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A checklist of halophytes and salt-tolerant plants of Iran: characteristics, distribution and potential economic values

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Abstract

The climate of Iran is mostly arid or semi-arid, except for the coasts of Caspian Sea and northern forests and western parts of the country. These climatic conditions, along with other environmental and human factors, have created vast salt lands in Iran, so that 40.3% of Iran's total area is comprised of salt-affected soils. According to the collection of plants from the saline habitats of Iran during the years 1990–2023, 460 taxa belonging to 193 genera and 49 families were identified. The largest families rich in species were Amaranthaceae with 153 species and 41 genera, Poaceae with 56 species and 29 genera, and Tamaricaceae with 34 species and two genera. The genera with the highest number of species are *Tamarix* with 28 species, *Suaeda* with 17 species, and *Halothamnus* with 15 species. The life form spectrum reveals that, the highest number of species is assigned to therophytes (33.9%). Phytogeographically, Irano-Turanian elements had the highest contribution in the flora of saline habitats of Iran with 38.9%. In terms of ecological type, xerophytes and xerohalophytes were the most abundant species in saline habitats with 27.2 and 23.3%, respectively. The succulent and salt-exclusion plants constituted 32.7% and 21.6% of the flora of these habitats, respectively. Among the halophyte and salt-tolerant species of Iran, 67.1% are of economic importance.

Keywords: Ecological classification, ecomorphological classification, geographical regions, plant biodiversity, saline habitats

فهرست هالوفیت‌ها و گیاهان مقاوم به شوری ایران: ویژگی‌ها، پراکندگی و ارزش‌های اقتصادی بالقوه

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خلاصه

اقلیم ایران، به جز مناطق ساحلی و جنگلی شمال و بخش‌های غربی کشور عمدتا خشک یا نیمه‌خشک است. این شرایط اقلیمی به همراه سایر عوامل محیطی و انسانی، اراضی شور وسیعی را در کشور به وجود آورده است، به طوری که ۴۰/۳ درصد مساحت ایران را خاک‌های تحت تأثیر شوری تشکیل می‌دهد. براساس جمع‌آوری گیاهان از رویشگاه‌های شور کشور طی سال‌های ۱۴۰۲-۱۳۶۹، ۴۶۰ آرایه‌هایی متعلق به ۱۹۳ جنس و ۴۹ تیره شناسایی شدند. بزرگترین تیره‌ها از نظر غنای گونه‌ای، اسفناجیان (Amaranthaceae) با ۱۵۳ گونه و ۴۱ جنس، گندمیان (Poaceae) با ۵۶ گونه و ۲۹ جنس و گزیان (Tamaricaceae) با ۳۴ گونه و دو جنس بودند. جنس‌های با بیشترین تعداد گونه، *Tamarix* با ۲۸، *Suaeda* با ۱۷ و *Halothamnus* با ۱۵ گونه بودند. طیف شکل زیستی گیاهان نشان داد که بیشترین تعداد گونه‌ها به تروفیت‌ها (۳۳/۹ درصد) اختصاص دارد. از نظر فیتوجغرافیایی، عناصر ایران-تورانی با ۳۸/۹ درصد بیشترین سهم را در فلور رویشگاه‌های شور ایران داشتند. از نظر تیپ بوم‌شناختی، گزروفیت‌ها و گزروهالوفیت‌ها به ترتیب با ۲۷/۲ و ۲۳/۳ درصد بیشترین گونه‌ها در رویشگاه‌های شور بودند. گیاهان گوشتی و دفع‌کننده نمک به ترتیب ۳۲/۷ و ۲۱/۶ درصد فلور این رویشگاه‌ها را تشکیل داده بودند. در میان گونه‌های هالوفیت و مقاوم به شوری ایران، ۶۷/۱ درصد دارای اهمیت اقتصادی هستند.

واژه‌های کلیدی: تنوع‌زیستی گیاهی، دسته‌بندی بوم‌شناختی، دسته‌بندی بوم‌ریخت‌شناختی، زیستگاه‌های شور، نواحی جغرافیایی

Introduction

Around the world, salt-affected lands are vast. The extent of these lands in Australia, Asia, America, Africa, and Europe is estimated 357.6, 316.5, 146.9, 80.4, and 30.8 Mha, respectively (Shahid *et al*. 2018). Saline and sodic soils are distributed in arid and semi-arid areas in Iran. These soils are scattered around inland salt lakes and waters, desert lowlands, Persian Gulf, and Oman Sea. Banie (2001) estimate the area of lands with slightly saline, moderately saline, severely saline and very severely saline levels 4.9, 11.5, 6.5, and 8.2 Mha, respectively.

Soil salinization in Iran is the result of natural phenomena and human activities. Soil-bedrock (such as halite and gypsum with layers of marls), salinization of rivers, salinity due to intense winds from salt lands, penetration of seawater and saltwater lakes in coastal areas, low rainfall, and high evapotranspiration potential are the main natural causes of salt accumulation in the soils of the Iranian plateau. The human activities affecting salinity of soils include unmanaged saline water irrigation, improper drainage, excessive groundwater pumping from saline aquifers, improper freshwater irrigation management practices, and and overgrazing of pastures (Qadir *et al*. 2008). In addition, irrigated agricultural lands are contributed to the accumulation of soluble salts and of exchangeable sodium in the soil where the plant roots are grown (Arzani & Ashraf 2016).

Taxonomic studies and the resulting checklists play an important role in underpinning all biodiversity research. These checklists serve as a basic references for investigating the flora of each country and are continuously updated through detailed taxonomic research. The aim of a checklist is to compile taxonomic information and provide accepted, standardized, and transparent scientific names for all plant species representing the country's flora (Victor *et al*. 2024). Checklists encompass various plant groups, including bryophytes and vascular plants (ferns, lycophytes, gymnosperms, and angiosperms), such as Ferns of Iran (Khoshravesh *et al.* 2009), Vascular Plants of the Czech Republic (Danihelka *et al*. 2012), Gymnosperms of India (Singh & Srivastava 2013), Bryophytes of Europe (Hodgetts *et al*. 2020), Iranian Grasses (Bidarlord & Ghahremaninejad 2022), Aquatic Vascular Plants of Iran (Dinarvand *et al*. 2022), and Endemic Vascular Plants of Lebanon (El Zein *et al*. 2025).

There are a total of 1216 halophytes and salt-tolerant plants worldwide, which belong to 93 families (eHALOPH 2025). Ghazanfar *et al*. (2014) reported 728 halophytes and salt-tolerant taxa from SW Asia, which belong to 68 families and 328 genera. A checklist of halophytes and salt-tolerant plants has been published in some countries. For example, Zhao *et al.* (2011) published a list of 587 plant taxa grown in Chinese saline habitats, along with their life form, geographic distribution and economic potential. Ajmal Khan & Qaiser (2006) introduced 410 plant taxa from Pakistan saline habitats, along with the life form, geographic distribution, ecological type and its economic potential. In addition, the saline habitats flora of UAE with 143 species (Karim & Dakheel 2006), Bahrain with 97 species (Abbas 2006), Turkey with 300 species (Güvensen *et al.* 2006, Öztürk *et al*. 2008), Syria with 110 species (Al-Oudat & Nadir 2011), Romania with 140 species (Grigore 2012), Afghanistan with 96 species (Breckle 2016), Argentina with 673 species (José Cantero *et al*. 2016), and central Europe with 190 species (Dítě *et al*. 2023) has also been reported.

Halophytes have structural adaptations like succulence, salt glands, and bladders to manage high salt levels in saline environments. Physiologically, they regulate internal salt concentrations by synthesizing compatible solutes, accumulating inorganic ions like Na^+ and K^+, and storing them in specific cellular compartments or excreting them through salt glands to maintain osmotic balance and cellular turgor (Meng *et al.* 2018, Grigore & Toma 2020).

Several case studies have been conducted on the introduction of plant biodiversity in saline areas of Iran, including the following: Maharlu Lake (Carle & Frey 1977), Howz-e Soltan Lake (Ghorbanli & Lambinon 1978), Kavir-e Meyghan (Akhani 1988), Dasht-e-Kavir, Dasht-e-Lut, Jaz Murian (Léonard 1991/1992), Salt Marshes of Iran (Asri 1994–2002), Orumieh Lake (Asri & Ghorbanli 1997, Asri 1999, Asem *et al.* 2014, Ghorbanalizadeh *et al.* 2020),

Kavir-e Garmsar (Asri & Hamzeh'ee 1999), Touran Protected Area (Asri *et al*. 2000, Asri 2017), Oil Field Areas (Alaie 2001), Gavkhouni Wetland (Asri *et al*. 2002), Kavir Protected Area (Asri 2004), Qeshm Island (Attar *et al.* 2004), Miankaleh Biosphere Reserve (Sharifnia *et al.* 2007), Kish Island (Ghahreman *et al.* 2007), Dara, Booneh, and Ghabr-e Nakhoda Islands in SW Persian Gulf (Akhani & Deil 2012), Mouteh Refuge (Asri 2008, Rabie & Asri 2014), Mond Protected Area (Mehrabian *et al*. 2008), Eshtehard (Asri *et al.* 2014), Lake Urmia, Lake Meyghan, Musa Estuary, and Nayband Bay (Matinzadeh *et al.* 2022).

Despite the efforts made in Iran, the plant biodiversity of salt marshes has not yet been well known, and so far, no complete checklist of the flora of saline habitats has been published. The purpose of this research is to introduce halophytes and salt-tolerant plants in Iran with their ecological and ecomorphological characteristics, life form and phytogeographical distribution. In addition, halophytic and salt-tolerant plants have been introduced with potential economic uses.

Materials and Methods

According to the collection of plants from Iranian saline habitats during the years 1990–2023 using Flora Iranica (Rechinger 1963–2015) and Flora of Iran (Assadi *et al.* 1988–2024), a list of native halophytes and salt-tolerant plants (and not planted) was prepared. Some species were added to the list of Iranian halophyte plants based on the collection and introduction of other researchers, including the following: Pratov (1985), Akhani (1988, 2002, 2008, 2015), Akhani & Förther (1994), Ghobadnejhad *et al*. (2004), Sukhorukov (2007), Dehghani & Akhani (2009), Akhani *et al*. (2012, 2019), Kadereit *et al*. (2012), and Freitag *et al*. (2013).

Accepted names of species and their authors were checked using the data base International Plant Names Index (IPNI 2019). The list of plant species was also checked with the Halophytes Database Website (eHALOPH 2025). The life form of the species was determined based on Raunkiaer classification system (Raunkiaer 1934). Geographical distribution of species in the world was determined using the World Plants Website (Hassler 1994–2025) and Plants of the World Online (POWO 2025). In determining the chorotype of the species, the phytogeographical regions were taken into account in which the species were native rather than being introduced there. The mechanisms of salt resistance in halophytes and salt-tolerant plants were determined according to Aslam *et al*. (2011) and Meng *et al.* (2018).

