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Flora and Vegetation of the Chorokhi Delta

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General description of the paper

Introduction

The floristic region of Adjara is located in the north-western part of the Western Caucasus corridor of the Caucasus "hot spot",Which is distinguished by the unique diversity of the relict Colchian flora.The Caucasus Ecoregion is included in the International Union for Conservation of Nature (IUCN) in the list of 36 hotspots in the world, which are characterized by the greatest biodiversity and an abundance of endangered terrestrial ecosystems.At the same time geographically, this area is among the 200 world-recognized ecoregions, Which is allocated by the World Wide Fund for Nature (WWF 1997) based on criteria such as: level of endemism,taxonomic uniqueness, evolutionary processes, species diversity and peculiarities of historical development of flora and fauna,diversity of vegetation types and rarity of biomes globally.Due to the abundance of species, the rate of endemism, taxonomic uniqueness, peculiarities of origin and habitat rarity, the floristic region of Adjara is distinguished in the south-western corridor of the Lesser Caucasus of the Caucasus Ecoregion.

Actuality of the topic. The Chorokhi Delta area is experiencing the greatest anthropogenic pressure in the floristic district of Adjara, which is part of the Georgian-Turkish cross-border zone and covers the area from the Georgian-Turkish state border to the confluence of the River “Korolistskali”. (http://aves.biodiversity-georgia.net/spa-n-15) urbanizationprocessesis actively taking place in the mentioned area: Improvement of hotel complexes, leisure and entertainment places, residential houses, shopping malls, river banks and roads,which leads to disintegration-fragmentation of plant areasand clusters, the degradation of landscapes, as a result of which many species have fallen out of their natural range and become extinct, many endemic and relict species are in danger of extinction and their area has been reduced, Aboriginal plants have been replaced by, adventurous and invasive species, primary cenoses were replaced by secondary ones.Therefore, identifying and studying the diversity of flora and vegetation of the Chorokhi Delta, systematic structure, endemic, relict, extinct, endangered species is one of the current problems.

Aim and objectives of the research: Field surveys were conducted in 2016-2019. The aim of the study was to study the flora and vegetation of the Chorokhi Delta.

The following tasks were set to achieve the purpose of the research:

- Study of the diversity and systematic structure of the flora and vegetation of the Chorokhi Delta, compiling of the flora concept.
- Study of Chorokhi Delta Habitats.
- Study of endemic species distributed in the Chorokhi Delta.
- Identification of spices with adventive, introduced, decorative and medicinal valuesdistributed in the Chorokhi Delta.
- Study of the diversity of extinct and endangered species distributed in the Chorokhi Delta.
- Identification of species with questionable taxonomic status in the Chorokhi Delta, Determining their morphological features, seasonal development dynamics, population diversity, Global Positioning System (GPS) coordinates, soil content, phytochemical composition, taxonomic status, and building a cluster dendrogram.

Scientific novelty:

It was studied for the first time:

- Systematic structure of the flora and vegetation of the Chorokhi Delta, a flora concept was drawn up;
- Have been compared: Ranun-culus ficaria of Adjara (*Ficaria popovii* A. Khokhr) andordinary ranun-culus ficaria (*Ficariacalthifolia*Rchb)caucasianhelleborus caucasicus (*Helleborus caucasicus* A. Br)andAbkhazianhelleborus caucasicus (*Helleborus. Abchasicus* A. Br.)DNAs by RAPD - PCR method.
- Soil content of ranun-culus ficaria of Adjara (*Ficaria popovii* A. Khokhr)andcaucasianhelleborus caucasicus (*Helleborus caucasicus* A. Br)in some habitats's distribution,Phytochemical study of aboveground and underground parts.

Object and methods of research

Object of research. The object of research was the flora and vegetation of the Chorokhi Delta and the surrounding slopes.

Methods of research. Field surveys were conducted using the traditional route expedition method, Collection and in-camera processing processing of herbarium material was carried out by the method of Skvortsov(Скворцов, 1977:51);

Plant species identification was carried out with the help of Adjara (Дмитриева, 1990:44), clarificationof Georgian plant species (1964:23,1969:24), "Georgian flora" (1971-2016 vol. I-XVI:25) and botanical dictionary (Makashvili, 1991: 18);

Systematic status was granted to species POWO (http://www.plantsoftheworldonline.org/) (2019),The Plant List (www.theplantlist.org.) (2013), WFO (http://www.worldfloraonline.org/) (2018) and Catalogue of life (https://www.catalogueoflife.org/) (2020) using systematic nomenclatures and reconciliation.

Phenological observations on the studied species were carried out by Beidemann (Бейдеман 1954:32) method. Observations were performed once every 10 days, the results were analyzed in relation to climatic conditions.

Population diversity studies were performed using Brown-Blanche, transect and quadratic methods (http://serc.fiu.edu/seagrass/!).

The DNAs of the study species were compared by the RAPD-PCR method (William, 1990:69).The discovery of this method is the most important development in molecular biology in the last 20 years (PCR).

Global Positioning System (GPS) data were used to determine the distribution areas of the study species;

Soil acidity, total amount of nitrogen, phosphorus, potassium and organic compounds in the area of distribution of the study specieswere determined by standard method Ghost 26483-1985, Ghost26213-1991, Ghost26107-1984, Ghost26206-1991).

Ultra-performance liquid chromatography-mass spectrometry (UPLC) method was used to study the phytochemical composition of the study species - (Waters, UPLC Acquity, QDa Detectore). A chromatographic column (Acquity UPLC BEN C18, 1.7m.) was used to

separate the compounds.The method makes it possible to simultaneously conduct a study of the compound,The reliability of their identification is much higher.The chromatographic characteristics of the compound as well as the spectral and mass spectral characteristics are determined (https://metlin.scripps.edu) through a free database, as well as by comparing to data from peer-reviewed literary publications (Stanojevic, 2018:66).Peak areas generated for individual compounds of the UPLC-MS system (ESI) were used to construct the caliber curve

Material technical base: Dissertation thesis is performed in the Department of Biology, Faculty of Natural Sciences and Health Batumi Shota Rustaveli State University, Department of Plant Disease Monitoring, Diagnostics and Molecular Biology Batumi Shota Rustaveli State University, Regional Chromatographic Center of Western Georgia, Ministry of Agriculture of Autonomous Republic of Adjara Laboratory Research Center.

Approbation of research outcomes: The research materials, seminar and colloquium works presented for the Biology Department of the Natural Science and Health Faculty in 2016-2019 at Batumi Shota Rustaveli State University. The work successfully got approbation at the faculty council, in 2021. The results of the paper are published in 6 scientific articles.

Dissertation volume and structure. Text of dissertation covers 111 electonically printed pages and includes introduction, literature review, experimental part, conclusions, bibliography (84 units) and appendix. There are 14 tables, 2 figures (diagram) and 24 pictures in the text.

Literature review

The first chapter of the dissertation presents the description of the physical-geographical and climatic conditions of Adjara. The second chapter presents the diversity and systematic structure of the flora of coastal Adjara.

Experimental part

Chapter 3. Diversity of flora and vegetation of the Chorokhi Delta

3.1 Systematic structure of the Chorokhi delta flora

Chorokhi Delta is located in the extreme southwestern part of Georgia, Its area is 85 km^2, covering the area from the Georgian-Turkish state border to the confluence of theriver "Korolistskali". (https://rec-caucasus.org/wp-content/uploads/2020/08/1557341331.pdf)

The shoreline of the Chorokhi Delta is represented by sand-pebble beaches of different widths.The latter consists of modern and ancientembankment and is an important geomorphological element of the Adjara coast.Only in the form of separate, local areas are found the shores represented by rocky vertical plateaus, along to which the beaches are not developed. Such is the coastal area of cape "Kalendere", located in the north of the Georgian-Turkish border.

The flora of the Chorokhi Delta is represented by the vegetation of coastal sands, sediments, lowlands, ponds, roadsides, roadside slopes and shrubs.

Human activity has brought about significant changes in the diversity of flora and vegetation in the Chorokhi Delta, The share of introduced, adventiveand invasive species has increased.Invasive woody lianas - *Pueraria hirsuta* (Thunb.) C.K.), of East Asian descent dominated the roadside slopes, who changed the face of the roadside slopes in some places, while the invasive species of American origin (*Robinia pseudoacacia* L.)set foot on the lowlands and slopes.

The flora of the Chorokhi Delta is represented by 298 species, which are united in 73 families and 185 genus.

There are 19 species of ferns, 3 species of cereals, 2 species of gymnospermous, 274 species of flowering plants, including 47 species of monocotyledon, 227 species of dicotyledon.

