BIOLOGICA NYSSANA
13 (1) September 2022: 11-25
DOI: 10.5281/zenodo.7117406

Critical revision of Lamiaceae family in Albanian flora

Original Article

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Abstract:

The territory of Albania includes a wide range of habitats and biodiversity. In the 3rd published volume of "Flora of Albania" Lamiaceae family is recognized as Labiatae family and includes 32 genera. The aim of this study is to bring an update of data on one of the large families of "Flora of Albania", Lamiaceae family. First, this study refers to "Flora of Albania" volumes, as the only complete publication for the Albanian flora. Most of the data for the critical revision has been extracted from literature, such as the four volumes of "Flora of Albania", the five volumes of the "Flora Europaea", the MedChecklist and the Euro+Med Plantbase. Two genera: *Acinos* Miller and *Calamintha* Miller did not exist so far, and now this two genera are part of *Clinopodium* L. genus. From 276 taxa of this family only 143 remain unchanged like in the 3rd edition of "Flora of Albania", whereas 133 taxa are new for Albania (with changed species/subspecies names or not even found in any of "Flora of Albania" published volumes).

Key words:
Lamiaceae, new taxa, Albania

Apstrakt:

Kritički pregled porodice Lamiaceae u flori Albanije

Teritorija Albanije uključuje širok spektar staništa i biodiverziteta. U trećem publikovanom volumenu "Flora Albanije" porodica Lamiaceae je prepoznata kao porodica Labiatae i sadrži 32 roda. Cilj ovog istraživanja je da ažurira podatke o jednoj vrstama bogatijih porodica u publikaciji "Flora Albanije", porodici Lamiaceae. Prvo, ovo istraživanje se odnosi na volumene "Flora Albanije", kao jedinoj kompletnoj publikaciji flore Albanije. Većina podataka za kritičnu reviziju je preuzet iz literature, poput četiri volumena "Flora Albanije", pet volumena "Flora Europaea", MedChecklist i Euro+Med Plantbase. Dva roda: *Acinos* Miller i *Calamintha* Miller do sada nisu postojali, a sada su oni deo roda *Clinopodium* L. Od 276 taksona ove porodice, svega 143 ostalo je nepromenjeno u odnosu na treće izdanje "Flora Albanije", dok je 133 taksona novo za Albaniju (sa promenjenim imenima vrsta/podvrsta ili uopšte nisu postojali u publikovanim volumenima "Flora Albanije").

Ključne reči:
Lamiaceae, novi taksoni, Albanija

Received: May 04, 2022
Revised: June 29, 2022
Accepted: July 11, 2022

Introduction

Many scientific studies and a lot of fieldwork have been carried out for the "Flora of Albania". "Flora of Albania" represents the most important work in the field of floristic studies, which analyzes 3,235 species and 689 subspecies, grouped in 165 families and 300 genera. It has been published in 4 volumes (Paparisto et al., 1988; Qosja et al., 1992; Qosja et al., 1996; Vangjeli etal., 2000) from the Institute of Biological Research, Academy of Sciences, Albania. The material for "Flora of Albania" is taken mainly by the National Herbarium and includes over 150,000 specimens. Many scientific publications of foreign and Albanian botanists, who have carried out expeditions throughout Albania, have been used.

The territory of Albania includes a wide range of coastal habitats from maritime limestone and sandstone cliffs to sand dunes, saline grasslands and brackish waters to mountains above 2000 m (Barina et al., 2017). From year 2000 when the publication of the 4th and last volume of "Flora of Albania" was completed and onwards, a considerable number of taxa have been reported by many national and foreign authors. From the general analysis of all these studies it results that the Albanian Flora already consists of about 3,629 species which belong to 960 genera and 170 families (Meço & Mullaj, 2017).

Lamiaceae (Mint family) has a cosmopolitan distribution (Heywood et al., 2007). The enlarged Lamiaceae contain about 236 genera (Raymond et al., 2004). The largest genera are *Salvia* (900), *Scutellaria* (360), *Stachys* (300), *Plectranthus* (300), *Hyptis* (280), *Teucrium* (250), *Vitex* (250), *Thymus* (220), and *Nepeta* (200) (Raymond et al., 2004) (https://en.wikipedia.org/wiki/Lamiaceae).

The stems usually, but not exclusively, have a square cross-sectional. Its flowers are bilaterally symmetrical with 5 petals and 5 sepals. Lamiaceae are commonly bisexual and they appear to have one whorl of flowers even though they are comprised of two clusters. The leaves are either decussated (crossing one another) or whorled. These plants are most frequently shrubs or trees but could also be vines. This family includes the characteristically aromatic herbs used in cooking such as rosemary, oregano, thyme, basil, mint, marjoram, sage, and lavender (Patwardhan & Mashelkar, 2009).

In the 3rd published volume of "Flora of Albania" Lamiaceae family is recognized as Labiatae family and includes 32 genera.

The aim of this study is to bring an update of data on one of the large families of "Flora of Albania", Lamiaceae family, obtained from the use of modern methods of molecular analysis, research expeditions for the recognition and discovery of new species by Albanian botanists or foreigners, by completing the lists of families or genera with newly discovered species, establishing current names if they have changed starting from family, genus and species, etc.

Materials and Methods

Most of the data for the critical revision of Lamiaceae family in Albanian flora has been extracted from literature, such as the four volumes of "Flora of Albania" (Paparisto et al., 1988; Qosja et al., 1992; Qosja et al., 1996; Vangjeli et al., 2000), the five volumes of the "Flora Europaea" (Tutin et al., 1964-1980), the MedChecklist (Greuter et al., 1984-1989) and the Euro+Med Plantbase (http://ww2.bgbm.org/euroPlusMed/query.asp). Euro+Med Plantbase has been selected as a reference for the taxa names. We have also referred, as an important study on the flora of Albania, to the monograph "Checklist of vascular plants of Albania" (Barina et al., 2018). Also, to complete the study with the discoveries of recent years, all new species found in the territory of Albania (year 2018-2022) and published in international scientific journals have been taken into consideration. Additionally, the rest of the information is gathered through visiting the National Herbarium of Albania at the Research center of flora and fauna.