Halophytes and salt-tolerant plants have many economic uses and are used as food, forage, medicine, sand stabilization, ornamentation, fuel, fiber, ethereal oil and gum. According to field observations, local information as well as references such as Pasternak (1987), Ajmal Khan & Qaiser (2006), Karim & Dakheel (2006), Al-Oudat & Nadir (2011), Asri (2011, 2012), Öztürk *et al*. (2014), and Vineeth *et al*. (2020), the economic application of the species was determined.

Results

In general, Iranian halophytes and salt-tolerant plants belong to 460 species, 193 genera and 49 families (Table 1). Amaranthaceae with 153 species and 41 genera is the largest family in terms of the species richness, followed by Poaceae (56 species and 29 genera), Tamaricaceae (34 species and two genera), Fabaceae (29 species and 16 genera), Cyperaceae (22 species and eight genera), Asteraceae (18 species and 14 genera), and Plumbaginaceae (15 species and two genera). The genera with the most species richness are *Tamarix*, *Suaeda*, *Halothamnus*, *Caroxylon*, *Halimocnemis*, *Limonium*, and *Juncus* with 25, 17, 15, 13, 12, 12, and 11 species, respectively.

Among the life forms, therophytes (33.9%) have the largest share in the biological spectrum of Iranian saline habitats, followed by chamaephytes and cryptophytes (each with 17.6%), hemicryptophytes (15.7%), and phanerophytes (15.2%). The geographical distribution of species shows that, Irano-Turanian elements contribute 38.9% of the species, followed by Saharo-Sindian, Euro-Siberian/ Irano-Turanian/Mediterranean, subtropical/tropical, Irano-Turanian/Saharo-Sindian, and Irano-Turanian/

Mediterranean elements with 15, 6.3, 5.9, 5.2, and 4.6%, respectively (Fig. 1).

Of the total 460 halophytes and salt-tolerant plants, 32 are endemic to Iran, of which 23 belong to the Amaranthaceae (Table 1). In addition, 21 species are semi-endemic, meaning that most of their distribution range is limited to Iran, but they also have a limited distribution in one of the neighboring countries. These species are *Anabasis haussknechtii*, *Asparagus lycaonicus*, *Atriplex griffithii*, *Caroxylon iljinii*, *Cistanche laxiflora*, *Halimocnemis purpurea*, *Halothamnus cinerascens* subsp. *cinerascens*, *H. iranicus*, *Heliotropium mamanense*, *Limonium carnosum*, *L. iranicum*, *Reaumuria alternifolia* subsp. *panjgurica*, *R. persica*, *R. stocksii*, *Sabulina urumiensis*, *Salicornia iranica* subsp. *sinus-persica*, *S. persica*, *Soda kerneri*, *Tamarix dubia*, *T. kermanensis*, and *T. stricta.*

The geographical distribution of saline habitat plants in nine regions of Iran (NW, N, NE, W, C, E, SW, S, and SE) has been determined (Table 1). In general, halophytes and salt-tolerant plants showed 17 distribution patterns in different regions of the country (Fig. 2). The highest number of species was observed in the NW/NE/C regions (18.7%), followed by species present throughout Iran (12.8%) and in the SW/S/SE regions (11.7%).

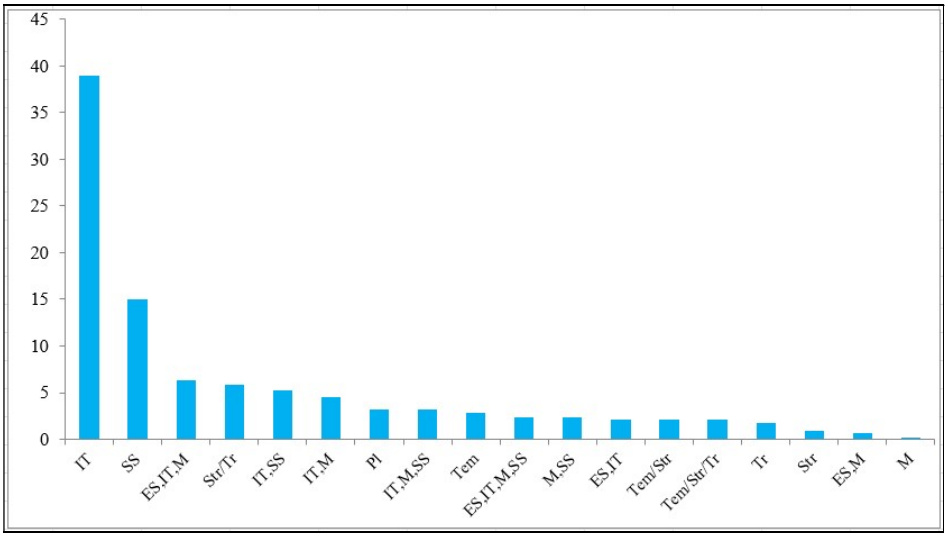

Fig. 1. Chorological type of halophytes and salt-tolerant plants in Iran: Chorotypes: ES = Euro-Siberian, IT = Irano-Turanian, M = Mediterranean, SS = Saharo-Sindian, Str = Subtropical, Tr = Tropical, Tem = Temperate.

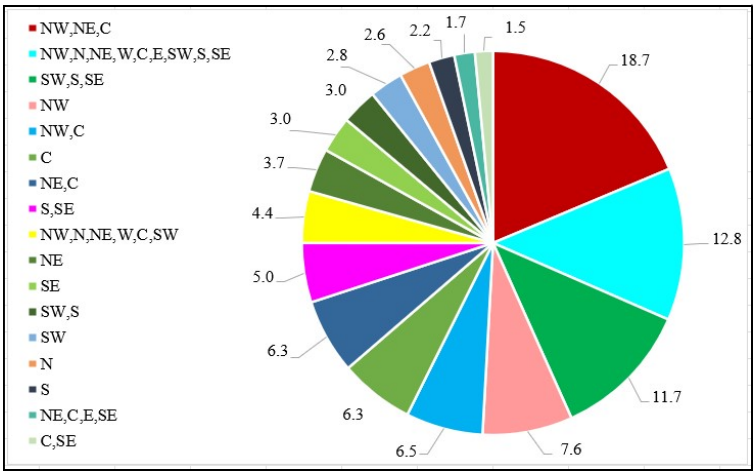

Fig. 2. Geographical distribution pattern of halophytes and salt-tolerant plants in Iran.

Halophytes based on ecological characteristics were classified into the following five groups (Fig. 3): 1) Xerohalophytes are found in steppe habitats, salt deserts and gypsiferous and marl saline soils. This group constitutes 23.3% of plants in saline habitats. The widely distributed xerohalophytic species include: *Atriplex turcomanica*, *Nitrosalsola incanescens*, *N. nitraria*, *Plantago coronopus*, *Prosopis farcta*, *Soda florida*, *S. rosmarinus*, and *Tamarix passerinoides*; 2) Hygrohalophytes are on wet saline soils in the margins of rivers, swamps, lakes and seas. These plants account for 18.7% of the species of saline habitats. In this group, *Aeluropus littoralis*, *A. lagopoides*, *Climacoptera turcomanica*, *Cressa cretica*, *Frankenia pulverulenta*, *Halocnemum strobilaceum*, *Spergularia marina*, and *Suaeda heterophylla* are widely spread; 3) Psammohalophytes are on salt sandy deserts and sand dunes. In addition to salinity tolerance, these plants have been adapted to the very light and nutrient-poor soils. These plants contain 2.8% of the flora of saline habitats. In this group, *Cistanche tubulosa*, *Cynomorium coccineum*, *Cyperus conglomeratus*, *Haloxylon ammodendron*, *H. salicornicum*, *Nitraria schoberi*, and *Xylosalsola richteri* can be mentioned; 4) Hydrophilous halophytes are on the margins of the salt rivers, swamps, lakes and seas, but part of the stems of these plants are present throughout the year or a period of the year in the water. This group includes 2% of plants in saline habitats. The plants of this group except for tree species *Avicennia marina* and *Rhizophora mucronata* are perennial monocotyledons such as *Bolboschoenus maritimus*, *Cyperus laevigatus* subsp. *laevigatus*, *Phragmites australis*, and *Schoenoplectus litoralis*; and 5) Hydrohalophytes are aquatic plants found in brackish and saline rivers and swamps, inland salt lakes, and northern and southern coastal waters of Iran. This group includes the species *Halodule wrightii*, *Halophila ovalis*, and *Thalassodendron ciliatum*, which are distributed on the coasts of the Persian Gulf and the Oman Sea, and two species *Ruppia cirrhosa* and *R. maritima*, which are widely distributed in the aquatic habitats of Iran. Sometimes separation between hydrophilous halophytes and hygrohalophytes is difficult. For example, *Juncus* spp. and *Salicornia* spp. in addition to the margins of salt rivers and wetlands, are also found in flooded soils at the margins of salt lakes. These plants are periodically affected by flooding in tidal zones and therefore spend part of their vegetative period in the aquatic environment and the rest in dry environment.

Salt-tolerant plants were also classified into five groups based on ecological characteristics. Xerophytes, with 27.2%, have the highest number of species in these habitats, followed by hygrophytes, psammophytes, hydrophiles, and hydrophytes with 15, 5.2, 2.8, and 2%, respectively (Fig. 3).