The families distinguished by the richness of the species are: *Asteraceae* – 34, *Fabaceae* – 29, *Poaceae* – 19, *Brassicaceae* – 17, *Lamiaceae* – 13, *Rosaceae* – 10, *Apiaceae* – 8, *Euphorbiaceae* – 8*, Ranunculaceae* – 8, *Cyperaceae* – 7, *Polygonaceae* – 7, *Polypodiaceae - 7,*

Aspleniaceae - 6, *Plantaginaceae* – 6, *Amaranthaceae – 5, Araliaceae* – 5, *Geraniaceae* – 5, *Amaryllidaceae – 4, Betulaceae – 4, Boraginaceae* – 4, *Caryophyllaceae* – 4, *Convolvulaceae – 4, Pteridaceae* - 4, *Scrophulariaceae* – 4.

The genus distinguished by the abundance of species are: *Euphorbia* – 8, 6-6 სახეობა - *Ranunculus* , *Trifolium*, 5-5 სახეობა - *Geranium, Lepidium*, *Polygonum*, *Rubus*, 4-4 სახეობა -*Asplenium, Cardamine* , *Cirsium*, *Cyperus*, *Poa*, *Veronica*, 3-3 სახეობა - *Digitaria*, *Dryopteris*, *Equisetum* , *Erigeron*, *Eucalyptus* , *Galium*, *Hydrocotyle*, *Hypericum, Juncus*, *Lamium*, *Lathyrus*, *Lotus*, *Medicago*, *Senecio*, *Verbascum*, *Vicia*.

There are 236 species of grasses, including 82 annuals and 139 perennials. There are 48 species of woody trees: 20 species of trees, 22 species of shrubs, 6 species of lianas.

3.2. Chorokhi Delta Habitats

The following habitats are represented in the Chorokhi Delta area: sands, sediments, swamps, puddle, lowlands, roadside slopes, roadside slopes and shrubs.

16 species take part in the composition of **coastal sand** vegetation,Where the grouping (Cynodon dactylon (L.) Pers.) is found. The following species are common in cenosis: *Imperata cylindrical* (L.) P. Beauv, *Carex colchica* J.Gay, *Poa bulbosa* L., *Trifolium tumens* Steven ex M.Bieb., *Lathyrus tuberosus* L., *Euphorbia paralias* L., *Euphorbia hirsuta* L. (*Euphorbia pubescens* Vahl), *Hippophae rhamnoides* L., *Matricaria chamomilla* L., *Filago eriocephala* Guss.

There are 53 species in the habitats of the **coastal sediments,** including: *Trifolium arvense* L., *Rubus anatolicus* (Focke) Focke ex hausskn. (*R. sanctus* Schreb.) *Hippophae rhamnoides* L. *Plantago lanceolata* L., *Plantago major* L., *Cyperus longus* subsp. *badius* (Desf.) Bonnier & Layens, *Equisetum arvense* L., *Equisetum ramossianum* Dasf. (*E. giganteum* L.), *Eryngium maritimum.* L., *Echinops colchicus* D.SoSn. *(Echinops ossicus* K.Koch), *Erigeron crispus.* Pourr. (*E. bonariensis* L.), *Arabidopsis thaliana* (L) Heynh., *Lepidium coronopus* (L.) Al-Shehbaz *Coronopus procumbens* Gilib.

coastal swamp, which is located at the confluence of Chorokhi and near Gonio Fortress, is represented by 17 species. Groupingsovergrown with reeds and overgrown with reedmace are widespread in the mentioned swamps, in the formation of which thefollowing species

take part: *Phragmites australis* (Cav.) Trin. Ex Steud., *Typha angustifolia* L., *Sagittaria trifolia* L., *Alisma plantago-aquatica* L., *Cyperus colchicus* K.Koch., *Juncus bufonius* L., *Juncus articulatus* L., *Elodea canadensis* Michx., *Iris pseudacorus* L., *Lemna minor* L. *Lonicera japonica* Thunb, *Juncus effusus* L., *Ranunculus repens* L., *Datura stramonium* L.

Different spore relict ferns (*Marsilea quadrifolia* L.,) were growing in the swamp near Gonio Fortress, which is included in the IUCN International Red List with a status - Needs Care (LC). This habitat was polluted with household waste by a temporary shopping center located in 2015, which closed after 3 years, But this species has not been observed by us in the swamp for the last 5 years.

There are 4 species in the **swamps:** *Phragmites australis (*Cav.) Trin. Ex Steud., *Iris pseudoacorus* L. *Trapa colchica* Albov *Trapa natans* L., *Elodea canadensis* Michx.

In lowland habitat - 84 species are distributed: *Sorghum halepense* (L.) Pers., *Poa trivialis* L., *Poa annua* L., *Digitaria ciliaris* (Retz.) Koeler., *Digitaria ischaemum* (Schreb.) Muhl., *Juncus effusus* L., *Viola alba* Besser., *Commelina communis* L., *Microstegium imberbe* (Nees ex Steud.) Tzvelev. *M. vimineum* (Trin.) A.Camus. *Solanum nigrum* L., *Datura stramonium* L. *Ranunculus bulbosus* L., *Ranunculus ficaria* subsp. *calthifolius* (Rchb.) Arcang.(*Ficaria calthifolia* Rchb.), *Ranunculus repens* L.

In the roadside habitat - 41 species are distributed, among them are: *Hippophae rhamnoides* L., *Rubus anatolicus (Focke) Focke ex hausskn.* (*R. sanctus* Schreb.)., *Lonicera japonica* Thunb, *Datura stramonium* L., *Erigeron canadensis* L., *Equisetum majus* Schinz. Thell. *Equisetum telmateia* Ehrh., *Salix babylonica* L., *Salix caprea* L., *Rubus caesius* L., *Rubus hirtus* Waldst.& Kit., *Potentilla reptans* L., *Potentilla indica* (Andrews) Th.Wolf (*Duchesnea indica* (Andrews) Teschem.)., *Fragaria vesca* var. *chiloensis* L. *F. chiloensis* (L.) Mill., *Plantago lanceolata* L., *Plantago major* L.

77 species are distributed in **roadside slope habitats,** he following species are distributed in this habitat: *Alnus barbata* C.A.Mey. *Alnus glutinosa subsp. Barbata* (C.A.Mey.) Yalt., *Salix caprea* L. *Staphylea pinnata L., Cornus sanguine* subsp. Australis (C.A.Mey.) Jav., *Pterocarya*

pterocarpa (Michx.) Delchev. *Pterocarya fraxinifolia* (Poir.) Spach., *Ajuga reptans* L., *Vinca major*.L., *Vinca minor* L., *Pteris cretica* L., *Pteris vittata* L., *Helleborus caucasicus* A.Braun (*H. orientalis* Lam.)., *Potentilla reptans* L., *Smilax excelsa* Duhamel (*Sm. aspera* L.).

There are 6 species in the habitat of shrubland, this habitat is located on the adjacent of Sarpislope, where the following species are distributed: *Rhododendron ponticum* L., *Rhododendron luteum* Sweet., *Celtis australis* L., *Carpinus orientalis* Mill., *Eeuropaeus leiophloeus* Steven *Cornus sanguine subsp. Australis* (C.A.Mey.)Jav, *Prunus laurocerasus* L. (*Laurocerasus officinalis* M. Roem.)., *Clematis vitalba* L.,

3.3.Endemic species of the Chorokhi Delta

The diversity of endemic flora of the Chorokhi Delta is represented by 24 species, which are united in 18 families and 20 genus. Among them are the endemic of Kolkheti - 11 species, the endemic of the Caucasus - 5 species, the endemic of Georgia - 3 species, the narrow local endemic of Adjara - 3 species, the endemic of Adjara-Lazeti - 2 species.

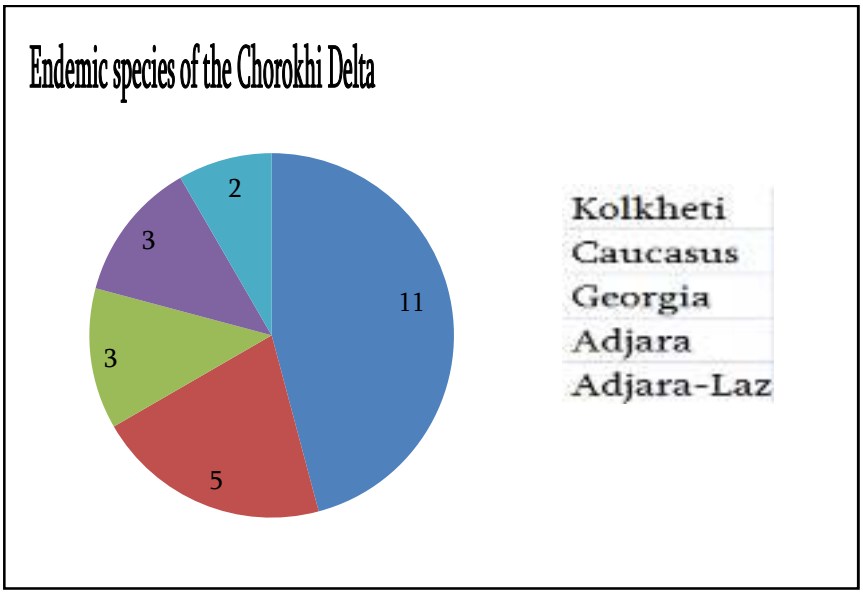

Diagram 1. Diversity of endemic species of Chorokhi Delta

The endemic of Kolkheti species are: *Ficus colchica Grossh., Hedera colchica* (k.Koch) k.Koch., *Iris lazica* Albov., *Trapa colchica* Albo. *Trapa natans* L. *Dryopteris alexeenkoana* Fomin. (*D. dilatata* (Hoffm.) A.Gray)., *Heracleum sosnovskyi* Manden., *Echinops colchicus* D. SoSn. *(Echinops ossicus* K.Koch)., *Myosotis lazica* Popov.,

Euonymus leiophloeus Steven., *Ranunculus ficaria* subsp. *calthifolius* (Rchb.) Arcang. (*Ficaria calthifolia* Rchb.)., *Viola alba* Besser.

