

Dendroflora of Adjara (Ajara Floristic Region)

Dendroflora regiunii floristice Adjara (Regiunea floristică Ajara)

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Abstract

In the area under review, 185 taxa belonging to 104 genera and 58 families were identified. Spermatophytes contained 11 Gymnospermae and 174 Angiospermae taxa. The richest families are Rosaceae with 39 taxa, Leguminosae and Ericaceae with 9 taxa; Fagaceae with 8 taxa; Aceraceae, Oleaceae and Corylaceae with 6 taxa; Salicaceae and Betulaceae with 5 taxa. The richest genera are Rubus (12 taxa); Sorbus (7 taxa); Acer, Quercus, Rosa and Rhododendron (6 taxa). The rates of taxa included in certain phytogeographical regions were as follows: Euxinian element 49 taxa – 26,5%; Asian element 31 taxa – 16,8 %; Euro-Siberian element 28 taxa – 15,0%; Mediterranean element 17 taxa – 9,4%; European element 12 taxa – 6,5 %; North American element 6 taxa – 3,1 % and 42 taxa – 22,7% are multiregional or of unknown phytogeographic origin. The life form spectrum of the taxa was as follows: trees 65 taxa – 33%; shrubs 120 taxa (with 6 lianas) – 67%. The alien flora is presented by 35 taxa – 19 % (adventive 3, invasive 3, subspontaneous 22, naturalized 7). The endemic flora is presented by 25 taxa – 13,5 % (Caucasian 6, Georgian 4, Colchetic 8, Adjara-Lazetic 6, Ajarian 1); 23 taxa included in Red List of Georgia; 3 taxa included in IUCN Red List.

Keywords: *floristic region Adjara, Euxinian element, Asian element, Euro-Siberian element, Mediterranean element, European element, Red List of Georgia*

Introduction

The floristic region of Adjara is located within the administrative borders of the Autonomous Republic of Adjara, in the south-western part of Georgia, and covers an area of 3,000 km², with altitudes ranging from 0 to 2,993 m above sea level (GAMKRELIDZE, 1949; NIJARADZE, 1961).

In view of its topography, the territory of Adjara can be divided into four parts: lowlands, hilly zone, mountain gorges and high mountains (MARUASHVILI, 1964). Considerably dissected terrain, widely ranging altitudes and deep ravines are characteristic for the mountainous part of Adjara. Over 80% of the area is slopes inclined at ≥ 20 degrees. Further towards the tops of the ridges, the topography is simpler. Geological structure is mainly formed by volcanic sediments of the Tertiary age.

Adjara is distinguished by special vertical distribution of Forest vegetation types conforming to the following pattern (MANVELIDZE, 2005):

Littoral and lowland vegetation (0-25 m above sea level – a.s.l.)
Forests (from 0- 25 m to 2,100-2,200 m a.s.l.)

- **Hygrophilous, thermophilous mixed deciduous forest belt** (from 0-25 m to 400-500 m a.s.l.);
- **Sub-belt of broad-leaved – chestnut forests (*Castanea sativa*)** (from 400-500 m to 1,000-1,100 (1,200) m a.s.l.) covers northern and western slopes of the hilly coastal part of Adjara;
- **Sub-belt of broad-leaved – oak forests (*Quercus dshorochensis*; *Q. hartwissiana*)** (300-800 m a.s.l.);
- **Sub-belt of mixed forests** (polydominant communities of dark coniferous species: *Picea orientalis*, *Pinus sosnovskyi*; deciduous species: *Fagus orientalis*, *Carpinus caucasica*, *Acer campestre*, *A. platanoides*, etc.) covers the intermountain part of Adjara (from 300 to 1500-1600 m a.s.l. on north-facing slopes and from 800 to 1,500-1,600 m a.s.l. on south-facing slopes);
- **Sub-belt of beech forests (*Fagus orientalis*)** covers the hilly zone of the Adjara's coast (from 1,100 to 1,900-1,950 m).
- **Sub-belt of spruce and abies forests (*Picea orientalis*, *Abies nordmanniana*)** (from 1,500-1,600 to 2,100-2,200 m a.s.l.);
- **Sub-alpine forest-meadow vegetation belt** (from 2,000-2,100 to 2,350-2,370 m a.s.l.);
- **Alpine vegetation belt** (from 2,350 (2,400) m to 2,993 m a.s.l.).