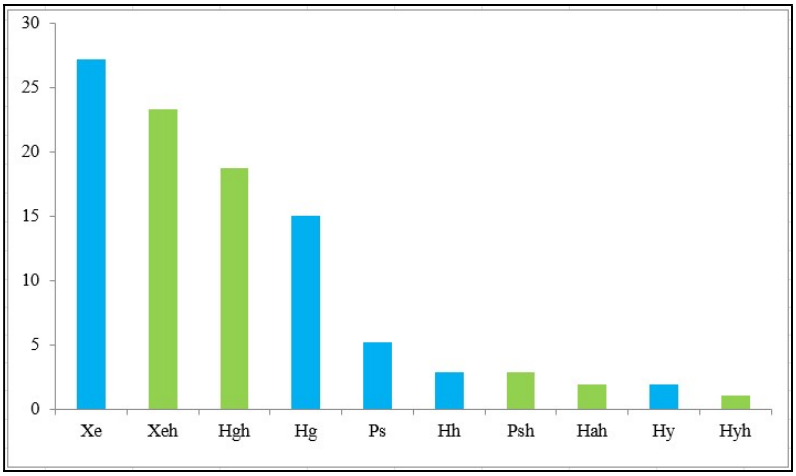

Fig. 3. Ecological type of halophytes and salt-tolerant plants in Iran: Ecological types: Hg = Hygrophyte, Hgh = Hygrohalophyte, Hh = Hydrophilous plant, Hah = Hydrophilous halophyte, Hy = Hydrophyte, Hyh = Hydrohalophyte, Ps = Psammophyte, Psh = Psammohalophyte, Xe = Xerophyte, Xeh = Xerohalophyte

Halophytes and salt-tolerant plants were classified into three general groups based on ecomorphological characteristics: 1) Recretohalophytes are plants that excrete absorbed ions through bicellular salt glands of leaves and stems, such as *Aeluropus* spp., *Panicum* spp., and *Phragmites* spp., or multicellular, such as *Avicennia marina*, *Frankenia* spp., *Limonium* spp., *Reaumuria* spp., *Rhizophora mucronata*, and *Tamarix* spp.; or the salt is accumulated in epidermal bladders, such as *Atriplex* spp., *Chenopodiastrum murale*, and *Oxybasis* spp. Salt-releasing plants constitute a total of 21.6% of halophytes and salt-tolerant plants in Iran; 2) Succulent euhalophytes are plants that store ions absorbed in leaves and stems, and absorb water to prevent the ion concentration increase, and thus appear to be succulence. Leaf-succulent plants include *Caroxylon* spp., *Climacoptera* spp., *Halimocnemis* spp., *Halothamnus* spp., *Kaviria* spp., *Nitrosalsola* spp., *Salsola* spp., and *Suaeda* spp. Stem-succulent plants include *Halocnemum strobilaceum*, *Halostachys caspica*, and *Salicornia* spp. Some plants, such as *Anabasis annua*, *A. setifera*, *Halopeplis perfoliata*, *H. pygmaea*, and *Kalidium caspicum*, have succulent stems and leaves. Succulent plants account for 32.7% of halophytes and salt-tolerant plants. Exceptionally, the *Aizoanthemopsis hispanica*, *Aizoon canariense*, and *Mesembryanthemum nodiflorum* have salt bladders in addition to succulent stems and leaves; and 3) Other halophytes and salt-tolerant plants withstand high salt concentrations due to various adaptations and mechanisms, including shedding of the salt saturated leaves, synthesis of osmolytes such as proline, aquaporin and glycine betaine. These plants do not show significant morphological changes. Among these plants, *Alhagi* spp., *Asparagus* spp., *Bassia* spp., *Bolboschoenus* spp., *Cyperus* spp., *Haloxylon* spp., *Heliotropium* spp., *Juncus* spp., *Puccinellia* spp., and *Spergularia* spp. can be mentioned.

Discussion

There are several efforts made to compile the halophytic flora of the Iran as well list of regional halophytes. However, the information of halophytes and salt-tolerant plants of Iran is far from completion. In the first published list of halophytic and salt-tolerant plants of Iran, 165 species belonging to 73 genera and 26 families were introduced (Akhani & Ghorbanli 1993). The largest families in terms of species richness were Chenopodiaceae/Amaranthaceae (87), Tamaricaceae (15), and Plumbaginaceae (13). Later, Akhani (2006) increased the number of plants collected from saline habitats to 365 species belonging to 151 genera and 43 families. Accordingly, Amaranthaceae (139), Poaceae (35), Tamaricaceae (29), Asteraceae (23), and Plumbaginaceae (14) were the largest families in terms of species richness. Finally, Akhani (2016) introduced 528 taxa in saline habitats of Iran, belonging to 230 genera and 56 families. Amaranthaceae is the largest family with 151 species, followed by Poaceae (52), Asteraceae (47), Fabaceae (28), Brassicaceae (26), and Tamariacaceae (22). However, these articles do not provide a list of plant species, only the families are presented along with the number of genera and species. In the present study, 460 halophytes and salt-tolerant plants belonging to 193 genera and 49 families are introduced from saline habitats of Iran with some relevant details. The families Amaranthaceae (153), Poaceae (56), Tamaricaceae (34), Fabaceae (29), Cyperaceae (22), Asteraceae (18), and Plumbaginaceae (15) account for the largest number of these plants.

The difference in the number of halophyte species seems to be related to the disagreement among researchers about the tolerance of species to salinity. Ajmal Khan & Qaiser (2006) considered halophytes to be plants that complete their life cycle in saline habitats and where salt concentration of soil solution is about 85 mM NaCl or 7–8 dS m^{-1}. According to Zhao *et al.* (2011), halophytes are plants that survive and reproduce in environments where the salt concentration is about 200 mM NaCl or more. For example, Ajmal Khan (2003) initially reported 380 taxa from saline areas of Pakistan and later Ajmal Khan & Qaiser (2006) increased this number to 410 taxa. Güvensen *et al*. (2006) identified

300 species in the saline areas of Turkey, and then 137 halophyte species were reported from the Irano-Turanian region (Öztürk *et al.* 2008) and 210 species from the Mediterranean region (Öztürk *et al.* 2014) of Turkey. These two regions have only 18 similar halophyte taxa. The number of halophytes in China was first reported by Zhao *et al.* (2002) as 430 species, after which Zhao *et al.* (2011) increased this number to 587 species. Therefore, the halophyte species introduced by different researchers may differ due to differences in the definition of halophytes.

Halophytes and salt-tolerant plants in Iran due to various compatibility can grow in habitats with very diverse environmental conditions from low to high salt, gypsum, marl, and dry to moist soils, and water of rivers, lakes and seas. One of the most successful compromise methods is therophyte life form that has caused the plants to settle in arid and semi-arid areas of the inland and even coastal areas. These plants through the surface roots absorb water and nutrients from the low-depth layers of soil, while completing their vegetative growth in a period of a year that, the amount of soil salinity has not increased significantly due to low evaporation of the soil moisture. The flowering and seeding stages of these plants, such as Amaranthaceae members, may continue during the dry period (with high levels of salinity), but during this period, the plant's nutritional needs have been minimized due to vegetative growth cessation. Therophytes with 33.9% had the dominant life form of low to high-saline habitats in Iran, where 56.2% of these plants belong to Amaranthaceae.

Halophytes and salt-tolerant plants under various environmental stresses show a variety of ecological compatibility. Due to the extent of arid and saline areas as well as the diversity of their habitat conditions, xerohalophytes with xeromorphic adaptive characteristics such as succulence, reduction in leaf area, thick cuticle, dense hairs on stem and leaves, sunken stomata, salt glands and bladders, etc. have a large share in these habitats. Some of the more restricted distribution xerohalophytes are at risk due to climate changes, cutting of bushes and shrubs in order to provide charcoal and firewood, excessive livestock grazing, destruction of habitats for the development of cities, roads, factories and mines, uncontrolled exploitation of medicinal and industrial plants, as well as the change in the use of natural habitats to agricultural lands, etc. The following species can be mentioned: *Acanthophyllum diaphanopterum*, *A. stenocalycinum*, *Anabasis firouzii*, *A. lachnantha*, *A. salsa*, *Asparagus azerbaijanensis*, *A. lycaonicus*, *Bienertia kavirense*, *Bupleurum semicompositum*, *Caroxylon abarghuense*, *C. chorassanicum*, *C. inermis*, *C. persicum*, *Cistanche fissa*, *Eremopyrum triticeum*, *Halimocnemis alaeflavum*, *H. azarbaijanensis*, *H. longifolia*, *H. pedunculata*, *H. pilosa*, *H. purpureum*, *Halothamnus sistanicus*, *Heliotropium dissitiflorum*, *Kaviria zehzadii*, *Lachnoloma lehmannii*, *Limonium nudum*, *L. stocksii*, *Malacocarpus crithmifolius*, *Nitraria retusa*, *Pteropyrum gypsaceum*, *Reaumuria persica*, *Sabulina urumiensis*, *Schrenkiella parvula*, *Tamarix humboldtiana*, *T. kermanensis*, *T. octandra, Thesium compressum*, *Vitex trifolia*, *Zygophyllum oxianum*, and *Z. pinnatum.*

Hygrohalophytes on the margins of Caspian Sea, Persian Gulf, and Oman Sea as well as brackish and salt lakes, swamps and permanent and seasonal rivers make a significant contribution to the flora of salt lands. The flowing water caused by melting of snow and rain in the southern slopes of Alborz Mountains and the slopes of Zagros Mountains as well as the scattered mountains on the Iranian plateau through permanent and seasonal rivers, mainly moves to the central plateau of Iran, where salt lagoons and lakes have been formed. In the last two decades, most aquatic ecosystems, especially in the central Iranian plateau have dried up due to climate change (rainfall reduction and temperature increase) and inadequate water management caused by the construction of multiple dams on the rivers entering salt lakes and lagoons. In addition, due to the digging many wells to cultivate crops around these lakes and lagoons that cause a reduction in groundwater level, most of their hygrohalophytes and hydrophilous halophytes are either

endangered or extinct. Among hygrohalophytes and hygrophytes that are highly at risk, the following species can be mentioned: *Aeluropus laciniatus*, *A. macrostachyus*, *Arthrocaulon macrostachyum*, *Asparagus griffithii*, *Atriplex belangeri*, *A. flabellum*, *Beckmannia eruciformis*, *Carex extensa*, *Cirsium alatum*, *Climacoptera longipistillata*, *Frankenia persica*, *Gladiolus halophilus*, *Inula aucheriana*, *Isolepis cernua*, *Juncus littoralis*, *J. socotranus*, *J. subulatus*, *Kosteletzkya pentacarpos*, *Limonium bellidifolium*, *Microcnemum coralloides* subsp. *anatolicum*, *Oxybasis chenopodioides*, *Paspalum distichum*, *Psylliostachys beludshistanica*, *Puccinellia bulbosa, P. dolicholepis*, *P. grossheimiana*, *P. koeieana*, *P. poecilantha*, *Salicornia iranica* subsp. *iranica*, *S. iranica* subsp. *rudshurensis*, *S. persica*, *S. perspolitana*, *Saussurea salsa*, *Soda austroiranica*, *Sphaerophysa salsula*, *Sporobolus aculeatus*, *Suaeda linifolia*, *S. monoica*, *S. physophora*, *S. splendens*, and *Tripolium pannonicum*. Among the hydrophilous halophytes, there are also species at risk of *Bolboschoenus planiculmis*, *Cyperus malaccensis* subsp. *malaccensis*, *C. pannonicus*, *Eleocharis argyrolepis*, *Phragmites karka*, and *Rhizophora mucronata*.

Some psammohalophytes that grow on salt sand dunes, sand deserts and coastal zones are at risk of extinction due to limited distribution, habitats destruction, transformation and expansion of tourism. These include *Bassia muricata*, *Cakile maritima*, *Chloris flagellifera*, *Convolvulus persicus*, *Halopyrum mucronatum*, *Haloxylon scoparium*, and *Tetraena propinqua* subsp. *propinqua*.

