.01%) of nanophanerophytes: *Junioerus oblonga* Bieb. (*J. communis* L.), *J. sabina* L., *Cotinus coggygria* Scop., *Berberis vulgaris* L., *Euonymus europaea* L., *Corylus aveliana* L., *Hyppohpae rhamnoides* L., *Elaeagnus angustifolia* L., *Rhododendron caucasicum* Pall., *Grossularia reclinata* (L.) Mill., *Ligustrum vulgare* L., *Palurus spina*, *Frangula alnus* Mill., *Prunus spinosa* L., *Rosa canina* L., *R. myriacantha* Smith., *Rubus caesius* L., *R. hirtus* Waldst. et Kit., *Tamarix hohenackeri* Bunge, *T. ramosissima* Ledeb., *Daphne mezereum* L., *Viburnum opulus* L., *Viscum album* L. [10].

There are 16 species of Chamefis (4.88%): *Huperzia selago* (L.) Bernh. ex Schrank et C. Mart. (*H. petrovii* Sipl.), *Lycopodium annotinum* L., *Ephedra distachya* L., *E. procrea* Fisch. Et C.A. Mey., *Periploca graeca* L., *Capparis herbacea* Willd. (*C. spinosa* L.), *Lonicera caprifolium* L., *Anabasis aphylla* L., *Arctostaphylos caucasica* Lipsch. (*A. iivarsi* (L.) Spreng.), *Alhagi pseudalchagi* (Bieb.) Fisch., *Teucrium chamaedrys* L., *T. polium* L., *Thymus marschallianus* Willd., *Pentaphylloides fruticosa* (L.) O. Schwarz (*Dasiphora fruticosa* (L.) Rydb., *Potentilla fruticosa* L.), *Rubus buschii* Grossh. ex Sinjakova, *Solanum pseudopersicum* Pojark. [10].

There are 171 species (52.13%) of hemicyptophytes: *Athyrium filix-femina* (L.) Roth, *Dryopteris assimilis* S.Walker (*D. austriaca* (Jacq.) Woynar; *D. expansa* (C.Presl) Fraser-Jenkins et Jermy), *D. carthusiana* (Vill.) H.P.Fusch (*D. lanceolatocristata* (Hoffm.) Alst., *D. Spintlosa* (O.F.Muell.) O.Kuntze), *D. filix-mas* (L.) Schott, *Asplenium trichomanes* L., *Polypodium vulgare* L., *Asparagus officinalis* L. (*A. polyphyllus* Stev.; *A. caspius* Schult.et Schult.fil.), *Convallaria transcaucasica* Utkin ex Grossh. (*C. majalis* L.), *Cypripedium calceolus* L., *Cynodon dactylon* (L.) Pers., *Elytrigia repens* (L.) Nevski (*A. repens* (L.) Beauv.), *Stipa pennata* L. (*S. joannis* Celac.), *Eryngium planum* L., *Eryngium campestre* L., *Aegopodium podagraria* L., *Carum carvi* L., *Conium maculatum* L., *Daucus carota* L., *Falcaria vulgaris* Bernh. (*F. sioides* (Wib.) Aschrers.), *Heracleum sibiricum* L., *Libanotis transcaucasica* Schischk. (*Seseli libanotis* (L.) Koch), *Pimpinella saxifrage* L., *Sanicula europaea* L., *Visnaga daucoides* Gaertn. (*Ammi visnaga* (L.) Lam.), *Asarum ibericum* Stev.