The endemic of the Caucasus species are: *Angelica pachyptera* Avé-Lall., *Helleborus caucasicus* A. Br., *Helleborus orientalis* Lam., *Lotus caucasicus* Kuprian. (*L. corniculatus* subsp. corniculatus), *Pachyphragma macrophyllum* (Hoffm.) N.Busch., *Symphytum caucasicum* M.Bieb.

The endemic of Georgia species are: *Galanthus woronowii* Losinsk., *Symphytum ibericum* Steven., *Verbascum sessiliflorum* Murb.

The narrow local endemic of Adjara species are: *Rubus adzharicus* sanadze., *Ranunculus kochii* Ledeb. (*F. popovii* Khokhr.)., *Dryopteris kemulariae* Mikheladze. (*D. remota* (Döll) Druce).

The endemic of Adjara-Lazeti species are: *Cyclamen adzharicum* pobed. (*Cyclamen coum* Mill.)., *Galanthus rizehensis* Stern.

3.4. Adventive species of Chorokhi Delta

In the Chorokhi Delta area, Advent species (41 species) are mainly distributed on the roadside slopes, as well as in ruderal, ruderal-segetal and segetal vegetation.They are mainly species of cosmopolitan, or wide area, with a high rate of reaction to the environment.

Adventive species include:

Araliaceae - *Hydrocotyle ramiflora* Maxim., *Hydrocotyle ranunculoides* L.f., *Hydrocotyle vulgaris* L.;

Asteraceae - *Ambrosia artemisiifolia* L., *Artemisia vulgaris* L., *Erigeron anuus* (L.) Pers., *Erigeron canadensis* L., *Erigeron crispus.* Pourr. (*E. bonariensis* L.), *Galinsoga quadriradiata* Ruiz & Pav. (*G. ciliate* S.F. Blake), *Galinsoga parviflora* Cav.;

Caprifoliaceae – *Lonicera japonica* Thunb.;

Caryophyllaceae - *Stellaria media* (L.) Vill. (Alsinula media (L.) Dostal, comb.invalid.);

Commelinaceae - *Commelina communis* L.;

Convolvulaceae - *Cuscuta australis* R.Br.;

Fabaceae - *Acacia dealbata* Link, *Acacia melanoxylon* R.Br., *Galega officinalis* L., *Gleditsia triacanthos* L., *Robinia pseudoacacia* L., *Pueraria hirsuta* Thunb. C.K.Schneid.

(*P.montana* var. *lobata* (Willd.) Maesen & S.M.Almeida ex Sanjappa & Predeep), *Trifolium ambiguum* M. Bieb. *(Amoria ambigua* (Bieb.) Sojak), *Trifolium scabrum* L.;

Hydrocharitaceae - *Elodea canadensis* Michx.;

Juglandaceae - *Carya cordiformis* (Wangenh.) K.Koch;

Juncaceae - *Juncus articulatus* L. , *Juncus bufonius* L., *Juncus effusus* L.;

Lamiaceae -*Lamium purpureum* L., *Perilla ocimoides* var. crispa (Thunb.) Benth. (*P. frutescens var. crispa* (Thunb.) H.Deane), *Perilla nankinensis* (Lour). Decne. *(*P. frutescens *var.* crispa (Thunb.) H.Deane);

Polygonaceae - *Polygonum aviculare* L., *Polygonum hidropiper* Neck. (*Persicaria hydropiper* (L.) Delarbre), *Polygonum thungergii.* Siebold & Zucc. (*Persicaria thunbergii* (Siebold & Zucc.) H.Gross);

Polypodiaceae - *Polypodium australe* Fee, (*P. cambricum* L.)*;*

Pteridaceae - *Adiantum cuneatum* Langsd. &Fisch. (*A. raddianum* C.Presl)*,* *Pteris vittata* L.;

Rosaceae - *Potentilla indica* (Andrews) Th.Wolf *(Duchesnea indica* (Andrews) Teschem.), *Rubus anatolicus* (Focke) Focke ex hausskn. (*R. sanctus* Schreb.);

Simaroubaceae - *Brucea javanica* (L.) Merr. (*Rhus javanica* L.), *Poa annua* L.

3.5.Introduced species of Chorokhi Delta

There are 5 introduced species in the Chorokhi Delta:

Cupressaceae - *Cryptomeria japonica* (Thunb. ex L.f.) D.Don.

Myrtaceae -*Eucalyptus cinerea* subsp. *victoriensis* Rule & N.G.Walsh (*E. cinerea* F.Muell. ex Benth.), *Eucalyptus globulus* Labill., *Eucalyptus viminalis* Labill.;

Pinaceae - *Cedrus deodara* (Roxb. ex D.Don) G.Don.;

3.6. Endangered species of the Chorokhi Delta

There are 19 endangered species in the Chorokhi Delta. Among them, the Georgian Red List (2006) includes 4 species: *Celtis australis* L. status - Vulnerable (VU), *Castanea sativa* Mill. status - Vulnerable (VU), *Laurus nobilis* L. status - Vulnerable (VU), *Ulmus glabra* Huds. status - Vulnerable (VU);

IUCN The International Red List includes 9 species: *Trapa colchica* Alb. status - Critically Endangered (CR); *Butomus umbellatus* L.- status - requires care (LC), *Marsilea quadrifolia* L. status - requires care (LC), *Ficus carica* L. (Ficus colchica Grossh.) status - requires care (LC), *Glaucium flavum* Crantz - status - requires care (LC), *Adiantum capillus*-veneris L. - status - requires care (LC), *Leucojum aestivum* L. - status - requires care (LC) (LC), *Asparagus* litoralis Stev. status - incomplete data (DD), *Asparagus officinalis* L. - status - requires care (LC).

The Georgian Red Book includes 3 species: *Hippophae rhamnoides* L., *Staphylea pinnata* L., *Ulmus glabra* Huds.

3 species are listed in the Annexes to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): *Cyclamen adzharicum* Pobed., *Galanthus rizehensis* Stern, *Galanthus woronowii* Losinsk.

3.7. Species of decorative value of the Chorokhi Delta

Among the species distributed in the Chorokhi Delta, 44 species are distinguished by their decorative value, 16 of which are involved in the country's domestic trade network.These species are: *Helleborus caucasicus A.Br. Helleborus orientalis* Lam., *Pachyphragma macrophyllum* (Hoffm.)N. Busch, *Primula sibtorpii* Hoffmanns, *Leucojum aestivum* L., *Dryopteris filix-mas* (L.) Schott,

And 2 species are involved in the country's foreign trade network: *Cyclamen adzharicum* Pobed and *Galanthus woronowii* Losinsk.

3.8.Medical species distributed in the Chorokhi Delta

Out of the species distributed in the Chorokhi Delta, 108 species are distinguished by their healing properties (Varshanidze 2013:13, 2014:14), including:

1. **There are 4 types used to treat kidney and bladder diseases:** *Equisetum arvense* L., *Equisetum majus* Dars. Schinz & Thell. ***E.*** *telmateia* Ehrh., *Polygonum hidropiper* Neck. (*Persicaria hydropiper* (L.) Delarbre)., *Pueraria hirsuta Thunb. C.K.Schneid. (P.montana var. lobata (Willd.) Maesen & S.M.Almeida ex Sanjappa & Predeep).*

2. **1 species is used to treat diabetes:** *Galega officinalis* L.

3. **There are 4 types of diuretics and blood purifiers:** *Cynodon dactylon* (L.) Pers., *Ranunculus bulbosus* L., *Ranunculus ficaria* subsp. calthifolius (Rchb.) Arcang. (*Ficaria calthifolia* Rchb.)., *Ranunculus kochii* Ledeb. (*F. popovii* Khokhr.).

4. **types are used against cardiovascular diseases:** *Gleditsia triacanthos* L., *Helleborus caucasicus* A. Braun (*H. orientalis* Lam.)., *Mentha longifolia* (L.) Huds., *Periploca graeca* L., *Rhododendron ponticum* L. *Sophora alopecuroides* L.

