

## Taxonomic content of the family of *Campanulaceae* Juss. family spread in the Nakhchivan Autonomous Republic territory and spreading conformity according to the vertical zones

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### Abstract

In the article there has been described the last taxonomic composition of the *Campanulaceae* Juss. family for the NAR flora. At the result of the carried out researches and fiction investigations there have been defined that serious changes have happened in the content of the family and some species have been shown as synonymous. So, for the Autonomous Republic there have been shown 20 species concerning to 3 genera within the family.

Also, there have been determined the objective laws of spreading frequency and spreading degree of the *Campanulaceae* Juss. family in the lowland, mid-highland and highland zones of the NAR territory. During the researches only in one zone there were met 2 species [*C. massalskyi* Fomin, *M. laevigata* Vent.] in the mid-highland and 3 species [*C. sclerotricha* Boiss., *C. tridentata* Scherb., *A. amplexicaule* (Willd.) Hand. – Mazz.] in the highland. Besides these, there have been met 3 species [*C. glomerata* L., *C. karakuschensis* Grossh., *C. propinqua* Fisch. et C.A Mey.] common for the lowlands and mid-highlands, 7 species [*C. latifolia* L., *C. rapunculoides* L., *C. bononiensis* L., *C. zangezura* (Lipsky) Kolak et Serdjukova, *C. bayerniana* Rupr., *A. campanuloides* (Bieb. ex Sims) Bornm., *A. rigidum* (Willd.)] common for the mid-highlands and highlands, 2 species [*C. daralaghezica* (Grossh.) Kolak. et Serdjukova, *C. saxifraga* Bieb.] common for the lowlands and highlands and 3 species [*C. coriaceae* P.H. Davis, *C. stevenii* Bieb., *A. pulchellum* (Fisch. et C.A. Mey.)] common for the all three zones. Spreading frequency of the species is different. The species of *C. glomerata* L., *C. rapunculoides* L., *C. stevenii* Bieb., *A. pulchellum* (Fisch. et C.A. Mey.), *M. laevigata* Vent. are met mostly. The gathered herbarium samples were included into the Bioresources Institute Herbarium Fund.

**Keywords:** *Campanulaceae*, spreading, genera, species, zone, lowland, mid-land, highland.

### 1. Introduction

If we cast a glance at the history of the of studying chronology the NAR flora we find that the *Campanulaceae* Juss. - Bellflower family has been studied relatively poorly. Therefore it is very important to study the species composition, ecology, objective laws of spreading over the zones and usage of the plants of this family.

Caucasian representatives of the *Campanulaceae* Juss. family plants have been studied by many researchers. The first complete commentary of the family was developed by Dekandol [4]. Later F. Ruprecht [9], E. Trautvetter [12] presented separate researches about the Caucasian bellflowers. But fundamental works concerning to the present-day situation of the family has especially been shown in the regional floras. The research works by E. Boissier [3] "Flora orientalis" and A.V. Fomin [18] "Flora caucasica critica" are of special importance. A.A. Fedorov's monographic character work "Flora SSR" (14) about the *Campanulaceae* family is of great importance. In addition, L.A. Kharadze has got very valuable researches [19, 20, 21] about the Caucasian representatives of the Bellflower family.

The information of the Bellflower family is found in the following researches - A.A Grossheim "Flora of Azerbaijan" [6], "Флора СССР" [14], "Флора Азербайджана" [15], Флора Грузии [17], Флора Армении [16], "Flora of Turkey" [5], Biodiversity of plant species in Iran [2], Конспект флора кавказа [13], as well as Т.Н. Talibov, A.Sh. İbrahimov's

"Taxonomic spectrum of the Nakhchivan Autonomous Republic flora" [10], A. M. Askerov's "Review of the Azerbaijan flora" books [1].

### Material and methods

Research object is the *Campanulaceae* family and as the material there have been studied the *Campanulaceae* family species collected from the lowland, mid-land and highland zones of the Nakhchivan Autonomous Republic during the field expeditions.

