

A REVISION ON THE GEOBOTANICAL STRUCTURE OF IRAN

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Abstract

Based on the data from the Flora of Iran, completed in 184 numbers, the geobotanical structure of Iran has been revised. A total of 130420 specimens were studied for the preparation of the Flora of Iran. The specimens were computerized, and distribution maps were prepared for all taxa, including 177 families, 1303 genera, 7371 species, 681 subspecies, and 486 varieties, of which 19 genera and 2390 (28%) taxa are endemic to Iran. Based on the distribution of taxa, especially endemics, the phytochoria of Iran were recognized. Following the former authors, two kingdoms, including the Holarctic and Paleotropical kingdoms, were recognized in Iran. The Holarctic kingdom includes two regions, the Euro-Siberian and Irano-Turanian Regions. Euro-Siberian consists of the Euxino-Hyrcanian Province and Irano-Turanian, introduced by four provinces, including the Armeno-Atropatanian, Elborzo-Khorasanian, Kurdo-Zagrosian, and Central Iranian. Paleotropical kingdom harbors the lower elevations of the southern part of Iran with a single region and a province, namely the Saharo-Sindian Region and Nubo-Sindian Province. Phytochoria known in this paper are compared with former studies in a table. The most characteristic and or frequent taxa of the phytochoria are mentioned. Also, endemic taxa of the phytochoria are listed. Images of different recognized phytochoria are presented.

Keywords: Plant Geography, Iran, Flora, endemics, distribution, gypsum soil. saline

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بازنگری جغرافیای گیاهی ایران

مصطفی اسدی: استاد، موسسه تحقیقات جنگلها و مراتع کشور، سازمان تحقیقات، آموزش و ترویج کشاورزی، ایران
چکیده: جغرافیای گیاهی ایران بر اساس مجموعه فلور ایران که در ۱۸۴ شماره منتشر شده، مورد بازنگری قرار گرفته است. در مجموع برای تهیه فلور ایران تعداد ۱۳۰۴۲۰ نمونه گیاهی مورد مطالعه قرار گرفته است. نمونه‌های مطالعه شده وارد کامپیوتر شد و بر اساس آنها نقشه انتشار تمامی آرایه‌ها تهیه گردید که شامل ۱۷۷ تیره، ۱۳۰۳ جنس، ۷۳۷۱ گونه، ۶۸۱ زیرگونه و ۴۸۶ واریته می‌باشد. از مجموع آرایه‌های فوق تعداد ۱۹ جنس و ۲۳۹۰ گونه یا واحدهای تحت گونه (۲۸٪) برای ایران انحصاری تشخیص داده شد. بر اساس طریقه انتشار آرایه‌ها و به خصوص آرایه‌های انحصاری، مناطق رویشی ایران مشخص گردید که شامل دو قلمرو شمالی (هولارکتیک) و گرمسیری قدیم (پالئوتروپیک) است. از قلمرو شمالی دو ناحیه اروپائی-سیبری شامل حوزه اوگزینی-هیرکانی و ناحیه ایرانی-تورانی شامل حوزه‌های ارمنستانی-آذربایجانی، البرزی-خراسانی، کردستانی-زاگرسی و مرکزی ایران تشخیص داده می‌شود. مناطق رویشی

شناخته شده در این مقاله با مطالعات قبلی در یک تابلو مقایسه می‌شود. از قلمرو گرمسیری قدیم فقط ناحیه صحرائی-سندی شامل حوزه نوییائی-سندی برای مناطق کم ارتفاع جنوب ایران تشخیص داده می‌شود. گونه‌های شاخص و فراوان و همچنین انحصاری مناطق رویشی ذکر می‌شود. تصاویری از مناطق مختلف فیتوجغرافیایی ارائه می‌گردند.

INTRODUCTION

The geobotanical structure of Iran has been studied since earlier times. Boissier (1867), in the preface of the *Flora Orientalis* vol. 1, discussed the area covered by *Flora Orientalis* from a geobotanical point of view. He recognized four botanical regions for the area, which roughly corresponded to parts of Iran. Some of them are divided into subregions. These divisions are as follows:

I. The Middle Europe Region, the Hyrcanian forests are part of this region.

II. Mediterranean Region: No part of Iran belonged to this region.

III. Oriental True Region that is divided into: 1. Plateau Subregion covering the Iranian Plateau as well; 2. The Aralo-Caspian Subregion encompasses eastern Iran, while the Mesopotamian Subregion spans areas along the Tigris and Euphrates, including Asia Minor and the Armenian Plateau.

IV. The Palm Region covers southern Iran as well.

Zohary (1963), in his monumental work titled 'On the Geobotanical Structure of Iran', based on excursions and taking transects in different directions, divided Iran into the following phytocoria:

I. The Euro-Siberian Region, which comprises most of Europe except the Arctic in the north and the Mediterranean Region in the south, and in the east extending to northern Anatolia and Hyrcanian forests in northern Iran, is known as part of the Euxino-Hyrcanian Province.

II. The Irano-Turanian Region is divided into two subregions. From the Western Irano-Turanian Subregion, the following choria are known from Iran: **a.** Mesopotamian Province extending to the foothills of the Zagros Mountains and part of Khuzestan in its eastern part. **b.** The Irano-Anatolian Province covers most of Iran except the northern slopes of the Elborz Mountains and the low altitudes of southern Iran along the Persian Gulf and the Oman Sea. The Irano-Anatolian Province was further divided into the following units: 1) The Armeno-Iranian steppe forest district. 2) The Zagrosian forest district. 3) The Afghan-Anatolian steppe district. 4) The Turanian sand and marsh enclaves, 5) The alpine and subalpine zones.

III. The Sudanian Region that in Iran covers lower altitudes along the Persian Gulf and the Oman Sea, named the Nubo-Sindian territory.

Later in 1973, Zohary published a book, dividing Iran into the following regions:

I. The Euro-Siberian Region that covers the Hyrcanian forests, as the Pontic Province and Hyrcanian district.

II. The Irano-Turanian Region. This region covers most of Iran except the northern slopes of Elborz and S. of Iran, as the Irano-Anatolian Province, and was subdivided into: **a.** The Armeno-Iranian Sector, which covers the southern slopes of Elborz and continues to the north of Khorasan and Azerbaijan. **b.** The Kurdo-Zagrosian Sector comprises the Zagros Mountain Chains. **c.** The Central Iranian Sector covers the steppe and deserts of Iran.

III. The Sudanian Region, which comprises the Nubo-Sindian Province in Iran and covers low altitudes along the Persian Gulf and the Oman Sea. Also, Zohary mentions the presence of the Mediterranean and Saharo-Arabian elements as well as Turanian enclaves in Iran.

Takhtajan (1986), in his monumental work titled "Floristic Regions of the World," recognized only two regions for Iran:

I. The Irano-Turanian Region, which comprises most of Iran except for lower altitudes along the Persian Gulf and the Oman Sea. This region is subdivided into western and central Asiatic subregions, with the former comprising Iran. The Iranian part of the western subregion is divided into: **a.** The Mesopotamian Province covers some parts of Khuzestan in southwest Iran. **b.** The Armeno-Iranian Province covers most of Iran. He divides this province into some subprovinces, but he claims that at least part of them may need to be known as separate provinces. These subprovinces are: 1) The Atropatanian Subprovince covers Azerbaijan, continuing along the southern slopes of the Elborz Mountain Chains to the mountains about N. of Semnan. 2) The Khorasan Subprovince comprises the eastern part of the Atropatanian Subprovince, including the mountainous areas of northern Khorasan. 3) The Fars-Kerman Subprovince that covers the mountains of Yazd, Kerman, N. of Hormozgan, and SE. of Zagros in Fars province. 4) The Central Iranian Subprovince, which includes the main part of the Iranian plateau, including the Namak and Lut Kavirs. **c.** The Hyrcanian Province covers the Hyrcanian forests. **d.** The Northern

Baluchistan Province covers the elevations of the SE—Iran in Baluchistan Province.

II. Sudano-Zambesian Region, which comprises its four subregions, of which only the Omano-Sindian Subregion occurs in Iran, which is divided into three provinces, and only the South Iranian Province covers low elevations along the Persian Gulf and the Oman Sea.

White and Leonard (1991) dealt with the south and the partly Iranian Plateau. They recognized south of Iran as the Nubo-Sindian local Centre of Endemism belonging to the Saharo-Sindian Regional Zone. For the other parts of Iran, except the northern slopes of Elborz, they used the name Irano-Turanian Regional Centre of Endemism.

This paper aims to review the Phytochoria of Iran based on the newly completed Flora of Iran (Assadi & al. 1989-2024).

MATERIALS AND METHODS

For the preparation of the Flora of Iran (Assadi & al., l.c.), altogether 130420 specimens have been studied. The specimens were computerized, and distribution maps were prepared for all known taxa. The distribution pattern of whole and endemic taxa, including genera, species, and subspecifics, was studied. Available and the most important literature were studied. According to the literature, the concept of phytochoria is based on the distribution pattern of taxa, with some modification for different authors. Many authors have recognized two plant kingdoms in Iran that are based on the distribution pattern of plant families. This concept is accepted in the present paper that the main part of Iran, excluding the lower altitudes of southern Iran along the Persian Gulf and Oman Sea, belongs to the Holarctic Kingdom. The southern part of Iran belongs to the Paleotropical Kingdom. The next lower phytochorion is a region that is based on the distribution pattern of the genera, including the presence of an acceptable number of endemic genera and the concentration of species in the area. The next phytochorion is a province that is based on the presence of endemic species and mono- or pauci-genera endemics. This division might be divided into subsidiary phytochoria. Worth mentioning that these divisions partly followed Takhtajan's (1986) concept of phytochorian classification.

RESULTS AND DISCUSSION

Altogether 177 families, 1303 genera, 7371 species, 681 subspecies, and 486 varieties are known from Iran.

Moreover, 538 taxa are regarded as doubtful species for Iran. These represent species for which no specimens have been seen by the authors. They may involve unresolved taxonomic issues or may be valid taxa that have not yet been collected within the country.

Among the taxa known from Iran, there are no endemic families, but 19 genera and 2390 taxa, including species and subspecific taxa, are known as endemics of Iran. Table 1 shows endemic genera and their distribution in Iran. Some of the genera are not well known or might need to be transferred to other genera. Obviously, at least part of them have been included in other genera (*Zhumeria*, included in *Salvia*) or might not be good genera, and further studies are needed to clear their taxonomic position (Sales & Hedge 2013). In Table 1, it is clear that the endemic genera are either in mountainous areas, special habitats (genus *Hypericopsis*), or the transition zone (genus *Dicyclophora*).

A list of the number of specimens, recognized taxa, and endemic taxa for all provinces used in the Flora of Iran was prepared (Assadi 1989), which cannot be presented here. Nomenclature of taxa is based on 184 numbers of Flora of Iran and a supplement (Assadi et al. 1989-2023; Assadi & Heydarnia 2024). Based on that table, another table including the number of specimens cited in the Flora, the number of taxa, the relative number of specimens to taxa, the endemic taxa of Iran, and the endemic genera of Iran was prepared for the provinces recognized in the Flora of Iran, as shown in Table 2. According to Table 2, mountainous provinces are usually rich in the number of species. However, provinces with a low relative number of specimens to taxa indicate that either they are under collection, or further collecting excursions are needed.

A list of species has been prepared for different areas of Iran, having unique areas in view of the concentration of species and genera, and also the number of endemics that are explained here. Most of the authors dealt with the flora of Iran and its plant geography, recognized three regions in Iran, which is accepted here.

I. Euro-Siberian Region

The Euro-Siberian Region covers most of Europe except the north and south, and extends to Asia, including Siberia, north of Anatolia, and north of Iran. This region has been variously subdivided into provinces such as Atlantic European Province in the west, through Central European to finally Japanese-Korean in the east and Euxine, Caucasian and Hyrcanian in SW Asia.

Table 1. Endemic genera of Iran.

Genera	Family	Species	Distribution	Province	Altitude (a.s.l)
<i>Alococarpum</i>	Apiaceae	<i>A. erianthum</i>	NW., C.	Azerbaijan and Tehran	1200-2480
<i>Azilia</i>	Apiaceae	<i>A. eryngioides</i>	W.	Lorestan, Khuzestan	1820-2400
<i>Dicyclophora</i>	Brassicaceae	<i>D. persica</i>	S.	Fars, Kerman, Khuzestan, Bushehr, Hormozgan	250-1400
<i>Elburzia</i>	Brassicaceae	<i>E. fenestrata</i>	C.	Tehran	2200-2250
× <i>Festulolium</i>	Poaceae	<i>Festuca sclerophylla</i> × <i>Lolium</i> sp.	NW, W, C, NE	Azerbaijan, Kerman, Khorasan, Tehran	1600-2300
<i>Haussknechtia</i>	Apiaceae	<i>H. elymaitica</i>	W.	Bakhtiari, Kogilouyeh	1500-2500
<i>Heliocarya</i>	Boraginaceae	<i>H. monandara</i>	C.	Isfahan	1550-2000
<i>Hymenocephalus</i>	Asteraceae	<i>H. rigidus</i>	C.	Isfahan, Fars	ca. 2100
<i>Hypericopsis</i>	Frankeniaceae	<i>H. persica</i>	C.	Fars	1300-1700
<i>Kalakia</i>	Apiaceae	<i>K. marginata</i>	C.	Tehran	1020-1700
<i>Kelussia</i>	Apiaceae	<i>K. odoratissima</i>	W.	Bakhtiari, Isfahan	2500-2855
<i>Mozaffariania</i>	Apiaceae	<i>M. insignis</i>	W.	Khuzestan, Ilam	400-500
<i>Opoidea</i>	Apiaceae	<i>O. galbanifera</i>	NE.	Khorasan	Ca. 1500
<i>Opsicarpium</i>	Apiaceae	<i>O. insignis</i>	W.	Kordestan	1450-2000
<i>Pseudofortuynia</i>	Brassicaceae	<i>P. leucoclada</i>	C.	Isfahan, Yazd, Fars	2050-3000
<i>Sclerochorton</i>	Apiaceae	<i>S. haussknechtii</i>	W.	Kordestan	3600-3900
<i>Straussiella</i>	Brassicaceae	<i>S. purpurea</i>	C.	Isfahan, Tehran, Hamadan	1600-2300
<i>Zerdana</i>	Brassicaceae	<i>Z. anchonioides</i>	W., C.	Isfahan, Yazd, Kohgilouyeh, Kerman	3000-4000
<i>Zeugandra</i>	Campanulaceae	<i>Z. iranica</i>	W.	Kermanshah	1020-2100
<i>Zhumeria</i>	Lamiaceae	<i>Z. majdae</i>	S.	Hormozgan	500-1200

Table 2. The number of specimens studied, the number of species and subspecific taxa, the relative number of specimens studied for each taxon, and the endemic taxa of Iran in the political provinces of Iran.

