Plant & Fungal Research (2018) 1(1): 69-85
http://dx.doi.org/10.29228/plantfungalres.10

November 2018

Vascular plants of Azerbaijan: a nomenclatural update and survey of Lamiaceae L.

Rashad Salimov[1], Vugar Karimov
Zarnigar Babayeva, Gulnar Gasimova
Zenfira Aliyeva, Asya Akbarova
Aytan Fatdayeva, Parvana Nabiyeva
Lala Isgandarova, Sabina Hajiyeva
Institute of Botany, Azerbaijan National Academy of Sciences, Badamdar 40, Baku, AZ1004, Azerbaijan

Abstract: Lamiaceae (Labiatae) is the fourth largest angiosperm family in Azerbaijan flora. Previous taxonomical studies on Lamiaceae were mainly based on morphological characters. But latest molecular studies on the phylogeny of the Lamiaceae shed light towards understanding, clarifying borders of and relationships among its genera. The aim of our study was to nomenclatural updates and classification of Lamiaceae species distributed across Azerbaijan. The family is represented by 37 genera, 241 taxa (204 (native and introduced) species, and 37 subspecies) of which 19 taxa are endemics. 4638 herbarium specimens of BAK and 1245 specimens from various virtual herbaria have been analyzed. 46 new taxa were added as a supplementary to the VII volume Flora of Azerbaijan after its publication. According to the most recent classification, a new monotypic genus *Drymosiphon* Melnikov is revealed within subfamily Nepetoideae of the Lamiaceae in Azerbaijan. And also in the context with the latest taxonomic reconstructions *Vitex* L. from Verbenaceae Juss. is transferred into subfamily Viticoideae Briqone within the Lamiaceae. The largest three genera according to taxon number are *Salvia* L. (38 taxa), *Nepeta* L. (30 taxa), and *Stachys* L. (25 taxa). Mountain part of Nakhchivan (62 taxa), Diabar (58), Guba part of the Greater Caucasus (37) are the most species-rich and genera-rich botanical-geographical regions. The phytogeographic regions with the highest taxon number are Irano-Turanian (88 taxa (37%)), Euro-Siberian (42 taxa (18%) and Caucasian (39 taxa (16%)) regions.12 taxa are in threatened categories (CR-4, EN-1, and VU-7) and 12 are near threatened (NT) according to IUCN. 7 species are listed in the 2nd edition of Red Book of Azerbaijan. After current nomenclatural updates, the result proved that Azerbaijan with its landscape and habitat diversity plays a significant role in speciation of the Lamiaceae family in the Caucasus.

Key Words: *Azerbaijan, Lamiaceae, flora, vascular plants, taxonomy*

Accepted for publication: 12 November 2018
[1]E-mail: resad_selimov@yahoo.com

INTRODUCTION

The Republic of Azerbaijan is located at the crossroads of Eastern Europe and Southwestern Asia, surrounded by the Greater and Lesser Caucasus in the north and west, the Talysh Mountains in the south and the Caspian Sea in the east. The wide range of soils and climatic conditions, as well as the historical development of ecosystems in Azerbaijan, support high biodiversity and rich genetic resources. Almost all types of ecosystems from glacier-capped high mountains to semi-deserts exist in the country. Plains, steppes, and deserts occupy 31.8% of the territory, and more than half of the country is mountains and highlands.

The diverse geographic, biological and climatic conditions in Azerbaijan have provided the higher levels of biological diversity in its flora and fauna over time. More than 4500 vascular plant species, representing around 65% of the Caucasus' plant diversity, including approximately 200 endemics of Azerbaijan and 950 endemics of Caucasus are recorded in Azerbaijan [Solomon et al. 2013].

Some 1550 species, including endemic and relict species, have been identified as medicinal plants and considered to have an ethnobotanical use in folk and traditional medicine [Mehdiyeva et al. 2017]. Representatives of 125 plant families or 80% of all 156 families grow in Azerbaijan and Caucasus region. By species count, Lamiaceae is the fourth largest angiosperm family in Azerbaijan flora. It includes many economically and medicinally important species, as well as famous culinary herbs such as mint, thyme, sage, savory and etc. They have also a very wide range of uses in horticulture and landscaping [Harley et al. 2004]. Along with Iran and Turkey within the Irano-Turanian phytogeographic region, Azerbaijan has the greatest number of taxa and sits on one of the high diversity centers for the family [Harley et al. 2004; Jamzad, 2013; Celep 2017].

62 years after the first comprehensive work on the

family which were included in the Flora of Azerbaijan volume 7 [Isayev et al. 1957], and the "Synopsis of species of the family Lamiaceae from the Caucasus" [Menitsky, 1992] as well as other publications in regard to Lamiaceae [Asgerova, 1972; Ahmed-zade, Novruzova, 1980; Ahmed-zade, Hajiyev, 2003; Asgerov, 2016], many new taxa were added. Moreover, some taxonomic and nomenclature changes have been established via molecular studies in the last decades [Harley et al. 2004; Li et al. 2016].

In the present work, a nomenclature update according to the latest taxonomic status of genera and species is given. Distribution data were analyzed using the botanical-geographic regions of Azerbaijan. In addition, life forms, rarity, and endemism, the conservation challenges of the family are also discussed.

MATERIAL AND METHODS

The studies conducted by the authors were based on extensive herbarium work, including analysis of herbarium specimens deposited at the BAK, and related literature which is also accompanied by several field expeditions. The BAK, the herbarium of the Institute of Botany, Azerbaijan National Academy of Sciences, is the largest collection of plants in the Caucasus, and hosts more than 600.000 specimens, with a great representation of all the major groups of vascular plants of the region. The general collection and also historical collections of BAK have served as reference for the main floras of this region.

The digital specimens of the Lamiaceae species collected from Azerbaijan are available in GBIF portal. The Global Plants database provide a joint and overall vision of all information that is useful for compiling the list.

Additionally, the VII volume Flora of Azerbaijan [Isayev et al. 1957] which was considered as an initial step to prepare a list of species as well as related taxonomic literature [Asgerova, 1972; Menitsky, 1992; Ahmed-zade, Hajiyev, 2003; Asgerov, 2016] was reviewed. The collection locality, collector's name, etc. were clarified via checking the related protologue of each species comprehensively.

The scientific names of accepted taxa and their synonyms, standard abbreviations of authors conform to the latest information in IPNI [2018] and the World Checklist of Lamiaceae [Govaerts et al. 2018] respectively. The digital resources such as The Plant List [2018], Euro+Med PlantBase [2018], The Biodiversity Heritage Library [BHL, 2018], Azerbaijan Plant Data Service [AZBIMM, 2018] were of great help for completion of the species list.

The nomenclature revision of Lamiaceae species of Azerbaijan and survey of relevant information were analyzed based on the updated data set.

RESULTS AND DISCUSSION

Overall taxonomic and temporal coverage of BAK. In the BAK, the specimens of Lamiaceae species have been analyzed by checking the almost existing species in VII volume Flora of Azerbaijan, as well as identifying the newly recorded taxa sixty years after the publication of this scientific account.

A working list of wild, cultivated and/or introduced species of Lamiaceae was compiled according to the herbarium specimens deposited at the BAK. This dataset, an essential source of occurrence data which is represented in the BAK, includes 4638 specimens, that is more than 66% of the 241 taxa (Fig. 1).

The highest number of records is from *Salvia* L. with 688 specimens; this genus also has the largest number of herbaria taxa with 29 species and subspecies. According to the number of specimensthe second largest genus is *Stachys* L. with 555 specimens and 19 taxa respectively. On the contrary, some genera with many taxa (three or more) have few specimens, so they are not well represented in the BAK. *Marrubium* L. (nine taxa but only 76 specimens of 1 taxon) and *Lamium* L. (11 taxa but only 135 specimens of 3 taxa) are not well represented in the herbaria due to the challenges in the identification of these species.

The Institute of Botany, Azerbaijan National Academy of Sciences plays an important role in the botanical exploration of Azerbaijan since it is established. According to the collecting year indicated in the label of specimens, the temporal coverage is between 1900 and 2018 (Fig. 2). The highest amount of specimens was collected from 1920 until the 1950s when the number of botanists dedicated to floristic studies of Azerbaijan, as well as, the Caucasus flora was significantly increased. Among the numerous botanists A. Grossheim, I. Karyagin, L. Prilipko, R. Rzazade, Y. Isayev, R. Asgarova As took several fieldworks across Azerbaijan and made an important contributions to the first comprehensive work on the Lamiaceae in Azerbaijan [Isayev et al. 1957]. Due to various objectives, the studies on Lamiaceae species and sampling collections were continued by R. Asgarova [Asgarova, 1972], F. Ahmed-zade [Ahmed-zade, 1981], V. Karimov [Mammadov et al. 2012], Mammadova