5. **1 type is used against nervous diseases:** *Melissa officinalis* L.
6. **1 type is used to enhance memory and concentration:** *Staphylea pinnata* L.
7. **16 types are usedagainstrespiratorydiseases:** *Cedrus deodara (Roxb. ex D.Don) G.Don.*, *Cirsium arvense (L.) Scop., Cyclamen adzharicum* pobed. *(Cyclamen coum* Mill.*)., Datura stramonium* L., *Hedera colchica* (k.Koch) k.Koch., *Hedera helix* L., *Glaucium flavum* Crantz., *Glechoma hederacea* L. (G. borealis Salisb.)., *Pteris cretica* L., *Primula sibthorpii* Hoffmanns. *(P. vulgaris* Huds. *P. acaulis* (L.) Hill)., *Sambucus nigra* L., *Sisymbrium officinale* (L) Scop., *Trifolium arvense* L., *Tussilago farfara* L., *Verbascum gnaphalodes* M. Bieb., *Viola arvensis* Murray.
8. **10 types are used to treat gastritis and ulcers:** *Achillea filipendula* Lam., *Capsella bursa-pastoris* (L.) Medik., *Fragaria vesca* var. *chiloensis* L. *F. chiloensis* (L.) Mill., *Hypericum androsaemum* L., *Hypericum perforatum* L., *Hypericum xylosteifolium* (spach) Robson., *Matricaria chamomilla* L., *Plantago lanceolata* L., *Plantago major* L.
9. **5 types are used against inflammation (stomach disorder) of the gastrointestinal tract:** *Alnus barbata C.A.Mey. (A.glutinosa subsp. barbata (C.A.Mey.) Yalt.), Castanea sativa* Mill., *Centaurea iberica* Trevir. ex Spreng., *Hippophae rhamnoides* L., *Paliurus spina-christi* Mill.
10. **8 types are used to treat constipation and hemorrhoids:** *Rubus adzharicus sanadze, Rubus anatolicus* (Focke) Focke ex hausskn. (*R. sanctus* Schreb.)., *Rubus hirtus* Waldst.& Kit., *Rubus serpens* Weihe ex Lej. & Courtois., *Rumex crispus* L., *Ruscus ponticus Woronow* (*R. aculeatus* L.)., -*Salix caprea* L., *Taraxacum officinale* F.H. Wigg.,
11. **2 types are used for appetizing: სახეობა:** *Artemisia annua* L., *Cichorium inthybus* L.

12. **9 types are used against intestinal parasites:** *Allium ursinum* L., *Athyrium acrostichoideum* Bory (*A. filix femina* subsp. *Filix-femina*), *Dryopteris alexeenkoana* Fomin, (*D. dilatata* (Hoffm.) A.Gray), *Dryopteris filix-mas* (L.) Schott., *Dryopteris kemulariae* Mikheladze *(D.remota* (Döll)Druce), *Dysphania ambrosioides* (L.) Mosyakin & Clemants, *Polypodium australe* Fee, (*P. cambricum* L.) *Polypodium vulgare* L., *Pteridium tauricum* (C.Presl) V.I.Krecz. exGrossh. (*P. aquilinum* (L.) Kuhn).
13. **There are 3 types used against liver and gallbladder diseases:** *Cuscuta australis* R.Br., *Salsola tragus* L., *Sambucus ebulus* L.
14. **There are 5 types containingvitamins:** *Aegopodium podagraria L., Artemisia vulgaris* L., *Calystegia sepium (L.) R.Br., Rubus caesius* L., *Rosa canina* L.
15. **here are 2 types containingessential oils:** *Pimpinella tripartita* Kalen. (*Scrithacola kurramensis* (Kitam.) Alava)., *Satureja laxiflora* K.Koch.
16. **3 types are used against boil (furuncle), pimple, allergies, purulent wounds, burn:** *Bidens tripartita* L., *Clematis vitalba* L., *Melilotus officinalis* (L.) Lam.
17. **There are 5 types of antispasmodic and analgesic properties:** *Asplenium nigrum* Lam. (*A. adiantum-nigrum* L.), *Asparagus litoralis* Stev., *Galanthus rizehensis* Stern., *Galanthus woronowii* Losinsk., *Leucojum aestivum* L.
18. **There are 2 types used to treat hypertension:** *Vinca major.* L., *Vinca minor* L.
19. **There are 3 types used against bleeding:** *Erigeron canadensis* L., *Lamium album* L., *Persicaria persicaria* L. (*P. maculosa* Gray).
20. **1 type is used to treat diabetes:** *Laurus nobilis* L.
21. **1 species is used against excrescence, warts:** *Juncus bufonius* L.
22. **1 type is used to treat malignant tumors:** *Chelidonium majus* L.
23. **3 types are used against hair loss:** *Adiantum capillus-veneris* L., *Asplenium trichomanes* Thunb. (*A. incisum* Thunb.)., *Urtica dioica* L. (*U.dioica* subsp. gansuensis C.J.Chen).
24. **There are 2 types used against gingivitis:** *Cyperus longus* subsp. badius (Desf.) Bonnier & Layens., *Rhus coriaria* L.,

25. **1 type is used against thrombus:** *Corylus avellana* L. (*C.avellana* var. pontica (K.Koch) H.J.P.Winkl.).
26. **1 type is used to prevent obesity, reduce appetite and counteract salt metabolism:** *Polygonum aviculare* L.
27. **1 type is antibiotic generator:** *Robinia pseudoacacia* L.
28. **1 type contains acids:** *Rumex acetoselloides* Baill. *R. acetosella* subsp. acetoselloides (Balansa) Den Nijs.
29. **4 types are used to treat bronchitis and cough:** *Asplenium ruta-muraria L., Pachyphragma macrophyllum* (Hoffm.) N.Busch, *Petasites petasites H.Karst. (P. albus* (L.) Gaertn.), *Sedum hispanicum* L.
30. **2 types are used for stimulation of regeneration and healing of wounds and fractures:** *Prenanthes petiolata* (K.Koch) *Sennikov (Cicerbita pontica* (Boiss.) Grossh.), *Symphytum ibericum* Steven.

3.9. Vegetation of the Chorokhi Delta

There are 2 groups of vegetation in the Chorokhi Delta area: thorny and alder. Both groups are found in the Chorokhi confluence area. Thorny creates the first tier in thorny grouping (*Hippophae rhamnoides* L.,) alder (Alnus *barbata* C.A.Mey. (*A.glutinosa* subsp. *barbata* (C.A.Mey.) Yalt.)) and Fig (*Ficus colchica* Grossh.,) weeping willow (*Salix caprea* L.)

The second tier is made up of blackberry species: *Rubus adzharicus sanadze, Rubus anatolicus (Focke) Focke ex hausskn.*(*R. sanctus* Schreb.) *Rubus caesius* L., *Rubus hirtus* Waldst.& Kit., *Rubus serpens* Weihe ex Lej. & Courtois.

Liana plants (*Lonicera japonica* Thunb.,- *Lonicera caprifolium* L (*L. etrusca* Santi) are entwined in blackberries and thorns.

The second group found to the east of the thorny group is alder. In the above grouping, the first tier is formed by alder, and the second tier is formed by shrubs: Blackberry species: *Rubus adzharicus sanadze, Rubus anatolicus (Focke) Focke ex hausskn.*(*R. sanctus* Schreb.) *Rubus caesius* L., *Rubus hirtus* Waldst.& Kit., *Rubus serpens* Weihe ex Lej. & Courtois., *Paliurus spina-christi* Mill., *Celtis australis* L., *Carpinus orientalis* Mill., *Carex colchica* J.Gay, *Poa bulbosa* L., *Trifolium tumens* Steven ex M.Bieb., *Lathyrus tuberosus* L., *Euphorbia*

paralias L., *Euphorbia hirsuta* L. (*Euphorbia pubescens* Vahl), *Filago eriocephala* Guss., *Glaucium flavum* Crantz., *Polygonum aviculare* L., *Polygonum hidropiper* Neck. (*Persicaria hydropiper* (L.) Delarbre), *Polygonum litorale* Meissn (*P. arenastrum* Boreau).

3.10. Species with unknown taxonomic status

In the process of studying the flora of the Chorokhi Delta and the surrounding slopes, it was necessary to clarify the status of 2 species, these species are: Ranun-culus ficaria of Adjara (*Ficaria popovii* Khokhr.) and caucasian helleborus caucasicus (*Helleborus caucasicus* A.Br.).

In 1969, the researcher of Adjara flora A. Khokhryakov in the article ,,Новый вид чистяка из западного закавказья" indicates the existence of a new endemic species (Ficaria adzharica kem-nat.) In the floristic region of Adjara. This species was first described by Grossheim in 1939, which botanists Popov and Kemularia-Natadze called *Ficaria adzharica* kem-nat.The mentioned information was not published. The botanist A. Khokhryakov changed the name of this species due to Popov's merit and named it*Ficaria popovii* Khokhr. In the clarification of the vegetation of Adjara (дмитриева, 1990:40), it is indicated that species *Ficaria popovii*Khokhr.is a narrow local endemic of Adjara,but there is not described distinctive features from*Ficaria calthifolia*. *Ficaria calthifolia* Rchb is characterized by radicaldentateleaves, which are at some distance from each other.A leaf stem emerges from the leafy axil, which ends with a single flower. The species is characterized by the development of darkblack spots along the main vein and sometimes light spots on the edges of the leaf blade, as well as the development of tubers in the leaf axils. With the form of Ranun-culus ficaria leaves (Distributed in the floristic region of Adjara) and with the presence of tubers, it resembles that of spring,but differs from it by: a short stem, the stalks of the leaves close to each other and the small number of leaves on the flower stem, also the leaf edges of this species are not dentate.It also develops tubers not only in the leaf axils but also in the stem,and a black spot develops not only along the main vein but also along the lateral vein.