Provinces	No. of specimens	No. of taxa	Relative no. of specimens to taxa	Specific or subspecific endemics	Endemic genera
Azerbaijan	22341	3505	6.37	495	2
Bakhtiari	3344	1190	2.3	375	2
Baluchestan	4473	942	3.7	85	-
Bushehr	1625	543	2.9	42	1
Fars	6852	1650	3.2	366	4
Gilan	4031	1472	2.3	112	-
Hamadan	2561	1069	2	228	1
Hormozgan	8731	1028	6.3	129	2
Gorgan	4066	1427	2.4	112	-
Isfahan	5173	1587	2.9	4.8	5
Ilam	586	352	1.5	51	1
Khorasan	11546	2101	4.78	330	2
Khuzestan	4423	1005	3.41	91	3
Kordestan	4291	1385	2.5	206	3
Kerman	3699	1163	2.7	251	3
Kermanshah	3092	1171	2.3	144	1
Kohgilouyeh-Boirahmad	2435	958	2	240	2
Lorestan	3570	1240	2.2	206	1
Mazandaran	8381	1971	3.5	288	-
Semnan	5160	1503	2.86	264	-
Sistan	234	129	1.59	3	-
Tehran	17909	2773	5.2	585	5
Yazd	1897	457	3	161	2
Total	130420	8533	-	-	-

Frequent Euro-Siberian taxa in the Hyrcanian forests in northern slopes of Elborz Mountain Chains suggest that the area belong to the Euro-Siberian Region. Some of the Euro-Siberian elements are: *Acer platanoides*, *Ajuga reptans*, *Alnus glutinosa*, *Anthoxanthum odoratum*, *Arum maculatum*, *Astragalus glycyphyllos*, *Astrantia maxima*, *Athyrium filix-foemina*, *Bidens tripartita*, *Blechnum spicant*, *Briza media*, *Calamintha grandiflora*, *C. officinalis*, *Calystegia silvatica*, *Cardamine bulbifera*, *C. impatiens*, *Carex digitata*, *C. divulsa*, *C. grioletii*, *C. pendula*, *Carpesium abrotanoides*, *C. cernuum*, *Carpinus betulus*, *Castanea sativa*, *Cephalanthus rubra*, *Cerasus avium*, *Circaea lutetiana*, *Clinopodium umbrosum*, *Cornus sanguinea* subsp. *australis*, *Corylus avellana* var. *avellana*, *C. colurna*, *Cydonia oblonga*, *Daphne mezereum*, *Dryopteris filix-mas*, *D. pallida*, *D. affinis*, *Elymus caninus*, *Epimedium pinnatum*, *Eupatorium cannabinum*, *Evonymus latifolius*, *Fagus orientalis*, *Fragaria vesca*, *Festuca drymeia*, *Fraxinus excelsior*, *Hypericum androsaemum*, *H. perforatum*, *Inula helenium*, *Juglans regia*, *Juniperus communis*, *J. sabina*, *Lamium album*, *Lathraea squamaria*, *Laurocerasus officinalis*, *Limodorum abortivum*, *Luzula fosteri*, *Matteuccia struthiopteris*, *Mercurialis perennis*, *Mespilus germanica*, *Neottia nidus-avis*, *Ophrys apifera*, *Oplismenus undulatifolius*, *Perilla frutescens*, *Petasites hybridus*, *Peucedanum glaucopruinosum*, *P. pimenovii*, *Platanthera bifolia*, *Polygala anatolica*, *Polypodium vulgare*, *Polystichum aculeatum*, *P. woronowii*, *Pteris cretica*, *Pulicaria dysenterica*, *Rubus hirtus*, *Sambucus ebulus*, *Sanicula europaea*, *Solidago virgaurea*, *Sorbus aucuparia*, *S. graeca*, *S. torminalis*, *Tamus communis*, *Taxus baccata*, *Ulmus glabra*, *U. minor*.

1. Euxino-Hyrcanian Province

The Northern slopes of the Elborz Mountain Chains, from sea level to about 2500 m, and part of the Arasbaran forest, belong to the Euxino-Hyrcanian Province. The vegetation of the area is mainly broad-leaved deciduous forest (Fig. 1), which changes to woodland or scrub deciduous in higher altitudes, about 2000-2500 m (a.s.l.), or meadows (Fig. 2) in favorable habitats with deep and wet soil, and also, evergreen needle-leaved scrub of *Juniperus communis* and *J. sabina*. Enclaves of evergreen needle-leaved forest of mainly *Cupressus sempervirens* occur in favorable conditions at Rudbar-Manjil valley, mixed with *Olea europaea*, Chalus valley, and Katul valley, East of Gorgan. This area contains about 2146 (25% of the whole plant taxa of Iran) taxa, including subspecies and varieties, of which 137 are endemics, but no endemic genera. It means about 25% of the Iranian plant taxa are Euro-Siberian elements. Obviously, some taxa are

really Irano-Turanian that have penetrated to this area in favorable conditions as enclaves. From phytochorian point of view, the area has been regarded as a member of the Pontic, Euxino-Hyrcanian, and Hyrcanian Provinces of Euro-Siberian or Middle Europe Region (Zohary 1963 and 1973; Boissier 1876; Davis 1965-1985 and many other authors). Takhtajan (1986) recognized the area as a province of the Hyrcanian but from the Irano-Turanian Region. He explains that he accepts the regions as a continuous area and therefore regards the northern slopes of Elborz as belonging to the Irano-Turanian Region. There is a fact that, as the area is the ending part of the Euro-Siberian region in a narrow belt, and also the area is the southern part of the Caspian Sea, which is the remnant of the Tethys Sea, in favorable conditions, Irano-Turanian and also Mediterranean elements appear. Also, the presence of generic elements of SE. Asia, Mediterranean, and northern American Atlantic Regions, such as *Parrotia*, *Castanea* (closely related to *Castaneopsis*), *Cercis*, *Albizia*, *Gleditsia*, *Diospyros*, *Melia*, etc. affect the phytochorian position of the area related to other regions (Sales & Hedge 1996; Li & Tredici 2008; Takhtajan 1986). However, these taxa are obviously remnants of continuous East to West Asia and Europe, and partly N. American forests in the Tertiary period that were later disjointed and finally glaciations of the Quaternary completed a quite disjunct distribution of taxa by diverged evolutionary pathway. Therefore, as there are no endemic genera in the area, based on the definition of the province, the area is not known as a distinct province, but together with the Euxin area as the Euxino-Hyrcanian Province.

Some of the endemic taxa of the Hyrcanian forests are as follows:

Acer mazandaranicum, *Acer zareii*, *Aconitum iranshahrii*, *Alcea gorganica*, *A. wilhelminae*, *Alchemilla citrina*, *A. fluminea*, *A. condensata*, *A. farinosa*, *A. gigantodes*, *A. melancholica*, *A. microscopica*, *A. pectiniloba*, *A. plicatissima*, *A. surculosa*, *Alnus djavanshirii*, *A. dolichocarpa*, *Alyssopsis mollis*, *Alyssum lanigerum*, *A. mazandaranicum*, *Anthemis gilanicum*, *A. masandaranicum*, *Arabis rimarum*, *Aristolochia hyrcana*, *Asperula gorganica*, *A. mazandaranicum*, *A. microphylla*, *A. sherardii*, *Astragalus bekkii*, *A. doghrunensis*, *A. memoriosus*, *A. ernii-gaubae*, *A. herbertii*, *A. jessenii*, *A. lacus-valashti*, *A. masandaranicum*, *A. montis-alamkuhi*, *A. rosellus*, *Ballota platyloma*, *Bupleurum ghahremanii*, *Buxus hyrcana*, *Centaurea kandavanensis*, *Cephalorrhynchus gorganicus*, *Cerastium dahuricum*, *Cirsium gadukense*, *Cortusa mathioli* subsp. *iranica*, *Corydalis chionophila* subsp. *firouzii*, *C. hyrcana*, *Cotoneaster assadii*,



Fig. 1. Broad-leaved deciduous forest of Euxino-Hyrcanian province; 2. Meadows of higher altitudes in the Euxino-Hyrcanian province.

C. kotschyi, *C. demavendi*, *Cousinia erinacea*, *Crocus gilanicus*, *Crucianella platyphylla*, *Delphinium elbursense* var. *gymnobotrys*, *Delphinium elbursense*, *D. ursinum*, *Dianthus hyrcanicus*, *D. mazanderanicus*, *D. rudbaricus*, *Dichodon tenuifolium*, *Draba aucheri*, *Dolichorrhiza persica*,

Elymus lazicus subsp. *iranicus*, *Epipactis rechingeri*, *Erigeron hyrcanicus*, *Erysimum spetae*, *Euphorbia caspica*, *E. mazandarana*., *E. mirzakhani*, *Galium elbursense*, *Glyceria hyrcana*, *Hedera pastuchovii*, *Heracleum gorganicum*, *H. rechingeri*, *Hypericum fursei*, *Isatis gaubae*, *Johhrenia golestanica*, *J. ramosissima*, *Jurinea sharifiana*, *Laser rechingeri*, *Lactuca azerbaijanica*, *Leontodon hispidus* subsp. *mazanderanicus*, *Linaria golestanensis*, *L. guilanensis*, *L. khalkhalensis*, *Lindelofia kandavanensis*, *Noccaea maasoumii*, *Onobrychis mazandarana*, *Origanum strobilaceum*, *Ornithogalum bungei*, *Orobancha eriophora*, *Papaver chelidoniifolium* subsp. *chelidoniifolium*, *P. chelidoniifolium* subsp. *pinnatum*, *Perilla frutescens*, *Polygala platyptera*, *Phleum iranikum*, *Phlomis mazandarana*, *Polygala platyptera*, *Polygonum hyrcanicum*, *Populus caspica*, *Prunus divaricata* subsp. *caspica*, *Pseudomuscari chalusicum*, *Pyrus mazanderana*, *Ranunculus buhsei*, *Rindera regia*, *Rumex elbursensis*, *Salix australior*, *S. firouzkuhensis*, *Saxifraga ramsarica*, *S. wendelboi*, *Satureja isophylla*, *Saxifraga iranica*, *S. ramsarica*, *S. wendelboi*, *Scilla gorganica*, *Scorzonera kandavanica*, *Scrophularia elburzensis*, *S. gaubae*, *S. megalantha*, *S. rostrata*, *Sempervivum atropatanum*, *S. iranikum*, *Serratula gracillima*, *Stachys laxa*, *S. nivea* subsp. *mazandarana*, *Teucrium orientale* subsp. *gloeotrichum*, *Tilia sabetii*, *T. stellato-pilosa*, *Tragopogon gongylorrhizus*, *Tulipa ulophylla*, *Verbascum stachydiforme*, *V. sublobatum*, *Veronica francispetae*, *V. mazanderana*, *V. rechingeri*, *V. siaratensis*.

Some of the Hyrcanian taxa distributed in the Euxin area are as follows: *Acer cappadocicum*, *Acer hyrcanum*, *Acer velutinum*, *Acer subcordatum*, *Amblyocarpum inuloides*, *Andrachne colchica*, *Anemone caucasica*, *Betula litwinowii*, *Carpinus orientalis*, *Corylus avellana* var. *pontica*, *C. maxima* (probably cultivated), *Crataegus microphylla*, *Cyclamen coum* subsp. *caucasicum*, *Danae racemosa*, *Daphne pontica*, *Digitalis nervosa*, *Diospyros lotus*, *Doronicum macrophyllum*, *D. dolichotrichum*, *Echium amoenum*, *Erythronium caucasicum*, *Fagus orientalis*, *Frangula grandifolia*, *Ilex spinigera*, *Juniperus oblonga*, *Lathyrus roseus*, *Mespilus germanica*, *Primula heterochroma*, *Quercus macranthera*, *Q. petraea* subsp. *iberica*, *Ribes biebersteinii*, *Rubus hyrcanicus*, *Scilla hohenackeri*, *Scutellaria tournefortii*, *Serratula quinquefolia*, *Smilax excelsa*, *Stachys nivea* subsp. *mazandarana*, *Stevaniella satyrioides*, *Symphyandra odontosepala*, *Teucrium hircanicum*, *Tragopogon gongylorrhizus*, *Vaccinium arctostaphylos*, *Vincetoxicum scandens*.

II. Irano-Turanian Region

The Irano-Turania Region starts from central Anatolia and part of Sinai, continues to parts of Syria, Palestine, Jordan, the northern part of Iraq, the main part of Iran, part of Caucasus, Afghanistan, Part of Pakistan, E. of the Caspian Sea eastwards to the Gobi plain at 120° East longitude. The area in Iran contains about 5092 plant taxa (60% of the whole plant taxa of Iran). This area covers most of Iran except the northern slopes of the Elborz Mountain Chains and the lower elevations in southern Iran, including the margin of the Persian Gulf and the Oman Sea up to about 800 m. The altitude of the area varies from about 800 to about 4800 m above sea level. Temperature varies from -30°C to +50°C. The flora and vegetation of the area are extremely diverse, comprising forests, scrublands, forbs, salt flats, dunes, and cushion-shaped plants. The



Fig. 3. Typical vegetation of *Artemisia* species in the Irano-Turanian Region; 4. Vegetation of *Eremurus persicus* and *Artemisia* species in the Irano-Turanian Region.

area has been variously divided into subchoria by different authors (Figs. 3 and 4).