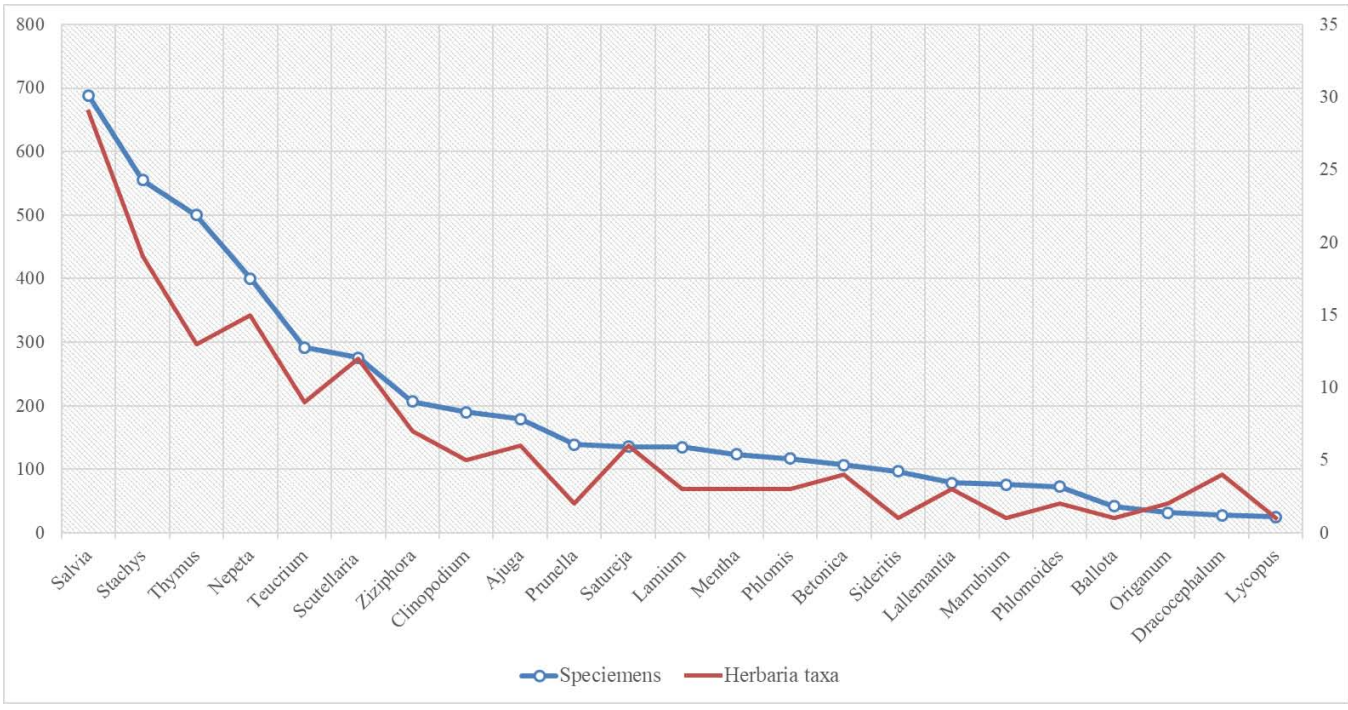

Figure 1. Genera with 25 or more specimens (number of the specimens in the left vertical axis and number of taxa in the right vertical axis).

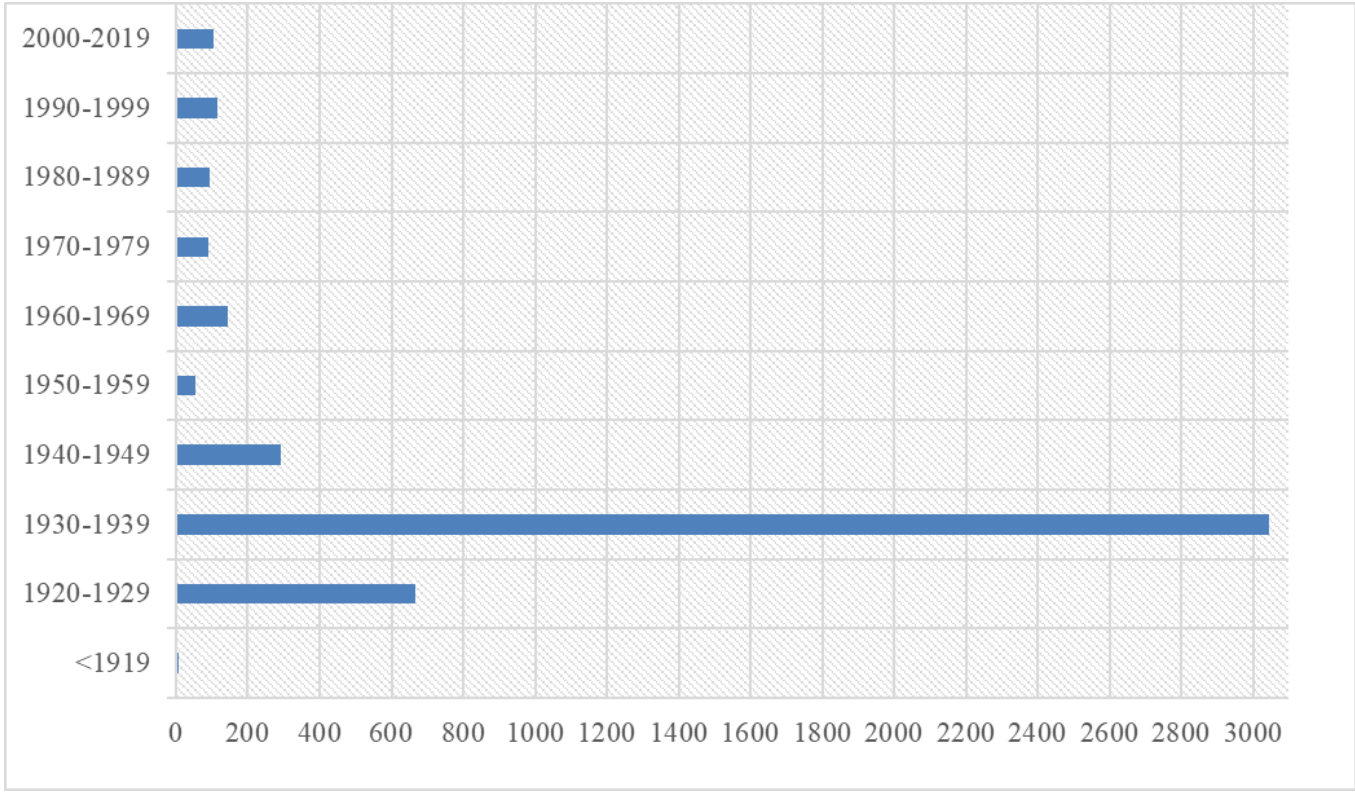

Figure 2. Collecting years according to the specimens labels.

[Mammadova, 2013], Salimov [Salimov, 2018] and etc. during the in subsequent periods.

On the other hand, during a large period of time, between 1970 and 2018, the number of specimens has been declined. Therefore, herbarium collection related to those years covers less than 650 specimens.

It should be noted that increasing further collection of specimens will provide baseline: 1) to clarify the uncertain taxonomic status of species within genera; 2) to extend study based on morphological-floral characters and molecular studies for phylogenetic relationships at subfamilial and subgeneric levels; 3) to improve the accessibility of this data for conservation purposes.

The herbarium specimens recorded from Azerbaijan have been evaluated from published data through GBIF (1205 specimens) and The Global Plants database (40 type specimens) provide quantitative analysis of Lamiaceae species. They also focus on overall taxonomic diversity and nomenclature updates of Azerbaijan vascular plants.

Overall taxonomic diversity within the Lamiace of the flora of Azerbaijan. According to the VII volume Flora of Azerbaijan 36 genera (including 2 cultivated ones) and 208 native species of Lamiaceae were described for Azerbaijan [Isayev et al. 1957]. *Rosmarinus* L. and *Ocimum* L. were recorded as introduced and/or cultivated genera. Later on, a number of researchers have studied various genera of the family, but there were not taxonomic analysis and nomenclature updates of the family itself.

Almost the last thirty years, various taxonomic studies including nomenclature updates of Lamiaceae for Azerbaijan have been provided by different authors (Table 1). In 1992, Y. Menitsky compiled a synopsis related to Lamiaceae family from the Caucasus. Here, he indicated that the 33 genera and nearly 210 taxa are distributed across the floristic regions of the Caucasus (Eastern Caucasus, Eastern, and Southern Transcaucasia, and Talysh) where the Azerbaijan territories are also included. Later, A. Asgarov reviewed the taxonomic composition of the family based on the Flora of Azerbaijan, Y. Menitsky's [Menitsky, 1992] works. However, it would be appropriate to note that, while compiling this list, it did not propose a substantial nomenclature change in the rank of the genus level of the family in accordance with latest modern approaches. On the other hand, according to his studies, he revealed a total of 220 species under 37 genera of which 8 species of 5 genera are introduced and/or cultivated.

Based on studies and collections, taxonomic and floristic novelties published after the first edition of Flora Azerbaijan [Isayev et al. 1957], and also a revision of the digital specimens of the Lamiaceae species which are collected from Azerbaijan is available in GBIF and Jstore Global Plants are considered here. However, they will be a subject to prospective comprehensive systematical researches within genera and intraspecies taxa of the Lamiaceae. The new taxa were added to the VII volume are shown in the following (The asterisk (*) indicates an introduced and/or cultivated taxa):

1. *Ballota grisea* Pojark.
2. *Betonica nivea* Steven subsp. *nivea*
3. *Clinopodium menthifolium* (Host) Stace
4. *Clinopodium nepeta* (L.) Kuntze
5. *Galeopsis ladanum* L.
6. *Lamium album* L. subsp. *album*
7. *Lamium album* subsp. *crinitum* (Montbret & Aucher ex Benth.) Mennema
8. *Lamium caucasicum* Grossh.
9. *Lamium macrodon* Boiss. & A.Huet
10. *Lavandula angustifolia* Mill.*
11. *Lavandula latifolia* Medik.
12. *Leonurus glaucescens* Bunge
13. *Leonurus quinquelobatus* Gilib.
14. *Marrubium astracanicum* Jacq.
15. *Mentha spicata* L.
16. *Nepeta alaghezi* Pojark.
17. *Nepeta micrantha* Bunge
18. *Nepeta racemosa* Lam. subsp. *racemosa*
19. *Nepeta ucranica* subsp. *parviflora* (M.Bieb.) M. Masclans
20. *Nepeta teucriifolia* Willd.
21. *Origanum majorana* L.*
22. *Perilla frutescens* (L.) Britton
23. *Salvia alexeenkoi* Pobed.
24. *Salvia beckeri* Trautv.
25. *Salvia brachyantha* (Bordz.) Pobed.
26. *Salvia fominii* Grossh.
27. *Salvia golneviana* Rzazade
28. *Salvia hajastana* Pobed.
29. *Salvia kuznetzovii* Sosn.
30. *Salvia nemorosa* L.
31. *Salvia reuteriana* Boiss.
32. *Salvia splendens* Sellow ex Nees*
33. *Salvia vergeduzica* Rzazade
34. *Satureja borissovae* Zein.
35. *Satureja hortensis* L.
36. *Scutellaria zivari* Akhmed-Zade
37. *Stachys cretica* L. subsp. *cretica*
38. *Stachys recta* L.

Table 1. Comparison of the taxonomic studies of Lamiaceae by different authors.