Results and discussion

After revising the family Lamiaceae using the above methodology, it results that in Albania from this family already exist 32 genera, but most of them with lot of changes that needs to be updated for the Albanian Flora. All the genera that have undergone major changes have been analyzed one by one.

Genus Ajuga L.

Ajuga genus is represented by 11 taxa (**Tab. 1**), of which 3 (2 types and 1 species) are not published in any of the volumes of "Flora of Albania":

1. *Ajuga chamaepitys* (L.) Schreb. subsp. *chamaepitys* (Barina et al., 2018)
2. *Ajuga pyramidalis* L. subsp. *pyramidalis* (The Euro+Med Plantbase, 2010)
3. *Ajuga laxmannii* (L.) Benth. (Barina et al., 2018)

Genus Ballota L.

Ballota genus is represented by 7 taxa (**Tab. 1**), of which 2 have new accepted names by "The Euro+Med Plantbase".

1. *Ballota hispanica* (L.) Benth. In the 3rd volume of "Flora of Albania" this species is known as *Ballota rupestris* (Biv.) Vis.
2. *Ballota nigra* subsp. *ruderalis* (Sw.) Briq. This subspecies in the same volume of "Flora of Albania" is known as subspecies *unicata*.

Genus Clinopodium L.

This genus for Albania brings many changes. First, according to the Euro+Med Plantbase (http://ww2.bgbm.org/euroPlusMed/query.asp), the genera *Calamintha* and *Acinos*, which are present in the 3rd published volume of "Flora of Albania", have already changed the name of genus and are part of the genus *Clinopodium*. From the genus *Clinopodium* in "Flora of Albania", only two taxa are mentioned: *Clinopodium vulgare* L., and *Clinopodium vulgare* L. subsp. *vulgare*. Meanwhile, with all the analysis done, already, 23 taxa exist for the genus *Clinopodium* (**Tab. 1**).

1. *Clinopodium acinos* (L.) Kuntze. Known as *Acinos arvensis* (Lam.) Dandyin "Flora of Albania" 3rd edition.
2. *Clinopodium alpinum* (L.) Kuntze. Known as *Acinos alpinus* (L.) Moench in "Flora of Albania" 3rd edition.
3. *Clinopodium alpinum* subsp. *albanicum* (Kümmerle & Jáv.) Govaerts. New subspecies according to The Euro+Med Plantbase 2010, not published in any of the volumes of "Flora of Albania".

Table 1. Lamiaceae family in Albanian flora

Genera	Species
***Ajuga* L.**	*Ajuga chamaepitys* (L.) Schreb.
	Ajuga chamaepitys subsp. *chia* (Schreb.)
	Ajuga chamaepitys (L.) Schreb. subsp. *chamaepitys*
	Ajuga genevensis L.
	Ajuga orientalis L.
	Ajuga piskoi Degen & Bald.
	Ajuga pyramidalis L.
	Ajuga pyramidalis L. subsp. *pyramidalis*
	Ajuga reptans L.
	Ajuga laxmannii (L.) Benth.
	Ajuga iva (L.) Schreb.
***Ballota* L.**	*Ballota hispanica* (L.) Benth.
	Ballota macedonica Vandas
	Ballota nigra L.
	Ballota nigra subsp. *foetida* Hayek
	Ballota nigra L. subsp. *nigra.*
	Ballota nigra subsp. *sericea* (Vandas) Patzak.
	Ballota nigra subsp. *ruderalis* (Sw.) Briq.
***Clinopodium* L.**	*Clinopodium acinos* (L.) Kuntze
	Clinopodium alpinum (L.) Kuntze
	Clinopodium alpinum subsp. *alpinum*
	Clinopodium alpinum subsp. *albanicum* (Kümmerle & Jáv.) Govaerts
	Clinopodium alpinum subsp. *hungaricum* (Simonk.) Govaerts
	Clinopodium alpinum subsp. *meridionale* (Nyman) Govaerts
	Clinopodium grandiflorum (L.) Kuntze
	Clinopodium grandiflorum (L.) Kuntze subsp. *grandiflorum*
	Clinopodium menthifolium (Host) Stace
	Clinopodium menthifolium subsp. *ascendens* (Jord.) Govaerts
	Clinopodium menthifolium (Host) Stace subsp. *menthifolium*
	Clinopodium nepeta (L.) Kuntze
	Clinopodium nepeta (L.) Savi subsp. *nepeta*
	Clinopodium nepeta subsp. *glandulosum* (Req.) Govaerts
	Clinopodium suaveolens (Sm.) Kuntze
	Clinopodium serpyllifolium (M. Bieb.) Kuntze
	Clinopodium thymifolium (Scop.) Kuntze
	Clinopodium vardarense (Šilic) Govaerts
	Clinopodium vulgare L.
	Clinopodium vulgare subsp. *orientale* Bothmer
	Clinopodium vulgare L. subsp. *vulgare*