Some taxa of the Irano-Turanian Region are as follows:

Acantholimon erinaceum, *A. festucaceum*, *A. flexuosum*, *A. scorpius*, *Anabasis haussknechtii*, *Artemisia aucheri*, *A. scoparia*, *A. sieberi*, *Amygdalus scoparia*, *Astragalus aegobromus*, *A. brachyodontus*, *A. campylorrhynchus*, *A. chrysostachys*, *A. compactus*, *A. cyclophyllus*, *A. denudatus*, *A. effusus*, *A. eriopodus*, *A. floccosus*, *A. glumaceus*, *A. gossypinus*, *A. iranicus*, *A. michauxianus*, *A. microcephalus*, *A. oleaefolius*, *Cerasus microcarpa*, *Chaenorhinum foroughii*, *Cousinia alexeenkoana*, *C. belangeri*, *C. deserti*, *C. incompta*, *C. iranica*, *C. isfahanica*, *C. kotschyi*, *C. lucida*, *C. pugionifera*, *Cotoneaster kotschyi*, *C. persicus*, *Dionysia archibaldii*, *D. aretioides*, *D. bazoftica*, *D. bryoides*, *D. curviflora*, *D. esfandiarii*, *D. iranshahrii*, *D. janthina*, *D. khuzistanica*, *D. leucotricha*, *D. revoluta*, *D. rhaptodes*, *Dorema aucheri*, *Dracocephalum kotschyi*, *Euphorbia microsciadia*, *E. polycaulis*, *Juniperus excelsa*, *Gypsophila persica*, *G. polyclada*, *Halothamnus auriculus*, *Haplophyllum glaberrimum*, *Hedysarum criniferum*, *H. plumosum*, *Helichrysum artemisioides*, *H. globiferum*, *H. leucocephalum*, *H. oligocephalum*, *H. ooecephalum*, *Hordeum brevisubulatum* subsp. *iranicum*, *Lagochilus aucheri*, *L. macranthus*, *Launaea acanthodes*, *Linaria michauxii*, *Linum album*, *Matthiola ovatifolia*, *Medicago persica*, *Mentha longifolia*, *M. mozaaffarianii*, *Noaea mucronata*, *Nonnea suchtelenioides*, *Onobrychis cornuta*, *Onopordon acanthium*, *Ornithogalum sintenisii*, *Physogeton occultus*, *Prangos acaulis*, *Pseudocamelina glaucophylla*, *Pycnocycla spinosa*, *Ranunculus amblyolobus*, *R. crymophilus*, *R. kotschyi*, *Rhamnus pallasii* subsp. *iranica*, *Rheum persicum*, *R. ribes*, *Roemeria hybrida*, *R. refracta*, *Rubia albicaulis*,

Scorzonera intricata, *S. mucida*, *Scrophularia elburzensis*, *S. frigida*, *Stipa arabica*, *S. hohenackeriana*, *Silene behboudiana*, *Tanacetum persicum*.

Based on the floristic component, the Irano-Turanian Region in Iran varies considerably; therefore, from a geobotanical point of view, it may be divided into the choria lower than the region.

1. Armeno-Atropatenian Province

This province is an extension of a province from part of Caucasia (Armenia) and Anatolia to the Azerbaijan part of Iran. Takhtajan (1986) and Zohari (1973) included this part and some other parts of Iran in a province and named it the Armeno-Iranian Province. But, as some of the very important characteristic species of the other parts of Iran, namely *Artemisia sieberi*, *A. aucheri*, *Amygdalus scoparia*, do not occur in this area, I refrain from regarding the whole area as a single province named Armeno-Iranian Province. Moreover, the single monotypic genus *Alococarpum* was described from Azerbaijan, and the main distribution of its species *A. erianthum* is in Azerbaijan. Additionally, there are about 216 endemic taxa in Azerbaijan of Iran, and the area deserves to be excluded from the other parts of Iran from a provincial point of view. Therefore, Azerbaijan, together with parts of Caucasia and Anatolia, is known as a distinct province named Armeno-Atropatenian. Altitude of the area varies from about 1200 to 4300 m above sea level. Vegetation is of shrub lands, scrub lands, woodlands, forbs, alpine, and thorn-cushion formations. The list of well-distributed taxa in Azerbaijan is presented here:

Acantholimon bracteatum, *A. karelinii*, *A. hohenackeri*, *Achillea biebersteinii*, *A. vermicularis*, *Aegilops cylindrica*, *A. triuncialis*, *Agropyron cristatum*, *Ajuga chamaepitys*, *Alkana orientalis*, *Allium atroviolaceum*, *A. rotundum*, *A. rubellum*, *A. scabriscapum*, *Allochrysa lutea*, *A. versicolor*,

Alopecurus arundinaceus, *A. aucheri*, *Amygdalus fenzliana*, *A. trichamygdalus*, *Anabasis aphylla*, *Anthemis tinctoria*, *Arenaria dianthoides*, *A. gypsophiloides*, *Artemisia fragrans*, *A. splendens*, *Asperula glomerata*, *Astragalus angustiflorus*, *A. apricus*, *A. arguricus*, *A. aureus*, *A. aznabjurticus*, *A. caraganae*, *A. caspicus*, *A. compactus*, *A. hymenostegis*, *A. iranicus*, *A. microcephalus*, *A. paralipomenus*, *A. pinetorum*, *A. suffianicus*, *A. tabrizianus*, *A. takhtadzhianii*, *Atriplex verrucifera*, *Bellevalia pycnantha*, *Bothriochloa ischaemum*, *Bromus cappadocicus*, *Campanula rapunculoides*, *C. stevenii*, *Carduus onopordioides*, *Carex divisa*, *Catabrosella humilis*, *Centaurea aucheri*, *C. pseudoscabiosa*, *C. sosnovskyi*, *C. zuvandica*, *Centranthus logiflorus*, *Cerasus incana*, *Cerinthe minor*, *Cirsium congestum*, *Colchicum kotschyi*, *C. szovitsii*, *Consolida orientalis*, *Cotoneaster nummularioides*, *Cousinia grandis*, *C. macrocephala*, *C. microcephala*, *Crataegus meyeri*, *C. pseudoheterophylla*, *Crucianella gilanic subsp. transcaucasica*, *Dactylorhiza umbrosa*, *Delphinium tuberosum*, *Dianthus tabrisianus*, *Echinops orientalis*, *Elymus pertenuis*, *Ephedra major*, *Eremurus spectabilis*, *Erysimum crassipes*, *Euphorbia condylolcarpa*, *E. heteradena*, *E. seguieriana*, *E. szovitsii*, *E. woronowii*, *Fibigia suffruticosa*, *Fritillaria crassifolia subsp. kurdica*, *Gypsophila transcaucasica*, *Helichrysum rubicundum*, *Hesperis persica*, *Iris barnumae*, *I. reticulata*, *Jurinea macrocephala*, *Koeleria cristata*, *Leontodon asperrimus*, *Leopoldia caucasica*, *L. comosa*, *Limonium carnosum*, *Lonicera iberica*, *Marrubium parviflorum*, *Melica ciliata*, *M. oreina*, *Moltkia coerulea*, *Nepeta haussknechtii*, *N. apiculata*, *Noccaea trinervia*, *Onobrychis atropatana*, *O. cornuta*, *O. michauxii*, *Onosma araraticum*, *O. microcarpum*, *O. seriseum*, *Ornithogalum acutum*, *O. brachystachys*, *O. orthophyllum*, *Oxytropis kotschyana*, *Papaver armeniacum*, *P. bracteatum*, *P. orientale*, *Pedicularis sibthorpii*, *Pennisetum orientale*, *Phlomis caucasica*, *P. tuberosa*, *Poa nemoralis*, *P. pratensis*, *P. trivialis*, *Polygala anatolica*, *Prangos ferulacea*, *P. uloptera*, *Pteroccephalus canus*, *Puschkinia scilloides*, *Pyrus salicifolia*, *Ranunculus caucasicus*, *R. constantinopolitanus*, *Rhamnus pallasii*, *Rindera lanata*, *Rosa canina*, *R. foetida*, *R. iberica*, *Rubia rigidifolia*, *Salsola ericoides*, *S. gemmascens*, *Salvia atropatana*, *S. hydrangea*, *S. nemorosa*, *S. sahendica*, *Satureja macrantha*, *S. sahendica*, *Scilla misczenkoana*, *Scorzonera phaeopappa*, *Scrophularia azarbaijanica*, *S. variegata*, *Scutellaria pinnatifida*, *Sedum caucasicum*, *Silene latifolia*, *S. marschallii*, *S. spargulifolia*, *S. swertiifolia*, *S. vulgaris*, *Solidago virga-aurea*, *Stachys byzantina*, *S. fruticulosa*, *Stipa*

pennata, *Tanacetum parthenium*, *T. polycephalum subsp. argyrophyllum*, *Teucrium chamaedrys subsp. sinuatum*, *T. orientale*, *T. polium*, *Thalictrum minus*, *Thymus fedtschenkoi*, *T. kotschyanus*, *T. migricus*, *T. pubescens*, *T. transcausicus*, *T. trautvetteri*, *Tragopogon kemulariae*, *T. reticulatus*, *Tripleurospermum disciforme*, *Trisetum flavescens*, *Tulipa armena*, *T. stylosa*, *Verbascum szovitsianum*, *Ziziphora clinopodioides*.

The list of endemic taxa of Azerbaijan is as follows:

Acantholimon jilliatii, *A. michaudagense*, *A. tragacanthinum*, *A. wilhelminae*, *Alcea assadii*, *A. ghahremanii*, *A. wilhelminae var. wilhelminae*, *Alchemilla citrina*, *A. fluminea*, *Allium iranshahrii*, *A. mahneshanense*, *A. matinae*, *A. pseudohollandicum*, *A. sabalense*, *A. sahandicum*, *A. schisticola*, *A. subakaka*, *Allochrysa lutea*, *A. persica*, *Alococarpum erianthum*, *Anthemis moghanica*, *A. triumfettii subsp. decumbens*, *Arenaria longibracteata*, *A. szowitsii*, *Asparagus azerbaijanensis*, *Asperula glomerata subsp. azerbaijanica*, *A. rezaiyensis*, *A. szovitsii*, *Astragalus abharensis*, *A. absconditus*, *A. aharicus*, *A. andabaddensis*, *A. anguranensis*, *A. arasbaranensis*, *A. austromahneshanensis*, *A. azizii*, *A. barnasariformis*, *A. bashmaghensis*, *A. basilicus*, *A. bejourensis*, *A. belgheisicoides*, *A. birangiae*, *A. biserullata*, *A. bozghoushensis*, *A. brachycarpus*, *A. bradoticus*, *A. brevipes*, *A. bukanensis*, *A. cancellatus*, *A. canosus*, *A. chehreganii*, *A. chichesticus*, *A. circumlacustris*, *A. demavendicolus subsp. microphysopsis*, *A. demonstratus*, *A. dianat-nejadii*, *A. dieteri*, *A. dilutuloides*, *A. diversus*, *A. doghrunensis*, *A. dysbatophilus*, *A. elegans*, *A. ermineus*, *A. expetitus*, *A. fausicola*, *A. foliosus*, *A. hymenocystis*, *A. hymenostegis*, *A. hystrix*, *A. ignotus*, *A. inoblitus*, *A. kaleibarensis*, *A. karl-heinzii*, *A. khadem-kandicus*, *A. khajehensis*, *A. khajiboulaghensis*, *A. kharvanensis*, *A. kiamaky-daghensis*, *A. lippertii*, *A. lisaricus*, *A. maabudii*, *A. mahneshanensis*, *A. marandicus*, *A. meshkinensis*, *A. montis-mishoudaghi*, *A. mozaffarianii*, *A. mutuus*, *A. neo-chaldoranicus*, *A. neo-iranshahri*, *A. neo-mobayenii*, *A. oligoflorus*, *A. parvulus*, *A. pauperiflorus*, *A. pediculariformis*, *A. pileh-khasehensis*, *A. polyanthus subsp. polyanthus*, *A. polystachys*, *A. pseudoantilibani*, *A. pseudocapito*, *A. pseudomultijugus*, *A. pseudopersicus*, *A. psilostylus*, *A. punctatus*, *A. qaratchaicus*, *A. qeydarnabiensis*, *A. qoturenensis*, *A. rollovii*, *A. rubicalyx*, *A. rubrocalycinus*, *A. rudimentus*, *A. sabetii*, *A. sahendi*, *A. sarabensis*, *A. savallanicus*, *A. seidabadensis*, *A. semilunatus*, *A. shabilensis*, *A. siahcheshmehensis*, *A. strictissimus*, *A. subspadanus*, *A. subkohrudicus*, *A. subrecognitus*, *A. subverus*, *A. taebiae*, *A. turkman-chaiensis*, *A. viridis*, *A. zarjabadensis*, *Atraphaxis suaedifolia*, *Bellevalia*

assadii, *B. multicolor*, *B. tabriziana*, *Bromus borianus*, *Buffonia iranica*, *Centaurea congesta*, *Cerastium assadii*, *C. azerbaijanicum*, *C. dahuricum*, *Corydalis verticillaris* subsp. *boissieri*, *Cousinia bobekii*, *C. canescens*, *C. gilliatii*, *C. grossheimii*, *C. satdaghensis*, *Crinitina villosa*, *Dianthus sahandicus*, *D. seidlitzii*, *Elymus lazicus* subsp. *lazicus*, *Erysimum damirliense*, *E. evinense*, *Euphorbia belgheisi*, *E. sahendi*, *Festuca rechingeri*, *F. sabalanica*, *Fritillaria atrolinaea*, *Gypsophila bazorganica*, *G. iranica*, *G. pseudopallida*, *G. wilhelminae*, *Halanthium alae flavum*, *Halimocnemis azarbayejanensis*, *Hedysarum atropatanum*, *H. marandense*, *H. orumiehense*, *H. papillosum*, *Heliotropium gypsaceum*, *Hieracium azerbaijanense*, *Inula rajamandii*, *Jurinea leptoloba*, *Leopoldia ghouschtchiensis*, *L. tabriziana*, *Linaria azerbaijanensis*, *Matthiola iranica*, *Milium atropatanum*, *Minuartia sabalanica*, *M. acuminata*, *Nepeta makuensis*, *Noccaea tenuis*, *Nonnea anchusoides*, *Onobrychis atropatanoides*, *O. aucheri* subsp. *aucheri*, *O. heliocarpa*, *O. marandensis*, *O. subacaulis* var. *erecta*, *O. subnitens*, *O. szovitsii*, *Onosma sabalanicum*, *Oxytropis azarbaijanica*, *O. mahneshanensis*, *O. rhodantha*, *O. sivehensis*, *Paeonia wendelboi*, *Phlomis herba-venti* subsp. *urmiensis*, *Potentilla argaea*, *Ranunculus sahandicus*, *Salsola persica*, *Salvia hypochionaea*, *S. sahendica*, *Scorzonera renzii*, *Scrophularia azarbaijanica*, *S. oxysepala*, *Scutellaria bornmulleri* subsp. *mianensis*, *S. szovitziana*, *S. theobromina*, *Serratula calcarea*, *Silene lulakabadensis*, *S. supina* subsp. *supina*, *Sphaerophysa salsula*, *Tanacetum sonbolii*, *Thalictrum tacabicum*, *Thymus marandensis*, *T. persicus*, *Trigonella khalkhalica*, *Trigonosciadium brachytaenium*, *Typha azerbaijanensis*, *Verbascum azerbaijanense*, *V. suworowianum* var. *pseudopersicum*, *Zeravschania membranacea*.

