Analysis of the genus thymus of the southeastern part of the northern caucasus

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Abstract. The paper presents the analysis of the genus *Thymus* of the flora of the South-East of the North Caucasus. Revealed the total species, compiled an aspect of the genus *Thymus*, and conducted the analysis's bioecological, geographical composition. In the investigated territory, we have registered eight *thymus* species, distributed mainly in xerophilic types of vegetation: steppe, friganoid, alpine, meadow-steppe, and meadow societies.

1 Introduction

The flora of the Caucasus is rich and original in the presence of endemic, relict elements, which is due to the islet effect and the presence of refugia in high mountain conditions, which always arouses great interest in terms of floristic research. The study area is characterized by high altitudes, a significant length of mountain ranges, orography, various soils, and complex dissected relief. A significant variety of species formed the conditions for uneven distribution of heat and moisture on its territory. Five zones of vegetation are distinguished here: steppe, forest, mid-mountain, subalpine and alpine.

One of the exciting groups for floristic research is the genus *Thymus L.* - the most significant and taxonomically complex genus in the *Lamiaceae* family. One of the critical characteristics of the *Lamiaceae* is its floral architecture, in which the petals merge into the upper lip and lower lip. The family includes 236 genera and about 7200 species, distributed almost all over the world [1].

The genus *Thymus* includes about 350 perennial aromatic grasses and shrubs found in Europe and North Africa. The center of diversity of the genus *Thymus L.* is located in the Mediterranean [2]. On the territory of Russia, there are about 140 species of the genus *Thymus* [3]. This study aimed to conduct a floristic analysis of species of the genus *Thymus* in the southeastern part of the Northern Caucasus.

2 Material and Methods

The genus Thymus served as the object of floristic research. The studies were carried out in the altitude range from 200 to 3500 m above sea level, within the whole South-Eastern part

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of the North Caucasus. The results of this work are based on our field studies, on the study of herbarium specimens (ISU, CSU), literature data.

The collection of the actual herbarium material, field observations, the study of the ecological and biological characteristics of the species of the studied genus were carried out using classical keys [4, 5].

3 Results and Discussion

On the South-Eastern part of the North Caucasus, we have registered eight genus *Thymus: Th. Collinus Beb., Th. marschanus Willd., Th. dagestanicus Klok., Th. saucasicus Willd., Th. nummularius Bieb., Th. pastoralis Iljin ex Klok., Th. pseudopulegioids Klok. et Shost., Th. transcausicus Ronn.,* distributed mainly in xerophilic types of vegetation: steppe, friganoid, as well as high-mountain meadow-steppe and meadow communities. In the study area, species of the genus *Thymus* are combined into groups with similar ecology, coenotic relationships and are confined to specific plant communities.

The distribution of species of the genus *Thymus* over the altitudinal belts of the study area showed a wide amplitude of the altitudinal distribution of the taxon under consideration, covering the range from the steppe to the alpine belt: *Th. marschallianus and Th. pastoralis* are found in the steppe cenoses both in the lowlands and in the distribution of upland xerophytes. The mid-mountain belt includes 7 out of 8 species (*Th. Collinus, Th.dagestanicus, Th. Marschallianus, Th.nummularius, Th. Pastoralis, Th. pseudopulegioides, Th.dagestanicus*). Three different zonation - mid-mountain, alpine and subalpine, cover two species - *Th.nummularius and Th. transcausicus. Th. caucasicus* (Table 1).

Table 1. Distribution of species of the genus *Thymus* in altitudinal zonation

№	Species name	Altitudinal zonation			
		Alpine	**subalpine**	**steppe**	**mid-mountain**
1.	*Th. caucasicus* Willd. TxRonn.	+	-	-	-
2.	*Th. collinus* Bieb.	-	-	-	+
3.	*Th. dagestanicus* Klok.	-	-	-	+
4.	*Th. marschallianus* Willd.	-	-	+	+
5.	*Th. nummularius* Bieb.	+	+	-	+
6.	*Th. pastoralis* Iljin ex Klok.	-	-	+	+
7.	*Th. pseudopulegioides Klok. etShost.*	-	-	-	+
8.	*Th. transcaucasicus* Ronn.	+	+	-	+

The genus *Thymus* is characterized by a wide range of habitats - talus, stony and gravelly slopes, dry meadow-steppe, meadows, which, as we have already noted, is a characteristic feature of the taxon under study. The largest number of species of the genus *Thymus* in the study area are confined to rocky and gravelly slopes. There are 7 types here: (*Th.nummularius, Th. pastoralis, Th. caucasicus, Th. marschallianus, Th. dagestanicus*, *Th. pseudopulegioides, Th. transcaucasicus),* however, only one species (*Th. transcausicus*) exhibits strict stenotopicity to this floracenoelement (Table 2).

Species of the genus Thymus play a significant role in the composition of the vegetation cover of the slopes of the southern, southeastern exposures of arid basins, characteristic of the mid-mountain zone, both for the territory under consideration and for the entire Caucasus, being part of the herbage with the dominance of cereals, legumes, or herb-cereal cenoses forming in places thinned thickets.