ex Ledeb. (*Asarum intermedium* (C.A. Mey.) Grossh.), *Aristoloechia clematitis* L., *Acroptilon repens* (L.) DC., *Achillea nobilis* L., *A. millefolium* L., *A. setacea* Waldst. et Kit., *A. micrantha* Willd. (*A. gerberi* Willd.), *Arctium lappa* L., *A. paliadinii* (Marc.) Grossh., *Artemisia vulgaris* L., *A. taurica* Willd., *A. santonica* L., *Eupatorium cannabinum* L., *Erigeron acris* L. (*E. acer* auct.), *Carduus nutans* L., *Chondrilla juncea* L., *Cichorium intybus* L., *Cirsium vulgare* (Savi) Ten., *C. arvense* (L.) Scop., *Crinalaria villosa* (L.) Grossh. (*Galatella villosa* (L.) Reichenb), *Echinops sphaerocephalus* L., *Hieracium pilosella* L., *Leucanthemum vulgare* Lam., *Onopordum acanthium* L., *Petasites hybridus* (L.) Gaertn., Mey. Et Schreb., *Pyrethrum parthenifolium* Willd., *Serratula coronata* L., *Silybum marianum* (L.) Gaertn., *Solidago virgaurea* L., *Taraxacum officinale* Wigg., *Tripolium vulgare* Nees, *Trommsdorffia maculata* (L.) Bernh. (*Achyrophorus maculatus* (L.) Scop.), *Tussilago farfara* L., *Anchusa azurea* Mill. (*A. italica* Retz.), *Echium vulgare* L., *Cynoglossum officinale* L., *Lithospermum officinale* L., *Pulmonaria mollis* Wulf. ex Hornem. (*Pulmonaria mollissima* A.Kerner), *Symphytum officinale* L., *Berteroa incana* (L.) DC., *Cardaria draba* (L.) Desv. (*Lepidium draba* L.), *Erysimum canescens* Roth (*E. diffusum* Ehrh.), *Lepidium latifolium* L., *Syrenia siliculosa* (Bieb.) Andrzej., *Humulus lupulus* L., *Dianthus armeria* L., *Gypsophila paniculata* L., *Melandrium album* (Mill.) Garcke, *Stellaria graminea* L., *S. holostea* L., *Saponaria officinalis* L., *Convolvulus arvensis* L., *Calystegia sepium* (L.) R.Br., *Hylotelephium caucasicum* (Grossh.) H. Ohba (*Sedum caucasicum* Grossh.), *Ecballium elaterium* (L.) A.Rich., *Knautia arvensis* (L.) Coult., *Drosera rotundifolia* L., *Amoria hybrida* (L.) C. Presl (*Thyridium* L.), *A. repens* (L.) C. Presl (*T. repens* L.), *Anthyllis macrocephala* Wend. (*A. polyphylla* (DC.) Kit. ex Loud.), *Asrtagalus glycyphyllos* L., *Glycyrrhiza glabra* L., *Lathyrus pratensis* L., *L. sylvestris* L., *Lotus corniculatus* L., *L. tenuis* Waldst. et Kit., *Medicago sativa* L., *Melilotus albus* Medik., *M. officinalis* (L.) Pall., *Ononis arvensis* L., *Trifolium medium* L., *Vicia cracca* L., *Gentiana schistocalyx* (C. Koch) C. Koch, *Glechoma hederacea* L., *Marrubiium vulgare* L., *Nepeta cataria* L., *Origanum vulgare* L., *Prunella vulgaris* L., *Lamium album* L., *Leonurus quinquelobatus* Gilib (*Leonurus cardiac* L.), *Melissa officinalis* L., *Menta aquatica* L., *M. arvensis* L., *M. caucasica* Gand. (*M. longifolia* (L.) Huds.), *Phlomis pungens* Willd., *Salvia glutinosa* L., *Salvia sylvatica* L., *Scutellaria verticillata* L., *S. galericulata* L., *S. aethiops* L., *Limonium meyeri* (Boiss.) O. Kuntze, *Lythrum salicaria* L., *Althaea armeniaca* Ten., *A. officinalis* L., *Chamerion angustifolium* (L.) Scop. (*Chamerion angustifolium* (L.) Holub), *Oenothera biennis* L. (*Onagra biennis* (L.) Scop.), *Peganum harmala* L., *Plantago lanceolata* L., *P. major* L., *Polemoniium caucasicum* N. Busch (*P. coeruleum* non L.), *Bistorta carnea* (C.Koch) Kom. (*Polygonum carneum* C. Koch), *Dryopteris aquatica* L., *D. Confertus* Willd., *D. obtusifolius* L., *Lysimachia nummularia* L., *Primula to macrocalyx* Bunge, *Pyrola rotundifolia* L., *Adonis vernalis* L., *Ficaria calthifolia* Reichenb., *Helleborus caucasicus* A.Br., *Thalictrum flavum* L., *T. foetidum* L., *T. minus* L., *Reseda lutea* L., *Agrimonia eupatoria* L., *Crataegus pentagyna* Waldst. et Kit., *Geum urbanum* L., *Filipendula ulmaria* (L.) Maxim, *F. vulgaris* Moench (*F. hexapatala* Gilib.), *Fragaria moschata* (Duch) Weston, *Potentilla argentea* L., *P. erecta* (L.) Ralusch., *Rubus saxatilis* L., *Sanguisorba officinalis* L., *Asperula odorata* L. (*Galium odoratum* (L.) Scop.), *Galium verum* L., *Cruciata laevipes* Opiz (*G. cruciata* (L.) Scop.), *Rubia tinctorum* L. (*R. iberica* (Fisch. ex DC.) C. Koch), *Dictamnus caucasicus* (Fisch. et C.A. Mey.) Grossh., *Sambucus ebulus* L., *Scrophularia nodosa* L., *Verbascum blattaria* L., *Verbascum phlomoides* L., *Veronica beccabunga* L., *V. chamaedrys* L., *V. teucrium* L., *Atropa caucasica* Kreyer (*A. bella-donna* L.), *Datura stramonium* L., *Hyoscyamus niger* L. (*H. bohemicus* F. W. Schmidt), *Physalis alkekengi* L., *Urtica dioica* L., *U. urens* L., *Viola canina* L., *V. odorata* L., *Zygophyllum fabago* L. [10].