Flora of Azerbaijan (1957)	Menitsky Yu. L. (1992)	Asgarov A. (2016)	Salimov et. al (2018)
Ajuga L.	*Ajuga* L.	*Ajuga* L.	*Ajuga* L.
Teucrium L.	*Teucrium* L.	*Teucrium* L.	*Teucrium* L.
**Rosmarinus* L.		**Rosmarinus* L.	
Scutellaria L.	*Scutellaria* L.	*Scutellaria* L.	*Scutellaria* L.
Marrubium L.	*Marrubium* L.	*Marrubium* L.	*Marrubium* L.
Sideritis L.	*Sideritis* L.	*Sideritis* L.	*Sideritis* L.
Nepeta L.	*Nepeta* L.	*Nepeta* L.	*Nepeta* L.
Glechoma L.	*Glechoma* L.	*Glechoma* L.	*Glechoma* L.
Dracocephalum L.	*Dracocephalum* L.	*Dracocephalum* L.	*Dracocephalum* L.
Lallemantia F. et M.	*Lallemantia* Fisch. et Mey.	*Lallemantia* Fisch. et Mey.	*Lallemantia* Fisch. et Mey.
Hymenocrater F.et M.	*Hymenocrater* Fisch. et Mey.	*Hymenocrater* Fisch. et Mey.	*Hymenocrater* Fisch. et Mey.
Prunella L.	*Prunella* L.	*Prunella* L.	*Prunella* L.
Eremostachys Bge.	*Eremostachys* Bunge	*Eremostachys* Bunge	
		Phlomoides Moench	*Phlomoides* Moench
Phlomis L.	*Phlomis* L.	*Phlomis* L.	*Phlomis* L.
Galeopsis L.	*Galeopsis* L.	*Galeopsis* L.	*Galeopsis* L.
Lamium L.	*Lamium* L.	*Lamium* L.	*Lamium* L.
Galeobdolon Adans.		*Galeobdolon* Adans.	
Chaiturus Willd.		*Chaiturus* Willd.	*Chaiturus* Willd.
Leonurus L.	*Leonurus* L.	*Leonurus* L.	*Leonurus* L.
Lagochilus Bge.	*Lagochilus* Bunge	*Lagochilus* Bunge	*Lagochilus* Bunge
Molucella L.	*Molucella* L.	*Molucella* L.	*Molucella* L.
Ballota L.	*Ballota* L.	*Ballota* L.	*Ballota* L.
Stachys L.	*Stachys* L.	*Stachys* L.	*Stachys* L.
Betonica L.	*Betonica* L.	*Betonica* L.	*Betonica* L.
Salvia L.	*Salvia* L.	*Salvia* L.	*Salvia* L.
Schraderia Medik.			
Ziziphora L.	*Ziziphora* L.	*Ziziphora* L.	*Ziziphora* L.
Melissa L.	*Melissa* L.	*Melissa* L.	*Melissa* L.
Satureja L.	*Satureja* L.	*Satureja* L.	*Satureja* L.
	Micromeria Benth.		
Calamintha L.	*Calamintha* L.	*Calamintha* L.	
		Antonina Vved.	
			Drymosiphon Melnikov
Clinipodium L.	*Clinipodium* L.	*Clinipodium* L.	*Clinipodium* L.
Acinos Moench	*Acinos* Moench	*Acinos* Mill.	
Hyssopus L.	*Hyssopus* L.	*Hyssopus* L.	*Hyssopus* L.
Origanum L.	*Origanum* L.	*Origanum* L.	*Origanum* L.
		**Majorana* Hill.	
Thymus L.	*Thymus* L.	*Thymus* L.	*Thymus* L.
Lycopus L.	*Lycopus* L.	*Lycopus* L.	*Lycopus* L.
Mentha L.	*Mentha* L.	*Mentha* L.	*Mentha* L.
**Ocimum* L.			**Ocimum* L.
		**Perilla* L.	*Perilla* L.
		**Lavandula* L.	*Lavandula* L.
			Vitex L.

Note: * indicates the genus with introduced and/or cultivated taxa

39. *Teucrium chamaedrys* L. subsp. *chamaedrys*
40. *Teucrium chamaedrys* subsp. *nuchense* (K.Koch) Rech.f.
41. *Teucrium chamaedrys* subsp. *trapezunticum* Rech.f.
42. *Thymus daghestanicus* Klokov & Des.-Shost.
43. *Thymus pallasianus* Heinr.Braun
44. *Thymus pastoralis* Iljin
45. *Ziziphora brantii* K.Koch
46. *Ziziphora raddei* Juz.

The studies by Cantino [1992] and a molecular phylogenetic analysis based on molecular data of cpDNA sequences did not provide sufficient support for relationships of Lamiaceae and Verbenaceae which concluded that the position of Lamiaceae is distinct from Verbenaceae [Cantino 1992; Wagstaff et al. 1998; Schäferhoff et al. 2010]. According to the latest classification and a large-scale phylogenetic reconstruction of Lamiaceae (Labiatae) in the last decades [Harley et al. 2004; Li et al. 2016], the family is represented by five subfamilies in the flora of Azerbaijan. The composition of each subfamily is updated at tribal and subtribal ranks:

I. Subfamily Ajugoideae Kostel

Ajuga L., *Teucrium* L.

II. Subfamily Scutellarioideae (Dumort.) Caruel

Scutellaria L.

III. Subfamily Lamioideae Harley

Tribe: *Stachydeae* - *Sideritis* L., *Stachys* L.
Tribe: *Phlomideae* - *Phlomis* L., *Phlomoides* Moench
Tribe: *Leonureae* - *Chaiturus* Ehrh. ex Willd., *Lagochilus* Bunge ex Benth., *Leonurus* L.
Tribe: *Marrubieae* - *Ballota* L., *Marrubium* L., *Moluccella* L.
Tribe: *Lamieae* - *Lamium* L.
Incertae Sedis – genera unassigned or of uncertain placement
Betonica L., *Galeopsis* L.

IV. Subfamily Nepetoideae (Dumort.) Luerss.

Tribe: *Mentheae*
Subtribe: *Salviinae* (Dumort.) Endl.- *Salvia* L.
Subtribe: *Menthinae* (Dumort.) Endl.
Thymus L., *Clinopodium* L., *Hyssopus* L., Lycopus L., *Mentha* L., *Origanum* L., *Satureja* L., *Prunella* L., *Ziziphora* L., *Drymosiphon* Melnikov
Incertae Sedis – genera unassigned or of uncertain placement
Melissa L.
Subtribe: *Nepetinae* (Dumort.) Coss. & Germ. - *Dracocephalum* L., *Glechoma* L., *Nepeta* L., *Hymonacrater* Fisch. & C.A.Mey, *Lallemantia* Fisch. & C.A.Mey
Tribe: *Ocimeae* Dumort.
Subtribe: *Lavandulinae* Endl.- *Lavandula* L.
Subtribe: *Ociminae* (Dumort.) Schmidt - *Ocimum* L.
Tribe: *Elsholtzieae* (Burnett) Sanders & Cantino - *Perilla* L.

V. Subfamily Viticoideae Briq.

Vitex L.

This study represents the comprehensive nomenclatural update of Lamiaceae species in Azerbaijan to date. Along with these changes analysis the herbarium specimens to built up priorities for further taxonomical researches with the implication of phylogenetic and phytogeographic aspects.

Regarding this, we started to generate the first overall molecular data set of the genus *Scutellaria* L. based on cpDNA and including a thorough sampling of species from Azerbaijan and adjacent countries [Salimov et al. 2018]. The result of this study will shed new light towards resolving classification and species delimitation particularly "*S. orientalis*"- species groups.

Although there are several molecular phylogenetic studies related to the family Lamiaceae and subfamily Lamioideae [Bendiksby 2011; Mathiesen et al. 2011; Salmaki et al. 2012, 2013] there is still unassigned placement for *Betonica* and *Galeopsis* in the updated tribal classification. Therefore all taxon names in our study follow World Checklist of Lamiaceae except for species *Betonica*. Besides this, the studies Salmaki et al. [Salmaki et al. 2012] supports to include *Eremostachys* and *Phlomoides* in one genus, named *Phlomoides*. In addition, we accept these molecular findings and along with this approach, we have also noted all *Eremostachys* species as a synonymy for *Phlomoides* species respectively. Although numerous phylogenetic researches [Brauchler et al. 2010; Will, Bockhoff, 2017] within tribes and/or subfamily Nepetoideae, there are some controversial issues regarding with their taxonomy. Nepetoideae is the biggest subfamily of Lamiaceae in the flora of Azerbaijan with 110 species (nearly half of the family) of which 10 are endemics.

Species of *Acinos* are all transferred and now regarded as part of *Clinopodium*, that is also considered and accepted by us. However, there is taxonomic confusion on morphological characters due to high-level polymorphism which questioning either the inclusion

of *Acinos* in *Clinopodium* or generic distinctness of *Ziziphora*.

M. Will and R. Claßen-Bockhoff [Will, Claßen-Bockhoff., 2017] proposed to divide *Salvia s.l.* which is one of the largest genera of the family, into four clades and/or possible future genera in accordance with molecular and morphological data. On the other hand, Drew et al. [Drew et al. 2017 based upon their phylogenetic results, as well as previous phylogenetic studies, taxonomic, morphological, and practical considerations, conclude that it would be the best work for maintaining a broadly defined *Salvia*, including the five small embedded genera, and also *Rosmarinus* as *Salvia* species. Therefore, the generic and specific delimitation of some taxon needs further research. So, we adequately accept this approach. It should be noted that the comprehensive molecular studies supported with selected morphological characters would be an important step towards understanding their taxonomy.

As a result of checking the specimens via virtual herbarium we determined that there exist some species (*Thymus pallasianus* Heinr. Braun, *Ziziphora raddei* Juz. and etc.) which were collected from Azerbaijan. Moreover, it is advisable to include them into the list.

According to the most recent classification, a new monotypic genus *Drymosiphon* Melnikov is revealed within subfamily Nepetoideae of the Lamiaceae in Azerbaijan. And also in the context with the latest taxonomic reconstructions *Vitex* L. from Verbenaceae Juss. is transferred into subfamily Viticoideae Briqone within the Lamiaceae.