Fundamental researches on the study of the *Campanulaceae* family in the Nakhchivan Autonomous Republic have been carried out within 2012-2015 years systematically planning the months and seasons and there have been taken into account the relief, soil and plant cover of the territory. During the researches there have been made continuous expedition routes that completely surrounded separate zones of the Nakhchivan Autonomous Republic (Sadarak, Sharur, Kangarli, Shahbuz, Babek, Julfa and Ordubad); collected and identified more than 200 herbarium samples.

Taking into account the broadness of the territory, richness of the flora and spreading zone diversity of the *Campanulaceae* family species during the field expeditions the great attention was paid to the route method. While choosing the routes also taken into account spreading of the plants in the zones and botanical- geographical features of the plants. During the

expeditions the species composition of the family plants and spreading zones were defined.

On the defining and naming the Bellflower family species there have been used A.A. Grossheim "Flora of Azerbaijan" [6], T.H. Talibov, A.Sh. İbragimov "Taxonomic spectrum of the Nakhchivan Autonomous Republic flora" [10], A.M. Askerov "Review of the Azerbaijan flora" [1], E.M. Gurbanov "Systematic of the supreme plants" [7] and some other monographs and articles.

**Experimental part** - A.A. Grossheim gave information about the Bellflower family in his research work "Flora of Azerbaijan" [6]. There have been found 34 species of the family belonging to the 5 genera (*Campanula* L.-25, *Symphyandra* D. C.-3, *Specularia* Heist.-1, *Michauxia* L. Her.-1, *Podanthum* Boiss.-4). There have been found 14 species (*Campanula propinqua* F. et M., *C. hohenackeri* Fisch. et Mey., *C. aucheri* D.C., *C. tridentata* Scherb, *C. bayerniana* Rupr. (Trautvetteri fomin.), *C. glomerata* L. (*cervicarioides* A.D.C.), *C. beauverdiana* Fom., *C. simplex* Stev.=*C. Steveni* M.B., *Symphyandra armena* D.C., *S. zangezura* Lipsky, *Michauxia laevigata* Vent., *Podanthum pulchellum* Boiss., *P. salicifolium* (A.DC.) Rupr., *P. amplexicaule* Boiss.) of the family belonging to the 3 genera (*Campanula*, *Symphyandra*, *Michauxia*, *Podanthum*) in the Nakhchivan Autonomous territory.

A.A. Federov in his research work "Флора СССР" [14] gave description of the 224 species belonging to the 20 genera (*Campanula* L., *Symphyandra* A.DC., *Brachycodon* Fed., *Adenophora* Fisch., *Popoviocodonia* Fed., *Astrocodon* Fed., *Peracarpa* Hook. f. et Thomas, *Ostrowskia* Rgl., *Michauxia* L.Her., *Phyteuma* L., *Asyneuma* Griseb. et Schenk, *Sergia* Fed., *Cryptocodon* Fed., *Cylindrocarpa* Rgl., *Legousia* Durand, *Codonopsis* Wall., *Platycodon* A.DC., *Edrajanthus* A.DC., *Jasione* L., *Sphenoclea* Gaerth.) of the family. 14 species (*C. propinqua*, *C. sclerotracha*, *C. bayerniana*, *C. takhtadzhianii*, *C. elegantissima*, *C. radula*, *C. massalskyi*, *C. ruprechtii*, *C. minsteriana*, *C. karakuschensis*, *Symphyandra daralaghezica*, *Michauxia laevigata*, *Asyneuma rigidum*, *A. pulchellum*) out of them belonging to the 4 genera (*Campanula*, *Symphyandra*, *Michauxia*, *Asyneuma*) have been spread in the Nakhchivan Autonomous territory.