Some halophyte species that are widely distributed in the saline lands of Iran have formed communities alone or with other species in the Irano-Turanian and Saharo-Sindian regions, including *Aeluropus lagopoides*, *A. littoralis*, *Atriplex turcomanica*, *Cressa cretica*, *Halocnemum strobilaceum*, *Phragmites australis*, *Prosopis farcta*, *Soda rosmarinus*, *Tamarix leptopetala*, and *T. passerinoides*. A number of halophytes are also present socially in most saline lands of the Irano-Turanian region. These species include: *Climacoptera turcomanica*, *Halimione verrucifera*, *Halostachys caspica*, *Kaviria tomentosa*, *Limonium iranicum*, *Lycium depressum* subsp. *depressum*, *Nitrosalsola incanescens*, *N. nitraria*, *Tamarix arceuthoides*, *T. kotschyi*, *T. ramosissima*, and *T. szowitsiana*. Some halophyte species such as *Caroxylon imbricatum*, *Haloxylon salicornicum*, *Soda drummondii*, *Suaeda aegyptiaca*, *S. fruticosa*, and *Tamarix mascatensis* have formed communities mainly in the Saharo-Sindian region.

Among native halophytes, Amaranthaceae has the highest (44%) number of species with wide adaptability and different usage such as forage, vegetable, food, and oil (Kafi & Salehi 2019). Although 67.1% of Iranian halophytes and salt-tolerant plants have high economic importance, the use of these plants is not currently common. For example, *Salsola tragus* is used to sterilize raisins, *Bassia scoparia* is used to make brooms, and *Haloxylon ammodendron* and *H. persicum* are used to stabilize sand. In addition, for the production of forage, non-native species of *Atriplex canescens*, *A. halimus*, *A. lentiformis*, and *A. nummularia* have been planted widely, which have yielded good results in some areas. A large number of halophytes and salt-tolerant plants as potential agricultural crops can be cultivated in salt lands and used in various fields. For example, species such as *Alhagi* spp., *Frankenia* spp., *Lycium* spp., *Nitraria* spp., and *Plantago* spp. can be used to prepare medicines. Many species such as *Aeluropus* spp., *Atriplex* spp., *Caroxylon* spp., *Halocnemum strobilaceum*, *Halostachys caspica*, *Kaviria* spp., *Nitrosalsola* spp., *Puccinellia* spp., *Salicornia* spp., *Salsola* spp., *Soda rosmarinus*, and *Trifolium* spp. have forage value. The species such as *Capparis decidua*, *Dactyloctenium scindicum*, *Haloxylon* spp., *Nitraria schoberi*, and *Sphaerocoma hookeri* subsp. *aucheri* can be used for sand stabilization. Some species such as *Frankenia* spp., *Limonium* spp., *Lycium shawii*, *Psylliostachys* spp., *Salvadora* spp., *Tamarix* spp., and *Typha* spp. have ornamental value. In addition, species such as *Populus euphratica*, *Prosopis* spp., *Tamarix* spp.,

and *Vachellia* spp. can be used for the production of wood and wood products and species such as *Cyperus* spp., *Juncus* spp., *Phragmites* spp., *Schoenoplectus* spp., and *Typha* spp. can be used for fiber production.

Sesuvium verrucosum has ornamental value and can be used in sand stabilization. It is native to the United States, but it has been reported from Mahshahr and Kish Island (Fadaie *et al*. 2006). In addition, *Limonium otolepis* is native to Afghanistan, China, and Central Asia, which is planted as an ornamental plant in parts of the world, including the United States, Australia and the margin of salt lakes of the central Iranian areas (Tashk, Bakhtegan, and Maharlou lakes). *Aloe vera* has high salt tolerance. It is a native species of the Arabian Peninsula, but is cultivated because of its ornamental and medicinal values in the tropical areas of the world, including the southern areas of Iran, especially Bushehr. The origin of the highly salt tolerant *Phoenix dactylifera* is probably Mesopotamia in West Asia, cultivated on a large area due to its ornamental value and fruit in the tropical and subtropical areas of the world, including the southern Iranian strip (Saharo-Sindian region).

Conclusions

Iran has vast salt lands that are of particular importance due to their high biodiversity and number of habitats. Halophytes and salt-tolerant plants are the natural flora of saline habitats. These plants can fulfill almost all human needs, including food, medicine, timber, fiber and fodder. Halophytes will be a sustainable alternative in arid and barren lands as a result of possible global warming threats in the future, as they are well-adapted to both wetlands and arid areas. Saline habitats are fragile and at high risk because of under extreme human pressure. Therefore, important acts must be taken to preserve the biodiversity and sustainability of these saline ecosystems.

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Table 1. Floristic composition, life forms and chorotype of halophytic and salt-tolerant taxa recorded from saline habitats in Iran; Life forms: Ch = Chamaephyte, Cr = Cryptophyte, He = Hemicryptophye, Ph = Phanerophyte, Th = Therophyte, hp = Haloparasite; Chorotypes: ES = Euro-Siberian, IT = Irano-Turanian, M = Mediterranean, SS = Saharo-Sindian, Str = Subtropical, Tr = Tropical, Tem = Temperate, ow = Old World, En = Endemic of Iran; Eco. type = Ecological types: Hg = Hygrophyte, Hgh = Hygrohalophyte, Hh = Hydrophilous plant, Hah = Hydrophilous halophyte, Hy = Hydrophyte, Hyh = Hydrohalophyte, Ps = Psammophyte, Psh = Psammohalophyte, Xe = Xerophyte, Xeh = Xerohalophyte; Ecom. type = Ecomorphological types: Ls = Leaf succulent, Ss = Stem succulent, Recretohalophytes: Sb = Salt bladder, Sg = Salt gland, Eco. usa = Economic usage: 1 = Food, 2 = Forage, 3 = Medicinal, 4 = Sand stabilization, 5 = Ornamental, 6 = Timber and other usages of wood, 7 = Fiber; Geo. dis = Geographic distribution, * = Salt-tolerant taxa

Taxon	Life form	Chorotype	Eco. type	Ecom. type	Eco. usa	Geo. dis
Acanthaceae						
Avicennia marina (Forssk.) Vierh. subsp. *marina*	Ph	Str/Tr (ow)	Hah	Sg	1, 2, 3, 6	SW, S, SE
**Blepharis ciliaris* (L.) B.L.Burtt	He	SS	Xe		2, 3	S, SE
Aizoaceae						
**Aizoanthemopsis hispanica* (L.) Klak	Th	IT, M, SS	Xe, Ps	Ss, Ls, Sb	1	NE, SW, S
**Aizoon canariense* L.	Th, He	SS	Xe	Ss, Ls, Sb	1, 3	SW, S, SE
Mesembryanthemum nodiflorum L.	Th	M, SS	Xeh	Ss, Ls, Sb	1, 3, 5	SW, S
Amaranthaceae						
**Aerva javanica* (Burm.f.) Juss.	Ch, Ph	Str/Tr (ow)	Xe		3, 7	SW, S, SE
**Agriophyllum minus* Fisch. & C.A.Mey.	Th	IT	Ps			NW, N, C

Table 1 (contd)

**Amaranthus viridis* L.	He	Str/Tr	Pg		2, 3	NW, N, NE, C, SW, S, SE
**Anabasis annua* Bunge	Th	IT	Xe	Ss, Ls		NE, C
A. aphylla L.	Ch	IT	Xeh			NW, NE, C
A. calcarea (Charif & Aellen) Bokhari & Wendelbo	He	IT (En)	Xeh			C
**A. eriopoda* (C.A.Mey.) Benth. ex Volkens	He	IT	Xe			NE, C, E
**A. firouzii* Akhanii	Ch	IT (En)	Xe	Ls		NE
A. haussknechtii Bunge ex Boiss.	Ch	IT	Xeh			C
A. lachnantha Aellen & Rech.fil.	Ch	SS	Xeh			S
A. salsa (C.A.Mey.) Benth. ex Volkens	Ch	IT	Xeh	Ls		C
A. setifera Moq.	Ch	IT, SS	Xeh	Ss, Ls		NE, C, E, SW, S, SE
**Anthochlamys multinervis* Rech.fil.	Th	IT (En)	Xe			NE, C
Arthrocaulon macrostachyum (Moric.) Piirainen & G.Kadereit	Ch, Ph	M, SS	Hgh	Ss	1, 2, 4, 5	SW, S, SE
**Atriplex aucheri* Moq.	Th	IT	Hg	Sb	2	NW, N, NE, C
**A. belangeri* (Moq.) Moq.	Th	IT	Hg	Sb	2	C
**A. dimorphostegia* Kar. & Kir.	Th	IT, SS	Xe, Ps	Sb	2	NE, C, E, S, SE
**A. flabellum* Bunge ex Boiss.	Th	IT	Xe, Hg	Sb	2	NE
**A. griffithii* Moq.	Ch	IT	Xe	Sb	2	NE, C, E
**A. lasiantha* Boiss.	Th	IT, M	Xe, Hg	Sb	2	NW, W, C
**A. micrantha* Ledeb.	Th	IT	Xe, Hg	Sb	2	NW, NE, C
**A. tatarica* L.	Th	ES, IT, M	Xe, Hg	Sb	2	NW, N, NE, W, C
A. turcomanica (Moq.) Boiss.	He	IT, SS	Xeh, Hgh	Sb	1, 2, 3	NW, N, NE, W, C, E, SW, S, SE
**Bassia eriophora* (Schrad.) Asch.	Th	IT, SS	Xe		2	NE, C, E, SW, S, SE
B. hyssopifolia (Pall.) Kuntze	Th	IT	Xeh		2, 3	NW, N, NE, C, SW
**B. muricata* (L.) Asch.	Th	M, SS	Ps		2	SE
**B. prostrata* (L.) Beck	Ch	ES, IT, M	Xe		2	NW, N, NE, W, C
**B. scoparia* (L.) Beck	Th	IT	Xe		2, 3	NW, W, C
**B. stellaris* (Moq.) Bornm.	Th	IT	Xe		2	NW, NE, W, C, SE
**Beta maritima* L.	Th, He	ES, IT, M, SS	Hg		1, 2, 3	N, SW, S
Bienertia cycloptera Bunge	Th	IT	Hgh	Ls	2	NW, NE, C, E
B. kavirense Akhani	Th	IT (En)	Xeh	Ls	2	C
B. sinuspersici Akhani	Th	SS	Hgh	Ls	2	SW, S, SE
**Camphorosma monspeliaca* subsp. *lessingii* (Litv.) Aellen	Ch	IT	Xe		2, 3	NW, W, C
Caroxylon abarghuense (Assadi) Akhani & Roalson	Ph	IT (En)	Xeh	Ls	2	C
C. chorassanicum (Botsch.) Akhani & Roalson	Th	IT	Xeh	Ls	2	NE
C. cyclophyllum (Baker) Akhani & Roalson	Ch, Ph	SS	Xeh	Ls	2	S, SE
C. gemmascens (Pall.) Tzvelev	Ch	IT	Xeh	Ls	2	NW, N, NE
**C. iljinii* (Botsch.) Akhani	Ch	IT	Xe	Ls	2	NE
C. imbricatum (Forssk.) Akhani & Roalson	Ph	SS	Xeh	Ls	2, 3, 4	SW, S, SE
**C. inermis* (Forssk.) Akhani & Roalson	Th	IT, SS	Xe	Ls	2	W, SW
C. jordanicola (Eig) Akhani & Roalson	Th	IT, SS	Xeh	Ls	2	NE, W, C, SW, S
C. nodulosum Moq.	Ch	IT	Xeh	Ls	2	NW, N
C. persicum (Bunge ex Boiss.) Akhani & Roalson	Ch	IT (En)	Xeh	Ls	2	NW
C. scleranthum (C.A.Mey.) Akhani & Roalson	Th	IT	Xeh	Ls	2	NE, C
**C. turkestanicum* (Litv.) Akhani & Roalson	Th	IT	Xe	Ls	2	NE, C, E
C. yazdianum (Assadi) Akhani & Roalson	Ph	IT (En)	Xeh, Hgh	Ls	2	C, SE
**Chenopodiastrum murale* (L.) S.Fuentes, Uotila & Borsch	Th	ES, IT, M, SS	Hg			NE, C, SW, S, SE
Climacoptera crassa (M.Bieb.) Botsch.	Th	IT	Hgh	Ls	2, 5	NW, NE, C