Genera	Species
***Clinopodium* L.**	*Clinopodium graveolens* subsp. *rotundifolium* (Pers.) Govaerts
	Clinopodium suaveolens (Sibth. & Sm.) G. Don.
***Galeopsis* L.**	*Galeopsis bifida* Boenn.
	Galeopsis ladanum L.
	Galeopsis pubescens Besser
	Galeopsis speciosa Mill.
	Galeopsis tetrahit L.
***Glechoma* L.**	*Glechoma hederacea* L.
	Glechoma hirsuta Waldst. & Kit.
***Hyssopus* L.**	*Hyssopus officinalis* L.
	Hyssopus officinalis subsp. *aristatus* (Godr.) Nyman.
	Hyssopus officinalis L. subsp. *officinalis*
***Lamium* L.**	*Lamium amplexicaule* L.
	Lamium amplexicaule L. var. *amplexicaule*
	Lamium galeobdolon (L.) Crantz.
	Lamium galeobdolon (L.) Crantz subsp. *galeobdolon*
	Lamium galeobdolon subsp. *montanum* (Pers.) Hayek
	Lamium garganicum L.
	Lamium garganicum L. subsp. *garganicum*
	Lamium garganicum subsp. *striatum* (Sm.) Hayek
	Lamium maculatum (L.) L.
	Lamium purpureum L.
	Lamium purpureum L. var. *purpureum*
	Lamium bifidum Cirillo
	Lamium flexuosum Ten.
	Lamium orvala L.
***Leonurus* L.**	*Leonurus cardiaca* L.
***Lavandula* L.**	*Lavandula angustifolia* Mill.
***Lycopus* L.**	*Lycopus europaeus* L.
	Lycopus exaltatus L. f.
***Marrubium* L.**	*Marrubium anisodon* K. Koch.
	Marrubium cylleneum Boiss. & Heldr.
	Marrubium incanum Desr.
	Marrubium peregrinum L.
	Marrubium thessalum Boiss. & Heldr.
	Marrubium vulgare L.
	Marrubium × *paniculatum* Desr.
***Melissa* L.**	*Melissa officinalis* L.
	Melissa officinalis subsp. *altissima* (Sm.) Arcang.
	Melissa officinalis subsp. *officinalis*

Genera	Species
***Melittis* L.**	*Melittis melissophyllum* L.
	Melittis melissophyllum subsp. *albida* (Guss.) P. W. Ball
***Mentha* L.**	*Mentha aquatica* L.
	Mentha longifolia (L.) L.
	Mentha longifolia (L.) L. subsp. *longifolia*
	Mentha pulegium L.
	Mentha spicata L.
	Mentha spicata subsp. *condensata* (Briq.) Greuter & Burdet.
	Mentha spicata L. subsp. *spicata*
	Mentha × *dumetorum* Schult.
	Mentha × *piperita* L.
	Mentha × *rotundifolia* (L.) Huds.
	Mentha suaveolens Ehrh.
***Micromeria* Benth.**	*Micromeria albanica* (K. Malý) Šilic
	Micromeria cremnophila Boiss. & Heldr.
	Micromeria cremnophila Boiss. & Heldr. subsp. *cremnophila*
	Micromeria cristata (Hampe) Griseb.
	Micromeria cristata (Hampe) Griseb. subsp. *cristata*
	Micromeria cristata subsp. *kosaninii* (Šilic) Ined.
	Micromeria croatica (Pers.) Schott.
	Micromeria graeca (L.) Benth.
	Micromeria graeca subsp. *fruticulosa* (Bertol.) Guinea
	Micromeria juliana (L.) Benth. ex Rchb.
	Micromeria parviflora Rchb.
	Micromeria microphylla (d'Urv.) Benth.
	Micromeria myrtifolia Boiss. & Hohen.
	Micromeria nervosa (Desf.) Benth.
***Nepeta* L.**	*Nepeta cataria* L.
	Nepeta nuda L.
	Nepeta nuda L. subsp. *nuda*
	Nepeta parnassica Heldr. & Sart.
	Nepeta spruneri Boiss.
	Nepeta argolica Baden.
	Nepeta argolica Baden subsp. *malacotrichos* (Baden) A.Strid & Kit. Tan.
***Ocimum* L.**	*Ocimum basilicum* L.
***Origanum* L.**	*Origanum vulgare* L.
	Origanum vulgare subsp. *hirtum* (Link) Ietsw.
	Origanum vulgare L. subsp. *vulgare*
	Origanum vulgare L. subsp. *viridulum* (Martrin- Donos) Nyman.
	Origanum majorana L.

Genera	Species
***Phlomis* L.**	*Phlomis fruticosa* L.
	Phlomis herba-venti L.
	Phlomis herba-venti L. subsp. *herba-venti*
	Phlomis tuberosa L.
***Prasium* L.**	*Prasium majus* L.
***Prunella* L.**	*Prunella albanica* Pénzes.
	Prunella grandiflora (L.) Scholler.
	Prunella grandiflora (L.) Scholler subsp. *grandiflora*
	Prunella laciniata (L.) L.
	Prunella vulgaris L.
	Prunella vulgaris L. subsp. *vulgaris*
	Prunella × *intermedia* Link.
	Prunella × *surrecta* Dumort.
***Rosmarinus* L.**	*Rosmarinus officinalis* L.
	Rosmarinus officinalis L. subsp. *officinalis*
***Salvia* L.**	*Salvia amplexicaulis* Lam.
	Salvia argentea L.
	Salvia candidissima Vahl.
	Salvia fruticosa Mill.
	Salvia glutinosa L.
	Salvia nemorosa L.
	Salvia nemorosa L. subsp. *nemorosa*
	Salvia officinalis L.
	Salvia officinalis L. subsp. *officinalis*
	Salvia pratensis L.
	Salvia pratensis L. subsp. *pratensis*
	Salvia ringens Sm.
	Salvia sclarea L.
	Salvia tomentosa Mill.
	Salvia verbenaca L.
	Salvia verticillata L.
	Salvia verticillata L. subsp. *verticillata*
	Salvia virgata Jacq.
	Salvia viridis L.
	Salvia aethiopis L.
	Salvia microphylla Kunth.
	Salvia splendens Sellow ex Schult.
***Satureja* L.**	*Satureja cuneifolia* Ten.
	Satureja hortensis L.