After current nomenclature updates, the family Lamiaceae comprises 204 species (native, introduced and/or cultivated) and 37 subspecies, representing 37 genera, belonging to 5 subfamilies. It is determined, so far, that more 70-75 species names included as synonyms. The list of Lamiaceae species in Azerbaijan flora based on nomenclatural updates are shown in the following. Square brackets ([]) are used to denote the synonyms of accepted names:

I. Subfamily Ajugoideae Kostel (1834)

1. *Ajuga* L. - Sp. Pl. 2: 561 (1753); Gen. Pl. ed. 5: 246 (1754). *Chamaepitys* Hill (1756) (40-50)
Ajuga chamaecistus Ging. ex Benth.
Ajuga chamaepitys subsp. *chia* (Schreb.) Arcang. [= *A. pseudochia* Des.-Shost., *A. glabra, A. chia*]
Ajuga genevensis L.
Ajuga oblongata M.Bieb.
Ajuga orientalis L.
Ajuga reptans L.

2. *Teucrium* L. - Sp. Pl. 2: 562 (1753); Gen. Pl. ed. 5: 247 (1754). *Melosmon* Raf. (1837). Kinostemon Kudo (1929)
Teucrium canum Fisch. & C.A.Mey.
Teucrium chamaedrys L.
Teucrium chamaedrys L. subsp. *chamaedrys*
Teucrium chamaedrys var. *multinodum* Bordz.
Teucrium chamaedrys subsp. *nuchense* (K. Koch) Rech. f. [= *T. nuchense* K.Koch]
Teucrium chamaedrys subsp. *trapezunticum* Rech. f. [= *T. trapezunticum* (Rech. f.) Juz.]
Teucrium hircanicum L.
Teucrium orientale L.
Teucrium orientale subsp. *taylorii* (Boiss.) Rech. f. [= *T. taylorii* Boiss., *T. taylorii* subsp. *muticum* Menitsky]
Teucrium parviflorum Schreb.
Teucrium polium L.
Teucrium scordium L.
Teucrium scordium subsp. *scordioides* (Schreb.) Arcang. [= *T. scordioides* Schreb.]

II. Subfamily Scutellarioideae Prantl (1880)

3. *Scutellaria* L. - Sp. Pl. 2: 598 (1753); Gen. Pl. ed. 5: 260 (1754). Paton A., Kew Bull. 45: 399 – 450 (1990), rev.
Scutellaria altissima L.
Scutellaria araxensis Grossh.
Scutellaria daghestanica Grossh.
Scutellaria darriensis Grossh.
Scutellaria galericulata L.
Scutellaria grossheimiana Juz.
Scutellaria karjaginii Grossh.
Scutellaria oreophila Grossh.
Scutellaria orientalis L.
Scutellaria platystegia Juz.
Scutellaria prilipkoana Grossh.
Scutellaria rhomboidalis Grossh.
Scutellaria sedelmeyerae Juz.
Scutellaria sevanensis Sosn. ex Grossh.
Scutellaria tournefortii Benth.
Scutellaria zivari Akhmed-Zade

III. Subfamily Lamioideae Harley (2003)

4. *Sideritis* L. - Sp. Pl. 2: 574 (1753); Pérez de Paz & Negrin, Phanerog. Monogr. 20: 1–327, plates 1–22 + 48 figs. (1992), rev. of subg.; Obón de Castro & Rivera, Phanerog. Monogr. 21: 1–640 (1994), rev. of section. Leucophae Webb & Berthel. (1845).
Sideritis montana L.

Sideritis montana L. subsp. *montana*
[= *Sideritis comosa* (Rochel ex Benth.) Stankov]
5. *Stachys* L.- Sp. Pl. 2: 580 (1753); *Stachys* L., Sp. Pl. 2: 580 (1753); Bhattacharjee, Notes Roy. Bot. Gard. Edinburgh 38: 65–96 (1980); excl. Betonica L. (1753)
Stachys annua (L.) L.
Stachys annua (L.) L. subsp. *annua*
[= *Stachys pubescens* Ten.]
Stachys atherocalyx K.Koch
Stachys balansae Boiss. & Kotschy
Stachys byzantina K.Koch [= *S. lanata* Jacq.]
Stachys cretica L.
Stachys cretica L. subsp. *cretica* [= *S. velata* Klokov]
Stachys fominii Sosn. ex Grossh.
Stachys fruticulosa M.Bieb. [= *S. grossheimii* Kapeller, *S. fruticulosa* subsp. *grossheimii* (Kapeller) Menitsky, *S. araxina* Kopell.]
Stachys germanica L.
Stachys iberica M.Bieb.
Stachys inflata Benth.
Stachys inflata Benth. subsp. *inflata*
Stachys inflata subsp. *caucasica* (Stschegl.) Takht.
[= *S. schtschegleevii* Sosn. ex Grossh.]
Stachys intermedia Aiton
Stachys lavandulifolia Vahl [= *S. boissieri* Kapeller, *S. zuvandica* Rzazade]
Stachys palustris L.
Stachys pauli Grossh.
Stachys persica S.G.Gmel. ex C.A.Mey.
Stachys recta L.
Stachys setifera C.A.Mey.
Stachys spectabilis Choisy ex DC.
Stachys sylvatica L.
Stachys talyschensis Kapeller
Stachys woronowii (Schischk. ex Grossh.) R.R.Mill
[= *Sideritis balansae* Boiss.]
6. *Phlomis* L. - Sp. Pl. 2: 584 (1753); Trambis Raf. (1837); excl. Phlomoides Moench (1794).
Phlomis cancellata Bunge
Phlomis herba-venti subsp. *lenkoranica* (Knorring) Rech.f. [= *P. lenkoranica* Knorring]
Phlomis herba-venti subsp. *pungens* (Willd.) Maire ex De Filipps [= *P. pungens* Willd., *P. pseudopuogens* Knorring]
Phlomis orientalis Mill. [= *Phlomis caucasica* Rech.f.]
Phlomis tuberosa L. [= *Phlomoides tuberosa* (L.) Moench]
7. *Phlomoides* Moench - Methodus: 403 (1794). incl. Eremostachys Bunge; Phlomis L. p.p.
Phlomoides laciniata (L.) Kamelin & Makhm.
[= Eremostachys laciniata (L.) Bunge, *E. iberica* Vis.]
Phlomoides molucelloides (Bunge) Salmaki
[= *Eremostachys mollucelloides* Bunge*,*
E. macrophylla Montbret & Aucher ex Benth.]
8. *Chaiturus* Ehrh. ex Willd. - Fl. Berol. Prodr. 200 (1787);
56 (1). *Chaiturus marrubiastrum* (L.) Ehrh. ex Rchb.
[= *Leonurus marrubiastrum* L.]
9**. *Lagochilus* Bunge ex Benth.**, Labiat. Gen. Spec.: 640 (1834). *Chlainanthus* Briq. in Engler & Prantl (1896). *Lagochilopsis* Knorring (1966).
Lagochilus cabulicus Benth.
10. *Leonurus* L. - Sp. Pl. 2: 584 (1753); Krestovskaja, Novost. Sist. Vysch. Rast. 26: 142–149 (1989) & 27: 139–144 (1990), rev. *Cardiaca* Mill. (1754).
Leonurus cardiaca L.
Leonurus glaucescens Bunge
Leonurus quinquelobatus Gilib.
11. *Ballota* L. - Sp. Pl. 2: 582 (1753); Patzak, Ann. Nat. Hist. Mus. Wien 62: 57–86 (1958), rev. of section; Ann. Nat. Hist. Mus. Wien 63: 33–81 (1959), rev. of sections
Ballota grisea Pojark.
Ballota nigra L.
12. *Marrubium* L. - Sp. Pl. 2: 582 (1753);
Marrubium astracanicum Jacq.
Marrubium astracanicum Jacq. subsp. *astracanicum*
[=*M. goktschaicum* Popov, *M. purpureum* Bunge]
Marrubium catariifolium Desr.
Marrubium leonuroides Desr.
Marrubium parviflorum Fisch. & C.A.Mey.
Marrubium persicum C.A.Mey.
Marrubium plumosum C.A.Mey.
Marrubium propinquum Fisch. & C.A.Mey. [= *M. nanum* Knorring]
Marrubium vulgare L.
13. *Moluccella* L. - Sp. Pl. 2: 587 (1753);
Moluccella laevis L.
14. *Lamium* L. - Sp. Pl. 2: 579 (1753); Mennema, Leiden Bot. Ser. 11: 1–196 (1989), rev. *Orvala* L. (1753). *Lamiastrum* Heist. ex Fabr. (1759). *Galeobdolon* Adans., Fam. (1763), nom. superfl. Polichia Schrank (1781), non Pollichia Aiton. Wiedemannia Fisch. & C.A.Mey. (1838)
Lamium album L.
Lamium album L. subsp. *album*. [= *L. hyrcanicum* A.P. Khokhr., *L. album* subsp. *hyrcanicum* (A.P.Khokhr.)Menitsky, *L. album* subsp. *transcaucasicum* (A.P.Khokhr.) Menitsky]

Lamium album subsp. *crinitum* (Montbret & Aucher ex Benth.) Mennema [= *L. crinitum* Montbret & Aucher ex Benth.]
Lamium amplexicaule L.
Lamium caucasicum Grossh.
Lamium galeobdolon subsp. *galeobdolon*. [= *Galeobdolon luteum* Huds.]
Lamium macrodon Boiss. & A.Huet [= *L. ordubadicum* Grossh.]
Lamium maculatum (L.) L. [= *L. gundelsheimeri* K.Koch]
Lamium purpureum L.
Lamium tomentosum Willd.

Genera unassigned or of uncertain placement
15. *Betonica* L. - Sp. Pl.: 573 (1753); Stachys L. p.p.
Betonica macrantha K.Koch [= *Betonica grandiflora* Stephan ex Willd., *Stachys macrantha* (K.Koch) Stearn]
Betonica orientalis L. [= *Stachys macrostachys* (Wender.) Briq.]
Betonica nivea Steven
Betonica nivea subsp. *nivea*. [= *Stachys discolor* Benth.]
Betonica officinalis L. [= *Stachys officinalis* (L.) Trevis.]
16. *Galeopsis* L. - Sp. Pl. 2: 579 (1753); Briq., Mem. Cour. Acad. Roy. Sci. Belg. 52: 1 (1893), rev.; Müntzing, Hereditas 13: 185–341 (1930), reg. rev. Cannabinastrum Heist. ex Fabr. (1759), nom nud.? Tetrahit Moench (1795) non Gérard. Ladanum Kuntze (1891) non Spach. Dalanum Dostál (1984).
Galeopsis bifida Boenn. [= *Galeopsis tetrahit* subsp. *bifida* (Boenn.) Nyman]
Galeopsis ladanum L.