Several climate types are distinguished in Adjara that correspond to the vertical arrangement of the vegetation belts (MANJAVIDZE, 1982):

- **Climate of the coastal plain and hygrophilous-thermophilous mixed deciduous forest zone:** average annual temperature is 12°C; average temperature of the coldest month (January) is over 2°C. Absolute minimum temperature rarely drops below 10°C, and accumulated temperatures above 10°C amount to 3,900-4,700°C.
- **Climate of the chestnut forest zone of coastal region of Adjara** is distinguished by moderately cold winter with deep but unsteady snow cover; warm, long-lasting summer with abundant precipitation (> 2,500 mm); average annual temperature is 10-11°C; absolute minimum temperature drops to –10-12°C (rarely to –16°C); duration of the growing season is 6.5-7.5 months.
- **Climate of the beech forest zone of coastal region of Adjara** is characterized by high annual air humidity (80-81%) and abundant precipitation – 3,500-3,800 mm; average annual temperature is 8.5-

9°C; average temperature of the warmest month (August) – 15-15.5°C; average temperature of the coldest month (January) – 0.5°C; absolute minimum rarely drops below –16-17°C.

- **Climate of the oak forest zone of intermountain region of Adjara** is distinguished by moderately humid and cold winter; average annual precipitation is 720-900 mm; average temperature of the warmest month (August) – 19.2-20.3°C, and highest temperature is 38-39°C; average temperature of the coldest month (January) – 0.8-1.2°C; average minimum temperature is 1.5-2.5°C, absolute minimum –14-16°C; duration of the growing season is 6-7 months.
- **Climate of the beech forest zone of intermountain region of Adjara** is characterized by moderately humid and comparatively cold winter, thick and steady snow cover, cool summer; duration of a growing season, 5-6.5 months.
- **Climate of the spruce and abies forest zone** is distinguished by humid, comparatively cold winter and deeper and steadier snow cover than the previous climate types; cool and short summer; maximum temperature is 28°C; average temperature of the coldest month (January) – 6.4°C; absolute minimum temperature is –20°C; duration of the growing season is 4.5-5.5 months.
- **Climate of the sub-alpine forest zone** includes climatic characteristics of spruce and pine forest zone and reaches to 2,400 m a.s.l.); the zone is characterized by cold winter and steady snow cover; cold and short summer; duration of the growing season is 3.5-4.5 months.

T. Urushadze *et alii* (2000; FAO) suggest the following scheme of vertical distribution of soil zones on the territory of Ajara:

- **Littoral vegetation zone soils:** littoral and riparian detritus rubbish (*Haplic Arenosols*) and alluvial meadow soils (*Distric Fluvisols*);
- **Hygrophilous-thermophilous mixed deciduous forest zone soils:** characterized by two kinds of red soils: red shallow (*Haplic Ferralsols*) and red true or podzolic (*Haplic Histosols* or *Rodic Acrisols*);
- **Beech forest zone soils:** represented by Brown forest true (Umbric Cambisols) and rusty brown soil - brown forest shallow (*Distric Cambisols*);
- **Chestnut forest zone soils:** mainly represented by yellow-brown forest soils (*Ocsic Cambisols*);
- **Spruce-abies forest zone soils:** characterized by brown forest podzolic soils (*Gleic Cambisols*);

- **Sub-alpine and alpine zone of Adjara soils** represented by mountain-meadow sward soils (*District Regosols*) and mountain-meadow sward-peat soils (*Folists Histosols*).

Based on specific composition of floristic complexes, history and taxonomic structure of the flora, Ajara (Ajara floristic region) is considered as a province (Colchic or Eastern Euxinian) of the ancient Mediterranean region. Indigenous flora that originated from the Tertiary Mediterranean flora is basis of the region's floristic diversity (GAGNIDZE, R., 1998).