Genera	Species
***Scutellaria* L.**	*Satureja montana* L.
	Satureja montana L. subsp. *montana*
	Satureja montana L. subsp. *variegata* (Host) P.E.Ball.
	Satureja subspicata Bartl. ex Vis.
	Satureja subspicata Bartl. ex Vis. subsp. *subspicata*
	Satureja parnassica Heldr. & Sart. ex Boiss.
	Satureja kitaibelii Wierzb. ex Heuff.
	Scutellaria alpina L.
	Scutellaria altissima L.
	Scutellaria columnae All.
	Scutellaria columnae All. subsp. *columnae*
	Scutellaria galericulata L.
	Scutellaria orientalis L.
	Scutellaria orientalis subsp. *pinnatifida* J. R. Edm.
	Scutellaria rupestris Boiss. & Heldr.
	Scutellaria rupestris subsp. *adenotricha* (Boiss. & Heldr.) Greuter & Burdet.
	Scutellaria hastifolia L.
	Scutellaria rubicunda Hornem.
	Scutellaria rubicunda Hornem. subsp. *rubicunda*
***Sideritis* L.**	*Sideritis montana* L.
	Sideritis montana L. subsp. *montana*
	Sideritis raeseri Boiss. & Heldr.
	Sideritis raeseri Boiss. & Heldr. subsp. *raeseri*
	Sideritis romana L.
	Sideritis romana L. subsp. *romana*
	Sideritis romana L. subsp. *purpurea* (Talbot ex Benth.)
	Sideritis scardica Griseb.
***Stachys* L.**	*Stachys albanica* Markgr.
	Stachys alopecuros (L.) Benth.
	Stachys alopecuros (L.) Benth. subsp. *alopecuros*
	Stachys alpina L.
	Stachys alpina L. subsp. *alpina*
	Stachys alpina L. subsp. *dinarica* Murb.
	Stachys anisochila Vis. & Pancic.
	Stachys annua (L.) L.
	Stachys annua (L.) L. subsp. *annua*
	Stachys arvensis (L.) L.
	Stachys atherocalyx K. Koch.
	Stachys beckeana Dörfl. & Hayek
	Stachys cretica L.

Genera	Species
***Stachys* L.**	*Stachys cretica* subsp. *cassia* (Boiss.) Rech. f.
	Stachys cretica L. subsp. *cretica*
	Stachys cretica subsp. *salviifolia* (Ten.) Rech. f.
	Stachys cretica subsp. *bulgarica* Rech. f.
	Stachys germanica L.
	Stachys germanica L. subsp. *germanica*
	Stachys germanica subsp. *heldreichii* (Boiss.) Hayek
	Stachys germanica subsp. *penicillata* (Heldr. & Sart. ex Boiss.) Nyman
	Stachys maritima Gouan.
	Stachys menthifolia Vis.
	Stachys mollissima Willd.
	Stachys obliqua Waldst. & Kit.
	Stachys officinalis (L.) Trevis.
	Stachys officinalis (L.) Trevis. subsp. *officinalis*
	Stachys officinalis subsp. *skipetarum* Ják.
	Stachys palustris L.
	Stachys recta L.
	Stachys recta subsp. *baldaccii* (K. Malý) Hayek.
	Stachys recta subsp. *doerfleri* (Hayek) Hayek.
	Stachys recta L. subsp. *recta*
	Stachys recta subsp. *subcrenata* (Vis.) Briq.
	Stachys recta subsp. *labiosa* (Bertol.) Briq.
	Stachys scardica (Griseb.) Hayek.
	Stachys serbica Pancic.
	Stachys sericophylla Halácsy.
	Stachys spinulosa Sm.
	Stachys sylvatica L.
	Stachys tymphaea Hausskn.
	Stachys canescens Bory & Chaub.
	Stachys parolinii Vis.
	Stachys plumosa Griseb.
***Teucrium* L.**	*Teucrium arduinii* L.
	Teucrium capitatum L.
	Teucrium capitatum L. subsp. *capitatum*
	Teucrium chamaedrys L.
	Teucrium chamaedrys L. subsp. *chamaedrys*
	Teucrium flavum L.
	Teucrium flavum L. subsp. *flavum*
	Teucrium montanum L.
	Teucrium montanum L. subsp. *montanum*

Genera	Species
***Thymbra* L.**	*Teucrium scordium* L.
	Teucrium scordium subsp. *scordioides* (Schreb.) Arcang.
	Teucrium polium L.
	Teucrium fruticans L.
	Teucrium divaricatum Sieber ex Heldr.
	Teucrium botrys L.
	Thymbra capitata (L.) Cav.
***Thymus* L.**	*Thymus boissieri* Halácsy.
	Thymus doerfleri Ronniger.
	Thymus longicaulis C. Presl.
	Thymus longicaulis subsp. *chaubardii* (Rchb. f.) Jalas.
	Thymus longicaulis C. Presl subsp. *longicaulis*
	Thymus parnassicus Halácsy.
	Thymus praecox Opiz.
	Thymus praecox subsp. *jankae* (Čelak.) Jalas.
	Thymus praecox subsp. *polytrichus* (A. Kern. ex Borbás) Jalas.
	Thymus praecox subsp. *zygiformis* (Heinr. Braun ex Wettst.) Jalas.
	Thymus pulegioides L.
	Thymus pulegioides subsp. *montanus* (Benth.) Ronniger.
	Thymus pulegioides L. subsp. *pulegioides*
	Thymus sibthorpii Benth.
	Thymus striatus Vahl.
	Thymus teucrioides Boiss. & Spruner.
	Thymus teucrioides Boiss. & Spruner subsp. *teucrioides*
	Thymus thracicus Velen.
	Thymus × *oblongifolius* Opiz.
	Thymus ciliatopubescens (Halácsy) Halácsy.
	Thymus dacicus Borb.
	Thymus degenii Heinr. Braun.
	Thymus odoratissimus Mill.
	Thymus heterotrichus Griseb.
	Thymus roegneri K. Koch
	Thymus leucotrichus Halácsy.
	Thymus serpyllum L.
	Thymus stojanovii Degen.
***Vitex* L.**	*Vitex agnus-castus* L.
***Ziziphora* L.**	*Ziziphora capitata* L.
	Ziziphora capitata L. subsp. *capitata*

4. *Clinopodium alpinum* subsp. *hungaricum* (Simonk.) Govaerts. Known as *Acinos alpinus* subsp. *majoranifolius* (Mill.) P.W.Ball in “Flora of Albania”.