IV. Subfamily Nepetoideae Kostel., Allg. Med.-Pharm. Fl. 3: 752.
17. *Salvia* L. - Sp. Pl. 1: 23 (1753); Benth., Lab. Gen. et Sp.: 190 (1833); Epling, Ann. Missouri Bot. Gard. 25, 1: 95–188 (1938), reg. rev.; Epling, Rep. Spec. Nov. Beih. 110: 1–383 (1938–1939), reg. rev.; Hedge, Notes Roy. Bot. Gard. Edinburgh 33: 1–121 (1974), reg. rev.; Hedge in Davis (ed.) Flora of Turkey 7: 400–461 (1982), reg. rev. Schraderia Medik. (1791), nom. rejec. Audibertia Benth. (1832) non Audibertia Benth. (1829). Salviastrum Scheele (1849). Polakia Stapf (1885). Ramona Greene (1892). Pycnosphace Rydb. (1918). Arischrada Pobed. (1972).
Salvia aethiopis L.
Salvia alexeenkoi Pobed.
Salvia andreji Pobed.
Salvia beckeri Trautv.
Salvia brachyantha (Bordz.) Pobed.
Salvia ceratophylla L.
Salvia fominii Grossh.
Salvia garedjii Troitsky
Salvia glutinosa L.
Salvia golneviana Rzazade
Salvia grossheimii Sosn.
Salvia hajastana Pobed.
Salvia hydrangea DC. ex Benth. [= *S. dracocephaloides Boiss.*, *Schraderia dracocephaloides* (Boiss.) Pobed.]
Salvia karabachensis Pobed.
Salvia kuznetzovii Sosn. [= *S. pratensis* var. *caucasica* Kusn.]
Salvia limbata C.A.Mey.
Salvia macrosiphon Boiss. [= *S. nachiczevanica* Pobed.]
Salvia nemorosa L.
Salvia nemorosa subsp. *pseudosylvestris* (Stapf Bornm. [= *S. tesquicola* Klokov & Pobed.]
**Salvia officinalis* L.
Salvia pachystachya Trautv.
Salvia prilipkoana Grossh. & Sosn.
Salvia reuteriana Boiss.
**Salvia rosmarinus* Spenn. [= *Rosmarinus officinalis* L.]
Salvia sclarea L.
Salvia spinosa L.
**Salvia splendens* Sellow ex Nees
Salvia staminea Montbret & Aucher ex Benth. [= *S. armeniaca* (Bordz.) Grossh., *S. transcaucasica* Pobed.]
Salvia suffruticosa Montbret & Aucher ex Benth. [= *S. alexandri* Pobed.]
Salvia syriaca L.
Salvia verbascifolia M.Bieb.
Salvia verbenaca L.
Salvia vergeduzica Rzazade
Salvia verticillata L.
Salvia verticillata subsp. *amasiaca* (Freyn & Bornm.) Bornm. [= *S. amasiaca* Freyn & Bornm.]
Salvia virgata Jacq. [= *S. sibthorpii* Sm.]
Salvia viridis L.
Salvia xanthocheila Boiss. ex Benth.
18. *Clinopodium* L. - Sp. Pl. 2: 587 (1753); incl. Acinos Mill., Gard. Dict. Abr. ed. 4: s.p. (1754), Calamintha Mill., Gard. Dict. Abr. ed. 4: s.p. (1754).

Clinopodium acinos (L.) Kuntze [= *Acinos arvensis* (Lam.) Dandy, *A. thymoides* Moench]
Clinopodium debile (Bunge) Kuntze [= *Calamintha debilis* (Bunge) Benth.]
Clinopodium graveolens (M.Bieb.) Kuntze [= *Acinos graveolens* (M.Bieb.) Link]
Clinopodium menthifolium (Host) Stace [= *Calamintha menthifolia* Host]
Clinopodium nepeta (L.) Kuntze [= *Calamintha nepeta* (L.) Savi]
Clinopodium nepeta subsp. *spruneri* (Boiss.) Bartolucci & F.Conti [= *Calamintha officinalis* Moench]
Clinopodium umbrosum (M.Bieb.) K.Koch
Clinopodium vulgare L.
19. *Drymosiphon* Melnikov - Novosti Sist. Vyssh. Rast. 46: 178 (2015).
Drymosiphon grandiflorus (L.) Melnikov [= *Calamintha grandiflora* (L.) Moench, *Clinopodium grandiflorum* (L.) Kuntze]
20. *Hyssopus* L. - Sp. Pl. 2: 569 (1753);
Hyssopus officinalis L.
Hyssopus officinalis L. subsp. *officinalis* [= *H. angustifolius* M.Bieb.]
21. *Lycopus* L.- Sp.Pl.1:21(1753); L.Gen.Pl.ed.5:12 (1754); Henderson, Am. Midl. Nat. 68: 95–138 (1962), rev.
Lycopus europaeus L.
Lycopus exaltatus L.f.
22. *Mentha* L. - Sp. Pl. 2: 576 (1753); Harley, Flora Europaea 3: 183–186 (1972), reg. rev.; Harley, in P.H. Davis (ed.) Flora of Turkey 7: 384–394 (1982), reg. rev. Pulegium Mill. (1753). Preslia Opiz (1824).
Mentha aquatica L.
Mentha longifolia (L.) L.
Mentha × *piperita* L.
Mentha pulegium L.
Mentha spicata L.
23. *Origanum* L. - Sp. Pl. 2: 588 (1753); Ietswaart, Leiden Bot. Ser. 4: 1–153 (1980), rev. Majorana Mill. (1754). Amaracus Hill (1756). Dictamnus Hill. (1756).
* *Origanum majorana* L.
[= Majorana hortensis Moench]
Origanum vulgare L.
24. *Satureja* L. - Sp. Pl. 2: 567 (1753); Doroszenko, Doct. Thesis, Edinburgh University: 175–205 (1985), rev. Euhesperida Brullo & Furnari (1979).
Satureja borissovae Zein.
Satureja hortensis L. [= *S. zuvandica* D.A.Kapan., *S. densiflora* Zein.]
Satureja intermedia C.A.Mey.
Satureja laxiflora K.Koch
Satureja macrantha C.A.Mey.
Satureja mutica Fisch. & C.A.Mey. [= *S. confinis* Boriss.]
Satureja spicigera (K.Koch) Boiss.
25. *Thymus* L. - Sp. Pl. 2: 590 (1753); Jalas & Kaleva, Feddes Rep. 81: 93–106 (1970); Jalas, Bot J. Linn. Soc. 64: 247–271 (1971), reg. rev.; Morales, Ruizia 3: 1–324 (1986), reg. rev.
Thymus collinus M.Bieb.
Thymus coriifolius Ronniger
Thymus daghestanicus Klokov & Des.-Shost. [= *Th. shemachensis* Klokov, *Th. hadzhievii* Grossh.]
Thymus desjatovae Ronniger
Thymus fedtschenkoi Ronniger [= *Th. kjapazi* Grossh.]
Thymus karamarianicus Klokov & Des.-Shost.
Thymus karjaginii Grossh.
Thymus kotschyanus Boiss. & Hohen. [= *Th. eriophorus* Ronniger]
Thymus migricus Klokov & Des.-Shost.
Thymus nummularius M.Bieb.
Thymus pallasianus Heinr.Braun
Thymus pastoralis Iljin
Thymus praecox subsp. *grossheimii* (Ronniger) Jalas [= *Th. grossheimii* Ronniger]
Th. praecox subsp. *caucasicus* (Willd. ex Ronniger) Jalas [= *Th. caucasicus* Willd. ex Ronniger, *Th. praecox* var. *medvedewii* (Ronniger) Jalas]
Thymus sipyleus Boiss. [= *Th. rariflorus* K.Koch]
Thymus tiflisiensis Klokov & Des.-Shost. [=*Th. klokovii* (Ronniger) Des. -Shost]
Thymus transcaucasicus Ronniger [=*Th. fominii* Klokov & Des.-Shost., *Th. ziaratinus* Klokov & Des.-Shost]
Thymus trautvetteri Klokov & Des.-Shost.
26. *Prunella* L. - Sp. Pl. 2: 600 (1753);
Prunella grandiflora (L.) Turra
Prunella laciniata (L.) L.
Prunella vulgaris L.
27. *Ziziphora* L. - Sp. Pl. 1: 21 (1753);
Ziziphora brantii K.Koch
Ziziphora capitata L.
Ziziphora clinopodioides subsp. *clinopodioides* [= *Z. denticulata* Juz., *Z. serpyllacea* M.Bieb.]
Ziziphora clinopodioides subsp. *pseudodasyantha* (Rech.f.) Rech.f.[= *Z. biebersteiniana* (Grossh.) Grossh.]
Ziziphora clinopodioides subsp. *rigida* (Boiss.) Rech.f. [= *Z. rigida* (Boiss.) Heinr.Braun]

