

A survey of *Lamiaceae* in the flora of Iran

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Z. Jamzad: Research Prof., Research Institute of Forests and Rangelands, P.O. Box 13185-116, Tehran, Iran
(jamzad@rifr-ac.ir & jamzadz@gmail.com)

Abstract

In Iran, the *Lamiaceae* family is represented by 46 genera, 406 species and 97 infraspecific taxa; of these, 165 taxa are endemic. The distribution of family in Iran covers the whole country but the species number decreases from the centre towards the east, south-east and south. The distribution pattern of endemic taxa shows that Chaharmahal-va-Bakhtiari, Esfahan, Fars, Tehran, Azarbayejan, Kohgiloueh-va-Boirahamad, Lorestan and Hamadan provinces are the hot spots for speciation of the family and in these provinces most of the endemic taxa occur. From the conservation point of view, 14 species are suspected of being extinct, or very rare and 55 taxa rare and endangered and are in a critical condition because of their narrow distribution. These taxa have been recorded only from one location in Iran and need special attention and must be considered in conservation programs. Nonetheless, there are a few species with very wide distributions and high frequency. Some of these species occur in ruderal or disturbed habitats.

Keywords: Distribution pattern, endemics, flora of Iran, *Labiatae*

Introduction

Lamiaceae (*Labiatae*) is a family in the *Lamiales* order. It has important medicinal and aromatic plants, very important in the honey and cosmetic industry. It has famous culinary herbs like sage, mint, thyme and savory. Their chemical constituents, including terpenoids and flavonoids, are the important agents for their aromatic, antioxidant, antibacterial and antifungal properties. There are also many well-known ornamental plants in the family which are widely used in horticulture and landscaping. The family contains 236 genera and about 7,173 species and is almost cosmopolitan, but absent from the coldest regions of high altitude or latitude (Harley *et al.* 2004).

South-West Asia with 66 genera and ca. 1100 species is one of the centers of diversity and morphological variation in genera and species of *Lamiaceae* (Hedge 1986, 1992). Among the South-West Asian countries, Iran with 46 genera and 406 species (Jamzad 2012, Rechinger *et al.* 1982) and Turkey with 45 genera and 530 species (Davis 1982) have the greatest number of taxa of *Lamiaceae*.

From the endemism points of view, *Lamiaceae* is an important family in the flora of Iran with 165 endemic taxa (Jamzad 2012, Rechinger *et al.* 1982). The other important families in this category are *Apiaceae* with 122, *Brassicaceae* with 79, *Fabaceae* with 660 and *Asteraceae* with 465 endemic taxa (Emami & Aghazari 2004, Emami *et al.* 2011). Most endemic taxa are represented in the Irano-Turanian region, the most important and wide spread phytogeographical region in Iran (Hedge & Wendelbo 1978).

According to the latest classification (Harley *et al.* 2004), the family is classified into seven subfamilies (*Symphorematoideae*, *Viticoideae*, *Ajugoideae*, *Prostantherioideae*, *Scutellarioideae*, *Lamioideae*, *Nepetoideae*) and a group of genera of doubtful position. Within some of the subfamilies, further divisions at tribal and subtribal ranks were also recognized. The subfamilial classification is mainly based on morphological-floral characters but also considers recently published works using modern methods *i.e.* molecular, cytological and phytochemical methods (Cantino 1992a, Cantino 1992b, Ryding 1992, 1995, Kaufmann & Wink 1994, Wagstaff *et al.* 1995). There have been many molecular studies on the family in the last decade and new evidences for phylogenetic relationships at subfamilial and subgeneric levels have been compiled *i.e.* Scheen *et al.* 2010, Bräuchler *et al.* 2010, Mathiesen *et al.* 2011 and Salmaki *et al.* 2012.