Table 1 (contd)

C. lanata (Pall.) Botsch.	Th	IT	Hgh	Ls	2	NE, C
C. longipistillata Botsch.	Th	IT	Hgh	Ls	2	NE
C. turcomanica (Litv.) Botsch.	Th	IT	Hgh	Ls	2, 5	NW, NE, W, C, E, SW, S, SE
**Cornulaca aucheri* Moq.	Th	IT, SS	Ps, Xe		2	W, C, E, SW, S
**C. monacantha* Delile	Ch	IT, SS	Ps, Xe		2, 3	W, C, E, SW, S, SE
**Girgensohnia oppositiflora* (Pall.) Fenzl	Th	IT	Xe			NW, NE, C
Halimione verrucifera (M.Bieb.) Aellen	He	ES, IT	Hgh	Sb	2	NW, NE, W, C
Halimocnemis alaeflava (Assadi) Akhani	Th	IT (En)	Xeh	Ls		NW
H. azarbaijanensis Assadi	Th	IT (En)	Xeh	Ls		NW
H. gamocarpa Moq.	Th	IT	Xeh	Ls		NE, C
H. longifolia Bunge	Th	IT	Xeh, Psh	Ls		NE, C
H. mamamensis (Bunge) Assadi	Th	IT (En)	Xeh	Ls		NW, N, W
H. mollissima Bunge	Th	IT	Xeh	Ls		NE, C
H. occulta (Bunge) Hedge	Th	IT (En)	Xeh	Ls		NE, C
H. pedunculata (Assadi) Akhani	Th	SS (En)	Xeh	Ls		SW, S
H. pilifera Moq.	Th	IT	Xeh	Ls		NW, NE, C, E
H. pilosa (Pall.) Akhani	Th	IT	Xeh	Ls		NW
H. purpurea Moq.	Th	IT	Xeh	Ls		W, SW
H. rarifolia (K.Koch) Akhani	Th	IT	Xeh	Ls		NW, W, C
Halocharis hispida (Schrenk) Bunge	Th	IT	Xeh	Ls		NE, E
H. sulphurea (Moq.) Moq.	Th	IT, SS	Xeh	Ls		NE, W, C, SW, S, SE
H. violacea Bunge	Th	IT	Xeh	Ls		E, SE
Halocnemum strobilaceum (Pall.) M.Bieb.	Ch	IT, M, SS	Hgh, Xeh	Ss	2	NW, NE, C, E, SW, S, SE
Halopeplis perfoliata (Forssk.) Schweinf. & Asch.	He	SS	Hgh	Ss, Ls	5	S
H. pygmaea (Pall.) Bunge ex Ung.-Sternb.	Th	IT	Hgh	Ss, Ls	5	NW, NE, C
Halostachys caspica (M.Bieb.) C.A.Mey.	Ph	IT	Hgh	Ss	2	NW, NE, C, E, SE
**Halothamnus auriculus* subsp. *acutifolius* (Moq.) Kothe-Heinr.	Ch	IT	Xe	Ls	2	NW, NE, C
**H. auriculus* (Moq.) Botsch. subsp. *auriculus*	Ch	IT	Xe	Ls	2	NW, NE, C, E
**H. auriculus* var. *moquinianus* (Jaub. & Spach) Assadi	Ch	IT	Xe	Ls	2	C, E
**H. cinerascens* (Moq.) Kothe-Heinr. subsp. *cinerascens*	Ch	IT	Xe	Ls	2	NW, NE, C
**H. cinerascens* subsp. *vestitus* (Aellen) Kothe-Heinr.	Ch	IT (En)	Xe	Ls	2	NW, NE, C
**H. glaucus* (M.Bieb.) Botsch. subsp. *glaucus*	Ch	IT	Xe	Ls	2	NW, NE, C
**H. glaucus* subsp. *hispidulus* (Bunge) Kothe-Heinr.	Ch	IT	Xe	Ls	2	NE
**H. hierochunticus* (Bornm.) Botsch.	Th	IT	Xe	Ls	2	N, W, C
**H. iranicus* Botsch.	Ch	SS	Xe	Ls	2	W, SW, S, SE
**H. kermanensis* Kothe-Heinr.	Ch	IT (En)	Xe	Ls	2	C, SE
**H. oxianus* Botsch.	Ch	IT	Xe	Ls	2	NE
**H. sistanicus* (De Marco & Dinelli) Kothe-Heinr.	Ch	IT (En)	Xe	Ls	2	E, SE
**H. subaphyllus* subsp. *charifii* (Aellen) Kothe-Heinr.	Ch	IT	Xe	Ls	2	NE, C, E, SE
**H. subaphyllus* subsp. *psammophilus* (Botsch.) Kothe-Heinr.	Ch	IT	Xe	Ls	2	NE
**H. subaphyllus* (C.A.Mey.) Botsch. subsp. *subaphyllus*	Ch	IT	Xe	Ls	2	NE, C
Haloxylon ammodendron (C.A.Mey.) Bunge ex Fenzl	Ph	IT	Psh, Xeh		2, 4	NE, C, E, SW, S, SE
**H. persicum* Bunge	Ph	IT, SS	Ps		2, 4	C, E, SE
H. salicornicum (Moq.) Bunge ex Boiss.	Ch, Ph	SS	Psh, Xeh		2, 4	W, C, E, SW, S, SE

Table 1 (contd)

**H. scoparium* Pomel	Ch	SS	Ps		2	SE
**Horaninovia ulicina* Fisch. & C.A.Mey.	Th	IT	Ps			C
Kalidium caspicum (L.) Ung.-Sternb.	Ch, Ph	IT	Hgh, Xeh	Ss, Ls		NW, NE, C
**Kaviria gossypina* (Bunge ex Boiss.) Akhani	Th	IT	Xe	Ls	2	NE, C
K. lachnantha (Botsch.) Akhani	Ch	SS	Xeh	Ls	2	W, SW, S, SE
**K. tomentosa* (Moq.) Akhani	Ch	IT	Xe	Ls	2, 5	NW, N, NE, W, C, E, SE
**K. zehzadii* (Akhani) Akhani	Ch	IT (En)	Xe	Ls	2	NE
**Kraschenninnikovia ceratoides* (L.) Gueldenst.	Ch	ES, IT, M	Xe		2	NW, N, NE, W, C, SE
Microcnemum coralloides subsp. *anatolicum* Wagenitz	Th	IT, M	Hgh	Ss		NW, C
Nitrosalsola dendroides (Pall.) Theodorova	Ch, Ph	IT	Xeh	Ls	2	NW, N, NE, C
N. ericoides (M.Bieb.) Theodorova	Ch, Ph	IT	Xeh	Ls	2	NW, N
N. incanescens (C.A.Mey.) Theodorova	Th	IT, SS	Xeh	Ls	2	NW, NE, W, C, SW, S
N. nitraria (Pall.) Tzvelev	Th	IT	Xeh	Ls	2	NW, N, NE, W, C, E, SW, S, SE
**N. orientalis* (S.G.Gmel.) Theodorova	Ch, Ph	IT	Xe	Ls	2	NW, N, NE, C, E
**N. vermiculata* (L.) Theodorova	Ch, Ph	M, SS	Xe	Ls	2	NW, N, NE, W, C, SW
**Noaea mucronata* (Forssk.) Asch. & Schweinf. subsp. *mucronata*	Ch	IT, M	Xe		2	NW, N, NE, W, C, E, S
**Oxybasis chenopodioides* (L.) S.Fuentes, Uotila & Borsch	Th	ES, IT, M	Hg	Sb		NW, E
**O. glauca* (L.) S.Fuentes, Uotila & Borsch	Th	Pl	Hg	Sb		NW, N, NE, C
**O. rubra* (L.) S.Fuentes, Uotila & Borsch	Th	Pl	Hg	Sb		NE, C, E, SE
Petrosimonia brachiata (Pall.) Bunge	Th	IT	Xeh	Ls	2	NW, NE
P. glauca (Pall.) Bunge	Th	IT	Xeh	Ls	2	NW, NE, W, C
**Piptoptera turkestana* Bunge	Th	IT	Ps	Ls	2	C
Pyankovia brachiata (Pall.) Akhani & Roalson	Th	IT	Xeh	Ls	2	NW, NE, C
Salicornia iranica Akhani subsp. *iranica*	Th	IT (En)	Hgh	Ss	2	NW, N, NE, C
S. iranica subsp. *rudshurensis* (Akhani) Chatren. & Akhani	Th	IT (En)	Hgh	Ss	2	C
S. iranica subsp. *sinus-persica* (Akhani) Chatren. & Akhani	Th, He	SS	Hgh	Ss	2	SW, S, SE
Salicornia persica Akhani	Th	IT	Hgh	Ss	2	C, E
S. perspolitana Akhani	Th	IT (En)	Hgh	Ss	2	C
Salicornia ×tashkensis Akhani	Th	IT (En)	Hgh	Ss	2	C
**Salsola paulsenii* Litv.	Th	IT	Xe	Ls	2	C
**S. tamamschjanae* Iljin	Th	IT	Xe			NW
**S. tragus* L.	Th	Pl	Xe	Ls	3	NW, N, NE, W, C
Soda austroiranica (Akhani) Akhani	Th	SS (En)	Hgh	Ls	2	SW
S. drummondii (Ulbr.) Akhani	Ph, Ch	SS	Xeh, Psh	Ls	2, 4	SW, S, SE
S. florida (M.Bieb.) Akhani	Th	IT	Xeh	Ls	2	NW, N, NE, C, E, SW, S, SE
S. inermis (Moench) Fourr.	Th	ES, IT, M	Hgh	Ls	1, 2	NW, N, C
**S. kerneri* (Wol.) Akhani	Ch	IT	Xe	Ls	2	C
S. rosmarinus (Bunge ex Boiss.) Akhani	Ch, Ph	IT, SS	Xeh, Psh	Ls	2, 3, 4	NE, W, C, E, SW, S, SE
S. stocksii (Boiss.) Akhani	Ch	SS	Xeh	Ls	2	SE
Spirobassia hirsuta (L.) Freitag & G.Kadereit	Th	ES, IT, M	Hgh	Ls		NW
Suaeda acuminata (C.A.Mey.) Moq.	Th	IT	Hgh	Ls		NW, W, C, SW
S. aegyptiaca (Hasselq.) Zohary	Th	SS	Hgh	Ls	1, 2	W, C, E, SW, S, SE
S. altissima (L.) Pall.	Th	IT, M	Hgh	Ls		NW, N, NE, W, C
S. arcuata Bunge	Th	IT	Hgh	Ls		NW, NE, C
S. dendroides (C.A.Mey.) Moq.	Ch	IT	Hgh	Ls		NW
S. fruticosa Forssk. ex J.F.Gmel.	Ph	IT, SS	Hgh	Ls	1	C, SW, S, SE
S. heterophylla (Kar. & Kir.) Boiss.	Th	IT	Hgh	Ls		NW, N, C, SW, S, SE