According to the nomenclature list (www.the plant list.org*2013) *Ficaria popovii*Khokhr.Is an independent species, while *Ficaria calthifolia* is synonymous of *Ficaria verna* subsp. *calthifolia* (Rchb.) Nyman, according to the latest nomenclature list (www.catalogueoflife.org) (2020) *Ficaria popovii* Khokhr.is synonymousof *Ficaria ficariiformis* (Rouy & Foucaud) A. W. Hill/, and according to nomenclature list (POWO-ს (plantsoftheworldonline))*Ficaria popovii* Khokhr. is synonymous of *Ficaria popovii* Khokhr., and *Ficaria calthifolia* Rchb. is synonymous of *Ranunculus ficaria* subsp. *calthifolius* (Rchb.) Arcang.

Endemic species of the Caucasus (*Helleborus caucasicus* A.Br), according toclarification of the vegetation of Adjara (дмитриева, 1990:40)is synonymousof *Helleborus orintalis* Lam., and according to the nomenclature listof www.the plant list.org* 2013both species exist independently, according to the nomenclature lists (www.catalogueoflife.org. (2020)) andPOWO-ს (plantsoftheworldonline), *Helleborus caucasicus* A.Bris synonymousof *Helleborus orientalis* subsp. Orientalis., As well as species*Helleborus abschasicus* A.Braun is synonymousof *Helleborus orientalis* Lam., and according to www.catalogueoflife.org. (2020)*Helleborus orientalis* subsp. *abchasicus* (A. Braun) B. Mathew.

For further research it is these 2 endemic species*Ficaria popovii*Khokhr.and*Helleborus caucasicus* A.Brwhose bioecology, population diversity, genetic and phytochemical study was the aim of the study.

Chapter 4. Morphological signs, bioecology, population diversity of Ranun-culus ficaria of Adjara(*Ficaria popovii* Khokhr.) and caucasianhelleborus caucasicus (*Helleborus caucasicus* A.Braun)

4.1. Morphological signs of Ranun-culus ficaria of Adjara (*Ficaria popovii* Khokhr.) and caucasian helleborus caucasicus (*Helleborus caucasicus* A.Braun)

Ranun-culus ficaria of Adjara- *Ficaria popovii* Khokhr.

Morphological signs: 10-20 cm tall perennial herbaceous plant,with leaves assembled as a radical-rosette, long-stemmed, idney-shaped at the beginning of development, and then rounded ovate, triangularly cut at the stalk, which develops black spots along the middle and lateral veins, Leaf blade length is 2.5-6 cm, width - 5 cm. Extra and lateral roots of the plant arethickened as spindle-shaped (tubercles), supplies are stored in them.The stem is 2 cm longand branched, one flower develops at the tip of each branch, 1, 2 or 3 leaves develop on the flower stem.The flowers are actinomorphic, yellow, 3 - 3.5 cm in diameter. leafletof bowlconsist of 3 yellow leaflet,The crown is represented by 8-10 dazzling, yellow petals,with honey-cupfossa at base;after flowering develops complex fruit gathered from seeds,1-2 cm in diameter.The species is characterized by the development of tubers in the leaf stalkand on the stem only after flower development.The plant is characterized by the event of flower closure in rainy weather, as well as in the morning and evening, and after pollination, the flower is open even in the rain.

Distribution: The species is distributed from the coastal lowlands to the middle of themountain belt,where it grows: on roadside lowlands, slopes, vegetable gardens, gardens, nut-grove, often forming rakes.

Pict 1. *Ficaria popovii* Khokhr.

Helleborus caucasicus A.Braun.

Morphological signs: Caucasian helleborus caucasicus is perennial, evergreen, rooted 30-50 cm tall herbaceous plant.root runner is often branched, stem weakly leafed, rooted leaves are dactylate complicated, with a long stalk,leathery, hard, glabrous, is divided into wide palmate lancelet or broad elliptical plots, it is cuneatenarrowed at the base, the edges are thickand doubly dentate.Flower stalks are short - 2-3 mm long,The flowers are actinomorphic, 5-8 cm in diameter,perianthis simple, caliciform, consists 5 oval-ovate white or light yellow leaflets, Whose length is 2-4 cm, width is 2.5 cm,inside the perianththere are small, 12-15 cm long honey-cups,the number of stamensis up to sixty. Dust grains are spherical, tri-striated,5-7 pistils are in the center of the flower,which form the apocarpous gynaeceum.Seed-buddevelops a long column.The fruit is an inflated carpel - 1.5-2.5 cm long and 1 cm wide.The seeds are black, elliptical, flowering in January-March.The fruits ripen in April-June.

Pict 2. *Helleborus caucasicus* A.Braun.

Distributed from the coastal slopes to the middle belt of the mountain, on forests, rocks, along roads, in bushes,Found in units and groups, rarely forming rakes.

4.2 , Bioecology of Ranun-culus ficaria of Adjara (*Ficaria popovii* Khokhr.) and caucasian helleborus caucasicus (*Helleborus caucasicus*A.Braun)

To study the rhythm of Ranunculus ficaria's seasonal development in Adjara, we conducted phenological observations in 2016-2019 on the roadside slope of the Chorokhi Delta In the village of Sarpi at an altitude of 39 m above sea level (41052'1.530 N, 41.54'9.590 E),also on the roadside slope of the "Kalendere" at an altitude of 63 m above sea level ($41^0$52'3.62^0 N, $41^0$55'0.34^{0}E, $41^0$52'8.93^{0}N, $41^0$54'9.96^{0}E, $41^0$52'2.47^{0}N, $41^0$55'3.47^{0}E) and on the Delta of River Chorokhi at an altitude of 25 m above sea level($41^0$31'5.99^0 N, 41.32'9.27^0 E). We analyzed the results in relation to environmental conditions,in particular, we used Meteoblue data (www.meteoblue.com).

Between 2016-2019, the winter and spring of 2016 and 2019 were relatively cold and rainy,and the winter and spring of 2017-2018 were characterized by warm climates.In 2016, the absolute minimum temperature for research objects in the first decade of January was -4 -10^{0}C,And the maximum temperature was recorded at 35^{0}C in July,the snow cover was 15-25 cm,precipitation was highest in the second decade of December and January. The winter of 2017 was warmer than 2016,The average temperature in January-February was +6+8^{0}C, +12+15^{0}Cin March-April, +16+20^{0}Cin March-April, Precipitation 60-80 mm.The minimum temperature was -5^{0}C in the second decade of February.High temperatures were marked in July-August 35-40^{0}C.Autumn and winter in 2018 were also the warmest between 2016-2019,The maximum temperature was recorded in the second decade of September38^{0}C, Spring turned out to be more groundy. In 2019 there was a relatively warm spring, The minimum temperature was recorded in January-8^{0}C, And the maximum at the end of May+37^{0}C, March and July were distinguished by precipitation.

Table 1. Ficaria popovii Khokhr. Results of phenological observations in 2016-2019.

The year of observation	Hight from sea level	Observation place	Vegetation		Flowering		Fertility		Rapidity		The end of vegetation	
			Beginning	Ending	Beginning	Ending	Beginning	Ending	Beginning	Ending	Beginning	Ending
2016	**25m**	Gonio	22/12	02/01	15/01	18/02	10/03	30/03	12/04	28/04	08/05	17/05
2017	**25m**	Gonio	28/11	25/12	15/01	15/02	02/03	20/03	30/03	20/04	05/05	08/05
2018	**25m**	Gonio	25/11	23/12	03/01	24/02	01/03	18/03	25/03	25/04	01/05	15/05
2019	**25m**	Gonio	29/11	26/12	10/01	15/02	12/03	29/03	16/04	01/05	03/05	12/05

According to meteorological data in the territory of Chorokhi Delta in 2016-2019, in the first and second decades of January 2016, 30-40 mm of snow cover was observed and -2 - 4^0C temperature, Which led to the start of vegetation of *Ficaria popovii* Khokhr. 1 month later than in 2017-2018 and 2019, In 2017 and 2018, the average temperature in November-January fluctuated within + 7 + 10^0C, Precipitation - 30-50 mm, without snow cover, Under these conditions, the change of phenological phases of Baia was carried out in Adjara as follows:Vegetation began in the last decade of November and ended in the third decade of December.Flowering begins in the second decade of January and lasts until the end of February at a temperature of 11-14^0C. From the beginning of March the species begins to bear fruit, The plant is in the fruiting phase throughout MarchFrom the first decade of April, the fruits begin to scatter the seeds,which lasts until the second decade of May.From the end of May the plant dries up and moves into a state of rest.