In Iran, *Lamiaceae* is represented by five subfamilies: *Viticoideae*, *Ajugoideae*, *Scutellarioideae*, *Lamioideae* and *Nepetoideae*. *Nepetoideae* is the largest with 242 species, *Lamioideae* (116 species) is the second, *Scutellarioideae* (27 species), *Ajugoideae* (18 species) and *Viticoideae* (3 species) have the third, fourth and fifth positions, respectively (Table 1).

The first comprehensive work on the family in Iran is the Flora Iranica account (Rechinger *et al.* 1982). In this Flora, covering Iran and Afghanistan, N Iraq, West Pakistan and South Turkmenistan 47 genera, 347 species were recognized for Iran. Thirty years after this account, the family was reviewed and published, in Persian, in the Flora of Iran (Jamzad 2012).

The present work discusses the family in Iran, distribution patterns, speciation centers, endemism, the species rich genera and those with limited species number. The conservation problem of the family is also discussed.

- Distribution patterns of *Lamiaceae* in Iran

A. General distribution

The family is present in almost all parts of the country but different genera have different patterns of distribution. A survey of the presence of the family in Iran

reveals the decrease of occurrence of the family members from centre towards the east, south-east and south of the country. In the east, the areas between longitudes 57°–63° E and latitudes 25°–36° N have the lowest species occurrence.

The genera present here include *Acinos* Miller, *Chamaesphacos* Schrenk, *Dracocephalum* L., *Eremostachys* Bunge, *Hymenocrater* Fisch. & C.A. Mey., *Hypogomphia* Bunge, *Lagochilus* Bunge, *Lallemantia* Fisch. & C.A. Mey., *Lamium* L., *Lavandula* L., *Marrubium* L., *Mentha* L., *Micromeria* Benth., *Nepeta* L., *Otostegia* Benth., *Perovskia* Kar., *Phlomidosema* Vved., *Salvia* L., *Satureja* L., *Scutellaria* L., *Teucrium* L., *Thuspeinanta* Durand, *Thymus* L., *Vitex* L., *Zataria* Boiss. and *Ziziphora* L.

As shown in Table 2, the total number of genera here is 28 which is about 60% of all genera in Iran, but the species number includes 85 species which is about 21% of total species of the family in Iran. The most frequent genera in this part of the country are *Nepeta* and *Salvia* which are represented by 17 and 15 species, respectively. These are the largest genera in Iran. The second group of genera with significant representation in eastern Iran includes *Eremostachys*, *Hymenocrater*, *Otostegia*, *Perovskia*, *Scutellaria*, *Teucrium*, *Thuspeinanta* and *Vitex*. These genera have their centre of origin in Central Asia, Turkmenistan, Pakistan and Afghanistan or subtropical areas in the Sahro-Sindian phytogeographical region. Among these genera *Eremostachys* (7 species) and *Hymenocrater* (5 species) are the most important in the area. The centre of diversity of *Eremostachys* is Afghanistan, Pakistan and Central Asia with radiations into Iran. It should be noted that in the recent molecular study of the tribe *Phlomoideae* (Salmaki *et al.* 2012), the generic outline within the tribe has been reconsidered and *Eremostachys* has been included in a previously recognized genus, *Phlomoidea*, but here I applied the generic name *Eremostachys* as in the global treatments of the family (Harley *et al.* 2004, World check list of *Lamiaceae-Verbenaceae*: www.kew.org/wcsp/lamiaceae).