2. Elborz-Khorasanian Province

This province harbors the southern slopes of the Elborz Mountains eastwards to northern Khorasan. The genera *Elburzia*, *Kalakia*, and *Opoidea* are monotypic endemic genera to this area. There are some 418 endemic taxa to this area, of which 152 are endemic to the mountains of N. Khorasan. Therefore, having 3 monotypic genera and a high number of endemics deserve the area to be known as a distinct province. The altitude of the area ranges from about 1200 to 4800 m above sea level. Vegetation is rather variable including forb in lower altitudes, evergreen needle-leaved woodland resistance to cold in an altitude ca. 2500 m, open thorn-cushion in higher altitudes of about 3000 m, high mountain scree formation in an altitude above 3000 m, rocky cushion formation of mainly *Gypsophila aretioides* confined on rocks in an altitude of 2000 to

about 3500 m, *Pistacia vera* woodland in N. and E. of Mashhad city. Some of the most important species of the area are as follows:

Acantholimon acmostegium, *A. curviflorum*, *A. erinaceum*, *A. scorpius*, *A. shahrudicum*, *Acanthophyllum adenophorum*, *A. bracteatum*, *A. festucaceum*, *A. glandulosum*, *A. scorpius*, *A. laxiusculum*, *A. mucronatum*, *A. sordidum*, *Aethionema grandiflorum*, *Ajuga chamaecistus*, *Allium atroviolaceum*, *A. derderianum*, *A. iranicum*, *A. scabriscapum*, *Alopecurus textilis*, *Amygdalus lycioides*, *A. scoparia*, *Arenaria insignis*, *A. gypsophiloides*, *A. polycnemifolia*, *A. zargariana*, *Arrhenatherum elatius*, *Artemisia sieberi*, *A. aucheri*, *Asperula glomerata*, *Astragalus aegobromus*, *A. aureus*, *A. brachyodontus*, *A. citrinus*, *A. iranicus*, *A. macerocephalus*, *A. macropelmatus*, *A. mesoleios*, *A. oxyglottis*, *A. remotijugus*, *A. sumbari*, *Berberis integerrima*, *B. vulgaris*, *Bilacunaria microcarpa*, *Bongardia chrysogonum*, *Bromus cappadocicus*, *B. tomentellus*, *Celtis caucasica*, *Centaurea aucheri*, *Cerasus microcarpa*, *C. pseudoprostrata*, *Clematis ispanica*, *Colutea buhsei*, *Corydalis verticillaris*, *Cotoneaster nummularioides*, *C. nummularius*, *C. ovatus*, *C. turkomanicus*, *Cousinia aggregata*, *C. calocephala*, *C. keredjensis*, *C. lucida*, *C. multiloba*, *C. onopordioides*, *C. xiphiolepis*, *Delphinium aquilegifolium*, *D. tuberosum*, *Dendrostellera lessertii*, *Dianthus orientalis*, *Diplotaenia cachridifolia*, *Dracocephalum kotschyi*, *Echinops elbursensis*, *E. leiopolyceras*, *E. ritrodes*, *Elymus elongatiformis*, *E. hispidus*, *E. libanoticus*, *E. longearistatus*, *E. transhyrcanus*, *Ephedra major*, *Epilobium minutiflorum*, *Eremostachys laciniata*, *E. macrophylla*, *Eremurus spectabilis*, *E. stenophyllus*, *E. luteus*, *Eryngium billardieri*, *Euphorbia cheiradenia*, *E. marschalliana*, *E. microsciadia*, *E. szovitsii*, *Ferula galbaniflua*, *Festuca arundinacea*, *F. sclerophylla*, *F. skvortsovii*, *F. valesiaca*, *Fibigia suffruticosa*, *Fraxinus angustifolia*, subsp. *syriaca*, *Gagea confusa*, *G. reticulata*, *Gaillonia bruguieri*, *Geranium persicum*, *G. tuberosum*, *Gundelia tournefortii*, *Gypsophila aretioides*, *Hedysarum callithrix*, *H. criniferum*, *Helichrysum oligocephalum*, *Heliotropium aucheri*, *H. dissitiflorum*, *H. europaeum*, *Hesperis persica*, *Hippophae rhamnoides*, *Hypericum scabrum*, *Juniperus excelsa*, *Lagochilus aucheri*, *Leopoldia longipes*, *Leutea petiolaris*, *Ligularia persica*, *Linum album*, *Minuartia lineata*, *Nepeta fissa*, *N. glomerulosa*, *Onobrychis altissima*, *O. cornuta*, *Onosma bodeanum*, *O. bulbotrichum*, *Papaver bracteatum*, *Pennisetum orientale*, *Phlomis olivieri*, *Pistacia atlantica* subsp. *mutica*, *Pistacia vera*, *Poa pratensis*, *Polygala hohenackeriana*, *Prangos latiloba*,

P. uloptera, *Rhamnus pallasii*, *Psathyrotachys fragilis*, *Rhus coriaria*, *Rosa canina*, *R. iberica*, *Salsola arbusculiformis*, *Salvia limbata*, *Scutellaria pinnatifida*, *Silene swertiifolia*, *Stachys lavandulifolia*, *Stipa arabica*, *S. hohenackeriana*, *Teucrium polium*, *Thymus kotschyanus*, *T. pubescens*, *Trisetum rigidum*, *Tulipa montana*.

Some of the endemic taxa of the area are as follows:

Acantholimon bodeanum, *A. cymosum*, *A. demawendicum*, *A. densiflorum*, *A. gadukense*, *Aethionema sabzevaricum*, *Ae. semnanense*, *Ajuga saxicola*, *Alyssopsis mollis*, *Allium akaka*, *A. aladaghense*, *A. derderianum*, *A. elburzense*, *A. ellisii*, *A. tuchalense*, *Arenaria polycnemifolia*, *A. zargariana*, *Artemisia melanolepis*, *Astragalus absentivus*, *A. alamliensis*, *A. alamouticus*, *A. altimontanus*, *A. altiusculus*, *A. anacamptus*, *A. askius*, *A. assadii*, *A. atricapillus*, *A. austrokorasanicus*, *A. baharensis*, *A. bajgiranensis*, *A. barnassari*, *A. beckii*, *A. bojnurdensis*, *A. bounophilus*, *A. brisianus*, *A. callainus*, *A. capax*, *A. capito*, *A. confusus*, *A. culminatus*, *A. demavandicus*, *A. demavendicolus* subsp. *demavendicolus*, *A. denticulatus*, *A. djenarensis*, *A. edmondsonii*, *A. erwinii-gaubae*, *A. esferayenicus*, *A. djenarensis*, *A. firouzkuhensis*, *A. fuliginosus*, *A. ghouchanensis*, *A. gigantirostratus*, *A. gulul-saranii*, *A. hamadryadis*, *A. harazensis*, *A. holosemius*, *A. homandicus*, *A. hypsogeton*, *A. idoneus*, *A. joharchii*, *A. kaswinensis*, *A. keredjensis*, *A. khoshyailensis*, *A. kuhidashtehensis*, *A. lilacinus*, *A. macrosemius*, *A. magistratus*, *A. membranostipulatus*, *A. mesopotamicus*, *A. michaudagense*, *A. monanthemus*, *A. montis-mishoudaghi*, *A. mousaianus*, *A. naftabensis*, *A. neo-maassoumianus*, *A. neo-rechingeri*, *A. nezva-montis*, *A. nigrolineatus*, *A. nubicola*, *A. nurensis*, *A. ochreatus*, *A. ochrochlorus*, *A. parvarensis*, *A. perdurabilis*, *A. perdurans*, *A. pinetorum* subsp. *alamutensis*, *A. platysematus*, *A. poliotrichus*, *A. pseudoindurascens*, *A. pseudokurramensis*, *A. pseudomultijugus*, *A. pseudo-orthocarpus*, *A. recognitus*, *A. remotijugus*, *A. repentinus*, *A. rimarum*, *A. rosellus*, *A. rubrolineatus*, *A. salmakiae*, *A. scapiger*, *A. schahrudensis*, *A. segregatus*, *A. seidabadensis*, *A. sitiens*, *A. speciosus*, *A. stenolepis*, *A. subalpinus*, *A. subbrevidens*, *A. subglaberrimus*, *A. subrosulariformis*, *A. tuyehensis*, *A. typhaeformis*, *A. vereskensis*, *A. vulcanicus*, *A. yushensis*, *Atraphaxis aucheri*, *A. binaludensis*, *A. radkanensis*, *Ballota platyloma*, *Buffonia elata*, *Bunium wolffii*, *Bupleurum flexile*, *Caccinia actinobole*, *C. strigosa*, *Calendula aurantiaca*, *Camelinopsis campylopoda* subsp. *campylopoda*, *Campanula gilliatii*, *Carduus transcaspicus* subsp. *macrocephalus*, *Centaurea elbursensis*, *C. galactochroa*, *C. kandavanensis*,

Cerastium cylindricum, *Cerasus chorassanica*, *C. pseudoprostrata*, *Cirsium iranica*, *C. strigosum* subsp. *korassanicum*, *Colutea gifana*, *C. porphyrogramma*, *C. triphylla*, *C. uniflora*, *Consolida tehranica*, *Corydalis verticillaris* subsp. *grandiflora*, *Cotoneaster esfandiarii*, *Cousinia adenosticta*, *C. aggregata*, *Cousinia amicorum*, *C. arctotidifolia*, *C. attariae*, *C. behboudiana*, *C. bienerti*, *C. calolepis*, *C. chamaepeuce*, *C. chamaepeucides*, *C. chrysantha*, *C. concolor*, *C. crssipes*, *C. crispa*, *C. czerniakowskiae* subsp. *czerniakowskiae*, *C. czerniakowskiae* subsp. *adenostegia*, *C. daryoushiana*, *C. decipiens*, *C. diezii*, *C. dipterocarpa*, *C. discolor*, *C. edmondsonii*, *C. elata*, *C. esfandiarii*, *C. euchlora*, *C. farimanensis*, *C. fragillima*, *C. gaubae*, *C. hablitzlii*, *C. hamosa*, *C. heliantha*, *C. hyrcanica*, *C. joharchii*, *C. keredjensis*, *C. lepida*, *C. neurocentra*, *C. onopordioides* var. *glabra*, *C. papillosa*, *C. piptocephala*, *C. platyacantha*, *C. platyraphis*, *C. prasina*, *C. pseudocandolleana*, *C. rabdodes*, *C. rechingeriae*, *C. renominata*, *C. raphiostegia*, *C. saloukensis*, *C. serratuloides*, *C. shahvarica*, *C. trachylepis*, *C. trachyphyllaria*, *C. wendelboi*, *C. xiphiolepis*, *Crataegus assadii*, *C. babakhanloui*, *Crepis gaubae*, *C. korassanica*, *C. semnanensis*, *Crocus almehensis*, *Cynoglossum semnanicum*, *Delphinium elbursense* var. *elbursense*, *D. korasanicum*, *D. ursinum*, *Deyeuxia parsana*, *Dianthus polylepis*, *Diaphanoptera stenocalycina*, *Dichodon persicum*, *D. scaturiginellum*, *D. tenuifolium*, *Dorema ghahremanii*, *Echinops chorassanicus*, *E. leiopolyceroides*, *E. procerus*, *E. shahrudensis*, *E. elbursensis*, *E. nizvanus*, *Elburzia fenestrata*, *Eremostachys* × *albocitrinus*, *E. hyoscyamoides*, *E. lanata*, *Eremurus stenophyllus*, subsp. *stenophyllus*, *Eriocycla olivieri*, *Eritricium gracillimum*, *Euphorbia ferdowsiana*, *Ferula alliacea*, *F. flabelliloba*, *F. gabrielii*, *F. latisepta*, *F. persica*, *F. serpentinica*, *F. xylorhachis*, *Ferulago trifida*, *Festuca akhanii*, *Galium aucheri*, *G. diploprion*, *G. decumbens*, *G. delicatulum*, *G. iranica*, *G. wendelboi*, *Glaucium calycinum*, *Gypsophila korasanica*, *G. saponarioedes*, *G. xanthochlora*, *Haplophyllum furfuraceum*, *Hedysarum bojnordense*, *H. damghanicum*, *H. glabrifoliolatum*, *H. joharchii*, *H. neyshaboricum*, *H. paucifoliolatum*, *Helichrysum persicum*, *Heliotropium esfandiarii*, *Hedysarum damghanicum*, *H. elbursense*, *H. hyrcanum*, *Heliotropium esfandiarii*, *Heracleum anisacatis*, *Hyacinthella persica*, *Hymenocrater oxyodontus*, *Iranecio elbursensis*, *I. oligolepis*, *Iris barnumae* subsp. *demawendica*, *Iris bornmulleriana*, *Isatis bornmulleriana*, *Johrenia platycarpa*, *J. macrocephala* subsp. *elbursensis*, *Johreniopsis stricticaulis*, *Jurinea catharinae*, *J. monocephala* subsp. *monocephala*, *J. radians* subsp. *radians*,

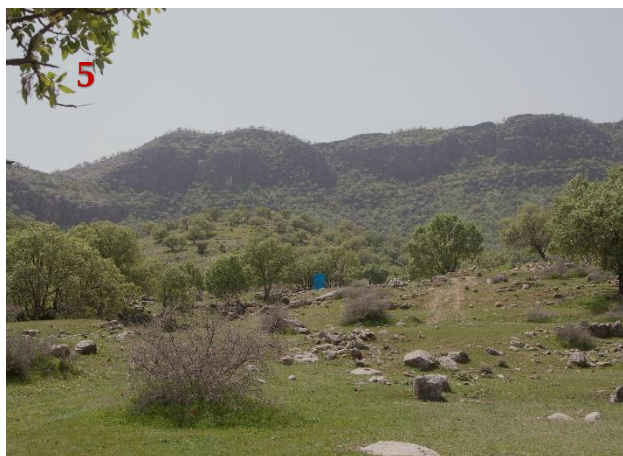


Fig. 5. Forest of *Quercus brantii* in Kurdo-Zagrosian province, in lower altitudes, *Ziziphus spina-christi* appears as an element of the Nubo-Sindian province; Fig. 6. Woodland of *Quercus brantii* in the Kurdo-Zagrosian province.