Table 2. *Helleborus caucasicus A.Br.* Results of phenological observations in 2016-2019.

The year of observation	Hight from sea level	Observation place	Vegetation		Flowering		Fertility		Rapidity		The end of vegetation	
			Beginning	Ending	Beginning	Ending	Beginning				Beginning	Ending
2016	63m	Sarpi	Evergreen, renewal of vegetation 25/10	15/12	27/12	20/04	07/03	25/03	17/04	30/04	18/05	15/06
2017	63m	Sarpi	Evergreen, renewal of vegetation 20/10	10/12	20/12	16/04	02/03	23/03	10/04	25/04	10/05	08/06
2018	63m	Sarpi	Evergreen, renewal of vegetation 29/10	05/12	15/12	05/04	25/02	16/03	05/04	15/04	02/05	04/06
2019	63m	Sarpi	Evergreen, renewal of vegetation 28/10	08/12	24/12	10/04	26/02	18/04	09/04	17/04	06/05	05/06

As can be seen from Table 2. *Helleborus caucasicus A.Br.* begins to develop new leaves in the last decade of October and ends in the third decade of December. Flowering takes place from late December to early April.From the beginning of March the species begins to bear fruit, the plant is in the fruiting phase throughout March, ցrom the first decade of April, the fruits begin to scatter the seeds, which lasts until the beginning of May.The flower remains on the plant with bowlleaflets, which gives the plant a decorative look.

4.3.Population diversity of *Ficaria popovii* Khokhr.and *Helleborus caucasicus A.Braun*

To study the number and coverage coefficients of different species in populations of *Ficaria popovii* Khokhr. and *Helleborus caucasicus A.Braun*, we conducted a study using the transect, quadratic, and brown-black methods.We took 50 squares measuring 1 m x 1 m for each object.The results of the study are presented in Table 3.

Table 3. Ficaria popovii Khokhr. Accompanying species in the population according to Brown-Blanche

Chorokhi Delta	Species coverage coefficient in population according to Brown-Blanche
***Ficaria popovii* Khokhr.**	4
Artemisia vulgaris L.	1
Lamium purpureum L.	+
Stellaria media (L.) Vill.(Alsinula media (L.) Dostal, comb.invalid.)	+
Rubus caesius L.	+
Solanum nigrum L.	+
Trifolium pratense L.	+
Trifolium arvense L.	+
Cirsium arvense (L.) Scop.	+
Potentilla erecta (L.) Raeusch.	+
Pteridium tauricum (C.Presl) V.I.Krecz. ex Grossh. *Pteridium aquilinum* (L.) Kuhn	+
Bellis perrenis L.	-
Lamium album L.	-
Fragaria vesca var. *chiloensis* L. *Fragaria chiloensis* (L.) Mill.	Г
Senecio vernalis Waldst. & Kit.	Г
Urtica dioica L. *Urtica dioica* subsp. *gansuensis* C.J.Chen	Г

As can be seen from Table 3. 1 species is distinguished by 50-75% of coverage in *Ficaria popovii* Khokhr. 10 species are characterized by a small tegument area: *Artemisia vulgaris* L.,*Lamium purpureum* L., *Stellaria media* (L.) Vill. (Alsinula media (L.) Dostal, comb.invalid.), *Rubus caesius* L., *Solanum nigrum* L., *Trifolium pratense* L., *Trifolium arvense* L., *Cirsium arvense* (L.) Scop., *Potentilla erecta* (L.) Raeusch., *Pteridium*

tauricum(C.Presl) V.I.Krecz. ex Grossh. The percentage of tegument area of other species is 1-01%.

It should be noted that according to the data of 2016-2019 in the territory of the Chorokhi Delta in February-March, a background species in the population of *Ficaria popovii* Khokhr. is *Ficaria popovii* Khokhr. Areas occupied by this species are growing as the *Ficaria popovii* Khokhr. grows intensively vegetatively with tubers, advent species interfere with the population during the fruiting period after flowering:mugwort (*Artemisia vulgaris* L.), stitchwort*(Stelaria media* (L.) Vill. (*Alsinula media* (L.), reddeaf-nettle (*Lamium purpureum* L.)They limit the development of the root system of other species and catch the predominant condition in this population,and Ranun-culus ficaria, as a species of ephemeral nature, goes into a state of rest.The existing area was a former military training ground where demining work began in 2018-2019, causing some populations to be destroyed.

Table 4. *Helleborus caucasicus* A.Braun Accompanying species in the population according to Brown-Blanche

Chorokhi Delta Roadside slope	Species coverage coefficient in population according to Brown-Blanche
***Helleborus caucasicus* A.Braun**	3
Artemisia vulgaris L.	1
Primula sibthorpii Hoffmanns. *P. acaulis* (L.) Hill)	1
Trachistemon orientalis (L)	1
Symphytum ibericum Steven	1
Ficaria popovii. Khokhr. *Ranunculus kochii* Ledeb.	1
Potentilla indica (Andrews) Th.Wolf	+
Dentaria quinquefolia M. Bieb. *Cardamine quinquefolia* (M.Bieb.) Schmalh.	+
Poa bulbosa L. ssp.vivipara (Koel.)Arcang.	+
Phyllitis scolopendrium (Asplenium scolopendrium L.)	+
Fragaria vesca L. var. *chiloensis* L. *Fragaria chiloensis* (L.) Mill.	+
Dryopteris filix-mas. (L) Schott.	+
Pteris cretica L.	+

Microstegium imberbe (Nees ex Steud.) Tzvelev *Microstegium vimineum* (Trin.) A.Camus	+
Cicerbita pontica Boiss, Grossh. *Prenanthes petiolata* (K.Koch) Sennikov	+
Microstegium vimineum (Trin.) A. Camus	+
Commelina communis L.	+
Hedera colchica (k.Koch) k.Koch.	+
Stellaria media (L) Vill. (Alsinula media (L.) Dostal, comb.invalid.)	+
Lamium album L.	+
Cyclamen adzharicum pobed. (*Cyclamen coum* Mill.)	+
Urtica dioica L. *Urtica dioica subsp. gansuensis C.J.Chen*	-
Vinca minor L.	Г
Asplenium nigrum L.	Г
Smilax excels Duhamel *Smilax aspera* L.	Г
Trifolium repens L.	Г
Sambucus ebulus L.	Г
Pteridium tauricum (C.Presl) V.I.Krecz. ex Grossh. *Pteridium aquilinum* (L.) Kuhn	Г

As can be seen from Table 4. The caucasian helleborus caucasicus population is characterized by a diversity of species.The species is distinguished by 25-50% of the coverage: *Helleborus caucasicus* A.Braun, 5 species with low coverage: *Artemisia vulgaris* L., *Primula sibthorpii* Hoffmanns. *P. acaulis* (L.) Hill), *Trachistem orientalis* (L), *Symphytum ibericum* Steven ღა *Ficaria popovii*. Khokhr. *Ranunculus kochii* Ledeb. he coverage rate of other species is 1-01%.

Helleborus caucasicus A.Braun advent species begin to emerge in the Chorokhi delta roadside slope population at the end of flowering in March-April: Snake strawberry *Potentilla indica* (Andrews) Th.Wolf stitchwort, mugwort, Georgian comfrey,danewort. Rarely found: hart's-tongue, deaf-nettle, fern, snake ivy and more.

According to our research, the populations of *Helleborus caucasicus* A. Braun are decreasing, Since its flowers are sold from January to March by the locals, which are even dyed.Within a year, about 1200 bouquets of caucasian helleborus caucasicus (*Helleborus caucasicus* A.Braun) were sold, which threatens the species' existence in nature.Most of the

plant populations have been destroyed due to ongoing construction and road repairs in the village of Sarpi.

4.4 Soil analysis of *Helleborus caucasicus* A.Braun Habitat soil analysis

Helleborus caucasicus A.Braun *is a* flowering ornamental and medicinal plant in winter-early spring. At the same time, according to A. Dimitrieva, the species is in danger of extinction, therefore, in order to protect plant populations, it is necessary to study the conditions of introduction into plant culture. Soil content analysis is of great importance for introduction into culture, as the presence of elements in the soil is essential for plant metabolism and a full life cycle. Therefore, we investigated the chemical content of the soil in the habitat of the caucasian helleborus caucasicus'sdistribution, in particular, on the roadside slope of the Chorokhi Delta, Namely: Percentage of pH, organic matter, nitrogen, phosphorus and potassium.

Soil analysis studies have shown that the pH in the populations of Helleborus caucasicus A. Br. is 5.0 pH, total amount of organic matter 3.20%, nitrogen 0.18%, P_2O_5 - 19 mln^{-1}, Existence of K_20not observed.