Table 1. Genera, species, infra-specific and endemic taxa of *Lamiaceae* in Iran

Subfamilies and Genera	Species	Infraspecific taxa	Endemic taxa
<i>Viticoideae</i>			
<i>Vitex</i>	3	2	
<i>Ajugoideae</i>			
<i>Ajuga</i>	6	8	7
<i>Teucrium</i>	12	12	4
<i>Scutellarioideae</i>			
<i>Scutellaria</i>	27	10	12
<i>Lamioideae</i>			
<i>Thuspeinantha</i>	2		
<i>Hypogomphia</i>	1		
<i>Chamaesphacos</i>	1		
<i>Sideritis</i>	3		
<i>Stachys</i>	38	6	14
<i>Phlomidosema</i>	1		
<i>Phlomis</i>	19	6	12
<i>Eremostachys</i>	17	2	8
<i>Lagochilus</i>	6	5	9
<i>Leonurus</i>	1	3	1
<i>Lamium</i>	9	6	2
<i>Marrubium</i>	11		1
<i>Ballota</i>	3	4	1
<i>Moluccella</i>	1		
<i>Otostegia</i>	3		1
<i>Nepetoideae</i>			
<i>Dracocephalum</i>	10	2	4
<i>Lallemantia</i>	5		
<i>Nepeta</i>	79	10	42
<i>Hymenocrater</i>	9		5
<i>Prunella</i>	2		
<i>Hyssopus</i>	1		1
<i>Lycopus</i>	1		
<i>Ziziphora</i>	4	2	
<i>Acinos</i>	2		
<i>Calamintha</i>	3		
<i>Clinopodium</i>	2		
<i>Gontscharovia</i>	1		
<i>Satureja</i>	16		9
<i>Micromeria</i>	3		1
<i>Origanum</i>	3	3	1
<i>Thymus</i>	18	3	4
<i>Zataria</i>	1		
<i>Thymbra</i>	1		
<i>Cyclotrichium</i>	4		3
<i>Mentha</i>	7	9	3
<i>Melissa</i>	1		
<i>Perovskia</i>	3	2	
<i>Zhumeria</i>	1		1
<i>Salvia</i>	61	2	18
<i>Lavandula</i>	2		1
<i>Ocimum</i>	1		
<i>Perilla</i>	1		
Total: 46	406	97	165

Table 2. Genera and their species number in east and south-east of Iran

Genera	East and SE	Genera	East and SE
<i>Acinos</i>	1	<i>Otostegia</i>	2
<i>Chamaesphacos</i>	1	<i>Perovskia</i>	3
<i>Dracocephalum</i>	1	<i>Phlomidioschema</i>	1
<i>Eremostachys</i>	7	<i>Satureja</i>	1
<i>Hymenocrater</i>	5	<i>Salvia</i>	15
<i>Hypogomphia</i>	1	<i>Scutellaria</i>	3
<i>Lagochilus</i>	1	<i>Sideritis</i>	1
<i>Lallemantia</i>	1	<i>Stachys</i>	2
<i>Lamium</i>	1	<i>Teucrium</i>	5
<i>Lavandula</i>	1	<i>Thuspeinanta</i>	2
<i>Marrubium</i>	3	<i>Thymus</i>	2
<i>Mentha</i>	1	<i>Vitex</i>	2
<i>Micromeria</i>	2	<i>Zataria</i>	1
<i>Nepeta</i>	17	<i>Ziziphora</i>	2
		Total: 28	85

The centre of diversity for the *Hymenocrater* is the southern part of Central Asia and Iran. *Teucrium* is another well represented genus of the second group in the area. It is a cosmopolitan genus but characteristically Mediterranean (Harley *et al.* 2004). The very wide spread species *T. polium* L. expands to far eastern areas in Iran.

Among the *Lamiaceae* in Iran, there are only a few very widespread species. The dispersal and establishment of these species are very interesting. Ecological and physiological factors allow them to disperse widely. They occupy ruderal or disturbed habitats where there are very low competition factors. Two such species are *Phlomis olivieri* Benth. and *Stachys byzantina* C. Koch. A number of very widespread species are very polymorphic and infra-specific taxa have been described for most of them. The following species come into this category: *Eremostachys macrophylla* Montbr. & Auch. is distributed in almost all parts of the country except the central deserts, *Lallemantia royleana* (Benth.) Benth., *Lamium amplexicaule* L., *Marrubium astracanicum* Jacq., *M. cuneatum* Banks & Solander, *M. vulgare* L., *Nepeta glomerulosa* Boiss., *N. fissa* C.A.