Ziziphora persica Bunge
Ziziphora puschkinii Adams
Ziziphora raddei Juz.
Ziziphora tenuior L.
28. *Dracocephalum* L. - Sp. Pl. 2: 594 (1753);
Dracocephalum austriacum L.
Dracocephalum botryoides Steven
Dracocephalum multicaule Montbret & Aucher ex Benth.
Dracocephalum ruyschiana L.
29. *Glechoma* L. - Sp. Pl. 2: 578 (1753);
Glechoma hederacea L.
30. *Hymenocrater* Fisch. & C.A.Mey. – Index Sem. Hort. Bot. Petropol. 2: 39 (1835);
Hymenocrater bituminosus Fisch. & C.A.Mey.
31. *Lallemantia* Fisch. & C.A. Mey. – Index Sem. Hort. Bot. Petropol. 6: 52 (1839);
Lallemantia canescens (L.) Fisch. & C.A.Mey.
Lallemantia iberica (M.Bieb.) Fisch. & C.A.Mey.
Lallemantia peltata (L.) Fisch. & C.A.Mey.
Lallemantia royleana (Benth.) Benth.
32. *Nepeta* L. - Sp. Pl. 2: 570 (1753);
Nepeta alaghezi Pojark.
Nepeta amoena Stapf
Nepeta betonicifolia C.A.Mey.
Nepeta betonicifolia C.A.Mey. subsp. *betonicifolia* [= *N. grossheimii* Pojark., *N. somkhetica* Kapeller]
Nepeta betonicifolia subsp. *strictifolia* (Pojark.) Menitsky [= *N. buhsei* Pojark., *N. speciosa* Boiss. & Noë, *N. strictifolia* Pojark.]
Nepeta cataria L.
Nepeta congesta Fisch. & C.A.Mey. [= *N. erivanensis* Grossh.]
Nepeta cyanea Steven
Nepeta grandiflora M.Bieb.
Nepeta lamiifolia Willd.
Nepeta longituba Pojark.
Nepeta meyeri Benth.
Nepeta micrantha Bunge
Nepeta nuda L. subsp. *nuda* [= *N. nawaschinii* Bordz., *N. pannonica* L., *N. sulphurea* K.Koch]
Nepeta racemosa Lam.
Nepeta racemosa subsp. *haussknechtii* (Bornm.) A.L. Budantsev [= *N. noraschenica* Grossh.]
Nepeta racemosa Lam. subsp. *racemosa* [= *N. hajastana* Grossh., *N. mussinii* Spreng. ex Henckel, *N. transcaucasica* Grossh.]
Nepeta sosnovskyi Askerova
Nepeta supina Steven *Nepeta supina* subsp. *buschii* (Sosn. & Manden.) Menitsky [= *N. buschii* Sosn. & Manden.]
Nepeta supina Steven subsp. *supina*
Nepeta teucriifolia Willd.
Nepeta teucriifolia subsp. *daghestanica* (Pojark.) A.L. Budantsev [= *N. daghestanica* Pojark.]
Nepeta teucriifolia Willd. subsp. *teucriifolia* [= *N. fissa* C.A.Mey.]
Nepeta trautvetteri Boiss. & Buhse
Nepeta ucranica L.
Nepeta ucranica subsp. *parviflora* (M.Bieb.) M. Masclans [= *N. parviflora* M.Bieb.]
Nepeta ucranica subsp. *schischkinii* (Pojark.) Rech.f. [= *N. schischkinii* Pojark.]
Nepeta velutina Pojark.
Nepeta zangezura Grossh.
33. *Melissa* L. - Sp. Pl. 2: 592 (1753);
Melissa officinalis L.
34. *Ocimum* L. - Sp. Pl. 2: 597 (1753);
**Ocimum basilicum* L.
35. *Lavandula* L. - Sp. Pl. 2: 572 (1753);
**Lavandula angustifolia* Mill.
**Lavandula latifolia* Medik.
36. *Perilla* L. - Gen. Pl. ed. 6: 578 (1764); Li Hsi-Wen & Hedge, Lamiaceae, in Wu Zheng-yi and Raven (eds.) Flora of China 17: 241–242 (1994), reg. rev.
**Perilla frutescens* (L.) Britton

V. Subfamily Viticoideae Briq. in Engler & Prantl (1895)
37. *Vitex* L.- Sp. Pl. 2: 638 (1753); Munir, J. Adelaide Bot. Gard. 10: 31–80 (1987), reg. rev. Neorapinia Moldenke (1955).
Vitex agnus-castus L.

Taxonomic diversity across the botanical regions of Azerbaijan. Although the species from the family Lamiaceae inhabit and widely distributed mainly in mountain and arid xerophytic vegetation, they are also found in mesophilic plant association of forests and meadows of Azerbaijan.

Ajuga chamaepitys subsp. *chia* (Schreb.) Arcang., *A. genevensis* L., *A. orientalis* L., *Marrubium vulgare* L., *Mentha longifolia* (L.) L., *Salvia viridis* L., *Sideritis montana* L., *Teucrium orientale* L, *T. polium* L., *T. scordium* subsp. *scordioides* (Schreb.) Arcang. and *Ziziphora capitata* L. are distributed in different ecosystems, and in almost all botanical-geographic regions of Azerbaijan.

By comparing different regions of Azerbaijan (Fig.3), it was revealed that the most species-rich and genera-

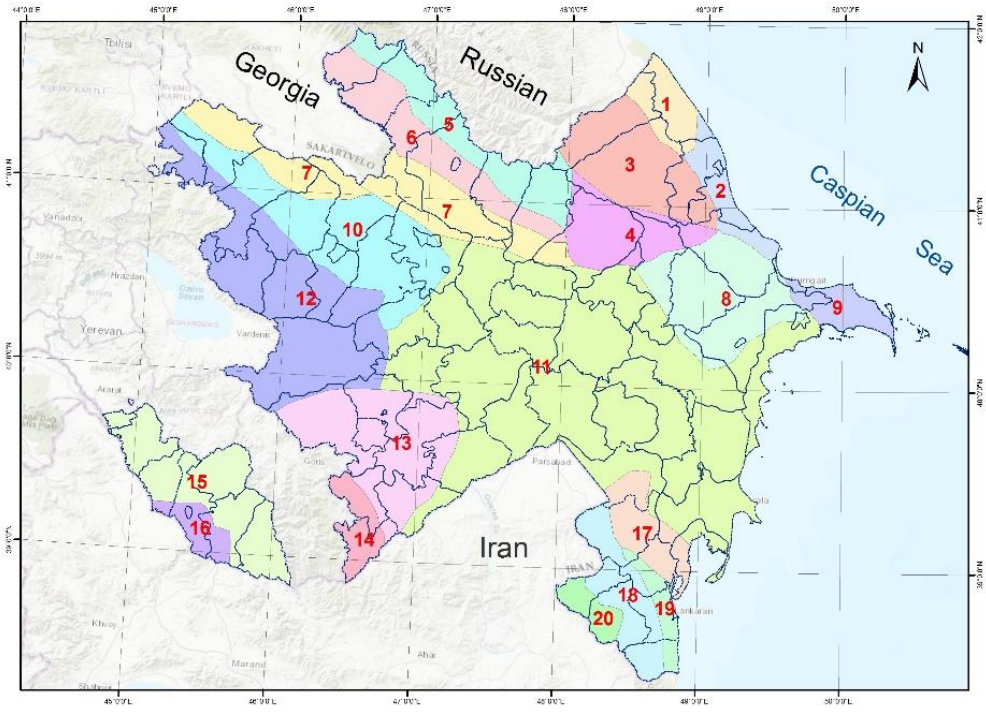

Figure 3. Lamiaceae species in each botanical-geographical regions (20) of Azerbaijan.

Table 2. Numbers (from the most species-rich to the species-poor region) of Lamiaceae species in each botanical-geographical regions of Azerbaijan.

	Botanical-geographical region	Genera	Species and subspecies
15	Mountain part of Nakhchivan	15	62
20	Diabar	21	58
3	Guba part of the Greater Caucasus	14	37
13	Central (AZ) Lesser Caucasus	11	33
4	Eastern (AZ) Greater Caucasus	12	31
18	Mountain part of Lankaran	13	30
12	Northern (AZ) Lesser Caucasus	10	29
10	Kur plain	13	27
14	Southern (AZ) Lesser Caucasus	9	27
7	Bozgir plateau	11	22
5	Western (AZ) Greater Caucasus	11	22
8	Gobustan	11	21
10	Kur-Araz lowlands	9	20
1	Samur-Devechi lowlands	9	17
16	Nakhchivan plain	10	16
9	Absheron	9	15
6	Alazan-Ayrichay valley	8	14
19	Lankaran lowlands	7	14
2	Caspian lowlands	8	12
17	Lankaran-Mugan	7	11

rich regions are Mountain part of Nakhchivan, followed by Diabar, Guba part of the Greater Caucasus, Central (AZ) Lesser Caucasus, Eastern (AZ) Greater Caucasus according to their distribution patterns. However, the most species-poor regions are Caspian lowlands and Lankaran Mugan (Table 2).

Chorological analysis of Lamiaceae species in the Flora of Azerbaijan. According to Hedge [1992] two of the greatest six centers of Lamiaceae diversity are the Mediterranean and SW Central Asia. The majority of species to be found here is belong to genera *Teucrium* (Ajugoideae), *Scutellaria* (Scutellarioideae), *Stachys*, *Lamium* (Lamioideae), *Salvia, Satureja, Thymus, Nepeta* (Nepetoideae). According to the analysis of our updated data, the results support the opinion of Hedge [Hedge, 1992] and Harley et al. [Harley, 2004]. 88 taxa (37%) are in the Irano-Turanian phytogeographic region followed by 42 taxa of Euro-Siberian (18%) and 39 taxa of Caucasian (16%) regions. About 15 % are unknown or multiregional elements in Azerbaijan flora and it could be an object of further comprehensive phylogenetic and biogeographical studies.

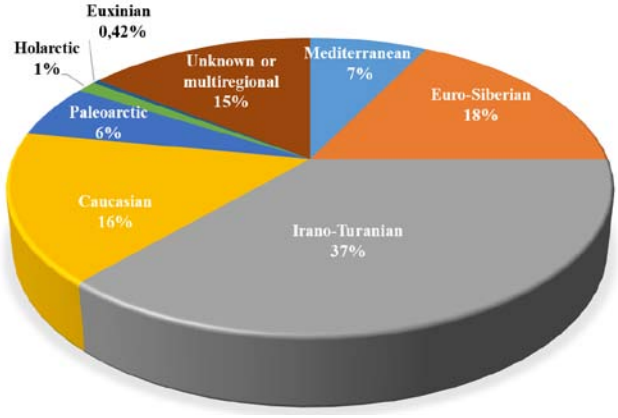

Figure 4. Phytogeoraphical distribution of Lamiaceae species in Azerbaijan.

Rare and endemic species/Conservation and threats. Landscape diversity, that is a combination of various phytogeographical entities and historical development of vegetation, provide Azerbaijan as one of the significant biodiversity hotspots, not only in terms of species number but also in endemism [Solomon et al. 2013].