5. *Clinopodium alpinum* subsp. *meridionale* (Nyman) Govaerts. In "Flora of Albania" 3rd edition it's known as *Acinos alpinus* subsp. *meridionalis* (Nyman) P.W.Ball.

6. *Clinopodium alpinum* subsp. *alpinum* (not published in any of the volumes of "Flora of Albania"), according to Barina *et al*., (2018), it's present in Albania under the genus Acinos).

7. *Clinopodium grandiflorum* (L.) Kuntze. Known as *Calamintha grandiflora* (L.) Moench. in "Flora of Albania" 3rd edition.

8. *Clinopodium grandiflorum* (L.) Kuntze subsp. *grandiflorum*. New subspecies according to The Euro+Med Plantbase 2010, not published in any of the volumes of "Flora of Albania".

9. *Clinopodium menthifolium* (Host) Stace. Known as *Calamintha sylvatica* Bromf. in "Flora of Albania".

10. *Clinopodium menthifolium* subsp. *ascendens* (Jord.) Govaerts. In "Flora of Albania" 3rd edition it's known as *Calamintha sylvatica* Bromf. subsp. *ascendens* (Jord.) P.W.Ball.

11. *Clinopodium menthifolium* (Host) Stace subsp. *menthifolium*. New subspecies according to The Euro+Med Plantbase 2010, not published in any of the volumes of "Flora of Albania".

12. *Clinopodium nepeta* (L.) Kuntze. Known as *Calamintha nepeta* (L.) Savi (L.) Moench in "Flora of Albania".

13. *Clinopodium nepeta* subsp. *glandulosum* (Req.) Govaerts. In "Flora of Albania" it's known as *Calamintha nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W.Ball.

14. *Clinopodium nepeta* (L.) Savi subsp. *nepeta*. In "Flora of Albania" it's known as *Calamintha nepeta* (L.) Savi subsp. *nepeta*.

15. *Clinopodium suaveolens* (Sm.) Kuntze. New species according to The Euro+Med Plantbase 2010, not published in any of the volumes of "Flora of Albania".

16. *Clinopodium thymifolium* (Scop.) Kuntze. In "Flora of Albania" it is known as *Micromeria thymifolia* (Scop.) Fritsch.

17. *Clinopodium vardarense* (icilic) Govaerts. Known as *Satureja vardarensis* (Šilić) Greuter & Burdet in "Flora of Albania" 3rd volume.

18. *Clinopodium vulgare* subsp. *orientale* Bothmer. Known as *Clinopodium vulgare* subsp. *arundanum* Boiss. in "Flora of Albania".

19. *Clinopodium serpyllifolium* (M. Bieb.) Kuntze. It's not published in any of the volumes of "Flora of Albania", but according to Barina et al. (2018), it's known as *Micromeria fruticosa* (L.) Druce subsp. *serpyllifolia* (M.Bieb.) P.H.Davis.

20. *Clinopodium graveolens* subsp. *rotundifolium* (Pers.) Govaerts. It's not published in any of the volumes of "Flora of Albania". According to Barina et al. (2018), it is present in Albania under the name *Acinos rotundifolius* Pers.

21. *Clinopodium suaveolens* (Sibth. & Sm.) G. Don. It's not published in any of the volumes of "Flora of Albania". According to Barina et al. (2018), it's present in Albania under the genus *Acinos*.

Genus Hyssopus L.

Hyssopus genus consists in 1 species and 2 subspecies (**Tab. 1**), of which in "Flora of Albania" only the species *Hyssopus officinalis* L. is found, without its type and the other subspecies.

1. *Hyssopus officinalis* subsp. *aristatus* (Godr.) Nyman (The Euro+Med Plantbase, 2010).

2. *Hyssopus officinalis* L. subsp. *officinalis* (The Euro+Med Plantbase, 2010).

Genus Lamium L.

Even the genus *Lamium* has undergone many taxonomic changes over the last few years. It is now accepted that this genus includes 14 taxa (**Tab. 1**), of which 8 taxa are not found published in any of the volumes of "Flora of Albania".

1. *Lamium amplexicaule* L. var. *amplexicaule* (The Euro+Med Plantbase, 2010).

2. *Lamium galeobdolon* (L.) Crantz. In "Flora of Albania" 3rd edition it's known as *Lamiastrum galeobdolon* (L.), so the name of the genus has changed from *Lamiastrum* to *Lamium*.

3. *Lamium galeobdolon* (L.) Crantz subsp. *galeobdolon*. In "Flora of Albania" 3rd edition it is known as *Lamiastrum galeobdolon* (L.) subsp. *galeobdolon*, so the name of the genus has changed from *Lamiastrum* to *Lamium*.

4. *Lamium galeobdolon* subsp. *montanum* (Pers.) Hayek. In "Flora of Albania" 3rd edition it is known as *Lamiastrum galeobdolon* (L.) subsp. *montanum*, so the name of the genus has changed from *Lamiastrum* to *Lamium*.

5. *Lamium garganicum* subsp. *striatum* (Sm.)

Hayek (The Euro+Med Plantbase, 2010, Barina et al., 2018).

6. *Lamium purpureum* L. var. *purpureum* (The Euro+Med Plantbase, 2010).

7. *Lamium flexuosum* Ten. (Barina et al., 2018).

8. *Lamium orvala* L. This species is most likely missing in Albania and its presence needs further confirmation. According to Barina et al. (2018), the presence of this species is reported only once (Hayek, 1917).