Mey., *Phlomis olivieri* Benth., *Stachys inflata* Benth., *St. lavandulifolia* Vahl and *Teucrium polium* L.

B. Endemic taxa

An overview of the distribution pattern of endemic taxa in Iran shows that Chaharmahal-va-Bakhtiari (43 species), Esfahan (42 species), Fars (34 species), Tehran (31 species), Azarbayegan (including East and West Azarbayegan, Zanzan and Ardabil provinces, 31 species), Kohgiloueh-va-Boir Ahmad (25 species), Lurestan (23 species) and Hamadan (20 species) provinces are the main localities for the endemics and the diversity hot spots of *Lamiaceae* in Iran. The second group are the provinces with a moderate number of endemic taxa including Kermanshah (16 species), Semnan (16 species), Kurdistan (15 species), Mazandaran (14 species), Kerman (13 species), Yazd (13 species), Hormozgan (13 species), Khorassan (12 species) and Markazi (11 species) provinces. The third group are the provinces with low number of endemics including Ghazvin (9 species), Khuzestan (9 species), Sistan-va-Baluchestan (6 species), Ilam (5 species) and Bushehr (2 species).

A review of the patterns of distribution of endemics shows that the mountainous areas in west, north-west, central, south-west and south Iran, which include the two main mountain ranges of Zagros and Alborz, are the main areas for the endemics. These mountains provide unique niches for genera like *Nepeta*, *Stachys*, *Salvia*, *Scutellaria* and *Satureja*. Most endemic taxa of *Lamiaceae* in Iran are Irano-Turanian elements, with some influences of the Mediterranean and Euxino-Hyrcanian phytogeographical regions in west and north-west Iran.

- *Lamiaceae* in Flora of Iran after Flora Iranica (Rechinger *et al.* 1982)

K.H. Rechinger and co-authors (I.C. Hedge, J. Jalas, J.H. Ietswaart; J. Mennema and S. Seybold) recognized 46 genera and 346 native species of *Lamiaceae* (*Labiatae*) for the flora of Iran (Rechinger *et al.* 1982). *Drepanocaryum* Pojark., *Betonica* L. were treated as distinct genera; *Perilla* L. was recorded as an introduced genus. Thus 47 genera and 347 species were described for Iran. In the new account of the family (Jamzad 2012) the genus *Drepanocaryum* was included in *Nepeta* based on a molecular study (Jamzad *et al.* 2003a) and *Betonica* in *Stachys* (according to Bhattacharjee 1982). Furthermore, *Gontscharovia* Boriss. was newly reported for the flora of Iran (Jamzad *et al.* 2004).

Based on studies after the publication of Flora Iranica the number of species was increased to 406. A total of 38 new taxa and new combinations were added to the previous account (Jamzad 1987, 1988, 1991, 1992, 1994, 1996, 1998, 1999, 2006, 2009, 2010, 2012, Jamzad & Assadi 1984, Jamzad *et al.* 2003b) as follows:

1. *Ajuga chamaecistus* Ging ex Benth. subsp. *tomentella* (Boiss.) Rech.f. var. *bachtiarica* Jamzad (2012).
2. *Ajuga chamaecistus* Ging ex Benth. subsp. *tomentella* (Boiss.) Rech.f. var. *heterophylla* Jamzad (2012).
3. *Ajuga saxicola* Assadi & Jamzad (1984).
4. *Dracocephalum ghahremanii* Jamzad (2012).
5. *Eremostachys lanata* Jamzad (1987).
6. *Lamium baktiaticum* Jamzad (2012).
7. *L. persepolitanum* (Boiss.) Jamzad (2012).
8. *Lagochilus quadridentatus* Jamzad (1988).
9. *L. aucheri* subsp. *heterophyllus* Jamzad (1988).
10. *Mentha mozaffarianii* Jamzad (1987).
11. *Nepeta assadii* Jamzad (1992).
12. *N. balouchistanica* Jamzad & Ingrouile (2003).
13. *N. bazoftica* Jamzad (2009).
14. *N. binaloudensis* Jamzad (1991).
15. *N. bokhonica* Jamzad (1999).
16. *N. glomerulosa* Boiss. var. *stapfiana* (Bornm. ex Rech.f.) Jamzad (2012).
17. *N. hormozganica* Jamzad (2003).
18. *N. kotschyi* Boiss. var. *persica* (Boiss.) Jamzad (2012).
19. *N. mahanensis* Jamzad & Simmonds (2003).
20. *N. makuensis* Jamzad & Mozaffarian (1998).
21. *N. minuticephala* Jamzad (1999).
22. *N. pogonosperma* Jamzad & Assadi (1984).
23. *N. shahmirzadensis* Jamzad & Assadi (1984).
24. *Phlomis anisodonta* subsp. *occidentalis* Jamzad (2012).
25. *P. herba-venti* L. subsp. *urmiensis* Jamzad (2012).
26. *P. lurestanica* Jamzad (2012).
27. *P. mazandaranica* Jamzad (2012).
28. *P. x wendelboi* Jamzad (2012).
29. *Salvia ceratophylla* L. var. *viridifolia* Jamzad (2012).
30. *Satureja kallarica* Jamzad (1992).
31. *S. khuzestanica* Jamzad (1994).
32. *S. rechingeri* Jamzad (1996).
33. *S. kermanshahensis* Jamzad (2010).
34. *Stachys lurestanica* Jamzad (2012).
36. *St. nivea* Benth. subsp. *mazandarana* (Bornm.) Rech.f. ex Jamzad (2012).
37. *Teucrium stocksianum* Boiss. var. *gabrielae* (Bornm.) Jamzad (2012).
38. *Thymus marandensis* Jamzad (2010).

A new record of *Gontscharovia* (Jamzad *et al.* 2004) and 24 species in the list below were reported as new since 1982 (Delghandi 1993; Jamzad 2006, 2009a & b, 2012; Attar & Joharchi 2009; Ghahremaninejad & Ezazi 2009):

1. *Cyclotrichium stamineum* (Boiss. & Hohen.) Manden. & Scheng. (Jamzad 2012).
2. *Dracocephalum lindbergii* Rech.f. (Jamzad 2012).
3. *Eremostachys thyrsiflora* Benth. (Jamzad 2012).
4. *Gontscharovia popovii* (B. Fedtsch. & Gontsch.) Borissova (Jamzad *et al.* 2004).
5. *Marrubium duabense* Murata (Ghahremaninejad & Ezazi 2009).
6. *Mentha rotundifolia* (L.) Huds. (Jamzad 2012).
7. *Micromeria cristata* (Hampe) Griseb. (Jamzad 2009a).
8. *Nepeta grandiflora* M. Bieb. (Jamzad 2012).
9. *N. kurdica* Hausskn. & Bornm. (Jamzad 2012).
10. *N. leucostegia* Boiss. & Hohen (Delghandi 1993).
11. *N. trachonitica* Post (Jamzad 2006).
12. *N. transcaucasica* Grossh. (Jamzad 2012).
13. *Origanum laevigatum* Boiss. (Jamzad 2012).
14. *Perovskia atriplicifolia* Benth. (Jamzad 2012).
15. *Salvia caespitosa* Montbr. & Aucher ex Benth. (Jamzad 2012).
16. *S. dracocephaloides* Boiss. (Jamzad 2012).
17. *S. verbascifolia* M. Bieb. (Jamzad 2012).
18. *Scutellaria amphichlora* Juz. (Jamzad 2012).
19. *Sc. lindbergii* Rech.f. (Attar & Joharchi 2002).
20. *Sc. sosnowskyi* Takht. (Jamzad 2012).
21. *Sc. virens* Boiss. & Kotschy (Jamzad 2012).
22. *Teucrium stocksianum* var. *patulum* Hedge & Lamond (Jamzad 2012).
23. *T. stocksianum* var. *incanum* (Aitch. & Hamsl.) Hedge & Lamond (Jamzad 2012).
24. *Thymus linearis* Benth. subsp. *linearis* (Jamzad 2009).
25. *Thymus armeniacus* Klok. & Shost (Jamzad 2012).