According to the updated dataset, Lamiaceae family in Azerbaijan comprises 19 taxa (~13% of the total number of taxa in Azerbaijan) (Table 3, Figure 5). These endemic taxa are shown in the following:

1. *Nepeta longituba* Pojark.
2. *Nepeta sosnovskyi* Askerova
3. *Phlomis herba-venti* subsp. *lenkoranica* (Knorring) Rech. f.
4. *Salvia andreji* Pobed.
5. *Salvia golneviana* Rzazade
6. *Salvia suffruticosa* Montbret & Aucher ex Benth.
7. *Salvia vergeduzica* Rzazade
8. *Satureja borissovae* Zein.
9. *Scutellaria darriensis* Grossh.
10. *Scutellaria grossheimiana* Juz.
11. *Scutellaria karjaginii* Grossh.
12. *Scutellaria prilipkoana* Grossh.
13. *Scutellaria rhomboidalis* Grossh.
14. *Stachys fominii* Sosn. ex Grossh.
15. *Stachys pauli* Grossh.
16. *Stachys talyschensis* Kappeler
17. *Thymus karjaginii* Grossh.
18. *Thymus karamarianicus* Klokov & Des.-Shost.
19. *Thymus desjatovae* Ronninger

In accordance with the distribution pattern of Lamiaceae species across the botanical-geographical regions, the highest number of endemic taxa is observed in Mountain part of Nakhchivan and Diabar.

Table 3. The genera of Lamiaceae based on the taxon number in Azerbaijan.

Genera	Taxon number	Endemic taxa number	Endemism ratio based on taxa number (%)
Phlomis	3	1	33.3
Satureja	7	1	14.3
Nepeta	17	2	11.8
Stachys	21	3	14.3
Thymus	16	3	18.8
Salvia	33	4	12.1
Scutellaria	16	5	31.3

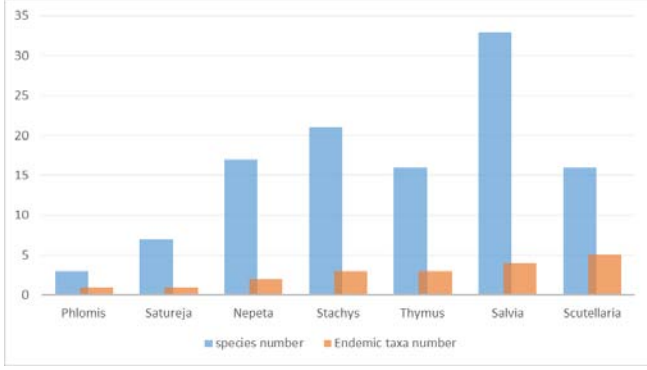

Figure 5. Endemic taxa number as compared with the number of taxa in the genera

Notes on threats and conservation of Lamiaceae species in Azerbaijan. Due to their economic importance, the Lamiaceae species are threatened particularly by anthropogenic impacts in terms of over-harvesting,

Table 4. The threatened Lamiaceae species of Azerbaijan flora.

IUCN categories	Taxa	IUCN categories	Taxa
Critically Endangered (CR)	*Nepeta betonicifolia* C.A.Mey. subsp. *betonicifolia*	Near Threatened (NT)	*Ballota grisea*
	Nepeta longituba		*Nepeta teucrifolia* Willd. subsp. *dagestanica* (Pojark.) A.L.Budantsev
	Nepeta sosnovskyi		*Nepeta ucranica* subsp. *schischkinii* (Pojark.) Rech.f.
Endangered (EN)	*Scutellaria rhomboidalis*		*Phlomis herba-venti* subsp. *lenkoranica*
	Thymus trautvetteri		*Salvia andreji*
	Salvia beckeri		*Scutellaria darriensis*
	Salvia garedji		*Stachys lavandufolia*
Vulnerable (VU)	*Scutellaria prilipkoana*		*Scutellaria darriensis*
	Stachys pauli		*Scutellaria grossheimiana*
	Thymus desjatovae		*Thymus karamarianicus*
	Thymus migricus		*Salvia kuznetzovii*
	Thymus pastoralis		*Stachys inflata* subsp. *caucasica* (Stschegl.) Takht.
Least Concern (LC)	*Stachys fominii*		
	Stachys talyschensis		

habitat loss during recreation works and tourism. It is revealed that 12 taxa are in threatened categories (CR-4, EN-1, and VU-7) and 12 are near threatened (NT) according to IUCN (Table 4) [Solomon et al. 2013]. 7 species are listed in the 2nd edition of Red Book of Azerbaijan [2013]. It should be noted that the regular monitoring activities and studies on a population level will allow more appropriate conservation strategies for Lamiaceae species to be developed.

ACKNOWLEDGMENTS

The authors are grateful to Prof. Dr. Valida Alizada for her valuable comments and research support, and to the staff of the Herbarium Department of the Institute of Botany, ANAS for permission to access to the herbarium specimens.

REFERENCES

Ahmed-zade F.A., Novruzova Z.A. (1980) Novyy vid *Scutellaria zivari* Ahmed-zade sp. nova iz Azerbaydzhana. Doklady akademii nauk Az.SSR. Baku. Elm: 36(8): 83-84. [In Russian]

Ahmed-zade F.A. (1981) About the bio-ecological features and useful value of the skullcaps of the Nakhichevan ASSR. Institute of Botany, ANAS. Baku: Elm, pp 32-34.

Ahmed-zade F.A., Hajiyev V.G. (2003). Synopsis of species of Lamiaceae (Labiatae) family of Azerbaijan. Chemistry, Biology, Medicine. Baku: (3) 30-38.

Ahmed-zade F.A. (2011) Distinctive morphological characters of some genera of Lamiaceae Lindl. and their distribution within Azerbaijan (Otlichatelniye morfologicheskiye priznaki nekotorykh rodov *Lamiaceae* Lindl. i ikh rasprostraneniye v predelakh Azerbaijana). *Prossedings of the Institute of Botany,* Baku: Elm, 31: 51-53. [In Russian]

Asgerov A. (2016) Lamiaceae Lindl. In A. Asgerov, pp The plant world of Azerbaijan (Embryiophyta), 344-362, Baku: TEAS Press.

Asgarova R.K. (1954) *Nepeta* L. species from the Caucasian flora. Synopsis of dis. cand. biol. Sciences: Leningrad, 21 p.

Asgarova R.K. (1972) About Nepeta L species of Caucasian flora (O kotovnikakh Kavkaza (*Nepeta* L.). Materials on the flora and systematics of higher plants of Azerbaijan. Baku, pp.72 - 110. [In Russian]

AZBIMM Version 2.1.1.: http://www.azbimm.az/ (accessed 1st January 2018).

Bendiksby M., Thorbek L., Scheen A.C., Lindqvist C., Ryding O. (2011) An updated phylogeny and classification of Lamiaceae subfamily Lamioideae. *Taxon* 60: 471-484.

BHL 2018: Biodiversity Heritage Library: http://www.biodiversity library.org

Bräuchler C., Meimberg H., Heubl G. (2010) Molecular phylogeny of Menthinae (Lamiaceae, Nepetoideae, Mentheae)–taxonomy, biogeography and conflicts. *Mol. Phylogenet. Evol.* 55: 501-523.

Cantino P. D. (1992) Toward a phylogenetic classification of the Labiatae. Eds. Harley R. M., Reynolds T. In Advances in Labiate science, 27-37, Kew, London: Royal Botanic Gardens.

Celep F., Dirmenci T. (2017) Systematic and Biogeographic overview of Lamiaceae in Turkey. *Nat. Volatiles & Essent. Oils* 4(4): 14-27.

Drew B., Gonzáles-Gallegos J.G., Xiang C.L., Kriebel R., Drummond C.P., Walker J.B., Systsma K.J. (2017) *Salvia* united: The greatest good for the greatest number. *Taxon*, 66: 133-145.

Euro+Med: Euro+Med Plant Base - the information resource for Euro-Mediterranean plant diversity: http://ww2.bgbm.org/EuroPlusMed/ [accessed 10 November 2018].

GBIF Home Page: Available from: https://www.gbif.org [13 August 2018].

Govaerts R., Paton A., Harvey Y., Navarro T., Del Rosario García Peña M. World Checklist of Lamiaceae. Facilitated by the Royal Botanic Gardens, Kew: http://wcsp.science.kew.org/ [Retrieved 10 November 2018].

Harley R.M., Atkins S., Budantsev A.L., Cantino P.D., Conn B.J., Grayer R., Harley M.M., de Kok R., Krestovskaya T., Morales R., Paton A.J., Ryding O., Upson T. (2004). Labiatae. In The families and genera of vascular plants 7. Eds. K. Kubitzki, J.W. Kadereit, pp. 167-275, Berlin & Heidelberg: Springer.

Hedge I.C. (1992) A global survey of the biogeography of the Labiatae. In: Harley R.M., Reynolds, T. (Eds.), Advances in Labiate Science. Royal Bot. Gard, Kew, pp. 7-18.

Isayev Y.M., Hajiyev V.J., Aliyev R.A., Rzazade R.Y, Akhundov G.F., Asgarova R.K., Karyagin I.I. (1957): Lamiaceae Lindl. V Flora of Azerbaijana, pod redak. I.I. Karjagin. 7: 223-389. Baku: Nauka. [In Russian]

Jamzad Z. (2013) A survey of Lamiaceae in the flora of Iran. *Rostaniha*, 14(1): 59-67. doi: 10.22092/botany.2013.101317

Li B., Cantino P.D., Olmstead R.G., Bramley G.L. C., Xiang C.L., Ma Z.H., Tan Y.H., Zhang D.X. (2016) A largescale chloroplast phylogeny of the Lamiaceae sheds new light on its subfamilial classification. *Sci Rep,* 6: 34343.

Mammadov G., Yusifov E., Khalilov M., Karimov V. (2012). The Ecotourism Potensial of Azerbaijan. Baku, I, 360 p., II, 420 p.

Mammadova Z.A. (2013) *Nepeta* L. species in the flora of Azerbaijan, their introduction and ecoprotective value. Synopsis of the dissert. on Dr.Sc. in Biology. Baku, 45 p.