In the research work "Флора Азербайджана" [15] there have been described 61 species of the family belonging to the 7 genera. Thus, it was noted that, 24 species (*C. propinqua*, *C. rapunculoides*, *C. bononiensis*, *C. sclerotracha*, *C. bayerniana*, *C. takhtadzhianii*, *C. elegantissima*, *C. radula*, *C. massalskyi*, *C. ruprechtii*, *C. aucheri*, *C. minsteriana*, *C. karakuschensis*, *C. beauverdiana*, *C. stevenii*, *Symphyandra armena*, *S. daralaghezica*, *S. zangezura*, *Michauxia laevigata*, *Asyneuma campanuloides*, *A. amplexicaule*, *A. salignum*, *A. rigidum*, *A. pulchellum*) belonging to the 4 genera (*Campanula*, *Symphyandra*, *Michauxia*, *Asyneuma*) have spread in Nakhchivan Autonomous Republic territory.

Information concerning to this family is also found in the flora of Turkey. So, there have been given description of the 124 species belonging to the 6 genera. Only one species out of them - *Campanula sclerotracha* Boiss. has been spread in the Autonomous Republic territory [5].

There have been given analyses of the 28 species belonging to the 4 genera (*Campanula* 21, *Asyneuma* 5, *Legousia* 1,

*Michauxia* 1) of the *Campanulaceae* family in the flora of Armenia [16].

There is information about systematic of the family in the research work "Flora of Georgia" published in 2001 [17].

In the article by T.H. Talibov and G.N. Rustamova "New species of the Nakhchivan Autonomous Republic flora" published in 2005 has been given description of some new species [11]. So, there has been discovered the *C. latifolia* L. species belonging to the *Campanula* L. genus of the Bellflower family in the forest of the "Shahbuz State Natural Reserve" of the Shahbuz region.

According to A.M. Askerov's book "Review of the Azerbaijan flora" 56 species belonging to the 7 genera of the *Campanulaceae* Juss. family have spread in the Azerbaijan flora [1].

In the book "Taxonomic spectrum of the Nakhchivan Autonomous Republic flora" T.H. Talibov and A.Sh. İbrahimov have noted on named book that, there are 23 species belonging to the 3 genera of the family in the Autonomous Republic territory [10].

The last systematical composition of the family has been given in the book of "Конспект флора Кавказа" [13]. Here only *Campanulaceae* Juss. family has been included into the *Campanulales*. Thus, the family has been represented by 79 species belonging to the 5 genera. 20 species out of them belonging to the 3 genera have spread in the Autonomous Republic territory.

As it is seen there have been carried out serious changes within *Campanulaceae* Juss. – Bellflower family and some species were given as synonyms. So, the number of the Bellflower family species that spread in the Nakhchivan AR has decreased from 23 to 20. At the result of the researches and information of the literature data, it becomes clear that there are the following species of the *Campanulaceae* Juss. family in the Nakhchivan Autonomous Republic.

Superordo: *Asteranae*

Ordo: *Campanulales*

Fam.: *Campanulaceae* Juss.

1. Genus: *Campanula* L.

Subgen.1. *Campanula*

Sect 1. *İnvolucrate* (Fomin) Charadze

1(1) *Campanula glomerata* L. (*C. trautvetteri* Grossh. ex Fed.)

1a. *C. glomerata* L. subsp. *caucasica* (Trautv.) Ogan.

Sect.2. *Campanula*

2(2) *C. latifolia* L.

2a. *C. latifolia* L. subsp. *latifolia* (*C. eriocarpa* Bieb.)

3(3) *C. rapunculoides* L. (*C. grosshemii* Charadze)

4(4) *C. bononiensis* L.

Sect.3. *Cordifoliae* (Fomin) Charadze

5(5) *C. sclerotracha* Boiss.

Sect.4. *Symphyandriformes* (Fomin) Charadze

6(6) *C. daralaghezica* (Grossh.) Kolak. et Serdjukova

[*Symphyandra armena* (Stev.)

DC., *Symphyandra daralaghezica* Grossh., *Campanula armena* Stev.]

7(7) *C. zangezura* (Lipsky) Kolak. & Serdjukova (*Symphyandra zangezura* Lipsky)

8(8) *C. bayerniana* Rupr. (*C. elegantissima* Grossh., *C. takhtadzhianii* Fed.)