Jurinella frigida, *Kalakia marginata*, *Lactuca alutaceus*, *Lagochilus quadridentatus*, *Laser rechingeri*, *Launaea piestocarpa*, *Lepechiniella persica*, *L. wendelboi*, *Ligularia persica*, *Limonium nudum*, *Linaria karajensis*, *L. khorasanensis*, *L. khalkhalensis*, *L. mazandaranensis*, *L. shahroudensis*, *Myopordon damavandicum*, *M. hyrcanum*, *Myosotis anomala*, *Nepeta allotria*, *N. binaloudensis*, *N. cephalotes*, *N. crassifolia*, *N. eremokosmos*, *N. pogonosperma*, *N. shahmirzadensis*, *N. wettsteinii*, *Noccaea apterocarpa*, *N. maassoumii*, *Nonnea anchusoides*, *Onobrychis alamutensis*, *O. amoena* subsp. *meshhedensis*, *O. assadii*, *O. aurea*, *O. gaubae*, *O. iranensis*, *O. longipes*, *O. ptychophylla*, *O. talagonica*, *O. subnitens*, *O. verae* var. *rechingeri*, *Onosma chrysochaetum*, *Ornithogalum bungei*, *Orobanche longibracteata*, *O. pulchra*, *Oxytropis aucheri*, *O. bicornis*, *O. binaludensis*, *O. compacta*, *O. guilanica*, *O. hypsophylla*, *O. iranica*, *O. javaherdehii*, *O. kordkoyensis*, *O. kuchanensis*, *O. neo-rechingeri*, *O. pseudosuavis*, *O. rechingeri*, *O. rudbarensis*, *O. sabzevarensis*, *O. salukensis*, *O. sutakensis*, *Papaver wendelboi*, *Paracaryum pygmaeum*, *Paraquilegia caespitosa*, *Pedicularis rechingeri*, *Phlomis anisodonta*, *Pimpinella khayamii*, *P. khorasanica*, *Poa damavandica*, *Polygonum hyrcanum*, *Psychrogeton aellenii*, *P. persicus*, *Ranunculus sojakii*, *Reseda bungei*, *Rheum khorasanicum*, *R. neyshabourense*, *Ribes khorasanica*, *Rindera bungei*, *Rochelia mirheidari*, *Rumex kandavanicus*, *Salix baladehensis*, *S. firouzkuhensis*, *S. lacus-tari*, *Salvia hypoleuca*, *S. chorassanica*, *S. oligophylla*, *Saponaria bodeana*, *Scabiosa koelzii*, *S. schimperiana*, *Scilla khorassanica*,

Scorzonera persica, *S. wendelboi*, *S. xylobasis*, *Scrophularia alhagioides*, *S. crassipedunculata*, *S. gaubae*, *S. gorganica*, *S. tortouissima*, *S. valida*, *Scutellaria ramazanica*, *Sedum elburzense*, *Semenovia subscaposa*, *Sempervivum atropatanum*, *S. iranicum*, *Senecio iranicus*, *S. joharchii*, *S. vulcanicus*, *Silene aminii*, *S. demawendica*, *Silene ferdowsii*, *S. karajensis*, *S. nizvana*, *S. palinotricha*, *Sisymbrium gaubae*, *Stachys subaphylla*, *S. laxa*, *Stellaria assadii*, *Stenotaenia nudicaulis*, *Tanacetum budjnurdense*, *T. elbursense*, *T. holoeucum*, *T. khorassanicum*, *T. polycephalum duderanum*, *Taraxacum azerbaijanicum*, *T. darbandense*, *T. hydrophilum*, *Thalictrum mazandaranicum*, *Tragopogon acanthocarpus*, *T. kotschyi*, *T. montanus*, *Trichodesma aellenii*, *Trifolium radicosum*, *Trigonella tehranica*, *Typha kalatensis*, *Verbascum aucheri*, *Veronica aucheri*, *V. chionantha*, *V. gaubae*, *V. longipedicellata*, *V. mirabilis*, *V. paederotae*, *Vicia sojakii*.

3. Kurdo-Zagrosian Province

Kurdo-Zagrosian Province harbors the Zagros Mountain Chains starting from the south of W. Azerbaijan, SE. wards to S. of Shiraz and N. of Kazeroun city. This province contains 514 specific and subspecific endemic taxa and six endemic genera, including *Azilia*, *Haussknechtia*, *Kellusia*, *Mozaffariania*, *Sclerochorton*, and *Zeugandra*; therefore, the area deserves to be accepted as a distinct province. Elevations of the area vary from about 800-4000 m above sea level. Vegetation of the area varies from forests (Fig. 5), woodlands (Fig. 6), scrubs, forbs, cushion formation, and rocky cushion formation of *Dionysia* spp. (Fig. 7).



Fig. 7. Rocky cushion formation of *Dionysia zagrica* in Kurdo-Zagrosian Province.

The main part of the area includes Oak forests of *Quercus brantii*, *Q. persica*, *Q. infectoria*, *Q. libani*, *Q. trojana*, mixed with other trees of *Pistacia atlantica* subsp. *kurdica*, *P. khinjuk*, *Crataegus pontica*, *Lonicera nummulariifolia*, *Cotoneaster luristanicus*, *Pyrus syriaca*, *Amygdalus scoparia*, *A. haussknechtii*, *Astragalus citrinus*, *A. denudatus*, *A. multijugus*, *A. pycnocephalus*, *Acer monspessulanum* subsp. *persicum* and subsp. *cinerascens*, etc. In higher altitudes, woodlands of *Juniperus excelsa* appear. In lower altitudes, oak forests change to xeromorphic scrub, where mainly *Ziziphus spina-christi* and *Amygdalus scoparia* and other trees or shrubs appear.

Some more frequent species of the area are as follows:

Acantholimon bromifolium, *A. olivieri*, *A. bakhtiaticum*, *A. blakelackii*, *A. hohenackeri*, *Acanthophyllum caespitosum*, *A. mucronatum*, *A. latifolium*, *Allium scabriscapum*, *A. stamineum*, *Artemisia fragrans*, *Arrhenatherum kotschyi*, *Arum conophaloides*, *Astragalus aspadanus*, *A. brachycalyx*, *A. carduchorum*, *A. cyclophyllus*, *A. chrysotrichus*, *A. compactus*, *A. eriosphaerus*, *A. gossypinus*, *A. ovinus*, *A. singarensis*, *A. verus*, *Aubrieta parviflora*, *Bellevalia pycnantha*, *Berberis integerrima*, *Bongardia chrysogonum*, *Bromus tomentellus*, *Buffonia*

kotschyana, *Campanula incanescens*, *Celtis tournefortii*, *Centaurea aucheri*, *Cerasus microcarpa*, *Cercis griffithii*, *Colutea persica*, *Convolvulus stachydifolius*, *Cornus sanguinea* subsp. *australis*, *Cotoneaster nummularius*, *Cousinia kotschyi*, *C. lucida*, *C. multiloba*, *C. sagittata*, *C. silyboides*, *Crataegus aronia*, *Delphinium saniculifolium*, *D. tuberosum*, *Dianthus longevaginatus*, *Daphne mucronata*, *D. oleioides*, *Dracocephalum kotschyi*, *Dionysia odora*, *D. revoluta*, *Echinops mosulensis*, *E. ritrodes*, *Elymus hispidus*, *E. libanoticus*, *E. tauri* var. *kosaninii*, *Eremurus spectabilis*, *Euphorbia denticulata*, *Festuca valesiaca*, *Fibigia multicaulis*, *F. umbellata*, *F. suffruticosa*, *Ficus johannis*, *Fraxinus angustifolia* subsp. *syriaca*, *Fritillaria imperialis*, *F. persica*, *F. reuteri*, *Graellsia saxifragifolia*, *Gundelia tournefortii*, *Gypsophila persica*, *Hedysarum criniferum*, *H. kotschyi*, *Helichrysum armenum*, *H. leucocephalum*, *Hypericum hirtellum*, *H. scabrum*, *Iris reticulata*, *Leontice armeniaca*, *Leopoldia longipes*, *L. tenuiflora*, *Melica jacquemontii*, *M. persica*, *Mentha longifolia*, *Mesostemma kotschayanum*, *Morina persica*, *Nepeta glomerulosa*, *Noaea mucronata*, *Onobrychis scrobiculata*, *Onopordon heteracanthum*, *Onosma* spp., *Ornithogalum arcuatum*, *O. persicum*,

Paliurus spina-christi, *Paronychia kurdica*, *Pilostyles haussknechtii*, *Phlomis bruguieri*, *P. herba-venti*, *P. olivieri*, *Piptatherum holciforme*, *Prangos ferulacea*, *P. uloptera*, *Pteroporum aucheri*, *Pyrus elaeagnifolia*, *Quercus robur* subsp. *pedunculiflora*, *Rhamnus cornifolia*, *R. pallasii*, *Rosa persica*, *Salvia nemorosa*, *Sageretia thea* var. *thea*, *Sanguisorba minor*, *Scrophularia variegata*, *Silene arbuscula*, *S. commelinifolia*, *S. marschallii*, *S. morganae*, *Stachys inflata*, *S. lavandulifolia*, *Sternbergia lutea*, *Teucrium oliveranum*, *T. orientale*, *Thalictrum isopyroides*, *T. minus*, *Thymus daenesis*, *T. kotschyanus*, *Tragopogon graminifolius*, *Trifolium scabrum*, *Tulipa armena*, *T. biflora*, *T. humilis*, *T. montana*, *T. systole*, *Vicia variabilis*, *Zataria multiflora*, *Ziziphora clinopodioides*, *Ziziphus nummularia*. Some endemic taxa of the area are as follows:

Acantholimon bakhtiaricum, *A. eschkerence*, *A. mobayenii*, *A. moradii*, *Acanthophyllum kurdicum*, *Aethionema erinaceum*, *A. umbellatum*, *Agrostis gariana*, *Alcea iranshahrii*, *A. koelzii*, *Allium bakhtiaricum*, *A. bisotunense*, *A. haemanthoides*, *A. kirindicum*, *A. koelzii*, *A. kotschy*, *A. kuhrangense*, *A. longivaginat*, *A. remediorum*, *A. sabalense*, *A. sahandicum*, *A. sanandajense*, *A. vescum*, *Alrawia bellii*, *Amygdalus haussknechtii*, *A. reticulata*, *Andrachne merxmuelleri*, *A. fruticulosa*, *Anthemis lorestanica*, *A. persica*, *Arenaria minutissima*, *Aristolochia olivieri*, *Arum giganteum*, *Asperula fragillima*, *A. rechingeri*, *A. seticornis*, *Aster bachtiaricus*, *Astragalus abnormalis*, *A. ahmad-parsai*, *A. allectus*, *A. aliomranii*, *A. archibaldii*, *A. ashtianensis*, *A. assadabadensis*, *A. avicennus*, *A. babakhanloui*, *A. bijarensis*, *A. bashmaghensis*, *A. bashmensis*, *A. bodeanus*, *A. brachycalyx* subsp. *eriostylus*, *A. bukanensis*, *A. campylanthus*, *A. chahartaghensis*, *A. ciceropsis*, *A. darlingtonii*, *A. delutulus*, *A. dengolanensis*, *A. distans*, *A. divandarrehensis*, *A. diversus*, *A. dopolanicus*, *A. dorudensis*, *A. doshman-ziariensis*, *A. ecbatanus*, *A. elwendicus*, *A. entomophyllus*, *A. expectatus*, *A. expetitus*, *A. facetus*, *A. fagh-soleimanensis*, *A. flexilipes*, *A. gamasiabensis*, *A. ghashghaicus*, *A. gigantifoliolatus*, *A. iranshahrii*, *A. glaucops*, *A. glumaceus*, *A. heinzianus*, *A. heterophyllus*, *A. heterozyx*, *A. hymenocalyx*, *A. ibicinus*, *A. ilamica*, *A. inexpectatus*, *A. iranshahrii*, *A. johannis*, *A. kabutarlanensis*, *A. kermanshahanensis*, *A. khatamsazae*, *A. koelzii*, *A. kordloricus*, *A. lateritiformis*, *A. lateritius*, *A. lepidus*, *A. lateriformis*, *A. longirostratus*, *A. lurorum*, *A. maassoumii*, *A. macrum*, *A. marivanensis*, *A. markasicus*, *A. maroofii*, *A. montis-bakhtiari*, *A. montis-nacarouzii*, *A. montis-parrowii*, *A. montosus*, *A. multicaulis*, *A. nahavandicus*, *A. neo-assadabadensis*, *A. neo-*