Table 1 (contd)

S. iranshahrii Akhani & Freitag var. *iranshahrii*	Th	SS (En)	Hgh	Ls		SW, S
S. khalijefarsica Akhani	Th	SS (En)	Hgh	Ls		SW, S
S. linifolia Pall.	Th	IT	Hgh	Ls		NE, C
S. microphylla (C.A.Mey.) Pall.	Ph	IT	Xeh	Ls		NW, NE, C
S. microsperma (C.A.Mey.) Fenzl	Th	IT	Hgh	Ls		NE, C
S. monoica Forssk.	Ph	SS	Hgh	Ls	2, 3	S, SE
S. physophora Pall.	Ph	IT	Hgh	Ls		NW, NE
S. salsa (L.) Pall.	Th	IT	Hgh	Ls		NW, N
S. splendens (Pourr.) Gren. & Godr.	Th	M	Hgh	Ls		NW
S. vermiculata Forssk. ex J.F.Geml.	Ch, Ph	M, SS	Hgh	Ls		SW, S
**Turania aperta* (Paulsen) Akhani	Th	IT	Ps	Ls	2	NE, C
Xylosalsola arbuscula (Pall.) Tzvelev	Ch, Ph	IT	Xeh	Ls	2	NE, C, E, SE
X. richteri (Moq.) Akhani & Roalson	Ph	IT	Psh	Ls	2	NE, C
Apiaceae						
**Apium graveolens* L.	He	ES, IT, M	Hg		1, 3	N, NE, W, C, S
**Bupleurum semicompositum* L.	Th	IT, M, SS	Xe			SW
**Daucus carota* L. subsp. *carota*	Th, He	ES, IT, M	Hg		1	NW, N, NE, C
**Foeniculum vulgare* Mill.	He	IT, M	Hg		1	N, W, C
**Visnaga daucoides* Gaertn.	Th, He	IT, M	Xe			NW, SW
Apocynaceae						
**Calotropis procera* (Aiton) W.T.Aiton	Ph	Str/Tr (ow)	Xe		3, 5	SW, S, SE
**Cynanchum acutum* L. subsp. *acutum*	Ph	M, IT	Ps, Hg		3	NW, N, NE, C, E, SW
**Leptadenia pyrotechnica* (Forssk.) Decne.	Ph	SS	Xe		3, 4	S, SE
**Pentatropis nivalis* (J.F.Gmel.) D.V.Field & J.R.I.Wood	Ph	SS	Xe			S, SE
**Pergularia tomentosa* L.	Ph	SS	Xe		3	SW, S, SE
Arecaceae						
**Phoenix dactylifera* L.	Ph	SS	Hg		1, 3	C, SW, S, SE
Asparagaceae						
Asparagus azerbaijanensis Hamdi & Assadi	Ch	IT (En)	Xeh			NW
**A. breslerianus* Schult. & Schult.f.	He	IT	Xe			NW, N, NE, W, C
A. griffithii Baker	He	IT	Hgh			NE, C
**A. khorasanensis* Hamdi & Assadi	Ch	IT	Xe			NE
A. lycaonicus P.H.Davis	He	IT	Xeh			C
**A. officinalis* L.	He	ES, IT, M	Hg			NW, N, NE
Asphodelaceae						
**Aloe vera* (L.) Burm.f.	Cr	Str/Tr	Xe	Ls	3, 5	SW, S, SE
Asteraceae						
**Artemisia scoparia* Waldst. & Kit.	Ch	Pl	Xe		3	NW, N, NE, W, C, E, SW, SE
**A. sieberi* Besser	Ch	IT, M	Xe		2, 3	NE, C, E, SE
**Cirsium alatum* (S.G.Gmel.) Bobrov	He	ES, IT	Hg			NW
**Gymnarrhena micrantha* Desf.	Th	IT, SS	Xe			W, C, E, SW, S, SE
Inula aucheriana DC.	Cr	IT	Hgh			NW
Karelinia caspia (Pall.) Less.	He	IT	Xeh	Ls		NE, W, C, SE
**Lactuca tatarica* (L.) C.A.Mey.	Cr	Tem	Xe			NW, NE, C
**Launaea acanthodes* (Boiss.) Kuntze subsp. *acanthodes*	He	IT	Xe		3	NE, C, E
**L. nudicaulis* (L.) Hook.fil.	He	M, SS	Xe		3	SW, S, SE
**L. procumbens* (Roxb.) Amin	He	Str (ow)	Xe		3	W, SW, S, SE
**Pentanema divaricatum* Cass.	Th	IT, SS	Xe			NE, C, SW, S, SE
Saussurea salsa (Pall.) Spreng.	He	IT	Hgh	Ls	3	NW
**Scorzonera laciniata* L.	He	ES, IT, M	Hg			NW, N, NE, W, C

Table 1 (contd)

S. parviflora Jacq.	Cr	ES, IT	Hgh			NW, W
**Sonchus maritimus* L.	Cr	IT, M	Hg		3	NW, N, NE, W, C, SW
**Taraxacum bessarabicum* (Hornem.) Hand.-Mazz.	He	ES, IT	Hg			NW, N, NE, W, C, SW
Tripolium pannonicum (Jacq.) Dobrocz.	He	Pl	Hgh	Ls	1, 3	NW, N
**Xanthium strumarium* L.	Th	Pl	Hg			NW, N, NE, W, C, SW
Boraginaceae						
**Heliotropium aucheri* DC. subsp. *aucheri*	He	IT	Xe, Ps			NW, N, NE, W, C, SE
**H. bacciferum* Forssk.	Ch	SS	Xe, Ps	Ls		SW, S, SE
**H. bovei* Boiss.	Th	IT	Xe			NW, N, W, C
**H. dissitiflorum* Boiss.	Th	IT (En)	Xe			NW, N, NE, C
**H. lasiocarpum* Fisch. & C.A.Mey.	Th	IT, SS	Xe			NW, N, NE, W, C, E, SW, S
**H. mamanense* Bunge	Th	IT	Xe			NW, N, W
**Moltkiopsis ciliata* (Forssk.) I.M.Johnst.	Ch	SS	Xe, Ps			SW, S, SE
Brassicaceae						
**Anastatica hierochuntica* L.	Th	SS	Xe			S, SE
**Cakile arabica* Velen. & Bornm.	Th	SS	Ps	Ls		S, SE
**C. maritima* Scop. subsp. *maritima*	Th	ES, M	Ps	Ls	1	N
Hornungia procumbens (L.) Hayek	Th	ES, IT, M	Xeh			NW, NE, C, SW, SE
**Lachnoloma lehmannii* Bunge	Th	IT	Xe			C
Lepidium cartilagineum (J.Mayer) Thell. subsp. *cartilagineum*	He	IT	Hgh	Ls		NW, W, C
**L. latifolium* L.	He	ES, IT, M	Hg		3	NW, N, NE, W, C, E
**L. perfoliatum* L.	Th	ES, IT	Hg		3	NW, N, NE, W, C
**Raphanus raphanistrum* L. subsp. *raphanistrum*	Th	ES, IT, M	Xe			SW, S
Schrenkiella parvula (Schrenk) D.A.German & Al-Shehbaz	Th	IT	Xeh			C
Capparaceae						
**Capparis decidua* (Forssk.) Edgew.	Ph	SS	Xe		3	S, SE
**C. spinosa* L.	Ch	Pl	Xe		1, 2, 3	NW, N, NE, C, E, SW, S
Caryophyllaceae						
**Acanthophyllum diaphanopterum* A.Pirani & Moazzeni	Ch	IT (En)	Xe	Ls		NE
Capparaceae						
**A. stenocalycinum* (Rech.fil. & Schiman-Czeika) A.Pirani & Moazzeni	Ch	IT (En)	Xe			NE
**Gypsophila perfoliata* L.	He	ES, IT	Xe			NW, NE, C
Sabulina urumiensis (Bornm.) Koç & Hamzaoğlu	Th	IT	Xeh			NW
**Spergularia bocconei* (Scheele) Graebn.	Th	M, SS	Hg			N, SW, SE
**S. diandra* (Guss.) Heldr.	Th	IT, M, SS	Hg			N, NE, C, E, SW, S, SE
S. marina (L.) Besser	Th, He	Pl	Hgh		3	NW, N, NE, C, E, SW, S, SE
S. media (L.) C.Presl subsp. *media*	He	ES, IT, M	Hgh			NW, N, NE, C
**Sphaerocoma hookeri* subsp. *aucheri* (Boiss.) Kool & Thulin	Ch	SS	Ps	Ls	2, 4	S, SE
Cistaceae						
**Helianthemum lippii* (L.) Dum.Cours.	Ch	SS	Ps			SW, S, SE
Convolvulaceae						
**Convolvulus glomeratus* Hochst. ex Choisy	Ch	SS	Ps			S, SE
**C. persicus* L.	Cr	IT	Ps		3	N
Cressa cretica L.	He	IT, M, SS	Hgh	Sg	2, 3	NW, NE, W, C, E, SW, S, SE
**Ipomoea pes-caprae* (L.) R.Br.	Cr	Str/Tr	Ps			S, SE
Cymodoceaceae						

Table 1 (contd)