Sect.5. *Oreocodon* (Fed.) Ogan.

9(9) *C. coriacea* P.H. Davis (*C. radula* Fisch.)

10(10) *C. massalskyi* Fomin

- Subgen. 2. *Scapiflorae* (Boiss.) Ogan.  
 11(11) *C. saxifraga* Bieb. (*C. aucheri* A. DC.)  
 12(12) *C. tridentata* Scherb. (*C. ruprechtii* Boiss.)  
 12a. *C. tridentata* Schreb. subsp. *Tridentate*  
 Subgen. 3. *Theodorovia* (Kolak) Ogan.  
 13(13) *C. karakuschensis* Grossh. [*C. minsterina* Grossh., *C. hakkarica* P.H. Davis,  
*Theodorovia karakuschensis* (Grossh.) Kolak]  
 Subgen. 4. *Megalocalyx* Damboldt  
 14(14) *C. propinqua* Fisch. & C. A. Mey.  
 Subgen. 5. *Rapunculus* (Boiss.) Charadze  
 15(15) *C. stevenii* Bieb.  
 15a. *C. stevenii* Bieb. subsp. *stevenii*,  
 15b. *C. stevenii* Bieb. subsp. *beauverdiana* (Fomin) Rech. f. et  
*Schimani-Czeika*, *C. beauverdiana* Fomin  
 2. Genus: *Asyneuma* Griseb. & Schenk  
 16(1) *Asyneuma amplexicaule* (Willd.) Hand.- Mazz.  
 16a. *A. amplexicaule* (Willd.) Hand. - Mazz. subsp.  
*amplexicaule*  
 (*A. talyschense* Fed.)  
 17(2) *A. campanuloides* (Bieb. Ex Sims) Bornm.  
 18(3) *A. rigidum* (Willd.) Grossh.  
 19(4) *A. pulchellum* (Fisch. & C.A.Mey.) Bornm.  
 3. Genus: *Michauxia* L. Her.  
 20(1) *Michauxia laevigata* Vent.

Though there is some information in the fiction about objective laws of spreading of the *Campanulaceae* Juss. family plants on the vertical zones, but this issue has not been studied completely yet. By the purpose of studying the objective laws of spreading of the *Campanulaceae* Juss. family plants in different zones of the Nakhchivan Autonomous Republic, there have been organized expeditions by the Bioresources Institute and free expeditions 2012-2015 years.

Relief of the Nakhchivan Autonomous Republic territory consists of sloping plains, lowland, mid-highland and highland zones. Sloping plains lie in the lowest part of the territory towards south-east in the form of narrow stripe from north-west surrounding the Araz riverside plains (600 – 1200m). The widest part of this plain is in the north-west (20 km) and the narrowest part is in the south-east (4-5 km). The Araz riverside plain mainly consists of sloping plains of Sadarak, Sharur, Boyukduz, Nakhchivan, Julfa and Ordubad regions.

From the Araz riverside plains towards the north in the 1000-1500 m height begins the low mountainous area. Garachoban, Tenenem, Taziuchan, Duzdag, Jehrigashi etc. are included into these sloping plains. In both plains, in the Araz riverside and in the low mountainous areas the clayey rocks have spread widely. Duzdag, Aghgaya and Badamli areas may be shown as examples. Mountain vegetation is characteristic for the low mountainous area.

During the researches, at the result of defining the Bellflower family plants samples gathered from the low mountainous zone and investigation of the fiction there have been determined the following species:

*Campanula glomerata* L. Abragunus village of the Julfa region; *Campanula daralaghezica* Grossh. Kolak et Serdjukova Garababa village of the Shahbuz region; *Campanula coriacea* P.H. Davis Chalkhangala village of the Kangarli region, the territory called Deresham in the Babek region; *Campanula massalskyi* Fomin Nehram village, the

territory called Deresham in the Babak region; *Campanula saxifraga* Bieb. Vaykhir village of the Babek region, Erezin and Gulustan villages of the Julfa region; *Campanula karakuschensis* Grossh. the territory called Deresham in the Babek region Babək; *Campanula propinqua* Fisch. & C. A. Mey. Chalkhangala village of the Kangarli region, Nehram village of the Babək region, Garababa village of the Shahbuz region; *Campanula stevenii* Bieb. Chalkhangala village of the Kangarli region; *Asyneuma pulchellum* Bornm. Abragunus village of the Julfa region, Ganza village of the Ordubad region; *Michauxia laevigata* Vent. Chalkhangala village of the Kangarli region, Abragunus village of the Julfa region.