mozaffarianii, *A. nervifolius*, *A. nurabadensis*, *A. ovigerus*, *A. paralurges*, *A. paucifoliolatus*, *A. platifoliolatus*, *A. pseudopulchellus*, *A. pseudorobustus*, *A. pseudozagrosicus*, *A. reconditus*, *A. rhabdophorus*, *A. rhodochorus*, *A. rhodosemius*, *A. runemarkii*, *A. saccatus*, *A. salavatabadensis*, *A. sanandajianus*, *A. saremi*, *A. shahbazanicus*, *A. shehbazii*, *A. shuturunkuensis*, *A. sirjaevii*, *A. sisakhtianus*, *A. sphaeranthus*, *A. stenostegius*, *A. sumarensis*, *A. susianus*, *A. talimansurensis*, *A. tarumensis*, *A. tavakolii*, *A. tekabensis*, *A. tenellus*, *A. townsendii*, *A. veiskaramii*, *A. xiphidiopsis*, *A. zagrosicus*, *A. zerdanus*, *Atraphaxis botuliformis*, *A. dumosa*, *A. ephedroides*, *A. salicornioides*, *Azillia eryngioides*, *Bellevia cyanopoda*, *B. decolorans*, *B. heweri*, *B. koeiei*, *B. tristis*, *B. wendelboi*, *Biarum platyspathum*, *Bromus frigidus*, *Buffonia capitata*, *B. iranica*, *B. kotschyana* subsp. *fasciculata*, *B. kotschyana* subsp. *calycina*, *Caccinia kotschy*, *Campanula candida*, *C. escalerae*, *C. hermannii*, *C. humillima*, *C. hystricula*, *C. lamondiae*, *C. luristanica*, *C. persepolitana*, *Centaurea amadanensis*, var. *amadanensis*, *C. amadanensis* var. *gymnoclada*, *C. elymaitica*, *C. kabirkuhensis*, *C. gaubae*, *C. ghahremanii*, *C. intricata* subsp. *kermanshahensis*, *C. iranshahrii*, *C. luristanica*, *C. paradoxa*, *C. persica* subsp. *subinermis*, *C. phlomoides*, *C. xeranthemoides*, *Cephalaria dichetophora*, *C. juncea*, *Cerastium bazofticum*, *C. brachypetalum* subsp. *iranicum*, *Chaerophyllum nivale*, *Codonocephalum stenocalathium*, *Colchicum varians*, *C. wendelboi*, *Consolida linarioides*, *C. lorestanica*, *Convolvulus stapfii*, *C. koeianus*, *C. schirazianus*, *Cousinia albescens*, *C. albida*, *C. araneosa*, *C. archibaldii*, *C. ardalensis*, *C. barbeyi*, *C. bazoftensis*, *C. bijarensis*, *C. bobekii*, *C. canescens*, *C. chlorosphaera*, *C. concinna*, *C. cylindrocephala*, *C. disfulensis*, *C. gatchsaranica*, *C. gracilis*, *C. incompta*, *C. iranica*, *C. isfahanica*, *C. khansarica*, *C. kilouyensis*, *C. lordeganensis*, *C. lucida* var. *arachnoidea*, *C. lurorum*, *C. oligocephala*, *C. orthoclada*, *C. pergamacea* subsp. *sardashtensis*, *C. sagittata*, *C. sakawensis*, *C. silyboides* subsp. *zardkuhensis*, *C. silyboides* subsp. *silyboides*, *C. tenuiramula*, *C. thamnoides*, *Crataegus persica*, *Crepis elymaitica*, *C. straussii*, *Cyclotrichium depauperatum*, *C. straussi*, *Delphinium jacobsii*, *Dianthus denaicus*, *D. elymaiticus*, *D. hafezii*, *D. jacobsii*, *D. longevaginat*, *D. macranthus*, *D. persicus*, *Dionysia archibaldii*, *D. aubrietiioides*, *D. bazoftica*, *D. bryoides*, *D. caespitosa*, *D. diapiensifolia*, *D. gaubae*, *D. haussknechtii*, *D. iranica*, *D. iranshahrii*, *D. khuzistanica*, *D. lamingtoni*, *D. leucotricha*, *D. lurorum*, *D. michauxii*, *D. stenocephalus*, *D. termeana*, *D. zagrica*, *Dracocephalum surmandinum*, *Echinophora cinerea*, *Echinops abazariae*, *E.*

avajensis, *E. bakhtiarius*, *E. ecbatanus*, *E. elymaiticus*, *E. erioceras*, *E. haussknechtii*, *E. iranshahrii*, *E. khansaricus*, *E. kotschyi*, *E. mosulensis* var. *papillosus*, *E. persepolitani*, *E. shulabadensis*, *E. vicsidulus*, *Elaeosticta nodosa*, *Elymus brachyphyllus*, *E. dorudicus*, *E. gentryi* var. *ciliatiglumis*, *E. shirazicus*, *E. transhyrcanus* subsp. *lorestanicus*, *E. zagricus*, *Eremopoa nephelochloides*, *Eremostachys laevigata*, *Erysimum elymaiticum*, *E. frigidum*, *E. nasturtioides*, *Euphorbia iranshahrii*, *E. plebeia*, *Ferula behboudiana*, *F. microcolea*, *F. pseudalliacea*, *Ferulago carduchorum*, *F. phialocarpa*, *Festuca iranica*, *Fraxinus angustifolia* subsp. *persica*, *Fraxinus angustifolia* subsp. *syriaca*, *Fritillaria atrolineta*, *F. chlorantha*, *F. chlororhabdota*, *F. olivieri*, *F. reuteri*, *F. straussii*, *Gagea calcicola*, *Galium iranicum*, *G. problematicum*, *G. psilocladum*, *G. schoenbeck-temesyae*, *G. sojakii*, *Gypsophila lurorum*, *G. alvandica*, *G. farsensis*, *G. mozaaffarianii*, *G. pseudovalida*, *G. virgata*, *Hausknechtia elymaitica*, *Hedysarum alshehbazii*, *H. gypsophilum*, *H. garinense*, *H. gypsophilum*, *Heliotropium crassifolium*, *H. denticulatum*, *Hesperis straussii*, *Hieracium cheirifolium*, *Hymenocrater incanus*, *Hypericum dogonbadanicum*, *Inula rajamandii*, *Isatis campylocarpa*, *Johreniopsis scoparia*, *Jurinea cordata*, *J. eriobasis*, *J. prasinophylla*, *J. viciosi*, *Kelusia odoratissima*, *Lactuca denaensis*, *Lagochilus lasiocalyx*, *Lamium bakhtiarius*, *L. persopolitanum*, *Leopoldia tijtjensis*, *Linaria nurensis*, *Linum persicum*, *Malabaila kotschyi*, *M. porphyrodiscus*, *Matthiola shiraziana*, *Michauxia koeiana*, *M. stenophylla*, *Micrantha multicaulis*, *Minuartia aucheriana*, *Myopordon persicum*, *Myosotis koelzii*, *Nanorrhinum khuzistanicum*, *Nepeta adenoclada*, *Nepeta archibaldii*, *N. assadii*, *N. bakhtiaria*, *N. bazoftica*, *N. crispa*, *N. depauperata*, *N. glomerulosa* var. *stapfiana*, *N. iranshahrii*, *N. kotschy* var. *kotschy*, *N. lasiocephala*, *N. laxiflora*, *N. makuensis*, *N. minuticephala*, *N. monocephala*, *N. schiraziana*, *N. sessilifolia*, *N. straussii*, *Notholirion koeiei*, *Onobrychis andalana*, *O. elymaitica*, *O. garinensis*, *O. melanotricha*, *O. mozaaffarianii*, *O. sojakii*, *Onosma rechingeri*, *O. straussii*, *Ophrys kurdistanica*, *Opsicarpium insignis*, *Ornithogalum pycnanthum*, *O. sanandajense*, *Oxytropis bakhtiaria*, *O. rhodantha*, *O. sivehensis*, *O. surmurdehi*, *Papaver galucum*, *Paracaryum luristaicum*, *P. modestum*, *Paronychia caespitosa*, *P. lordeganica*, *Pedicularis straussii*, *Peucedanum chenur*, *Phlomis ×pabotii*, *P. aucheri*, *P. lurestanica*, *P. pachyphylla*, *P. persica*, *P. ×stapfiana*, *Physogeton acanthophyllus*, *Pimpinella deverroides*,

Piptatherum denaense, *Postia bombycina*, *P. puberula*, *Potentilla elvendensis*, *P. flaccida*, *P. persica*, *P. shiraziana*, *Pseudocamelina aphragmodes*, *Pseudomuscari kurdicum*, *Psychrogeton chionophilus*, *Pterocephalus ghahremanii*, *P. melanobasis*, *Pycnocycla caespitosa*, *Pyrus farsistanica*, *P. glabra*, *Ranunculus elymaiticus*, *R. koeiei*, *R. microflorus*, *R. renzii*, *R. straussii*, *R. termei*, *R. zenjanensis*, *Rhabdosciadium aucheri*, *R. petiolare*, *R. strausii*, *Rindera albida*, *Rochelia retrosepala*, *Rorippa kurdica*, *Rumex ephedroides*, *Salix daviesii*, *S. elymaitica*, *Salvia jamzadiae*, *Salvia kermanshahensis*, *S. sclareopsis*, *S. wendelboi*, *S. ×spireaefolia*, *Satureja bachtiaria*, *S. edmondi*, *S. kallarica*, *S. kermanshahensis*, *S. khuzistanica*, *S. rechingeri*, *Scabiosa esfandiarrii*, *S. flavida*, *S. macrochaete*, *S. persica* var. *rosea*, *Scilla bisotunensis*, *Scorzonera flaccida*, *S. helodes*, *S. ispanhanica*, *S. luristanica*, *S. persepolitana*, *Scrophularia azarbaijanica*, *S. denaensis*, *S. farinosa*, *S. iranica*, *S. ispanhanica*, *S. papyracea*, *S. schiraziana*, *S. shulabadensis*, *S. xylobasis*, *Scutellaria farsistanica*, *S. nepetifolia*, *S. persica*, *Sedum callichroum*, *S. nanum*, *Semenovia dichotoma*, *Senecio kotschyanus*, *Silene bakhtiaria*, *S. dictyoneura*, *S. farsistanica*, *S. hirticalyx*, *S. nurensis*, *S. odontopetala* var. *rupestris*, *S. oxelmanii*, *S. persepolitana*, *S. persica*, *S. tragacantha*, *Sisymbrium bakhtiarius*, *Sorbus luristanica*, *Stachys ×tomentosa*, *S. acerosa*, *S. aucheri*, *S. benthamiana*, *S. ixodes*, *S. kermanshahensis*, *S. koelzii*, *S. obtusicrena*, *S. pilifera*, *S. veroniciformis*, *Straussella purpurea*, *Tanacetum bachtiarius*, *T. dumosum*, *T. sonbolii*, *Teucrium macrum*, *Tragopogon erostris*, *T. stroterocarpus*, *Trifolium kurdistanicum*, *Verbascum austroiranicum*, *V. intricatum*, *Veronica daranica*, *V. farinosa*, *V. fragilis*, *V. kurdica* subsp. *filicaulis*, *Vicia kotschyana*, *Vincetoxicum assadii*, *Zerdana anchonioides*, *Zeugandra iranica*.

4. Central Iranian Province

Central Iranian Province harbors the southern foothills of the Elburz Mountain Chains, the southern parts of Khorasan province, central Iran to the East, and the mountains of Fars, Hormozgan, Kerman, and Baluchestan. The area consists of 295 specific and subspecific endemics and 4 endemic genera, including *Heliocarya*, *Hymenocarpus*, *Hypericopsis*, and *Pseudofortuynia*. Therefore, the area deserves to be known as a distinct province. Altitude of the area ranges from about 800 to 4400 m a.s.l. Takhtajan (1986) introduced the subprovince of Fars-Kerman for the mountains of Yazd, Fars, Kerman, and northern Hormozgan political provinces. Obviously, the flora

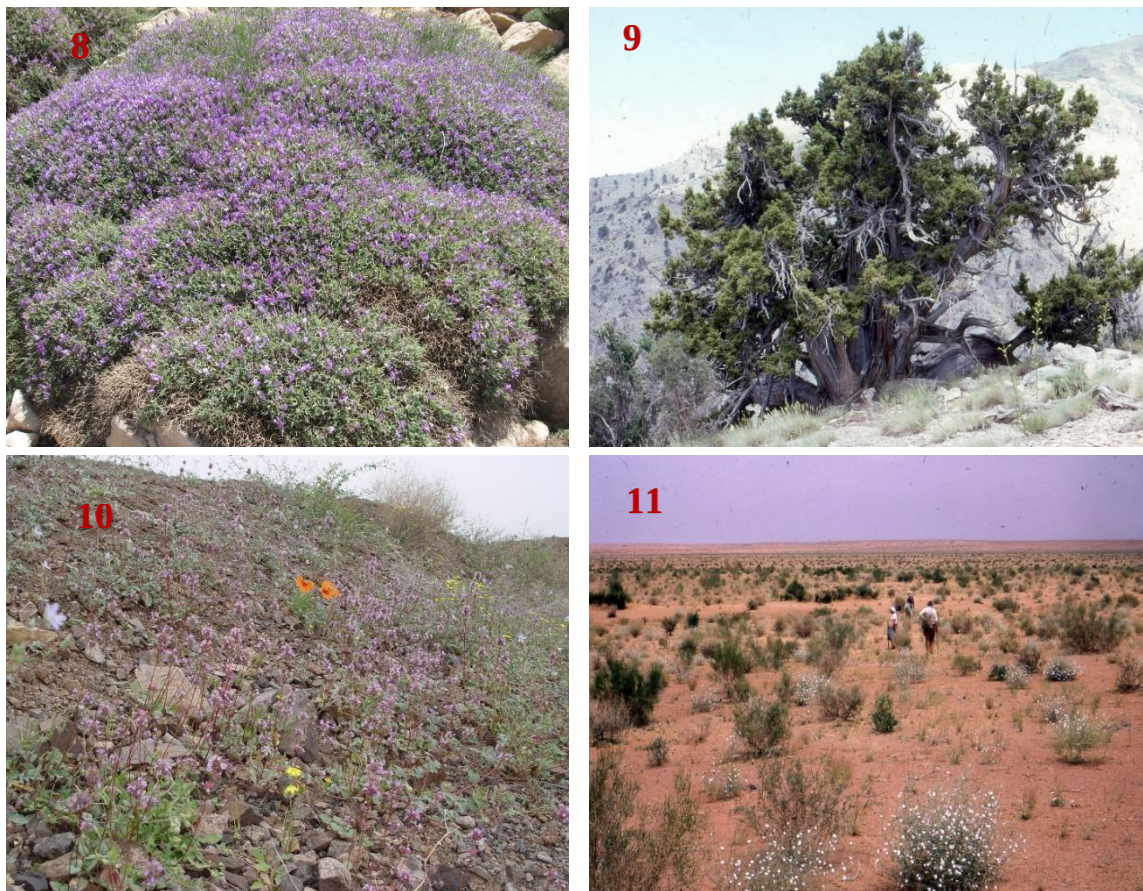


Fig. 8. Open cushion formation of *Onobrychis cornuta* in the Central Iranian Province; 9. Woodlands of *Juniperus excelsa* in the Central Iranian Province; 10. Forb formation in the Central Iranian Province; 11. Xeromorphic open scrub of *Ephedra strobilaceae* in Central Iranian Province (K.H. Rechinger, the director of Flora Iranica, and Wilhelmina Rechinger).

of the mountains differs considerably from the plains, but this happens for the other areas of Iran as well. Moreover, among these mountains, differences in the vegetation are visible. In the mountains N. of Hormozgan (Kuhe Genu) and some of the mountains of Kerman (Kuhe Khabr), woodlands of *Juniperus excelsa* appear. These mountains are, in fact, enclaves that appear in favourable conditions, not necessarily to be known as a distinct chorion. However, these mountains bear ca. 116 endemic species. Northern Baluchistan Province was recognized by Takhtajan (1986) for the northern part of Baluchistan of Iran and Pakistan. In Iran, there are about 20 endemic taxa in the area, but most of the flora is rather similar to the other

mountains of Central Iranian Province. However, as there are a few species common to the area not known in other areas, it may be known as a distinct subprovince. The most characteristic species of the area is *Stocksia brahuica*. As the habitat of Central Iranian Province varies considerably, vegetation of this area is extremely variable including open cushion formation of altitudes above 2000 to 3000 m a.s.l. of mainly *Onobrychis cornuta*, woodlands of *Juniperus excelsa*, forbs, xeromorphic open scrub, dwarf scrub, herbaceous semi-woody salty swamps, ephemeral forb communities, shrublands, forbs and grasslands of dunes (Figs. 8, 9, 10, 11, 12 and 13).