Genus Marrubium L.

This genus in Albania is already represented by 7 species (**Tab. 1**), of which 3 are not found in "Flora of Albania" published editions.

1. *Marrubium anisodon* K. Koch. In the 3rd volume of "Flora of Albania", it is known as *Marrubium alternidens* Rech.

2. *Marrubium thessalum* Boiss. & Heldr. (Barina et al., 2018).

3. *Marrubium* × *paniculatum* Desr. This hybrid species is most likely missing in Albania and its presence needs further confirmation. According to Barina et al. (2018), the presence of this species is reported only once (Schütt, ~1939).

Genus Mentha L.

Mentha genus has also undergone many taxonomic changes. It is now accepted that 11 taxa belong to this genus (**Tab. 1**), of which 5 (2 types, 1 subspecies and 2 hybrid species) are not found in published editions of "Flora of Albania".

1. *Mentha longifolia* (L.) L. subsp. *longifolia* (The Euro+Med Plantbase, 2010)

2. *Mentha spicata* subsp. *condensata* (Briq.) Greuter & Burdet. New name for Albania according to The Euro+Med Plantbase, in "Flora of Albania" 3rd edition, it's known as *Mentha microphylla* K. Koch.

3. *Mentha spicata* L. subsp. *spicata* (The Euro+Med Plantbase, 2010)

4. *Mentha* × *dumetorum* Schult. The presence of this hybrid species in Albania needs further confirmation, because according to Barina et al. (2018), its presence is reported only once (Schütt ,~1939).

5. *Mentha* × *rotundifolia* (L.) Huds. (Barina et al., 2018)

Genus Micromeria Benth.

The genus *Micromeria* is already represented by 14 taxa (**Tab. 1**), of which 8 taxa are not found in the "Flora of Albania".

1. *Micromeria albanica* (K. Malý) Šilic. (Barina et al., 2018)

2. *Micromeria cremnophila* Boiss. & Heldr. subsp. *cremnophila* (The Euro+Med Plantbase, 2010)

3. *Micromeria cristata* (Hampe) Griseb. subsp. *cristata*. According to Barina et al. (2018), the presence of this subspecies in Albania needs further confirmation, because it is reported only once (Greuter et al., 1986).

4. *Micromeria cristata* subsp. *kosaninii* (Šilic) Ined. (Barina et al., 2018)

5. *Micromeria croatica* (Pers.) Schott. (Barina et al., 2018)

6. *Micromeria graeca* subsp. *fruticulosa* (Bertol.) Guinea. New subspecies according to The Euro+Med Plantbase 2010.

7. *Micromeria microphylla* (d'Urv.) Benth. (Barina et al., 2018)

8. *Micromeria nervosa* (Desf.) Benth. (Barina et al., 2018)

Genus Nepeta L.

Nepeta genus is represented by 7 taxa (**Tab. 1**), of which only 3 (1 type, 1 species and 1 subspecies) are not found in the volumes of "Flora of Albania".

1. *Nepeta nuda* L. subsp. *nuda* (The Euro+Med Plantbase, 2010)

2. *Nepeta argolica* Baden (Barina et al., 2018)

3. *Nepeta argolica* Baden subsp. *malacotrichos* (Baden) A. Strid & Kit. Tan. (Barina et al., 2018)

Genus Origanum L.

In Albania this genus is represented by 5 taxa (**Tab. 1**), of which only 3 taxa (1 type and 2 subspecies) are not found in the "Flora of Albania" published editions.

1. *Origanum vulgare* subsp. *hirtum* (Link) Ietsw. (Barina et al., 2018)

2. *Origanum vulgare* L. subsp. *vulgare* (Barina et al., 2018)

3. *Origanum vulgare* L. subsp. *viridulum* (Martrin- Donos) Nyman. (Barina et al., 2018)

Genus Phlomis L.

In Albania, nowadays, this genus is represented by 4 taxa (**Tab. 1**), of which 2 (1 type and 1 species) are not published in "Flora of Albania".

1. *Phlomis herba-venti* L. subsp. *herba-venti* (The Euro+Med Plantbase, 2010)

2. *Phlomis tuberosa* L. (Barina et al., 2018)

Genus Prunella L.

The genus *Prunella* is already represented by 8 taxa (**Tab. 1**), of which 5 (1 species, 2 types and 2 hybrid species) are not found in "Flora of Albania" published volumes.

1. *Prunella albanica* Pénzes (The Euro+Med Plantbase, 2010)
2. *Prunella grandiflora* (L.) Scholler subsp. *grandiflora* (The Euro+Med Plantbase, 2010)
3. *Prunella vulgaris* L. subsp. *vulgaris* (The Euro+Med Plantbase, 2010)
4. *Prunella* × *intermedia* Link. (Barina et al., 2018)
5. *Prunella* × *surrecta* Dumort. According to Barina et al. (2018), for this hybrid species there is lack of information (no reported location), so it may need further confirmation.

Genus Rosmarinus L.

In Albania this genus already has as representative 1 species (*Rosmarinus officinalis* L.) also found in "Flora of Albania", but its type - *Rosmarinus officinalis* L. subsp. *officinalis* is missing (The Euro+Med Plantbase, 2010).

Genus Salvia L.

Salvia genus has 22 representative taxa found in Albania (**Tab. 1**), of which 8 (4 types and 4 species) are not published in the volumes of "Flora of Albania".

1. *Salvia fruticosa* Mill. In "Flora of Albania" 3rd edition, it's known as *Salvia triloba* L.f.
2. *Salvia nemorosa* L. subsp. *nemorosa* (The Euro+Med Plantbase, 2010)
3. *Salvia officinalis* L. subsp. *officinalis* (The Euro+Med Plantbase, 2010)
4. *Salvia pratensis* L. subsp. *pratensis* (The Euro+Med Plantbase, 2010)
5. *Salvia tomentosa* Mill. New name for Albania (The Euro+Med Plantbase), in "Flora of Albania", it's known as *Salvia grandiflora* Etl.
6. *Salvia verticillata* L. subsp. *verticillata* (The Euro+Med Plantbase, 2010)
7. *Salvia aethiopis* L. (Barina et al., 2018)
8. *Salvia microphylla* Kunth. According to Barina et al. (2018), this species is only found cultivated in Albania.