- Conservation notes

Among the species previously reported from Iran, 14 species could not be identified among the specimens studied in local herbaria and were not observed at their reported localities. These are mostly endemic taxa, collected only once: *Cyclotrichium haussknechtii* (Bunge) Manden. & Scheng.; *Marrubium procerum* Bunge; *M. cordatum* Nab.; *Nepeta hymenodonta* Boiss.; *Nepeta koeieana* Rech. f.; *Otostegia michauxii* Briq.;

Phlomis chorassanica Bunge; *Ph. ghilanensis* K. Koch; *Salvia kermanshahensis* Rech.f.; *Scutellaria xylorrhiza* Bornm.; *Sideritis balansae* Boiss.; *Stachys palustris* L.; *Teucrium procerum* Boiss. & Blanche and *Thymus nummularius* M. Bieb. Regarding to the global distribution of the above mentioned taxa and the good collections by different local taxonomist during the last decades, it should be admitted that the endemics of the list above are highly suspected of being extinct in the flora of the world, but those of wider distribution may be recognized as rare in the flora of Iran.

The following 55 taxa are known from a single location occurrence. They should be given priority from a conservation point of view:

Acinos arvensis (Lam.) Dandy*, *Ajuga saxicola* Assadi & Jamzad, *A. chamaecistus* Ging. ex Benth. subsp. *tomentella* (Boiss.) Rech.f. var. *heterophylla* Jamzad, *Cyclotrichium straussii* (Bornm.) Rech.f., *Dracocephalum ghahremanii* Jamzad, *D. polychaetum* Bornm., *Hypogomphia turkestanica* Bunge*, *Eremostachys codonocalyx* Rech.f., *Hymenocrater sessilifolius* Benth., *Lagochilus quadridentatus* Jamzad, *Lamium bakhtiaricum* Jamzad, *Micromeria cristata* (Hampe) Griseb.* *Nepeta adenoclada* Bornm., *N. allotria* Rech.f., *N. assadii* Jamzad, *N. bazoftica* Jamzad, *N. binaloudensis* Jamzad, *N. bokhonica* Jamzad, *N. chionophila* Boiss. & Hausskn., *N. grandiflora* * M. Bieb., *N. juncea* Benth. subsp. *desertorum* Bornm.*, *N. mahanensis* Jamzad, *N. makuensis* Jamzad & Mozaffarian, *N. minuticephala* Jamzad, *N. trachonitica* Post*, *Origanum laevigatum* Boiss.*, *Perovskia atriplicifolia* Boiss.*, *Phlomis mazandaranica* Jamzad, *Ph. lurestanica* Jamzad, *Salvia bazmanica* Rech.f. & Esfand., *S. caespitosa* Montbr. & Aucher ex Benth.*, *S. ceratophylla* L. var. *viridifolia* Jamzad, *S. frigida* Boiss.*, *S. hypochionaea* Boiss., *S. jamzadiae* Mozaffarian, *S. lachnocalyx* Hedge, *S. lanigera* Poir.*, *Satureja intermedia* C.A. Mey*, *S. kallarica* Jamzad, *S. kermanshahensis* Jamzad, *S. macrosiphonia* Bornm.*, *S. rechingeri* Jamzad, *Scutellaria megalaspis* Rech.f.*, *Sc. ramazanica* Parsa, *Sc. szovitziana* Bunge, *Sc. lindbergii* Rech.f.*. *Sc. sosnowskyi* Takht.*,