Chapter 5. Results of phytochemical research of *Ficaria popovii* Khokhr. and *Helleborus caucasicus* A.Braun

Phytochemical study of aboveground and underground parts of caucasian *Helleborus caucasicus* and *Ficaria popovii* A. Khokhr, distributed in the floristic district of Adjara, has not been implemented to date.

Helleborus caucasicus is an important source of chemical compounds with great medical potential because it contains medically important compounds: Alkaloids, cardiac glycosides, saponins, coumarins, flavonolglycosides, vitamins: C, D, E. (Varshanidze 2013:13), which are used in medicine: for the treatment of diseases of the central nervous system, gastrointestinal tract, antitumor and cardiovascular.

Ficaria popovii A. Khokhr. Extracts of tubers and leaves are used as a diuretic, blood cleanser and wound healing, salads are also made from the leaves, which cleanse the blood from pathogenic microbes.

Using UPLC-MS / MS, 4 flavonoides 2 saponins were identified in plant of ranun-culus ficaria extract, in particular, 2 substances have been identified in the leaves quercetin 3-O-rutinoside and kaempferol 3-Oβ-D- (6″-α---rhamnopyranosyl) - glucopyranoside, and 4 flavonolin tubers (quercetin 3-Orutinoside, kaempferol 3-O-β-D- (6″-α-L-rhamnopyranosyl) - glucopyranoside, luteolin 8-C-β-Dglucopyranoside and apigenin 8-C-β-D-glucopyranoside). It is found in tubers from saponins: (3-arabinoside,28- [Glucosyl- (1-> 6) - glucosyl] oleanolic acid 3-arabinoside).

Steroid compositions plant *Helleborus caucasicus* A. Br.and *Helleborus abchasicus* A. Br. have been studied using UPLC-MS / MS.In particular, 4 substances have been identified, of which 2 are found in leaves (Ecdysterone, Furostan), and 4 in the root runner(20-Hydroxyecdysone (Ecdysterone), Bufadienolide, Furostan, Hellebrigenin-D-glucose). Based on the results obtained, it can be concluded that the steroid composition of *Helleborus caucasicus* A. Br. and Helleborus *abchasicus* A. Br. leaves is similar. Thus three steroid glycosides were isolated with MeOH extracts of *Helleborus caucasicus* A. Br and *Helleborus abchasicus* A. Br: (Hellebrigenin-D-glucose, 20–Hydroxyecdysone and Hydroxyecdysone–3 glucoside).

Chapter 6. Genetic research results of *Heleborus caucasicus* A. Br. And *Helleborus. Abchasicus* A. Br., *Ficaria popovii* A. Khokhr. And *Ficaria calthifolia* Rchb.

Due to the purpose of the dissertation topic, one of the main objectives of the research was comparative genetic analysis of individuals of *Helleborus caucasicus* A. Br. From 2 different populations (Keda, Sarpi) and *Helleborus abchasicus* A. Br. from the population of Samegrelo (Khobi), as well as from 2 different populations of *Ficaria popovii* A. Khokhr (Angi, Batumi Botanical Garden) and *Ficaria calthifolia* Rchb.4 different populations (Angisa, Sarpi, Khashuri, Tsikhisdziri) For the detection of polymorphism by RAPD-PCR method. 18 primer with ten stemwas used in the study (Operon Technology).

Comparison of the DNA's of *Helleborus caucasicus* A. Br. and *Helleborus abchasicus* A. Br. revealed 100 to 500 BC. Length 37 (band we obtained when using analysis primers) RAPD - marker.

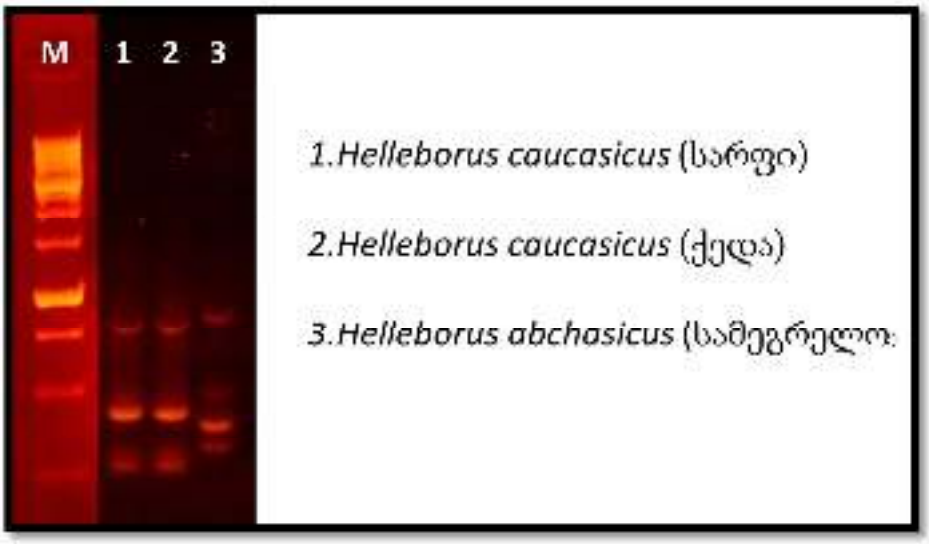

Figure 1. Electrophoresis of DNA fragments obtained by RAPD-PCR using OPB-4 primer *Helleborus caucasicus* A. Br.and *Helleborus abchasicus* A. Br.

The results obtained for the quantitative assessment of the degree of polymorphism of the studied species were presented as a matrix of binary features, where the presence of the component is marked as "1" and the absence - "0". Using this matrix and the Jaccard coefficient, a similarity matrix between the species was calculated, based on it a hierarchical

cluster analysis (UPGMA) was performed and based on it, a hierarchical cluster analysis (UPGMA) was performed and a dendrogram (unbalanced pair grouping method using arithmetic mean) was constructed (Figure 1). which expresses the degree of genetic similarity between different RAPD-PCR profiles.

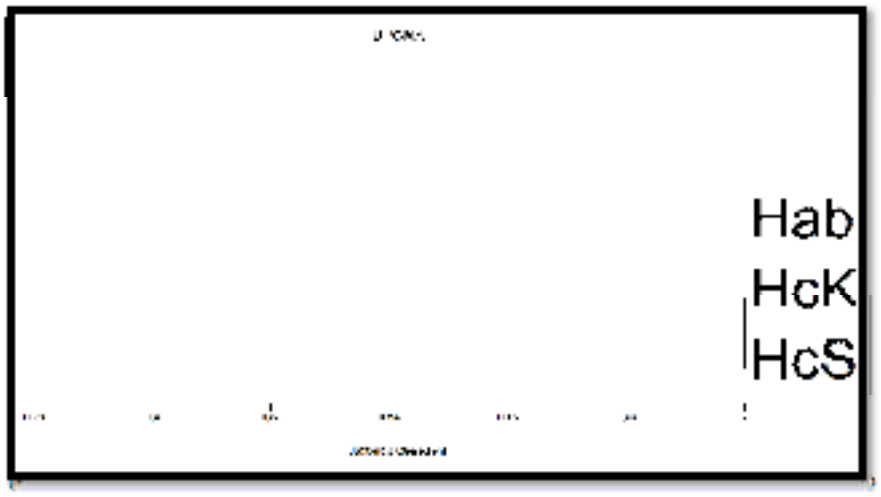

Figure 2. Dendrogram of *Helleborus caucasicus* A. Br.and *Helleborus abchasicus* A. Br. UPGMA

Dendrogram analysis showed that the analyzed genotypes were divided into two clusters.The first cluster united two populations of *Helleborus caucasicus* A. Br., and in the second cluster *Helleborus abchasicus* A. Br.population of Samegrelo. It is clear from the dendrogram that there is zero degree of internal variability among the populations of the species *Helleborus caucasicus* A. Br. I.e. there is no genetic polymorphism between these two populations, but There is a fairly low similarity between the DNA of *Helleborus caucasicus* A. Br. and *Helleborus abchasicus* A. Br.species - 30%.

Studies on *Ficaria calthifolia* Rchb. And *Ficaria popovii* A. Khokhr DNAs have revealed up to 50-1000 BC. Length 55 (band we obtained when using analysis primers) RAPD-marker.