Genus Satureja L.

The genus *Satureja* in Albania is represented by 9 taxa (**Tab. 1**), of which 3 (2 types and 1 species) are not published in "Flora of Albania" and 2 species come with new accepted names by "The Euro +Med Plantbase".

1. *Satureja kitaibelii* Wierzb. ex Heuff. New name for Albania, in "Flora of Albania" 3rd volume, this species is known as *Satureja montana* L. subsp. *kitaibelii* (Wierzb.) P.W.Ball.
2. *Satureja montana* L. subsp. *variegata* (Host) P.W.Ball. (Barina et al., 2018)
3. *Satureja subspicata* Bartl. ex Vis. New name for Albania (The Euro+Med Plantbase), in "Flora of Albania" 3rd volume, this species is known as *Satureja montana* L. subsp. *illyrica*.
4. *Satureja subspicata* Bartl. ex Vis. subsp. *subspicata* (The Euro+Med Plantbase, 2010)
5. *Satureja parnassica* Heldr. & Sart. ex Boiss. According to Barina et al., 2018, the presence of this species in Albania is mentioned only once (Kárpáti & Kárpáti, 1961), so it may need further confirmation.

Genus Scutellaria L.

This genus in Albania is represented by 12 taxa (**Tab. 1**), of which 3 (1 type and 2 subspecies) are not published in the "Flora of Albania" books and one has a new updated name according to "The Euro+Med Plantbase".

1. *Scutellaria columnae* All. subsp. *columnae* (The Euro+Med Plantbase, 2010)
2. *Scutellaria orientalis* subsp. *pinnatifida* J. R. Edm. (The Euro+Med Plantbase, 2010, Barina et al., 2018)
3. *Scutellaria rupestris* Boiss. & Heldr. New name for Albania, in "Flora of Albania" 3rd edition, this species is known as *Scutellaria rubicunda* Hornem. subsp. *rupestris* (Boiss. & Heldr.).
4. *Scutellaria rupestris* subsp. *adenotricha* (Boiss. & Heldr.) Greuter & Burdet. (The Euro+Med Plantbase, 2010)

Genus Sideritis L.

Sideritis genus in Albania is represented by 8 taxa (**Tab. 1**), of which only 2 types are not published in "Flora of Albania".

1. *Sideritis montana* L. subsp. *montana* (The Euro+Med Plantbase, 2010)
2. *Sideritis raeseri* Boiss. & Heldr. subsp. *raeseri* (The Euro+Med Plantbase, 2010)

Genus Stachys L.

The genus *Stachys* has the largest number of species in the Lamiaceae family. This genus has a total of 44

taxa (**Tab. 1**), of which 16 (5 types, 8 subspecies and 3 species) are not found in "Flora of Albania" books and one has changed its name.

1. *Stachys alopecuros* (L.) Benth. subsp. *alopecuros* (The Euro+Med Plantbase, 2010)
2. *Stachys alpina* L. subsp. *alpina* (Barina et al., 2018)
3. *Stachys alpina* L. subsp. *dinarica* Murb. (Barina et al., 2018)
4. *Stachys annua* (L.) L. subsp. *annua* (The Euro+Med Plantbase, 2010)
5. *Stachys cretica* subsp. *cassia* (Boiss.) Rech. f. (Barina et al., 2018)
6. *Stachys cretica* L. subsp. *cretica*. The presence of this subspecies in Albania needs further confirmation due to lack of records (Barina et al., 2018)
7. *Stachys cretica* subsp. *salviifolia* (Ten.) Rech. f. (Barina et al., 2018)
8. *Stachys cretica* subsp. *bulgarica* Rech.f. (Barina et al., 2018)
9. *Stachys germanica* subsp. *penicillata* (Heldr. & Sart. ex Boiss.) Nyman. (The Euro+Med Plantbase, 2010)
10. *Stachys mollissima* Willd. New name for Albania, in "Flora of Albania" 3rd book, this species is known as *Stachys decumbens* Pers.
11. *Stachys officinalis* (L.) Trevis. subsp. *officinalis* (The Euro+Med Plantbase, 2010)
12. *Stachys officinalis* subsp. *skipetarum* Ják. (Barina et al., 2018)
13. *Stachys recta* subsp. *baldaccii* (K. Malý) Hayek. (Barina et al., 2018)
14. *Stachys recta* subsp. *doerfleri* (Hayek) Hayek. (Barina et al., 2018)
15. *Stachys canescens* Bory & Chaub. (Barina et al., 2018)
16. *Stachys parolinii* Vis. (Barina et al., 2018)
17. *Stachys plumosa* Griseb. (Barina et al., 2018)

Genus Teucrium L.

This genus is represented by 15 taxa (**Tab. 1**), of which 6 (4 types and 2 species) are new to Albanian Flora and one has a new updated name according to "The Euro+Med Plantbase".

1. *Teucrium capitatum* L. New name for Albania, in "Flora of Albania" 3rd book, this species is known as subspecies: *Teucrium polium* L. subsp. *capitatum* (L.) Arcang. So it has passed from subspecies to species.
2. *Teucrium capitatum* L. subsp. *capitatum* (The Euro+Med Plantbase, 2010)
3. *Teucrium chamaedrys* L. subsp. *chamaedrys* (The Euro+Med Plantbase, 2010)
4. *Teucrium flavum* L. subsp. *flavum* (The Euro+Med Plantbase, 2010)
5. *Teucrium montanum* L. subsp. *montanum* (The Euro+Med Plantbase, 2010)
6. *Teucrium divaricatum* Sieber ex Heldr. (The Euro+Med Plantbase, 2010)
7. *Teucrium botrys* L. According to Barina et al. (2018), the presence of this species in Albania is mentioned only once (Demiri, 1983), so it may need further confirmation.