Fig. 12. Xeromorphic open scrub of *Amygdalus scoparia* in the Central Iranian province (M. Assadi, the author of this paper); 13. Xeromorphic open scrub of *Amygdalus scoparia* in the Central Iranian province, with Taftan Mountain in the back.

In plane areas and lower slopes up to 2000 m above sea level following species are common: *Alhagi maurorum*, *Anabasis aphylla*, *A. haussknechtii*, *Artemisia sieberi*, *Atraphaxis spinosa*, *Cousinia eryngioides*, *Krascheninnikovia ceratoides*, *Dendrostellera lesertii*, *Dorema ammoniacum*, *Ephedra intermedia*, *E. strobilacea*, *Eremurus persicus*, *Fortuynia garcinii*, *Halothamnus glaucus*, *H. subaphyllus*, *Hertia angustifolia*, *Launaea acanthodes*, *Noaea mucronata*, *Peganum harmala*, *Perovskia abrotanoides*, *Prosopis farcta*, *Pteropyrum aucheri*, *P. olivieri*, *Reseda lutea*, *Rheum ribes*, *Rosa persica*, *Scariola orientalis*, *Stipa arabica*, *S. hohenackeriana*, *Salsola orientalis*, *S. tomentosa*, *Zygophyllum atriplicoides*, *Z. eurypterum*. The most important plants of dunes, gypsum soil, and saline areas are mentioned later in this paper.

In higher altitudes above 2000 m following species are common:

Acantholimon aspadanum, *A. flexuosum*, *A. erinaceum*, *A. festucaceum*, *A. senganense*, *A. wendelboi*, *Acanthophyllum crassifolium*, *A. glandulosum*, *A. laxiusculum*, *A. mucronatum*, *A. sordidum*, *Achillea eriophora*, *Aethionema spinosum*, *Ajuga chamaecistus*, *Allium cathodicarpum*, *Arenaria persica*, *Arrhenatherum kotschy*, *Artemisia aucheri*, *A. desertii*, *A. persica*, *A. santolina*, *Astragalus albispinus*, *A. chrysotrichus*, *A. compactus*, *A. cyclophyllon*, *A. longistylus*, *A. lycioides*, *A. microphysa*, *A. multijugus*, *A. myriacanthus*, *A. ovinus*, *A. rhodosemius*, *A. trachyacanthos*, *A. verus*, *Aubrieta parviflora*, *Biebersteinia multifida*, *Bromus tomentellus*, *Campanula incanescens*, *Celtis caucasica*, *Colchicum szowitsii*, *Convolvulus leiocalycinus*, *Corydalis*

rupestris, *Cousinia calocephala*, *C. incompta*, *C. lasiolepis*, *C. longifolia*, *C. lucida*, *C. multiloba*, *C. onopordioides*, *C. silyboides*, *C. sicigera*, *Dactylorhiza umbrosa*, *Daphne oleoides*, *Dianthus orientalis*, *Didymophysa aucheri*, *Dionysia curviflora*, *D. raptodes*, *Elymus gentryi*, *E. hispidus*, *E. longearistatus*, *Euphorbia buhsei*, *E. cheiradenia*, *E. hebecarpa*, *E. heteradena*, *E. szovitsii*, *Ferula ovina*, *Festuca arundinacea*, *Fibigia suffruticosa*, *Gypsophila acantholimoides*, *G. persica*, *G. polyclada*, *Helichrysum leucocephalum*, *H. oligocephalum*, *Jurinea dumulosa*, *J. mobayenii*, *J. ramosissima*, *Matthiola alyssifolia*, *M. flavida*, *M. ovatifolia*, *Melica persica*, *Mentha longifolia*, *Nepeta glomerulosa*, *N. kotschy*, *Noccaea trinervia*, *Onobrychis cornuta*, *Parietaria judaica*, *Phlomis olivieri*, *Physoptychis gnaphaloides*, *Pimpinella gedrosiaca*, *Piptatherum holciforme*, *P. molinioides*, *Potentilla nuda*, *Prangos acaulis*, *Psathyrostachys fragilis*, *Pseudocamelina glaucophylla*, *Psychrogeton amorphoglossus*, *Pterocephalus affghanicus*, *P. canus*, *Ranunculus rionii*, *Rubia albicaulis*, *Salvia macrosiphon*, *S. rhytidea*, *Scorzonera intricata*, *S. ramosissima*, *Scrophularia scoparia*, *S. striata*, *S. variegata*, *Scutellaria multicaulis*, *Semenovia suffruticosa*, *Silene arbuscula*, *S. behboudiana*, *Stachys lavandulifolia*, *S. pilifera*, *S. setifera*, *Tanacetum fruticosum*, *T. polycephalum*, *Thymus carmanicus*, *Tragopogon jezdianus*, *Trisetum flavescens*, *Tulipa stylosa*, *Verbascum gabrielae*, *Zataria multiflora*, *Zizphora clinopodioides*.

The endemic taxa of the lower altitudes are as follows:

Acantholimon alavae, *A. aspadanum*, *A. curviflorum*, *A. horridum*, *A. hystrix*, *Aeluropus laciniatus*, *Ae. peterganicus*, *Allium chloroneurum*, *A. lalesaricum*, *Ammodendron persicum*, *Anabasis calcarea*, *A. haussknechtii*, *Artemisia khorassanica*, *Astragalus callistachys*, *A. ardahalicus*, *A. baraftabensis*, *A. bazarganii*, *A. biarjmandicus*, *A. ghamishlouensis*, *A. glaucacanthos*, *A. hekmat-safaviae*, *A. hirtus*, *A. indistinctus*, *A. indomitus*, *A. issatissensis*, *A. jamzadae*, *A. jarmalii*, *A. jesdianus*, *A. kashafensis*, *A. kashmarensis*, *A. kavirensis*, *A. keratensis*, *A. khongensis*, *A. khonikensis*, *A. khorasanicus*, *A. khunsarensis*, *A. macrobotrys*, *A. mehrizianus*, *A. melanocalyx*, *A. moussavii*, *A. mucronifolius*, *A. nalbandanicus*, *A. neyshaburensis*, *A. nowroozii*, *A. podoloboides*, *A. protectus*, *A. protractus*, *A. pseudobrachystachys*, *A. pseudonigrescens*, *A. qohestanus*, *A. recurvatus*, *A. renzianus*, *A. reticulato-venosus*, *A. sabzevarensis*, *A. schimperi*, *A. sclerocladus*, *A. semiglabricarpus*, *A. semiromensis*, *A. shahsavaranicus*, *A. sympileicarpus*, *A. tahbaziae*, *A. vernaculatus*, *A. yezdii*, *A. zangooianus*, *Buffonia hebecalyx*, *Calligonum persicum*, *Campanula khorasanica*, *Centaurea balsamita* subsp. *kermanensis*, *C. carduiiformis* subsp. *iranica*, *C. ispanhanica*, *Chesneya astragalina*, *Cicer spiroceras* subsp. *kermanense*, *Cousinia astrocephala*, *C. brevicaulis*, *C. candolleana*, *C. contumax*, *C. deserti*, *C. hergtiana*, *C. hololeuca*, *C. kadereitii*, *C. karkasensis*, *C. lasiandra*, *C. leptolepis*, *C. lignosissima*, *C. longibracteata*, *C. maassoumii*, *C. mehreganii*, *C. mutehensis*, *C. ottonis*, *C. papillosa*, *C. piptocephala*, *C. pugionifera*, *C. raphiocephala*, *C. taybadensis*, *C. tetanocephala*, *Dorema ammoniacum*, *Echinops heteromorphus*, *E. ilicifolius*, *E. keredjensis*, *E. lasiolepis*, *E. macrophyllus*, *Eremostachys codonocalyx*, *Euphorbia connata*, *E. kavirensis*, *E. malleata*, *E. sororia*, *Ferula alliacea*, *F. assa-foetida*, *F. hirtella*, *F. kashanica*, *Fortuynia garcinii*, *Girgensohnia imbricata*, *Glaucium yazdianum*, *Gypsophila acantholimoides*, *G. adenophora*, *G. pseudomelampoda*, *Haplophyllum rubro-tinctum*, *Heliocarya monandra*, *Heliotropium agdense*, *H. esfahanicum*, *H. mesianum*, *H. samoliflorum*, *Hertia angustifolia*, *Hymenocephalus rigidus* (not collected for Flora of Iran), *Iphiona discoidea*, *Jurinea bungei*, *J. stenocalathia*, *Linaria kavirensis*, *Matthiola dumulosa*, *Minuartia khorassanica*, *Neocryptodiscus persicus*, *Neoturularia dentata*, *N. gloeocephala*, *N. prostrata*, *Onobrychis iranensis*, *O. psoraleifolia*, *Paracaryum glandulosum*, *P. khorassanicum*, *Pseudofortuynia leucoclada*, *Reseda macrobotrys*, *Rheum iranshahrii*, *Salsola abarghuensis*, *S. chorassanica*, *S. yazdiana*, *Salvia eremophila*, *Sclerorhachis leptoclada*,

Scorzonera joharchii, *S. khorassanica*, *Scutellaria fragillima*, *Sedum kotschyanum*, *Serratula suffulta*, *Silene gertraudiae*, *S. microphylla*, *S. rasvandica*, *S. renzii*, *Stelleropsis iranica* subsp. *iranica*, *Taraxacum neolobulatum*, *Telephium eriglaucum*, *Verbascum disjectum*.

The endemic taxa of the higher altitudes of Fars, Yazd, Kerman, and northern Hormozgan are as follows:

Acantholimon albocalycinum, *A. aspadanum*, *A. chlorostegium*, *A. cupreo-olivascens*, *A. heratense*, *A. hesarense*, *A. horridum*, *A. kermanense*, *A. mirtadzadinii*, *A. modestum*, *A. nigricans*, *A. scabrellum*, *A. sirchense*, *A. zaeifii*, *Allium kazerouni*, *A. subnotabile*, *Anthemis gayana*, *Arenaria yazdiana*, *Astragalus bavanatensis*, *A. caespititius*, *A. caramanicus*, *A. darrehbidensis*, *A. dieterlii*, *A. hotakensis*, *A. dschuparensis*, *A. estahbanensis*, *A. fischeri*, *A. ghanbarianii*, *A. heterodoxus*, *A. lalesarensis*, *A. neo-podlechii*, *A. neosytinii*, *A. ovoideus*, *A. pseudofragiferus*, *A. pseudoibicinus*, *A. pseudojohannis*, *A. quenequifoliolatus*, *A. reuterianus*, *A. rubriphysa*, *A. rufescens*, *A. sarzehensis*, *A. simakanensis*, *A. sivendicus*, *A. spachianiformis*, *A. subpentanthus*, *A. kermanicus*, *A. khajeh-jamali*, *Bellevalia shirazana*, *Campanula kermanica*, *Centaurea gabriellae*, *Chaenorhinum grossecostatum*, *Chamaeeron asterellus*, *Cousinia barezica*, *C. beauverdiana*, *C. ghahremanii*, *C. ilicifolia*, *C. kermanensis*, *C. kotschyi*, *C. perspolitana*, *C. pulcherantha*, *C. sicigera*, *C. subpectinata*, *C. sarzehensis*, *Crataegus aminii*, *Delphinium lalesaricum*, *Deyeuxia kermanensis*, *Dionysia curviflora*, *D. esfandiarii*, *D. janthina*, *D. raptodes*, *D. sarvestanica*, *Dracocephalum polychaetum*, *Echinops austro-iranicus*, *E. farsicus*, *E. jesdianus*, *E. kazerunensis*, *E. lalesarensis*, *E. laricus*, *E. sojakii*, *Erysimum hezarensense*, *E. polatschekii*, *Fibigia pendula*, *Gaillonia eriantha*, *Glaucium vitellinum*, *Gypsophila yazdiana*, *Hymenocrater yazdianus*, *Hypericopsis persica*, *Isatis pachycarpa*, *I. rugulosa*, *Karvandarina aphylla*, *Lactuca hazaranensis*, *Linaria iranica*, *Nepeta assurgens*, *N. asterotricha*, *N. bornmulleri*, *N. eremophila*, *N. mahanensis*, *Onobrychis plantago*, *Polygonum iranicum*, *Potentilla poteriiifolia*, *Pycnocycla musiformis*, *Ranunculus eriorrhizus*, *Scabiosa kermanensis*, *Scrophularia kermanica*, *Senecio subnivalis*, *Silene circumcarmanica*, *S. dschuparensis*, *S. minutifolia*, *S. pseudonurensis*, *Sisymbrium kermanicum*, *Stachys asterocalyx*, *Sterigmotemum longistylum*, *Tanacetum paradoxum*, *Tricholepis edmondsonii*, *Trigonella latialata*, *Verbascum carmanicum*, *V. lyprocarpum*.



Fig. 14. Nubio-Sindian Province, *Nannorhops ritchiana* and *Phoenix dactylifera*, characteristic species of the area; 15. Mangrove vegetation of Nubio-Sindian Province, *Avicennia marina*.

The endemic taxa of northern Baluchistan are as follows:

Astragalus bazmanicus, *A. tenuiramosus*, *A. termeanus*, *Echinops taftanicus*, *Euphorbia sulphurea*, *Hyoscyamus malekianus*, *Jurinea mobayenii*, *Linaria remotifolia*, *Nepeta balouchistanica*, *Onobrychis laxiflora* subsp. *taftanica*, *Osyris daruma*, *Pimpinella gedrosiaca*, *Pycnocycla acanthorhipsis*, *Salvia bazmanica*, *Semenovia suffruticosa*, *Taraxacum baluchistanicum*, *Trigonella stenocarpa*.