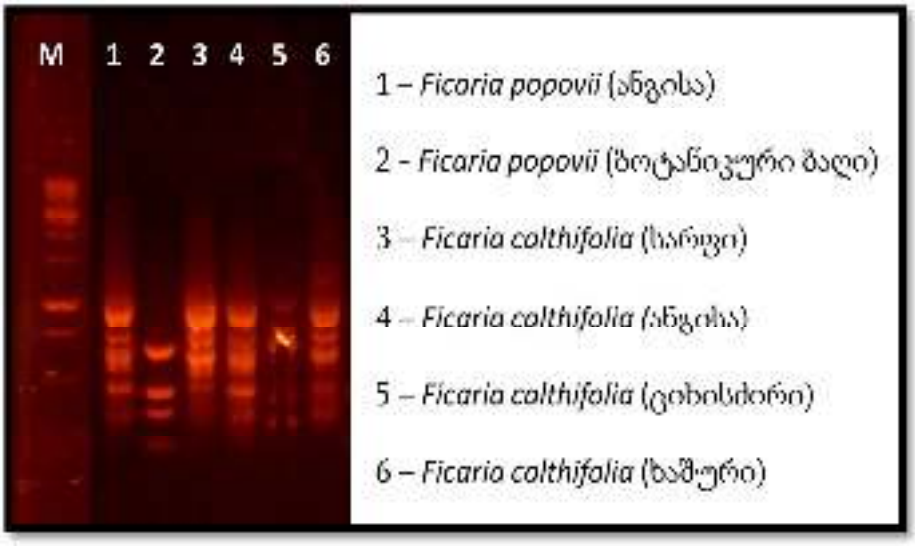

Figure 3. Electrograph of DNA fragments obtained by RAPD-PCR using OPC-9 primer *Ficaria calthifolia* Rchb. And *Ficaria popovii* A. Khokhr.

Based on the hierarchical cluster analysis, a dendrogram Figure 6was constructed.

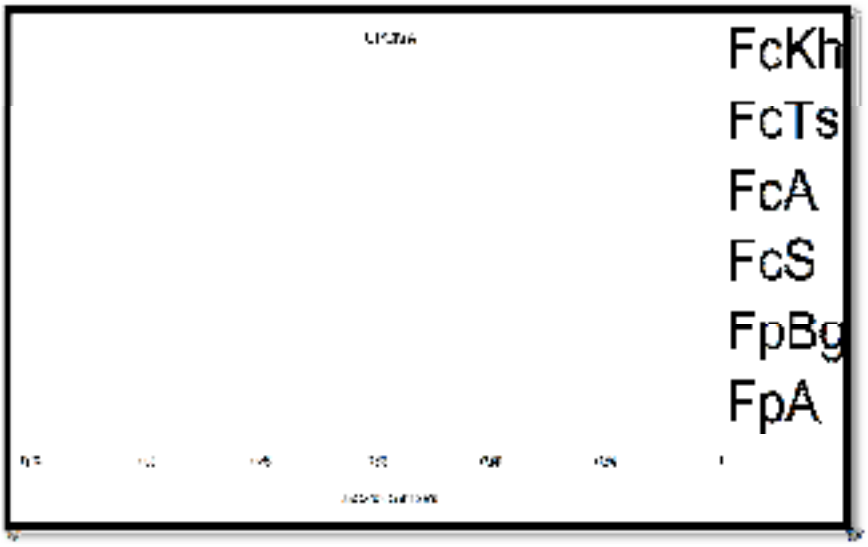

Figure 4. Dendrogramof *Ficaria calthifolia* Rchb.and*Ficaria popovii* A. Khokhr UPGMA

From the dendrogram (Fig. 6.) it can be seen that there is a 52% similarity between the DNAs of the individuals taken from the 2 populations (Botanical Garden, Angi)of *Ficaria popovii*A. Khokhr,the similarity between the 4 populations (Khashuri, Tsikhisdziri, Angisa, Sarpi) of *Ficaria calthifolia* Rchbis 95%,*Ficaria calthifolia* Rchb.And the similarity between the DNAs of *Ficaria popovii*A. Khokhr. and*Ficaria calthifolia* Rchb. is 33%.

Conclusions

1. The flora of the Chorokhi Delta is represented by 298 species, which are united in 73 families and 185 genus;
2. There are 19 species of ferns, 3 species of horsetail, 2 species of gymnospermous, 274 species of flowering plants, including 47 species of monocots, 227 species of dicotyledonous.
3. Families distinguished by the richness of species are:*Asteraceae* – 34, *Fabaceae* – 29, *Poaceae* – 19,*Brassicaceae* – 17, *Lamiaceae* – 13, *Rosaceae* – 10, *Apiaceae* – 8, *Euphorbiaceae* – 8, *Ranunculaceae* – 8, *Cyperaceae* – 7, *Polygonaceae* – 7,*Polypodiaceae* - *7, Aspleniaceae* - 6, *Plantaginaceae* – 6, *Amaranthaceae* – *5, Araliaceae* – 5, *Geraniaceae* – 5, *Amaryllidaceae* – *4, Betulaceae* – *4, Boraginaceae* – 4, *Caryophyllaceae* – 4, *Convolvulaceae* – *4, Pteridaceae* - 4, *Scrophulariaceae* – 4.
4. he genus distinguished by the abundance of species are:*Euphorbia* – 8, 6-6 species - *Ranunculus* , *Trifolium*, 5-5 species - *Geranium, Lepidium*, *Polygonum*, *Rubus*, 4-4 species -*Asplenium, Cardamine* ,*Cirsium*, *Cyperus*, *Poa*, *Veronica*, 3-3 species - *Digitaria*, *Dryopteris*, *Equisetum* , *Erigeron*, *Eucalyptus*, *Galium*, *Hydrocotyle*, *Hypericum, Juncus*, *Lamium*, *Lathyrus*, *Lotus*, *Medicago*, *Senecio*, *Verbascum*, *Vicia.*
5. The following habitats are represented on the territory of the Chorokhi Delta: sands, sediments, swamps, puddle, lowlands, roadside, roadside slopes and shrubs.
6. The diversity of endemic flora of the Chorokhi Delta is represented by 24 species, which are united in 18 families and 20 genus; Among them the endemic of Kolkheti - 11 species, the endemic of the Caucasus - 5 species, the endemic of Georgia - 3 species, the narrow local endemic of Adjara - 3 species, the endemic of Adjara-Lazeti - 2 species.
7. The adventiveflora of the Chorokhi Delta is represented by 41 species.
8. There are 5 introduced species in the Chorokhi Delta.
9. There are 19 endangered species in the Chorokhi Delta, including 4 species included in the Red List of Georgia, 9 species in the IUCN International Red List, 3 species in the Red Book of Georgia.
10. There are 44 ornamental and 108 medicinal species in the Chorokhi Delta.

11. There are 2 groups of vegetation in the Chorokhi Delta: thorny and alder.
12. Temperatures of -2 -4^{0}C and 30-40cm snow cover cause a one-month delay in the flowering phase of the study species.
13. In the population of the Chorokhi Delta, the coefficient of coverage of *Ficaria popovii* Khokhr on the Brown-Blanche scale is -4, and the coefficient of coverage of *Helleborus caucasicus* A.Braunon the Brown-Blanket scale corresponds to -3.
14. *Ficaria popovii*A. Khokhr. 4 flavonoids were identified in the tuber extract ((Quercetin-3- O-rutinoside, camperol-3-O-β-D- (6″-α-L-Ramnopiranoside) - glucopyranoside, Luteolin-8- C-β-D glucopyranoside and apigenin 8-C-β-D-glucopyranoside)) (quercetin 3-Orutinoside, kaempferol 3-O-β-D- (6″-α-L-rhamnopyranosyl) - glucopyranoside, luteolin 8-C-β-D glucopyranoside and apigenin 8-C-β-D-glucopyranoside) And 2 saponins 28glucosyl oleic acid 3-arabinoside ფა 28-[glucosyl -(1->6)-glucosyl] oleic acid3-arabinoside (3-arabinoside, 28- [Glucosyl- (1-> 6) - glucosyl] oleanolic acid 3-arabinoside).
15. 4 substances, 4-ekdisterone, furostanol, buffadienolide and helebrigenin-D-glucoside (20-Hydroxyecdysone (Ecdysterone), Bufadienolide, Furostan, Hellebrigenin-D-glucose)were identified in the roots of *Helleborus caucasicus* A. Br.and*Helleborus abchasicus* A. Br.
16. There is a 30% similarity between the DNA of species*Helleborus caucasicus* A. Br.And*Helleborus abchasicus* A. Br.
17. There is a 30% similarity between the DNA of species*Ficaria popovii*A. Khokhr. and*Ficaria calthifolia* Rchb.

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- Ivane Beritashvili Experimental Biomedicine Center Batumi Shota Rustaveli State University "Current Issues of Modern Biomedicine", Conference of Young Scientists and Students, "Helleborus caucasicus Bioecology and Application in Medicine" (2019) (ISBN-978-9941-8-1697).

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- "International conference on Innovations in Science and Educations 2020" (Medicine and Parmacy) Phytochemical study of endemic species *Helleborus caucasicus, Helleborus abchasicus* and *Ficaria popovii* spread in southern colchis Prague, Czech Republic (2020),(DOI: https://doi.org/10.12955/pmp.v1.89Issue:Vol. 1 (2020): Proceedings of CBU in Medicine and Pharmacy)

- HighTech and Innovation Journal, Phytochemical Study of Endemic Species *Helleborus Caucasicus* and *Helleborus Abchasicus* (2020),(ISSN: 2723-9535DOI: 10.28991/HIJ-2020-01-01-04).
- Internation journal of Environmental Science, Variety of plants of Chorokhi Delta of Adjara Floristic District, Georgia (2020),(ISSN: 2277-1948 CIF: 3.654).