Table 2. Placement of species of the genus *Thymus* by ecotopes

№	Species name	Ecotopes					
		Stony and gravelly slopes	Dry slopes	Scree	Forest glades	Meadow	Meadow-steppe
1.	*Th. caucasicus* Willd. TxRonn.	+	-	+	-	-	-
2.	*Th. collinus* Bieb.	-	+	-	-	-	-
3.	*Th. dagestanicus* Klok.	+	-	-	-	-	+
4.	*Th. marschallianus* Willd.	+	-	-	+	-	+
5.	*Th. nummularius* Bieb.	+	-	-	-	+	-
6.	*Th. pastoralis* Iljin ex Klok.	+	-	-	-		+
7.	*Th. pseudopulegioides Klok. etShost.*	+	-	-	-	+	+
8.	*Th. transcaucasicus* Ronn.	+	-	-	-	-	-

When analyzing the geographical structure developed by N.N. Portenier [7], two geographical elements were identified - Caucasian, Pontic-South Siberian.

1. Caucasian element. Species, the central area of which is limited by the Caucasian province with frequent irradiation to the adjacent provinces [8]. These are the following types: *Thymus nummularius, Th. dagestanicus, Th. collinus, Th. caucasicus., Th. pastoralis, Th. pseudopulegioides u Th. transcaucasicus.* An analysis of the relevance of the species of the Caucasian element to various ecotopes shows that the majority of Caucasian species are found on gravelly and stony slopes.

2. Pontico-South Siberian element. The Pontic Proposition limits the types of this element in the understanding of A. L. Takhtadzhyan [9]. It includes one species - *Thymus marschallianus*.

The analysis of life forms carried out based on the system of I.G. Serebryakova [10] showed that due to adaptation to the ecological conditions of an unstable petrophytic substrate, the genus *Thymus* developed similar adaptations, expressed in the form of semiprostatic - four species (*Th. Collinus, Th. Nummularius, Th. Dagestanicus, Th. Pseudopulegioides*) and steles half-shrubs - two species (*Th. caucacicus, Th. transcaucacicus*). Herbaceous polycarpic - two species (*Th.marschallianus, Th. Pastoralis*), confined to the conditions of meadow and meadow-steppe cenoses.

For a more visual picture of the distribution of species of the genus Thymus within the Greater Caucasus, in a comparative aspect, it was presented data for individual regions, covering the territory from the Western to the Eastern Caucasus (Table 3).

Table 3. The taxonomic spectrum of the genus Thymus of the southeastern part of the North Caucasus and adjacent territories.

№	Species	Western part of the Caucasus (Karachay-Cherkess Republic)	(Central Caucasus) Kabardino-Balkarian Republic	South-Eastern part of the North Caucasus (Republic Ingushetia and Chechen Republic)	Eastern Caucasus (Republic Dagestan)
1.	*Thymus borysthenicus* Klok.	-	+	-	-
2.	*Th. caucasicus* Willd. ex Ronn.	+	+	+	+
3.	*Th. collinus* Bieb.	+	+	+	+
4.	*Th. dagestanicus* Klok.	+	+	+	+
5.	*Th. elisabethae* Klok	+	+	-	-
6.	*Th. fedtschenkoi* Ronn.	-	-	-	+
7.	*Th. karamarianicus* Klok.	-	-	-	+
8.	*Th. liaculatus* Klok.	-	+	-	-
9.	*Th. majkopensis* Klok. etShost.	+	-		-
10.	*Th. marschallianus* Willd.	+	+	+	+
11.	*Th. nummularius* Bieb.	+	+	+	+
12.	*Th. pallasianus* H. Br.	-	-	-	+
13.	*Th. pastoralis* Iljin ex Klok.	-	+	+	+
14.	*Th. pulchellus* C.A. Mey	+	-	-	-
15.	*Th. pseudopulegioides Klok. et Shost.*	+	+	+	+
16.	*Th. transcaucasicus* Ronn.	-	+	+	+

The high polymorphism of the genus Thymus [11, 12, 13, 14, 15] is most likely the result of a wide amplitude of plasticity to environmental conditions, which allows them to develop particular adaptations to environmental conditions to inhabit both xerophilic types of vegetation: steppe, friganoid, and conditions of alpine, meadow-steppe and meadow habitats with a high degree of humidity and rockiness of the relief.

4 Conclusion

On the territory of the South-Eastern part of the North Caucasus, we have registered eight species of the genus *Thymus: Th.collinus* Bieb.*, Th. marschalianus* Willd.*, Th. dagestanicus* Klok.*, Th. caucasicus* Willd.*, Th. nummularius* Bieb.*, Th. pastoralis* Iljin ex Klok., *Th.*

pseudopulegioides Klok. et Shost., Th. transcaucasicus Ronn., distributed mainly in xerophilic types of vegetation: steppe, friganoid, as well as high-mountain meadow-steppe and meadow communities. Seven of the eight species in the study area are confined to rocky and gravelly slopes. Besides, they play a significant role in the composition of the vegetation cover of the slopes of the southern, southeastern exposures of the study area, being part of the herbage with the dominance of cereals, legumes, or herb-cereal cenoses. According to the geographical structure, the species of the genus under study belong to two geographical elements - Caucasian (seven species) and Pontic-South Siberian (one species).

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