III. Saharo-Sindian Region

This region extends from NW. to NE. of Africa (excluding the margin of the Mediterranean Sea), the Sinai desert, and the main part of the Arabian Peninsula (except the southern part), parts of Palestine, Jordan, Syria, S. of Iraq, S. of Iran, S. of Pakistan, and S. of Afghanistan to the Sind area. In Iran, it harbors lower elevations up to about 800 m along the Persian Gulf and the Oman Sea. In this region, the area from Nubia eastwards to Sind is referred to as the Nubio-Sindian Province, which southern lower elevation of Iran belongs to it.

1. Nubio-Sindian Province

This province in Iran harbors lower elevations up to about 800 m a.s.l. along the Persian Gulf and the Oman Sea. This province in Iran contains about 1300 (15%) taxa, of which 59 are endemics. Takhtajan (1986) regarded the area as a distinct province named South Iranian Province and reported the endemic monotypic genus *Zhumeria* for the area. The only species of the genus was later transferred to the genus *Salvia* as *S. majdae* (Rech. f. & Wendelbo) Systma. Moreover, the distribution of the species is mainly from a transition zone from Irano-Turanian to Saharo-Sindian.

Therefore, the area may not be known as a distinct province and is regarded as part of the Nubio-Sindian Province. Vegetation of the area consists of woodlands, pseudosavanna, grasslands, and mangrove in the coastal zone of the Persian Gulf and the Oman Sea (Figs. 14 and 15). Some of the most important elements are as follows:

Acacia ehrenbergiana, *A. nilotica*, *A. oerfota*, *A. tortilis*, *Aerva persica*, *Alhagi graecorum*, *Anastatica hierochuntica*, *Anvillea garcinii*, *Aristida abnormis*, *A. adscensionis*, *Avicennia marina*, *Blepharis persica*, *Calotropis procera*, *Cometes surattensis*, *Capparis decidua*, *Chrysopogon aucheri*, *Convolvulus spinosus*, *Crassula alata*, *Cymbopogon olivieri*, *Desmostachya bipinnata*, *Dichanthium foveolatum*, *Digitaria nodosa*, *Dipterogium glaucum*, *Dodonea viscosa*, *Ephedra foliata*, *Euphorbia larica*, *E. tirucalli*, *Farsetia heliophylla*, *Forsskaola tenacissima*, *Gisekia phanaceoides*, *Grewia makranica*, *G. tenax*, *Gymnocarpos deccander*, *Halopyrum mucronatum*, *Hammada salicornica*, *Helianthemum lippii*, *H. kahiricum*, *H. sinuspersicum*, *Heliotropium bacciferum*, *Hormuzakia aggregata*, *Hyparrhenia hirta*, *Indigofera argentea*, *I. articulata*, *I. intricata*, *I. oblongifolia*, *Jaubertia aucheri*, *Limonium axillare*, *Maerua arenaria*, *M. crassifolia*, *Nannorhops ritchieana*, *Neuroda procumbens*, *Ochradenus baccatus*, *Osyris daruma*, *Pennisetum divisum*, *Periploca aphylla*, *Populus euphratica*, *Prosopis cineraria*, *P. juliflora* (naturalized), *P. koelziana*, *Pteranthus dichotomus*, *Pycnocycla bashagardiana*, *P. musiformis*, *Rhazya stricta*, *Rhizophora mucronata*, *Rhynchosia schimperi*, *Salsola baryosma*, *drummondii*, *S. lachnantha*, *Salvadora oleoides*, *S. persica*, *Salvia aegyptiaca*, *Scilla autumnalis*, *Sphaerocoma aucheri*,

Sporobolus arabicus, *Stipa capensis*, *Suaeda monoica*, *S. vermiculata*, *Tamarix aphylla*, *T. stricta*, *Taverniera cuneifolia*, *T. echinata*, *T. nummularia*, *T. spartea*, *Tephrosia appolinea*, *T. persica*, *T. uniflora*, *Trigonella anguina*, *Urginea maritima*, *Withania coagulans*, *Ziziphus nummularia*, *Z. spina-christi*, *Zygophyllum hamiense*, *Z. qatarense*, *Z. simplex*.

Endemic taxa of the area:

Albraunia foveopilosa, *Anthemis bushehrica*, *A. persica*, *A. austro-iranica*, *A. mirheydari*, *Arnebia violascens*, *Astragalus cephalopodus*, *A. ensifer*, *A. gypsocola*, *A. jaskensis*, *A. kentrophyllus*, *Atracrylis delvarii*, *Brassica deflexa* subsp. *leptocarpa*, *Calligonum amoenum*, *C. intertextum*, *C. laristanicum*, *Chesneya kotschyi*, *Cleome dolichostyla*, *Convolvulus ammocharis*, *C. cephalopodus*, *C. gonocladus*, *Crotalaria assadii*, *Echichilon kotschyi*, *Echinops delicatus*, *E. dichorus*, *E. disfulensis*, *E. gedrosiacus* var. *glaber*, *E. glanduloso-punctatus*, *E. khuzistanicus*, *E. pachyphyllus*, *E. polychromus*, *E. psammophilus*, *Echiochilon kotschyi*, *Echium khuzistanicum*, *Euphorbia acanthodes*, *E. spartiformis*, *Gaillonia dezfulensis*, *Glaucium mathiolifolium*, *Helianthemum assadii*, *H. salicifolium* var. *securitium*, *H. sinuspersicum*, *Helichrysum makranicum*, *Iphiona arachnoidea*, *Linaria boushehrensensis*, *Lotus laricus*, *Mozaffariania insignis*, *Nannorrhops baluchestanica*, *Nepeta koeieana*, *N. rivularis*, *Orobancha penduliflora*, *Physogeton pedunculatus*, *Platychaete mucronifolia*, *P. velutina*, *Rheum austro-iranicum*, *Serratula khuzistanica*, *Silene wendelboi*, *Taverniera echinata*, *Verbascum kochiiforme*, *Zhumeria majdae*.

Phytochoria known in this paper are summarized and compared with former studies in Table 3.

Transition zone endemics

More to the choria recognized in Iran, there are transition zones that bear some endemic elements that are reported here. It is worth mentioning that in Iran, as altitudes increase rapidly, transition zones are rather narrow; therefore, few endemic taxa are known in these areas.

Irano-Turanian –Saharo-Sindian transition zone

This area has an altitude of about 800- 1000 m a.s.l. between the two regions. Some of the endemic taxa of the area are as follows:

Acantholimon austro-iranicum, *A. hormozganense*, *Astragalus biabanensis*, *A. curviflorus*, *A. fasciculifolius* subsp. *arbusculinus* et *fasciculifolius*, *A. filifoliolatus*, *A. khaneradarensis*, *A. laristanicus*, *Centaurea intricata*, *C. wendelboi*, *Convolvulus*

oxyphyllus, *C. reticulatus*, *C. stapfii*, *Ducrosia assadii*, *Echinops kermanshahanicus*, *E. longipenicillatus*, *Ephedra laristanica*, *Hyparrhenia hirta*, *Micromeria hedgei*, *Microparacaryum salsum*, *Ornithogalum khuzestanicum*, *Platychaete aucheri*, *Prosopis koelziana*, *Salvia persepolitana*, *S. sharifii*, *Scrophularia deserti*, *Teucrium persicum*.

Some enclave elements due to special habitats

Gypsum soil

The following taxa are worth mentioning because they exclusively or preferentially occur on gypsum soils.

Acantholimon cymosum, *Anabasis calcarea*, *A. eugeniae*, *A. setifera*, *Andrachne telephioides*, *Anthochlamis multinervis*, *Astragalus fridae*, *A. iranicus*, *A. semnanensis*, *Centaurea lachnopus*, *Cousinia argentea*, *C. deserti*, *C. trachyphyllaria*, *Diaphanoptera khorassanica*, *Diploaxis harra*, *Dorema ammoniacum*, *Euphorbia bungei*, *E. gypsicola*, *Gaillonia bruguieri*, *Gypsophila mucronifolia*, *Haplophyllum furfuraceum*, *H. robustum*, *Heliotropium gypsaceum*, *Jurinea radians*, *Krascheninnikovia ceratoides*, *Lomatopodium staurophyllum*, *Matthiola farinosa*, *M. ovatifolia*, *M. afghanica*, *Moltkia gysacea*, *Nepeta eremokosmos*, *Onobrychis gaubae*, *O. gypsicola*, *Reaumuria alternifolia*, *R. fruticosa*, *Rubia albo-costata*, *Silene lulakabadensis*, *Zygophyllum miniatum* subsp. *englerianum*.

Saline areas

There are many species in saline areas. Asri (2025) records 255 species, while Akhani & Ghorbanli (1993) recorded 165 species from the saline areas of Iran. The following is the most frequent species of saline areas of Iran (Figs. 16 and 17).

Aeluropus lagopoides, *A. littoralis*, *A. pungens*, *Anabasis salsa*, *Atriplex verrucifera*, *Bienertia cycloptera*, *Camphorosma monspeliaca* subsp. *lessingii*, *Cressa cretica*, *Desmostachya bipinnata*, *Frankenia hirsuta*, *Halocnemum strobilaceum*, *Halopeplis pygmaea*, *Halopyrum mucronatum*, *Halostachys bellangeriana*, *Halothamnus glaucus* subsp. *vestitus*, *Karelinia caspica*, *Limonium iranikum*, *Petrosimonia brachiata*, *Reaumuria fruticosa*, *Salicornia europaea*, *Salsola abarghuensis*, *S. crassa*, *S. dendroides*, *S. kali* subsp. *ruthenica*, *S. persica*, *S. turkomanica*, *S. yazdiana*, *Seidlitzia rosmarinus*, *Suaeda acuminata*, *S. aegyptiaca*, *S. dendroides*, *S. vermiculata*, *Tamarix dioica*, *T. hispida*, *T. mascatensis*, *T. passerinoides*.



Fig. 16. Vegetation of the Saline area, *Bienertia cycloptera* in Hamune Jazmurian; 17. Vegetation of the Saline area, *Halocnemum strobilaceum* and *Halostachys belangeriana* in Namak Lake.

Table 3. Phytochoria of Iran, known by the main authors, is compared with the present paper. Abbreviations: Euro-Sib., Euro-Siberian; R. Region; P.: Province; Irano-Tur., Irano-Turanian; D., District; C. Central.

Area Author	N. Iran	Azerbaijan	Elburz	N. Khorasan	C. & E. Iran	Zagros	N. Balouchestan	S. Iran
	Holarctic K.							Paleotropical K.
Zohari 1963	Euro-Sib. R. Euxino- Hyrcanian P.	Irano-Tur. R. Armeno- Iranian District	Irano-Tur. R. Armeno- Iranian District	Irano-Tur. R. Armeno- Iranian District	Irano-Tur. R. Afghano- Anatolian District	Irano-Tur. R. Zagrosian District	Irano-Tur. R. Afghano- Anatolian District	Sudanian R. Nubo-Sindian P.
Zohari 1973	Euro-Sib. Region Pontic Province Hyrcanian D.	Irano-Tur. Region Irano- Anatolian P. Armeno- Iranian Sector	Irano-Tur. Region Irano- Anatolian P. Armeno- Iranian Sector	Irano-Tur. Region Irano- Anatolian P. Armeno- Iranian Sector	Irano-Tur. Region Irano- Anatolian P. C. Iranian Sector	Irano-Tur. R. Irano- Anatolian P. Kurdo- Zagrosian Sector	Irano-Tur. Region Irano- Anatolian P. C. Iranian Sector	Sudanian R. Nubo-Sindian Province
Takhtajan 1986	Irano-Tur. R. Hyrcanian P.	Irano-Tur. R. Armeno- Iranian P. Atropatenian Subprovince	Irano-Tur. R. Armeno- Iranian P. Atropatenian Subprovince	Irano-Tur. R. Armeno- Iranian P. Khorassan Subprovince	Irano-Tur. R. Armeno-Ir. P. Central Ir. & Fars-Kerman Subprovinces	Irano-Tur. R. Armeno-Ir. P. Kurdo- Zagrosian Subprovince	Irano-Tur. R. Northern Baluchistanian P.	Sudano- Zambezian R. South Iranian Province
White & Leonard 1991	-	Irano-Tur. Regional Centre of Endemism	Irano-Tur. Regional Centre of Endemism	Irano-Tur. Regional Centre of Endemism	Irano-Tur. Regional Centre of Endemism	Irano-Tur. Regional Centre of Endemism	Irano-Tur. Regional Centre of Endemism	Saharo- Sindian Regional Zone Nubo-Sindian Local Centre of Endemism
Assadi (Present paper) 2025	Euro-Sib. R. Euxino- Hyrcanian P.	Irano-Tur. R. Armeno- Atropatenian P.	Irano-Tur. R. Elborzo- Khorasanian P.	Irano-Tur. R. Elborzo- Khorasanian P.	Irano-Tur. R. Central Iranian P.	Irano-Tur. R. Kurdo- Zagrosian P.	Irano-Tur. R. Central Iranian P.	Saharo- Sindian R. Nubo-Sindian P.



Fig. 18. Vegetation of dunes in Kashan. *Haloxylon ammodendron*.

Dunes

The following species are frequent on dunes (Fig. 18):

Agriophyllum latifolium, *A. minus*, *Ammodendron persicum*, *Anabasis annua*, *Astragalus squarrosus*, *Calligonum comosum*, *C. bungei*, *C. denticulatum*, *C. paletzkianum*, *C. turkestanicum*, *Capparis decidua*, *Carex physodes*, *Chamaesphacos ilicifolius*, *Chrozophora gracilis*, *Cithareloma lehmanii*, *Corispermum lehmannianum*, *Cornulaca leucantha*, *Cutandia memphitica*, *Cyperus conglomeratus*, *C. eremicus*, *Halopyrum mucronatum*, *Haloxylon ammodendron*, *H. persicum*, *Hammada salicornica*, *Horaninowia ulicina*, *Pennisetum divisum*, *Nitraria schoberi*, *Reaumuria stocksiana*, *Salsola aperta*, *S. griffithii*, *S. richteri*, *Schumannia karelinii*, *Smirnowia turkestana*, *Sporobolus arabicus*, *Stipagrostis karelinii*, *S. pennata*, *S. plumosa*, *Thuspeinantha persica*, *Torularia torulosa*, *Zygophyllum eichwaldii*.

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