Halodule wrightii Asch.	Cr	Tr	Hyh			S
Thalassodendron ciliatum (Forssk.) Hartog	Cr	Tr	Hyh			SE
Cynomoriaceae						
Cynomorium coccineum L. subsp. *coccineum*	Cr (hp)	IT, M, SS	Psh	Ss	1, 3	NE, C, SE
Cyperaceae						
Bolboschoenus maritimus subsp. *affinis* (Roth) T.Koyama	Cr	Pl	Hah		1, 2, 3	NW, N, C
B. maritimus (L.) Palla subsp. *maritimus*	Cr	Tem/Str	Hah		1, 2, 3	NW, C
**B. planiculmis* (F.Schmidt) T.V.Egorova	Cr	Tem (ow)	Hh			N
Carex extensa Gooden.	Cr	ES, M	Hgh		2	N
Cyperus arenarius Retz.	Cr	SS	Psh		2	SW, S, SE
C. conglomeratus Rottb. subsp. *conglomeratus*	Cr	SS	Psh		2	SW, S, SE
C. conglomeratus subsp. *curvulus* (Boeckeler) Kukkonen	Cr	SS	Ps		2	SW, S
C. laevigatus subsp. *distachyos* (All.) Ball	Cr	IT, M, SS	Hh			N, NE, W, C, E, SW, S, SE
C. laevigatus L. subsp. *laevigatus*	Cr	Str/Tr	Hah		3	C, SE
**C. malaccensis* Lam. subsp. *malaccensis*	Cr	Str/Tr	Hh			SW
C. pannonicus Jacq.	Cr	ES, IT	Hah			NW
**C. rotundus* L.	Cr	Str/Tr (ow)	Hh			NW, N, NE, C, E, SW, S, SE
**Eleocharis argyrolepis* Kierulff	Cr	IT	Hh			NW
**E. palustris* (L.) Roem. & Schult. subsp. *palustris*	Cr	Tem	Hh			NW, N, W, C
**E. uniglumis* (Link) Schult. subsp. *uniglumis*	Cr	Tem	Hh			NW, N, W, C
**Fimbristylis dichotoma* (L.) Vahl subsp. *dichotoma*	He	Str/Tr	Hg			N
**Isolepis cernua* (Vahl) Roem. & Schult. var. *cernua*	Cr	Tem	Hg		3	N
**Schoenoplectus lacustris* (L.) Palla subsp. *lacustris*	Cr	Pl	Hh			N, C
S. litoralis (Schrad.) Palla subsp. *litoralis*	Cr	Pl	Hah			NW, N, NE, C, E, SW, S, SE
**S. tabernaemontani* (C.C.Gmel.) Palla	Cr	Tem/Str	Hh			NW, N, W, C
**S. triqueter* (L.) Palla	Cr	Tem	Hh			N, SW
**Schoenus nigricans* L.	Cr	Tem/Str/Tr	Hg, Hh			N, W, C,
Fabaceae						
**Alhagi graecorum* Boiss.	He	M, SS	Xe, Ps		2, 3	W, SW, S
**A. maurorum* Medik.	He	IT	Xe, Hg		2, 3	NW, N, NE, W, C, E, SE
**A. pseudalhagi* subsp. *persarum* (Boiss. & Buhse) Takht.	He	IT	Xe, Hg		2, 3	NW, N, NE, W, C
**A. pseudalhagi* (M.Bieb.) Desv. ex Wangerin subsp. *pseudoalhagi*	He	IT, M, SS	Xe, Hg		2, 3	NW, N, NE, W, C, E, SW, S, SE
**Caragana halodendron* (Pall.) Dum.Cours.	Ph	IT	Xe	Ls		NW, NE, W, C
**Dalbergia sissoo* Roxb.	Ph	Tr (ow)	Xe		2, 3, 5, 6	SW, S, SE
**Glycyrrhiza glabra* L.	Cr	ES, IT, M	Hg		3	NW, N, NE, W, C, SW, S, SE
**Indigofera intricata* Boiss.	Ch	SS	Xe		2, 3	S, SE
**Indigofera oblongifolia* Forssk.	Ph	Tr (ow)	Xe		2, 3	S, SE
**Lotus corniculatus* L. subsp. *corniculatus*	He	ES, IT, M, SS	Hg		2	NW, N, NE, W, C, SW
**Lotus garcinii* Ser.	He	SS	Xe		2	SW, S, SE
**Lotus halophilus* Boiss. & Sprun.	Th	M, SS	Ps		2	SW, S
**Lotus tenuis* Waldst. & Kit. ex Willd.	He	ES, IT, M	Hg		2	SW, S, SE
**Medicago laciniata* (L.) Mill.	Th	Str (ow)	Xe		2	SW, S, SE
**Medicago littoralis* Rohde ex Loisel.	Th	M, SS	Ps		2	N, SW, S

Table 1 (contd)

**Medicago polymorpha* L.	Th	ES, IT, M, SS	Xe, Ps		2	N, NE, W, SW, S, SE
**Melilotus indicus* (L.) All.	Th	Tem/Str(ow)	Xe, Hg		2, 3	N, W, E, SW, S, SE
**Prosopis cineraria* (L.) Druce	Ph	SS	Xe		2, 3, 6	SW, S, SE
Prosopis farcta (Banks & Sol.) J.F.Macbr.	Ch	IT, M, SS	Xeh		2, 3, 6	NW, N, NE, C, E, SW, S, SE
**Senna italica* Mill. subsp. *italica*	Ch	Tr (ow)	Xe		2, 3, 5	SW, S, SE
**Sophora alopecuroides* L.	Cr	IT	Xe, Ps		3	NW, N, NE, W, C
**Sphaerophysa salsula* (Pall.) DC.	Ph, Ch	IT	Hg		2, 3	NW
**Taverniera spartea* (Burm.f.) DC.	Ph, Ch	SS	Xe		2, 3, 5	S, SE
**Tephrosia purpurea* subsp. *apollinea* (Delile) Hosni & El-Karemy	Ch	SS	Xe		3	S, SE
**Trifolium fragiferum* L.	He	ES, IT, M	Hg		2	NW, N, W, C
**Trifolium resupinatum* L.	Th	ES, IT, M	Hg		2	NW, N, W, SW
**Trifolium tomentosum* L.	Th	IT, M	Hg		2	W, SW
**Vachellia nilotica* subsp. *indica* (Benth.) Kyal. & Boatwr.	Ph	SS	Xe		2, 3, 6	SW, S, SE
**Vachellia tortilis* (Forssk.) Galasso & Banfi subsp. *tortilis*	Ph	SS	Xe		2, 3, 6	S
Frankeniaceae						
Frankenia hirsuta L.	He	IT, M	Hgh	Sg	3, 5	NW, N, NE, W, C, E
F. persica (Boiss.) Jaub. & Spach	He	IT (En)	Hgh	Sg		C
F. pulverulenta L. subsp. *pulverulenta*	Th	ES, IT, M, SS	Hgh	Sg	3, 5	NW, N, NE, W, C, E, SW, S, SE
Gentianaceae						
**Centaurium pulchellum* (Sw.) Druce subsp. *pulchellum*	Th	ES, IT, M, SS	Hg			NW, N, NE, W, C, SW, S
**Schenkia spicata* (L.) G.Mans.	Th	ES, IT, M	Hg			NW, N, C
Hydrocharitaceae						
Halophila ovalis (R.Br.) Hook.f. subsp. *ovalis*	Cr	Str/Tr (ow)	Hyh			S
**Hydrilla verticillata* (L.f.) Royle	Cr	Tem/Str/Tr(ow)	Hy		3	N
**Najas graminea* Delile	Th	Str/Tr (ow)	Hy			N, SW
**Najas marina* L. subsp. *marina*	Th	Tem/Str/Tr(ow)	Hy			N, W, C, SW
**Najas minor* All.	Th	Tem/Str (ow)	Hy			N, W, SW, SE
Iridaceae						
**Gladiolus halophilus* Boiss. & Heldr.	Cr	IT	Hg		5	NW, C
**Iris spuria* subsp. *musulmanica* (Fomin) Takht.	Cr	IT	Hg		5	NW, N, W, C
Juncaceae						
Juncus acutus L. subsp. *acutus*	Cr	ES, IT, M, SS	Hgh, Hah		7	NW, N, SW
**J. articulatus* L. subsp. *articulatus*	Cr	Tem	Hg, Hh		7	NW, N, NE, W, C
**J. compressus* Jacq.	Cr	ES, IT, M	Hg			NW
J. heldreichianus subsp. *orientalis* Snogerup	Cr	IT	Hgh, Hah		7	NW, N, C
**J. hybridus* Brot.	Th	IT, M	Hg			NW, N, W, C, SW, SE
**J. littoralis* C.A.Mey.	Cr	IT, M	Hgh, Hah		7	N
J. maritimus Lam.	Cr	ES, IT, M	Hgh, Hah		7	NW, N, C
J. persicus subsp. *libanoticus* (J.Thiébaut) Novikov & Snogerup	Cr	IT	Hgh			NW, N, W, C
J. rigidus Desf.	Cr	IT, M, SS	Hgh		7	C, SW, S, SE
**J. socotranus* (Buchenau) Snogerup	Cr	SS	Hg		7	S
J. subulatus Forssk.	Cr	IT, M	Hgh, Hah		7	C
Juncaginaceae						
Triglochin maritima L.	Cr	Tem	Hgh			NW, NE, W, C
**T. palustris* L.	Cr	Tem	Hg			NW, NE, W, C
Lamiaceae						

Table 1 (contd)