Mathiesen C., Scheen A.C., Lindqvist C. (2011) Phylogeny and biogeography of the lamioid genus Phlomis (Lamiaceae). *Kew Bull*. 66: 83-99.

Mehdiyeva N., Guliyev I., Alizade V., Alirzayeva E., Bussmann R. (2017). Ethnobotany of the Caucasus - Azerbaijan – In: R.W. Bussmann (ed.), Ethnobotany of the Caucasus. Springer International Publishing AG. Switzerland. 37-46 p.

Menitsky Yu.L. (1992) Konspekt vidov semeystva Lamiaceae (Labitae) flory Kavkaza. *Botanical Journal.* 6(77): 63-78 St. Petersburg. [In Russian]

Red Book of the Republic of Azerbaijan. Rare and endangered plant and mushroom species. (2013). Second edition. Baku, East-West Publish. House: 670 p.

Salimov R.A. (2018) Comparative analysis of taxonomic composition of *Scutellaria* L. (Lamiaceae) of Azerbaijan and adjacent countries. Systematic and floristic studies of Northern Eurasia (Sistematicheskiye i floristicheskiye issledovaniya Severnoy Yevrazii). Moscow: 3: 164-167.

Salimov R.A., Parolly G., Isgandarova L., Borsch T. (2018) Diversity and evolution of *Scutellaria* (Lamiaceae) in Azerbaijan and adjacent countries. Between Europe and the Orient - A Focus on Research and Higher Education in/on Central Asia and the Caucasus. Status Symposium. Almaty, 16/18.04.2018, ACBK, p.75

Salmaki Y., Zarre Sh., Ryding O., Lindqvist Ch. & Bräuchler Ch. & Heubl G. (2012) Phylogeny of the tribe Phlomideae (Lamioideae: Lamiaceae) with special focus on Eremostachys and Phlomoides: new insights from nuclear and chloroplast sequences. *Taxon* 61: 161-179.

Salmaki Y., Zarre S., Ryding O., Lindqvist C., Bräuchler C., Heubl G., Barber J., Bendiksby M. (2013) Molecular phylogeny of tribe Stachydeae (Lamiaceae subfamily Lamioideae). *Mol. Phylogenet. Evol.* 69: 535-551.

Schäferhoff B., Fleischmann A., Fischer E., Albach D.C., Borsch T., Heubl G., Müller K.F. (2010)Towards resolving Lamiales relationships: insights from rapidly evolving chloroplast sequences. *BMC Evol Biol,* 10: 352. https://doi.org/10.1186/1471-2148-10-352

Solomon J., Shulkina T., Schatz G.E. (Eds.) (2014): Red list of the endemic plants of the Caucasus: Armenia, Azerbaijan, Gerogia, Iran, Russia, and Turkey. St. Louis: *Missouri Botanical Garden Press*, 451 pp.

The International Plant Names Index: http://www.ipni.org [accessed 1 February 2017].

The Plant List Version 1.1.: http://www.theplantlist.org/ [accessed 1st February 2017].

Wagstaff S.J., Hickerson L., Spangler R., Reeves P.A., Olmstead R.G. (1998) Pl Syst Evol: Phylogeny in Labiatae s.l., inferred from cpDNA sequences. *Plant Syst Evol* 209: 265. https://doi.org/10.1007/BF00985232

Will M., Classen-Bockhoff R. (2017) Time to split Salvia s.l. (Lamiaceae) - New insights from Old World Salvia phylogeny. *Molecular Phylogeny and Evolution,* 109: 33-58.

Azərbaycanın ali bitkiləri: Lamiaceae L. fəsiləsinin nomenklatur yenilikləri və təhlili

Rəşad Səlimov, Vüqar Kərimov
Zərnigar Babayeva, Gülnar Qasımova
Zenfira Əliyeva, Asya Əkbərova
Aytən Fətdayeva, Pərvanə Nəbiyeva
Lalə İsgəndərova, Səbinə Hacıyeva
AMEA Botanika İnstitutu, Badamdar şossesi 40, Bakı, AZ1004, Azərbaycan

Dalamazkimilər (Lamiaceae Lindl.) və ya dodaqçiçəklilər (Labiatae Juss.) növlərinin sayına görə Azərbaycan florasında örtülütoxumlu bitkilərin dördüncü böyük fəsiləsidir. Əvvələr Lamiaceae fəsiləsinin morfoloji əlamətlərinə əsaslanan tədqiqatlar daha çox aparılmışdır. Lakin Lamiaceae fəsiləsinin filogeniyasının öyrənilməsi ilə bağlı son molekulyar tədqiqatlar onun cinslərinin taksonomik statusunu anlamağa, hüdudlarını müəyyənləşdirməyə və cinslərarası qohumluq əlaqələrini aydınlaşdırmağa töhfə vermişdir. Araşdırmamızın məqsədi, bu son dəyişikliklər əsasında Azərbaycan florasında yayılmış Lamiaceae fəsiləsinin təsnifatı da daxil olmaqla növlərinin taksonomik nomenklaturasını yeniləməkdir. Fəsilə 37 cins, 241 takson (204 növ, 37 yarımnöv) ilə təmsil olunur ki, bunlardan 19 takson Azərbaycan endemidir. Bu məqsədlə BAK herbari fondunda saxlanılan 4638 bitki nümunəsi və həmçinin müxtəlif virtual bazalarda olan 1245 nümunə analiz edilmişdir. Azərbaycan Florasının VII cildi nəşr olunduqdan sonra fəsiləyə 46 yeni taksonun əlavə olunduğu müəyyən edildi. Son təsnifata əsasən Azərbaycanın Lamiaceae fəsiləsi üçün yeni monotipik cins olan *Drymosiphon* Melnikov (Nepetoideae yarımfəsiləsi daxilində) aşkar edilmişdir. Həmçinin bu taksonomik dəyişikliklər nəticəsində əvvələr Verbenaceae Juss fəsiləsinə aid edilmiş *Vitex* L. cinsi də Lamiaceae fəsiləsinin Viticoideae Briqone yarımfəsiləsində göstərilmişdir. Takson sayına görə üç ən böyük cins - *Salvia* L. (38 takson), *Nepeta* L. (30 tak-son) və *Stachys* L. (25 takson) üstünlük təşkil edir. Cins və növ baxımından Naxçıvanın dağlıq sahəsi (62 takson), Diabar (58 takson), Böyük Qafqazın Quba sahəsi (37 takson) ən çox zəngin olan botaniki-coğrafi rayonlardır. Fəsilə daxilində takson sayına görə İran-Turan (88 takson (37%)), Avropa-Sibir (42 takson (18%)) və Qafqaz (39 takson (16%)) fitocoğrafi elementləri ən çox təmsil olunur. 12 takson Beynəlxalq Təbiətin Qorunması İttifaqı (IUCN) tərəfindən qəbul olunmuş təsnifata əsasən nadir və nəsli kəsilmək təhlükəsi olan kateqoriyalarına (CR-4, EN-1 və VU-7), 12 takson isə təhlükəli həddə yaxın olan kateqoriyasına (NT) aid edilir. 7 növ isə Azərbaycanın Qırmızı Kitabının 2-ci nəşrinə daxil edilmişdir. Mövcud nomenklatur dəyişikliklər və analizlərdən sonra, Azərbaycanın, landşaft və yaşayış mühiti müxtəlifliyi baxımından Lamiaceae fəsiləsinin Qafqazda yeni növəmələgəlmə mərkəzi kimi mühüm rol oynadığı təsdiq olunmuşdur.

Açar sözlər: *Azərbaycan, Lamiaceae, flora, ali bitkilər, təsnifat*

Сосудистые растения Азербайджана: Обновление номенклатуры и обзор Lamiaceae L.

Рашад Салимов, Вугар Каримов
Зарнигар Бабаева, Гульнар Касумова
Зенфира Алиева, Ася Акбарова
Айтан Фатдаева, Парвана Набиева
Лала Искандарова, Сабина Гаджиева
Институт Ботаники НАНА, Бадамдар 40, Баку, AZ1004,Азербайджан

Lamiaceae (Labitae) – четвертое по величине семейство покрытосеменных во флоре Азербайджана. Предыдущие таксономические исследования Lamiaceae, в основном, основаны на морфологических признаках. Последние молекулярные исследования филогении Lamiaceae проливают свет на понимание, выяснение границ и связей между его родами. Цель нашего исследования состояла в том, чтобы обновить номенклатуру азербайджанских видов Lamiaceae, включая их классификацию. Семейство представлено 37 родами, 241 таксонами (204 вида и 37 подвидов), из которых 19 таксонов являются эндемиками. Было проанализировано 4638 гербарных образцов БАК и 1245 образцов различ-

ных виртуальных гербариев. 46 новых таксонов были добавлены в дополнение к VII тому «Флора Азербайджана» после его публикации. Согласно последней классификации для семейства Lamiaceae Азербайджана был обнаружен новый монотипичный род *Drymosiphon* Melnikov (в составе подсемейства Nepetoideae). Кроме того в результате этих таксономических изменений ранее относящийся к семейству Verbenaceae Juss род *Vitex* L. тоже показан в подсемействе Viticoideae Brigone семейства Lamiaceae. По числу таксонов самыми крупными являются три рода: *Salvia* L. (38 таксонов), *Nepeta* L. (30 таксонов) и *Stachys* L. (25 таксонов). Горная часть Нахчывана (62 таксона), Диабар (58 таксона), Губинская часть Большого Кавказа (37таксонов) являются наиболее богатыми видами и родами ботанико-географическими регионами. Фитогеографическими регионами с наибольшим числом таксонов являются иранско-туранский (88 таксонов - 37%), евро-сибирский (42 таксона - 18%) и кавказский (39 таксонов- 16%). 14 таксонов находятся в угрожаемых категориях МСОП: CR-5, EN-1 и VU-8. 7 видов занесены во 2-е издание Красной книги Азербайджана. Результаты текущих обновлений номенклатуры свидетельствуют, что Азербайджан с его разнообразием ландшафов и среды обитания играет важную роль в видообразовании семейства Lamiaceae на Кавказе.

Ключевые слова: *Азербайджан, Lamiaceae, флора, сосудистые растения, таксономия*