Genus Thymbra L.

This genus is mentioned only by the Euro+Med Plantbase for the distribution of one species in Albania. This genus is not found in any of the 4 published books of "Flora of Albania"
Thymbra capitata (L.) Cav. In "Flora of Albania" the species is known as *Thymus capitata* L.

Genus Thymus L.

This is also a genus that consists in a large number of taxa, a total of 28 (**Tab. 1**), of which 19 taxa are new for Albanian Flora and 2 of the species come with new accepted names according to "The Euro+Med Plantbase".

1. *Thymus boissieri* Halácsy. In "Flora of Albania" 3rd volume, this species is known as *Thymus cherlerioides*.
2. *Thymus doerfleri* Ronniger. (Barina et al., 2018)
3. *Thymus longicaulis* subsp. *chaubardii* (Rchb. f.) Jalas. (The Euro+Med Plantbase, 2010)
4. *Thymus longicaulis* C. Presl subsp. *longicaulis* (The Euro+Med Plantbase, 2010)
5. *Thymus parnassicus* Halácsy (The Euro+Med Plantbase, 2010)
6. *Thymus praecox* subsp. *jankae* (.elak.) Jalas. In "Flora of Albania" 3rd volume, this species is known as *Thymus praecox* subsp. *scorpilii* (Vele.) Jalas.
7. *Thymus pulegioides* subsp. *montanus* (Benth.) Ronniger (The Euro+Med Plantbase, 2010)
8. *Thymus pulegioides* L. subsp. *pulegioides* (The Euro+Med Plantbase, 2010)
9. *Thymus sibthorpii* Benth. (Barina et al., 2018)
10. *Thymus teucrioides* Boiss. & Spruner subsp. *teucrioides* (The Euro+Med Plantbase,

2010)

11. *Thymus thracicus* Velen. (Barina et al., 2018)

12. *Thymus* × *oblongifolius* Opiz. According to Barina et al. (2018), the presence of this hybrid species in Albania is reported only once (Jávorka, 1922), so it may need further confirmation.

13. *Thymus ciliatopubescens* (Halácsy) Halácsy (Barina et al., 2018)

14. *Thymus dacicus* Borb. according to Barina et al. (2018), the presence of this species in Albania is reported only once (Hayek, 1924), so it may need further confirmation.

15. *Thymus degenii* Heinr. Brown. According to Barina et al. (2018), the presence of this species in Albania is reported only once (Jávorka, 1926), so it may need further confirmation.

16. *Thymus odoratissimus* Mill. According to Barina et al. (2018), the presence of this species in Albania is reported only once (Greuter et al., 1986), so it may need further confirmation.

17. *Thymus heterotrichus* Griseb. (Barina et al., 2018)

18. *Thymus roegneri* K. Koch. According to The Euro+Med Plantbase 2010, this is the updated and accepted name for *Thymus hirsutus* M. Bieb.

19. *Thymus leucotrichus* Halácsy. According to Barina et al. (2018), the presence of this species in Albania is confirmed since 1933: (Hayek (1933), Rechinger (1939), Mitrushi (1966), Meyer (2011), Rakaj et al. (2013), Vangjeli (2015).

20. *Thymus serpyllum* L. According to Barina et al. (2018), the presence of this species in Albania is reported only once (Heldreich, 1879), so it may need further confirmation.

21. *Thymus stojanovii* Degen. The presence of this species in Albania needs further confirmation. It is reported by Barina et al. (2018) referred to other references: Grimus (1871), Bornmüller (1937), Mitrushi (1966), Tutin et al. (1972), Qosja (1973), Demiri (1983), Greuter et al. (1986) and Ball (2011) .

Some of the genera with a small number of species/subspecies have not undergone any taxonomic change over the years and are found the same in "Flora of Albania", such as *Galeopsis* L., *Glechoma* L., *Leonurus* L., *Lavandula* L., *Lycopus* L., *Melissa* L., *Melittis* L., *Ocimum* L., and *Prasium* L.

Vitex L. genus in the 3rd published edition "Flora of Albania" is not part of Labiatae family, but is found under Verbenaceae family (Qosja et al., 1996).

Ziziphora L. genus has 2 representative taxa in Albania, 1 species and 1 subspecies/the type, of which only the species (*Ziziphora capitata* L.) is published in "Flora of Albania", not its type (*Ziziphora capitata* L. subsp. *capitata*).

After finishing the revision of Lamiaceae family for the flora of Albania, referring all the time to the only documented books (4 volumes of "Flora of Albania"), a lot of changes should be highlighted. Lamiaceae family is found in the 3rd volume of "Flora of Albania" with the name "Labiatae" and has a total of 32 genera (Qosja et al., 1996).

Lamiaceae family in Albania (following the above methodology) is represented by a total of 32 genera and 276 taxa (species/subspecies/varieties) (Barina et al., 2018). Two genera: *Acinos* Miller and *Calamintha* Miller do not exist so far, this two genera are part now of *Clinopodium* L genus. Also *Lamiastrum* Heister ex Fabr., genus does not exist anymore, it is now placed under the *Lamium* L. genus. Two new genera belong now to this family, *Thymbra* and *Vitex*, both with one representative species in Albania. (http://ww2.bgbm.org/euroPlusMed/query.asp). From 276 taxa of this family only 143 are also found unchanged like in the 3rd edition of "Flora of Albania", whereas 133 taxa are new for the flora (with changed species/subspecies name or not even found in any of "Flora of Albania" published volumes). The total composition of Lamiaceae family in Albanian flora is found in **Tab. 1**.

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