Cryptophytes 39 species (11.89%): *Equisetum arvense* L., *Allium ursinum* L., *Galanthus angustifolius* G.Koss., *Galanthus caucasicus* (Baker) Grossh., *Arum orientale* Bieb. (*A. maculatum* L.), *Butomus umbellatus* L., *Colchicum speciosum* Stev., *Tamus communis* L., *Iris pseudacorus* L., *Gagea lutea* (L.) Ker.Gawl., *Veratrum lobelianum*

Bernh., *Anacamptis pyramidalis* (L.) Rich., *Coeloglossum viride* (L.) C. Hartm., *Dactylorhiza euxina* (Nevski) Czer. (*D. caucasica* (Klinge) Soo), *D. salina* (Turcz. ex Lindl.) Soo (*D. sanasunitensis* (Fleischm.) Soo), *D. urvilleana* (Steudel) Baumann et Kunkele (*D. triphylla* (C.Koch)), *Gymnadenia conopsea* (L.) R.Br., *Neottia nidus-avis* (L.) Rich., *Orchis coriophora* L., *O. mascula* (L.) L., *O. militaris* L., *O. picta* Loisel. (*O. morio* L. subsp. *picta* (Loisel.) K.Richt.), *O. purpurea* Huds., *O. simia* Lam., *O. tridentata* Scop., *O. ustulata* L., *Platanthera bifolia* (L.) Rich., *P. chlorantha* (Cust.) Reichenb., *Traunsteinera sphaerica* (Bieb.) Schlechter, *Phragmites australis* (Cav.) Trin. ex Steud. (*Ph. communis* Trin.), *Potamogeton natans* L., *P. perfoliatus* L., *Paris quadrifolia* L., *Bryonia alba* L., *B. dioica* Jacq., *Nymphaea alba* L., *Ranunculus repens* L. [10].

Therophytes number 50 species (15.24%): *Hydrocharis morsus-ranae* L., *Lemna minor* L., *Artemisia annua* L., *Bidens tripartita* L., *Centaurea cyanus* L., *Filágo arvensis* L., *Lactuca serriola* L., *Lapsana communis* L., *Lepidotheca suaveolens* (Purch) Nutt. (*Matricaria suaveolens* (Pursh) Buschenau; *M. discoidea* DC.; *Chamomilla discoidea* (DC.) J. Gay ex A.Br.), *Pulicaria vulgaris* Gaertn. (*P. prostrata* (Gilib.) Aschers. nom. illegit.), *Senecio vulgaris* L., *Serratula oleraceus* L., *Myosotis arvensis* (L.) Hill, *Brassica juncea* (L.) Czern., *Descurainia sophia* (L.) Webb ex Prantl, *Draba nemorosa* L., *Lepidium ruderales* L., *Neslia paniculata* (L.) Desv., *Sisymbrium officinale* (L.) Scop., *Turritis glabra* L., *Agrostemma githago* L., *Herniaria hirsuta* L. (*H. cinerea* DC.), *Kohlruschia prolifera* (L.) Kunth, *Stellaria media* (L.) Vill., *Chenopodium album* L., *C. botrys* L., *C. vulvaria* L., *Atriplex rosea* L., *Kochia scoparia* (L.) Schrad., *Suaeda prostrata* Pall., *Cuscuta europaea* L., *Fumaria vaillantii* Loisel, *Centaureum pulchellum* (Sw.) Druce, *G. cruciata* L., *Geranium robertianum* L., *Erodium cicutarium* (L.) L'Her., *Ajuga chia* Schreb., *Malva sylvestris* L., *Phelypanche ramosa* (L.) Pomel (*O. ramosa* L.), *Papaver rhoeas* L., *Fallopia convolvulus* (L.) A. Love (*Polygonum convolvulus* L.; *Bilderdikia convolvulus* (L.) Dumort.), *Polygonum aviculare* L. (*P. heterophyllum* Lindem.), *P. maculata* (Rafin.) (*Polygonum maculatum* Rafm.; *P. persicaria* L.), *Anagallis arvensis* L., *Consoida paniculata* (Host) Schur (*Delphinium paniculatum* Host), *Ceratocephala falcata* (L.) Pers., *Galium aparine* L. (*G. spurium* L.), *Chrysosplenium alternifolium* L., *Solanum nigrum* L., *Viola arvensis* Murr. [10].