Mid-highland zone lies in 1500-2300 m absolute altitude towards the north of the low mountainous zone. This zone beginning with the north-west stretches towards the south-east occupying not very large area and expands gradually. The area is characterized by deep valleys, precipitous slopes, small intermountain troughs and strong fragmentation. Shada, Badamli, Paradash and other intermountain locations are in the mid-highland zone. This zone is severely dissected by a number of rivers (Nakhchivanchay, Alinjachay, Gilanchay, Venendchay, Aylischay, Ordubadchay etc.). The main vegetation of the mid-highland zone is formed by forests and highland plants.

Forests do not carry zone character in the Nakhchivan Autonomous Republic. It hesitates between 2000-2200 m and 1700-1800 m. In the Nakhchivan Autonomous Republic the forests arise in the humid soils where there is much snow and much water of the rivers. Therefore the 2550 hectares out of the 3016 hectares of forest area in the Autonomous Republic are in the surroundings of Bichenek village. Moreover, there are forest areas in the upper flows of the rivers Alinja and Gilan, 66 hectares in the surroundings of Arafsa village, about 400 hectares of small forests (Tillek, Khalil, Jalil) in the surroundings of the villages Khurs and Nesirvaz. In general, forests cover 0.5 %s of the Nakhchivan Autonomous Republic territory.

In 2012-2015 lots of expeditions were carried out in the mid-highland zone, collected samples, investigated and identified the Campanulaceae family species named below:

*Campanula glomerata* L. Garagush mountain of the Kangarli region, Ayrinj village of the Shahbuz region, Dirmis village of the Ordubad region; *Campanula latifolia* L. Tillek forest of the Ordubad region; *Campanula rapunculoides* L. Dirmis village of the Ordubad region; *Campanula bononiensis* L. Nursu village of the Shahbuz region; *Campanula zangezura* Kolak. & Serdjukova Dirmis village of the Ordubad region; *Campanula bayerniana* Rupr. surroundings of the Ordubad city; *Campanula coriacea* P.H. Davis Ardi mountain of the Sadarak region, Garagush mountain of the Kangarli region; *Campanula karakuschensis* Grossh. Akhura village of Sharur region, Garagush mountain of the Kangarli region, the territory called Nokhuddag of the Babek region; *Campanula propinqua* Fisch. & C. A. Mey. Hamzali, Akhura villages of the Sharur region, Badamli village of the the Shahbuz region; *Campanula stevenii* Bieb. Garagush mountain of the Kangarli region, Berdik mountain near the village of Gazanchi of the Julfa region, Kechili village of the Shahbuz region, Bilev, Dirmis villages of Ordubad region; *Asyneuma campanuloides* Bornm. Leketag village of the Julfa region; *Asyneuma rigidum* Grossh. Leketag village of the Julfa region; *Asyneuma pulchellum* Bornm. Ayrinj village of the Shahbuz region,

Dirnisi village of the Ordubad region, Leketag, Boyehmed village of the Julfa region.

The highland zones (2300-3904 m) covering the north and east parts of the Autonomous Republic mainly occupy watersheds of the Zangazur and Dereleyez ranges. According to the morphological features this part has almost deprived of the soil and vegetation and it consists of upright rocky peaks and severe shuttered cliffs. Subalpine and alpine grasslands are mainly characteristic for the highland zone and they stretch in 2350-2600 m heights in the form of narrow stripe. This stripe begins with the Kukuchay basin and reappears in the Elinjachay basin and in the river canyons again.