Certain scientific data on Ajara's dendroflora can be found in works dated by the beginning of the XX century; many Georgian and foreign researchers have visited and collected plant specimens from Ajara (***GOLITSIN, 1939; KOLAKOVSKI, 1961). Recent data about species of dendroflora and diversity of eco-systems are also provided in the further publications: DMITRIEVA, 1990a; DMITRIEVA, 1990b; DOLUCHANOV, NACHUCRIŠVILI, 2000; GAGNIDZE, DAVITADZE, 2000; MANVELIDZE *et alii*, 2008; MANVELIDZE *et alii*, 2009; MEMIADZE, 1971; ***.

Materials and Methods

A major method of investigation is a traditional route expedition-excursion method. Plant specimens for herbarium and cameral processing between 1990 and 2008 collected by us were used to create the species list, as well as samples enumerated in Batumi Botanical Garden (BAT) and N. Ketskhoveri Tbilisi Institute of Botany Herbarium Fund in 1960-1990; some samples of herbarium and digital pictures are kept as well as at M. Lomonosow State University.

We identified plants according to the plant indexes of Georgia and Turkey; Variety taxonomy is specified according to the temporary nomenclature (CZEREPA NOV, 1995; DAVIS, 1965-1982; DMITRIEVA, 1990a; DMITRIEVA, 1990b; GAGNIDZE, R., 2000; *** 1964; *** 1969).

In the Table 1 every wood taxa of Adjara (Ajara floristic region) the version is presented with following details: endemism, life forms and phytogeographical areas that have been estimated according to DAVIS (1965-1982) and KETSKHOVELI *et alii* (1971-2007). Conservation status are given according to the Red List of Georgia and IUCN Red List. The terminology of alien status presented below has been adapted from WEBER (1999), RICHARDSON *et alii* (2000) and KIKODZE *et alii* (2009).

The abbreviations used in the text and in the floristic list are as follows: **Euro-Sib**: Euro-Siberian element; **Eux**: Euxine element; **Hyrc-Eux**: Hyrcano-Euxine element; **Ir-Tur**: Irano-Turanian element; **Medit**: Mediterranean element; **E**: East; **mt**: mountain; **Endemism**: **K**-Caucasian; **G**-Georgian; **COLH**-Colchetian; **A-L** – Adjara-Lazetian, **A**-Ajarian.

Results and Discussion

The dendroflora of the floristic region of Adjara is represented by 185 taxa belonging to 104 genera and 58 families. Spermatophytes contain 11 Gymnospermae and 174 Angiospermae taxa. The list of the woody taxa that were defined in the study area is shown in Table 1. The richest families are Rosaceae, with 39 taxa, Leguminosae and Ericaceae, with 9 taxa; Fagaceae, with 8 taxa; Aceraceae, Oleaceae and Corylaceae, with 6 taxa; Salicaceae and Betulaceae, with 5 taxa. The richest genera are *Rubus* (12 taxa); *Sorbus* (7 taxa); *Acer*, *Quercus*, *Rosa* and *Rhododendron* (6 taxa). The life form spectrum of the taxa was as follows: Trees – 65 taxa – 33%; Shrubs – 120 (with 6 lianas) – 67%.

The area is a very important relictual refuge for many plant species that are remnants of an ancient Mediterranean flora such as *Periploca graeca* L. var. *graeca* (Asclepidaceae), *Cistus creticus* L., *C. salviifolius* L. (Cistaceae), *Jasminum officinale* L. (Oleaceae) and *Rhus coriaria* L. (Anacardiaceae) (DOLUCHANOV, NACHUCRIŠVILI, 2000).

The uniqueness of the presence of many relict plant species in the region is largely due to the fact that the Caucasus was spared from the severe effects glacial retreats during the last Ice Age. The region is also unique with respect to the fact that one of the characteristic features of the south Colchic is endemic endemism. The main kernel of mesophilic dendroflora formation of which is conditioned with positive balance of warm and humid atmosphere is mainly presented by relict endems that form peculiar “Shkeriani”. The following species belong to this first group: *Betula medwediewii* Regel (Betulaceae), *Quercus pontica* C.Koch (Fagaceae), *Epigaea gaultherioides* (Boiss. & Ball) Takht., *Rhododendron ungeri* Trautv., *R. smirnovii* Trautv. (Ericaceae) and *Osmanthus decorus* (Boiss. & Ball) Kasaplğıl (Oleaceae). The main factor of existence of these species is high precipitation, the least annual amount of that is not less than 1,300 mm.