Sc. amphichlora Juz.*, *Sc. glechomoides* Boiss., *Stachys balansae* Boiss. & Kotschy ex Boiss. subsp. *carduchorum* Bhattacharjee*, *St. lurestanica* Jamzad, *St. macrostachya* (Wend.) Briq.*, *Teucrium scordium* L. subsp. *serratum* (Benth.) Rech.f.*, *Thymus armeniacus* Klok. & Schost. **T. linearis* Benth. subsp. *linearis**, *T. marandensis* Jamzad, *T. nummularius* M. Bieb.* (the symbol* indicates non- endemic taxa).

Discussion

Lamiaceae have some characteristic genera which have part of their centres of origin in Iran. *Nepeta* is the most important by having 79 species of which 42 are endemics. Almost all the infra-generic taxa of the genus are present in Iran. Some previously recognized sections have all their members confined to Iran, i.e. Sect. *Psilonepeta* Benth. The groups of species belonging to this section are closely related to the genera *Lophanthus* Adans. and *Hymenocrater* Fisch. & C.A. Mey. The shared morphological characters of these genera are the presence of a hairy ring in their calyx throat, the corolla form and in some, the resupinate flowers. The annual species of *Nepeta* are mostly endemics of Iran and this country is a centre of speciation for them. There are 20 annual *Nepeta* species in Iran which covers about 25% of total number. The phylogenetic relationships of annuals inferred from the molecular study (Jamzad *et al.* 2003a), reveals that they are related to different groups of perennials not to distinct groups of annuals. For example, *N. ispanica* is closely related to group of species previously recognized as *Capituliferae* (Benth.) Pojark.; *N. meyeri* Benth. and *N. saccharata* Bunge are related to the *N. cataria* L. group of species. The shared synapomorphy among them is the shape of the lower lip of the corolla.

Salvia is the second biggest genus in the flora of Iran with 61 species of which 18 are endemics. A wide diversity of shapes and life form is observed among the members of this genus in Iran: the small shrubby species of southern Iran (*Salvia macilentata* Boiss.) with small flowers (a few millimeters long) to the group with very showy large flowers (*S. macrochlamys* Boiss. &

Kotschy, *S. bracteata* Banks & Soland., *S. hydrangea* DC. ex Benth.) with large flowers (up to four cm). Both annual and perennial life forms occur but most members of the genus in Iran are perennials. The stamen shape and structure is the most important morphological character for the recognition of species groups.

The genus *Stachys* with 38 species of which 14 are endemics is an important Irano-Turanian genus. The species belonging to sect. *Fragilicaulis* Bhattacharjee and sect. *Aucheriana* Bhattacharjee are mainly Iranian endemics.

Satureja, the very well known medicinal genus, in its narrow sense with about 25 species, is prominently present in west Iran. The perennials with 15 species of which nine are endemics, seem to have a centre of origin in Iran.

There are 14 genera with a single species in Iran which covers 21 percent of the total genera. Among these, the endemic monotypic genus, *Zhumeria* Rech.f. & Wendelbo is of special importance. It is closely related to *Salvia*, the *S. santolinifolia* Boiss. group of species (Walker & Sytsma 2007). *Zhumeria majdae* is a very important medicinal plant which has been severely harvested and consequently is now endangered (Mahboubi & Kazempour, 2009; Jalili & Jamzad 1999). The other rare monotypic genus is *Thymbra* L. with *T. spicata* L. which is very rare in Iran. It is a Mediterranean species which occurs in west Iran in limited locations. *Zataria multiflora* Boiss. is an important medicinal plant in Iran which is known from ancient times. It is severely harvested. Because of its low reproduction, it should be considered in conservation management programs. Some of the monotypic genera have very limited distributions in Iran and need special conservation strategies for their survival, such as *Phlomidioschema* and *Hypogomphia*.

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