The big amplitude difference of the temperature, cold winds, shortness of the vegetation period, severely influence on the plants, the severe climate condition of the highland area severely influence on the plants and they have adapted and endure this condition. These plants are short height, spread on the earth and firmly attached the soil by their roots. During the researches the significant number of samples were collected from the area and defined the following *Campanulaceae* Juss family species:

*Campanula latifolia* L. Batabat zone of the Shahbuz region, Mazra village of the Ordubad region; *Campanula rapunculoides* L. Arafasa village of the Julfa region (3100m), Kuku, Bichanak villages and Batabat zone of the Shahbuz region; Paraga, Pezmeri villages of the Ordubad region; *Campanula bononiensis* L. Mazra village of the Ordubad region; *Campanula sclerotracha* Boiss. Tivi, Nurgut, Nasirvaz villages of the Ordubad region; *Campanula daralaghezica* (Grossh.) Kolak et. Sedjukova Bichanak village of the Shahbuz region, Nasirvaz, Nusnus (2347m), Paraga villages, Gapijig and Soyugdug areas of the Ordubad region; *Campanula zangezura* Kolak. & Serdjukova Paraga village, Gapijig and Soyugdug areas of the Ordubad region; *Campanula bayerniana* Rupr. Buzgov village of the Babak region, Kecheldag (2700-3000m), Batabat zone, Kuku village of the Shahbuz region, Khazinedere area near the Julfa region; *Campanula coriacea* P.H. Davis Kukudag of the Shahbuz region, Soyugdug areas of the Ordubad region; *Campanula saxifraga* Bieb. Gelingaya area of the Julfa region, Gapijig area of Ordubad region; *Campanula tridentata* Scherb. Agdaban and Salvarti highlands of the Shahbuz region, Arafasa village of the Julfa region, Nusnus (2476m), Goy-gol, Pezmeri, Gapijig, Uchurdag of the Ordubad region; *Campanula stevenii* Bieb. Ag dag of the Babak region, the territory called Derebogaz of the Shahbuz region, surround the Batabat lake, Kecheldag, Salvarti, Kuku, Bichanak villages of the Shahbuz region, Khazinedere area of Arafasa village of the Julfa region, Nusnus, Paraga, Tivi (3000m) villages of the Ordubad region; *Asyenuma amplexicaule* Hand.- Mazz. Bichanak village of the Shahbuz region, Paraga village of the Ordubad region; *Asyenuma campanuloides* Bornm. Bichanak village of the Shahbuz region; *Asyenuma rigidum* Grossh. Bichanak village of the Shahbuz region; *Asyenuma pulchellum* Bornm. Bichanak village of the Shahbuz region, Arafasa village of the Julfa region, Nasirvaz, Paraga villages of the Ordubad region.



**Fig 1:** *Campanula karakuschensis* Grossh. Akhura village of Sharur region (03.06.2015)



**Fig 2:** *Campanula rapunculoides* L. Batabat massif of Shahbuz region (03.07.2013)

## Conclusion

So, at the results of the carried out researches and fiction information there has been defined that there are 3 genera and 20 species of the Bellflower family plants in the Nakhchivan Autonomous Republic territory. The final classification mentioned above defines the species composition and some species have been given as synonyms.

Studying of the objective laws of the Bellflower family plants spreading in the vertical zones have been carried out as mentioned above, according to the lowland, mid-highland and highland zones. During the researches only in one zone there were met 2 species [*C. massalskyi* Fomin, *M. laevigata* Vent.] in the mid-highland and 3 species [*C. sclerotracha* Boiss., *C. tridentata* Scherb., *A. amplexicaule* (Willd.) Hand. – Mazz.] in the highland. Besides these, there have been met 3 species [*C. glomerata* L., *C. karakuschensis* Grossh., *C. propinqua* Fisch. et. C.A Mey.] common for the lowlands and mid-highlands, 7 species [*C. latifolia* L., *C. rapunculoides* L., *C. bononiensis* L., *C. zangezura* (Lipsky) Kolak et Serdjukova, *C. bayerniana* Rupr., *A. campanuloides* (Bieb. ex Sims) Bornm., *A. rigidum* (Willd.)] common for the mid-highlands and highlands, 2