Table 2. Biomorphological spectrum of medicinal plants in the Chechen Republic

BIOMORFA	Plywoodophytes				Hamefits	Hemicryptophytes	Cryptophytes	Therophytes
	Mega veneerophytes	Meso veneerophytes	Micro veneerophytes	Nano veneerophytes				
Number of species	5	14	10	23	16	171	39	50
% of the total number	1.52	4.27	3.05	7.01	4.88	52.13	11.89	15.24

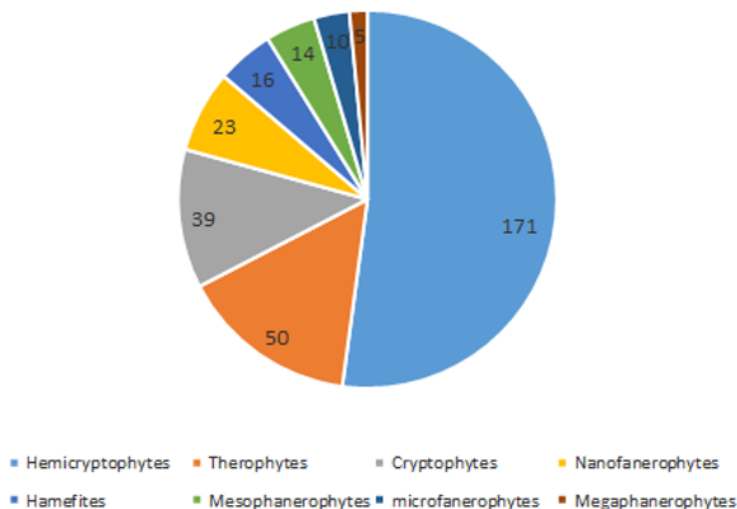


Fig. 1. Biomorphological analysis of medicinal plants of the Chechen Republic

4 Conclusions

The studied medicinal plant species of the Chechen Republic include 327 species belonging to 96 families. Systematic analysis and analysis of biomorphs revealed:

- the predominant families are Asteraceae (Compositae) and Rosaceae;
- hemicryptophytes predominate in the studied flora.

References

1. A. I. Galushko, Vegetation of Chechnya-Ingushetia, 4-103 (1975).
2. A. I. Galushko, Flora of the North Caucasus (identifier), **1-3**, 317, 350, 327 (1978-1980).
3. N. A. Gvozdetsky, Physical Geography of the Caucasus, 208 (1954).
4. Z. I. Iriskhanova, A. A. Ataeva, L. G. Molochaeva, Ecological and cenotic analysis of the family asteraceae in the Chechen Republic, 112-117 (2021).
5. Z. I. Iriskhanova, M. A. Takaeva, L. G. Molochaeva, Ecological-cenotic analysis of medicinal plants of the Chechen Republic, 35-39 (2021).
6. Z. I. Iriskhanova, M. A. Takaeva, L. G. Molochaeva, Systematic and Ecological-Cenotic Analysis of the Cyperaceae Family of the Chechen Republic', 25-28 (2022).
7. Red Book of the Czech Republic. Rare and threatened species of plants and animals, Grozny, 432 (2007).
8. I. G. Serebryakov, Ecological Morphology of Plants, 378 (1962).
9. P. P. Sokolov, E. S. Oskanova, V. M. Prima, Medicinal plants of Chechen-Ingushetia (1982).
10. M. U. Umarov, M. A. Taisumov, Flora of the Chechen Republic, 152 (2011).
11. A. L. Shennikov, Ecology of plants, 290 (1950).
12. C. Raunkiaer, The life forms of plants and statistical plant geography, 632 (1934).