The rates of taxa included in certain phytogeographical regions were as follows: Euxinian element – 49 taxa – 26,5%; Asian element – 31 taxa – 16,8 %; Euro-Siberian element – 28 taxa – 15,0%; Mediterranean element – 17 taxa – 9,4%; European element – 12 taxa – 6,5 %; N. American element – 6 taxa – 3,1 % and 42 taxa – 22,7% multiregional or of unknown phytogeographic origin.

On the research area Euxine elements are more spread than other phytogeographic elements of the region. Domination of Euxine and the Mediterranean elements not surprising as taking account that its species composition of florist complexes, historical past and systematic structure of flora Ajara belong to antic Mediterranean world, Mediterranean region, Colchic or east Euxine province. Its floristic diversity is based on auto tectonic flora developed from the kernel of Mediterranean flora in the Tertiary period (MANVELIDZE, 2005).

There are 25 species in the dendroflora of Adjara, which belong to 9 families and 12 genus, including **Caucasian – 6 taxa** (*Acer trautwetteri*, *Euonymus leiophloea*, *Pyrus caucasica*, *Salix caucasica*, *Sorbus fedorovii*, *S. subfusca*), **Georgian – 4 taxa** (*Quercus imeretina*, *Rubus moschus*, *Rubus woromowii*, *Sorbus migarica*), **Colchetic – 8 taxa** (*Betula medwedewii*, *Quercus pontica*, *Salix kikodzea*, *Sorbus colchica*, *Rhamnus imeretina*, *Staphylea colchica*, *Swida koenigii*, *Ficus carica*), **Adjara-Lazetic – 6 taxa** (*Astragalus sommieri*, *Epigaea gaultherioides*, *Quercus dzhorochensis*, *Rhododendron ungerii*, *Rhododendron smirnowii*, *Osmanthus decorus*), and **Ajarian –1 taxa** (*Rubus adzharius*).

Nowadays there are non-local species listed in the dendroflora of Adjara except the native element. The alien flora is represented by 35 taxa – 19 % (adventive-3, invasive-3, subsponaneous-22, naturalized-7) which belong to 24 families and 31 genus. According to living forms there are 17 trees, 18 bushes included. According to origin the majority is East Asian taxa (19); comparatively less is northern American (7) and Australian taxa (4). The most widely spread is 11 non-local taxa (*Robinia pseudoacacia*, *Spirea japonica*, *Ulex europaeus*, *Pueraria japonica*, *Lonicera japonica*, *Cryptomeria japonica*, *Cupressus lusitanica*, *Buddleja davidii*, *Clerodendron bungei*, *Ecalyptus cinerea*, *E. globulus*, *Aleurites fordii*).

There are 23 taxa included in Red List of Georgia (*Arbutus andrachne*, *Astragalus sommieri*, *Betula medwedewii*, *Buxus colchica*, *Castanea sativa*, *Celtis australis*, *Daphne albowiana*, *Epigaea gaultherioides*, *Juglans regia*, *Laurus nobilis*, *Osmanthus decorus*, *Ostrya carpinifolia*, *Pterocarya pterocarpa*, *Quercus hartwissiana*, *Quercus imeretina*, *Quercus pontica*, *Rhododendron smirnowii*, *Rhododendron ungerii*, *Salix kikodseae*, *Staphylea colchica*, *Taxus baccata*, *Ulmus glabra*); 3 taxa included in IUCN Red List (*Abies nordmanniana*, *Buxus colchica*, *Taxus baccata*); 5 taxa are recommended for the Red List of Caucasia: *Betula medwedewii*, *Rhododendron ungerii*, *Swida koenigii*, *Quercus pontica*, *Rhamnus imeretina*.

Nowadays, the gene pool of all these critical species is in correspondence to *ex situ* conservation requirements in the humid subtropics floristic department of Batumi Botanic Garden; Kintrishi reserve, Kintrishi protected landscape, Kobuleti reserve and Mtskheta National Park with a total area 30,137.75 ha are in correspondence to *in situ* conservation requirements; e.i. 15.70 % of total area of Forest Fund of Adjara Autonomous Republic is managed by management tolls stipulated by the Law of Georgia on "System of the Protected Territories".

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