species [*C. daralaghezica* (Grossh.) Kolak. et Serdjukova, *C. saxifraga* Bieb.] common for the lowlands and highlands and 3 species [*C. coriaceae* P.H. Davis, *C. stevenii* Bieb., *A. pulchellum* (Fisch. et C.A. Mey.)] common for the all three zones. Spreading frequency of the species is different. The species of *C. glomerata* L., *C. rapunculoides* L., *C. stevenii* Bieb., *A. pulchellum* (Fisch. et C.A. Mey.), *M. laevigata* Vent. are met mostly.

21. Харадзе А.Л. Род *Campanula* L. s.l. на Кавказе (Конспект) // Зам. сист. геогр. раст. (Тбилиси). 1976. Вып. 32. С. 46-56.

## References

1. Askerov AM. Review of the Azerbaijan flora. Baku: Elm, 2010, 183. (in azerbaijani)
2. Biodiversity of Plant Species in Iran. The vegetation of Iran. Plant species. Red Data of Iran. Endemic species. Rare species. Species threatened by extinction / A. Ghahreman, F. Attar., Tehran: Tehran University Publications 1999; 1:1176(75-76).
3. Boissier E. Flora Orientalis. Genevae et Basiliae 1875; 3:1033.
4. Candolle AI. PP de. Monographie des Campanulees. Paris, 1830, 384.
5. Damboldt J. Materials for a flora of Turkey // Not. Roy. Bot. Gard. Edinb 1976; 35(1):39-52.
6. Grossheim AA. Flora of Azerbaijan. Baku: Azerneshr 1935; III:424. (in azerbaijani)
7. Gurbanov EM. Systematic of the supreme plants. Baku: Baku State University, 2009, 429. (in azerbaijani)
8. Nasirova AS. Spreading conformity according to the vertical zones of the *Campanulaceae* Juss. family spread on the territory of Nakhchivan Autonomous Republic // Nakhchivan State University. "Scientific works". Natural sciences and medical series 2015; 3(68):54-58 (in azerbaijani)
9. Ruprecht FI. Revisio *Campanulacearum Caucasi* // Bull. Ac. Sei. Petersb 1866; 11:203-222
10. Talibov TH, Ibrahimov A.Sh. Taxonomic spectrum of the Nakhchivan Autonomous Republic flora. Acami, 2008, 349. (in azerbaijani)
11. Talibov TH, Rustamova GN. New species of the Nakhchivan Autonomous Republic flora // ANAS Biological Sciences 2005; 1-2:212-215. (in azerbaijani)
12. Trautvetter ER. Catalogus Campanulacearum rossicarum // Acta Horti Petropol 1879; 6(1):41-104.
13. Конспект флоры Кавказа. Санкт Петербург-Москва: Изд-во С.-Петербургского университета, 2008; Т.3(1):496с.
14. Федоров Ан.А. Сем. *Campanulaceae* Juss. // Флора СССР. М.-Лл АН СССР 1957; Т.24:с.126-450
15. Флора Азербайджана. Баку: Издв-во АН Азерб. ССР 1961; Т.8:645 с.
16. Флора Армении. Ереван: Изд АН Арм. ССР 1995; Т.9:674с.
17. Флора Грузии. Тбилиси: Мецниереба 2001; Т.13:283с.
18. Фомин АВ. Семейство *Campanulaceae*. Материалы для флоры Кавказа. Юрьев 1903-1907; Т.4:Вып.6, с.6-157
19. Харадзе А.Л. Опыт систематики кавказских видов рода *Campanula* L. секции *Medium* A.DC. // Зам. сист. геогр. раст. (Тбилиси) 1949; Вып.15.:С.14-33.
20. Харадзе А.Л. К флорогенезу кавказских колокольчиков // Зам. сист. геогр. раст. (Тбилиси). 1970. Вып. 28. С. 89-102.