Malvaceae						
**Vitex trifolia* L. var. *trifolia*	Ph	Tr	Xe		2, 3, 5, 6	SE
**Kosteletzkya pentacarpos* (L.) Ledeb.	He	Pl	Hg		7	N
Nitrariaceae						
Nitraria retusa (Forssk.) Asch.	Ph	SS	Xeh	Ls	1, 2, 3, 5	SW
Nitraria schoberi L.	Ph	IT	Psh, Xeh	Ls	1, 3, 4, 5	NW, NE, C
Orobanchaceae						
Cistanche fissa (C.A.Mey.) Beck	He (hp)	IT	Xeh	Ss	3	C
C. laxiflora Aitch. & Hemsl.	He (hp)	IT	Xeh	Ss	3	C, E, SW
C. ridgewayana Aitch. & Hemsl.	He (hp)	IT	Psh	Ss	3	N, C, SE
C. salsa (C.A.Mey.) Beck	He (hp)	IT	Psh	Ss	3	NW, C
Cistanche tubulosa (Schenk) Wight	He (hp)	IT, SS	Xeh, Psh	Ss	3	C, E, SW, S, SE
Plantaginaceae						
**Bacopa monnieri* (L.) Pennell	He	Str/Tr	Hy, Hh		3	SW, S
Plantago coronopus L.	Th	ES, IT, M, SS	Xeh		3	N, NE, W, C, E, SW, S, SE
P. salsa Pall.	Cr	IT	Hgh	Ls	1	NW, NE, W, C
**P. ovata* Forssk.	Th	IT, M, SS	Xe		3	N, W, C, S
**P. weldenii* Rchb.	Th	ES, M	Xe		3	N, W, C, SW
Plumbaginaceae						
Limonium axillare (Forssk.) Kuntze	Ch	SS	Hgh	Sg	3, 5	SW, S
L. bellidifolium (Gouan) Dumort.	He	IT	Hgh	Sg	5	NW
L. carnosum (Boiss.) Kuntze	Ch	IT	Hgh	Sg	5	NW
L. gmelini (Willd.) Kuntze	He	ES, IT	Hgh	Sg	3, 5	NW, NE, W, C, SW
L. iranicum (Bornm.) Lincz.	Ch	IT, SS	Hgh	Sg	5	NE, W, C, SW, S, SE
L. lobatum (L.fil.) Chaz.	Th	M, SS	Hgh	Sg		SW, S
L. meyeri (Boiss.) Kuntze	He	ES, IT	Hgh	Sg	5	NW, NE, C
L. nudum (Boiss. & Buhse) Kuntze	He	IT (En)	Xeh	Sg	5	NW, C
L. reniforme (Girard) Lincz.	He	IT	Hgh	Sg	5	NE, C
L. sogdianum (Popov) Ikonn.-Gal.	He	IT	Xeh	Sg	5	NE
L. stocksii (Boiss.) Kuntze	Ch	SS	Xeh	Sg	5	SE
L. suffruticosum (L.) Kuntze	Ch	IT	Xeh, Hgh	Sg	5	NE, C, E, SE
Psylliostachys beludshistanica Roshkova	Th	IT	Hgh	Sg	5	NE
*P. leptostachya (*Boiss.) Roshkova	Th	IT	Hgh	Sg	5	NW, NE, C
P. spicatus (Willd.) Nevski	Th	IT, SS	Hgh	Sg	5	NW, NE, SW, S
Poaceae						
Aeluropus laciniatus Khodash.	Cr	IT (En)	Hgh	Sg	2	NE
A. lagopoides (L.) Trin. ex Thwaites	Cr	IT, M, SS	Hgh	Sg	2	N, NE, C, E, SW, S, SE
A. littoralis (Gouan) Parl.	Cr	IT, M, SS	Hgh	Sg	2	NW, N, NE, W, C, E, SW, S, SE
A. macrostachyus Hack.	Cr	SS	Hgh	Sg	2	E, SE
**Agropyron cristatum* (L.) Gaertn.	Cr	Tem (ow)	Xe		2	NW, N, NE, W, C
**Agrostis stolonifera* L. subsp. *stolonifera*	He	Pl	Hg		2	NW, N, NE, W, C
**Arundo donax* L.	Cr	Pl	Hy		1, 3, 5	N, W, C, S
**Beckmannia eruciformis* (L.) Host	Cr	ES, IT, M	Hg		2	NW
**Cenchrus ciliaris* L.	Cr	Str/Tr (ow)	Xe, Ps	Sg	2, 5	SW, S, SE
**C. pennisetiformis* Steud.	Th, He	SS	Xe, Ps	Sg	2, 5	SW, S, SE
**Chloris flagellifera* (Nees) P.M.Peterson	He	SS	Ps	Sg	2, 4	S, SE
**C. gayana* Kunth	He	Tr (ow)	Hg	Sg	2	SE

Table 1 (contd)

**C. virgata* Sw.	Th	Str/Tr	Xe	Sg	2	SE
**Cynodon dactylon* (L.) Pers.	Cr	Tem/Str/Tr(ow)	Hg	Sg	2, 3	NW, N, NE, W, C, E, SW, S, SE
**Dactyloctenium aegyptium* (L.) Willd.	Th	Str/Tr (ow)	Hg	Sg	2, 3	SW, S, SE
**D. scindicum* Boiss.	He	SS	Xe	Sg	2, 3	S, SE
**Desmostachya bipinnata* (L.) Stapf	Cr	Str/Tr (ow)	Hg		2, 3	E, SW, S, SE
**Dichanthium annulatum* (Forssk.) Stapf	Cr	Str/Tr (ow)	Xe		2, 3, 4	SW, S, SE
**Diplachne fusca* (L.) P.Beauv. ex Roem. & Schult. subsp. *fusca*	Cr	Str/Tr	Hg	Sg	2, 3	SW
**Eleusine indica* (L.) Gaertn.	Th	Str/Tr (ow)	Hg	Sg	2, 3	N
**Elymus repens* (L.) Gould subsp. *repens*	Cr	Tem (ow)	Hg		2	NW, N, C
**Eremopyrum bonaepartis* (Spreng.) Nevski	Th	IT, M	Xe			NW, N, NE, W, C, E, SW, S, SE
**E. distans* (K.Koch) Nevski	Th	IT	Xe			NW, NE, C
**E. orientale* (L.) Jaub. & Spach	Th	IT, M	Xe			NW, N, NE
**E. triticeum* (Gaertn.) Nevski	Th	IT	Xe			NW
**Festuca ovina* L. subsp. *ovina*	Cr	Tem (ow)	Xe		2	NW, N, NE, W, C
**Halopyrum mucronatum* (L.) Stapf	Cr	SS	Ps		2	SW, S, SE
**Hordeum brevisubulatum* (Trin.) Link	He	Pl	Hg			NW, N, W, C
**H. marinum* subsp. *gussoneanum* (Parl.) Thell.	Th	ES, IT, M	Hg			NE, W, SW, S
H. marinum Huds. subsp. *marinum*	Th	ES, IT, M	Hg			C, W, SW
**H. murinum* subsp. *glaucum* (Steud.) Tzvelev	Th	IT, M	Hg, Xe			NW, N, NE, W, C, SW
**H. murinum* L. subsp. *murinum*	Th	ES, IT, M	Hg, Xe			NW, N, W, C
**Imperata cylindrica* (L.) Raeusch.	Cr	Str/Tr	Xe	Sg	3, 4	N, W, C, E, SW, S
**Panicum antidotale* Retz.	Cr	Str (ow)	Xe, Ps	Sg	4	SW, S, SE
**P. repens* L.	Cr	Str/Tr (ow)	Hg	Sg	2, 4	SW
**P. turgidum* Forssk.	He	SS	Xe, Ps	Sg	2, 4	S, SE
**Parapholis incurva* (L.) C.E.Hubb.	Th	ES, IT, M	Hg, Xe		2	NW, N, NE, W, SW, S, SE
**Paspalum distichum* L.	Cr	Str/Tr	Hg, Hh			NW, N, W, SW
**Phalaris arundinacea* L.	Cr	Tem/Str	Hg, Hh		2	NW, N, W, C
Phragmites australis (Cav.) Trin. ex Steud.	Cr	Tem/Str/Tr	Hah	Sg	2, 7	NW, N, NE, W, C, E, SW, S, SE
Ph. karka (Retz.) Trin. ex Steud.	Cr	Str/Tr (ow)	Hah	Sg	2, 7	C, SE
Polypogon maritimus Willd.	Th	IT, M	Hg	Sg	2, 5	NE, C, SW
**P. monspeliensis* (L.) Desf.	Th	Tem/Str/Tr(ow)	Hg	Sg	2, 3, 5	NW, N, NE, W, C, E, SW, S, SE
Puccinellia bulbosa (Grossh.) Grossh.	Cr	IT	Hgh		2	NW
P. distans (Jacq.) Parl.	He	ES, IT, M	Hgh		2	NW, NE, C, SE
P. dolicholepis (V.I.Krecz.) Pavlov	He	IT	Hgh		2	NW
P. gigantea (Grossh.) Grossh.	He	ES, IT	Hgh		2	NW, NE, W, C
P. grossheimiana V.I.Krecz.	He	IT	Hgh		2	NW, C
P. koeieana Melderis	He	IT	Hgh		2	NW, C
P. poecilantha (K.Koch) Grossh.	He	IT	Hgh		2	NE
*P. tenuiflora (*Griseb.) Scribn. & Merr.	He	IT	Hgh		2	NW, NE, W
**Sphenopus divaricatus* (Gouan) Rchb.	Th	IT, M, SS	Hg			N, SW
Sporobolus aculeatus (L.) P.M.Peterson	Th	ES, IT, M, SS	Hgh	Sg	2	NW
**S. arabicus* Boiss.	He	SS	Ps	Sg	2, 4	SW, S, SE
**S. schoenoides* (L.) P.M.Peterson	Th	ES, IT, M, SS	Hg	Sg	2	NW, N, NE, C, E
**Thinopyrum elongatum* (Host) D.R.Dewey	He	ES, IT, M	Hg		2	NW, NE, C
Polygonaceae						
**Polygonum aviculare* L. subsp. *aviculare*	Th	Tem/Str(ow)	Hg			NW, N, NE, W, C, E, SW, S, SE
**Pteropyrum gypsaceum* Akhani & Doostmohammadi	Ph	SS (En)	Xe			S

Table 1 (contd)

Portulacaceae						
**Portulaca oleracea* L.	Th	ES, IT, M, SS	Xe	Ss, Ls	1, 3	NW, N, NE, W, C, SW, S
Potamogetonaceae						
**Stuckenia pectinata* (L.) Börner	Cr	Tem/Str/Tr	Hy			N, NE, C, SW, SE
**Zannichellia palustris* L. subsp. *palustris*	Cr	Tem/Str	Hy			NW, N, C, SW, SE
Primulaceae						
Lysimachia maritima (L.) Galasso, Banfi & Soldano	He	Tem	Hgh	Ss, Ls, Sg		NW, NE, C, E
**Samolus valerandi* L.	He	Tem/Str/Tr(ow)	Hg	Sg		N, NE, W, C, E, S, SE
Resedaceae						
**Oligomeris linifolia* (Vahl ex Hornem.) J.F.Macbr.	Th	Str/Tr	Xe			SW, S, SE
**Ochradenus baccatus* Delile	Ph	SS	Xe			SW, S, SE
Rhizophoraceae						
Rhizophora mucronata Lam.	Ph	Tr (ow)	Hah	Sg	1, 2, 3, 6	S
Ruppiaceae						
Ruppia cirrhosa (Petagna) Grande	Cr	Tem/Str	Hyh			NW, N, SW
R. maritima L.	Cr	Tem/Str/Tr	Hyh			N, NE, W, C, SW
Salicaceae						
**Populus euphratica* Olivier	Ph	IT, SS	Hg		2, 3, 6, 7	NW, N, NE, W, C, SW, S
Salvadoraceae						
**Salvadora oleoides* Decne.	Ph	SS	Xe		1, 2, 3, 5, 6	SE
**S. persica* L.	Ph	SS	Xe		1, 2, 3, 5, 6	S, SE
Santalaceae						
Thesium compressum Boiss. & Heldr.	Th	IT	Xeh			NW
Solanaceae						
**Lycium depressum* Stocks subsp. *depressum*	Ph	IT	Xe	Ls	3	NW, N, NE, C, SW, S, SE
L. ruthenicum Murray	Ph	IT	Xeh	Ls	3	NW, NE, C, E, S
**L. shawii* Roem. & Schult.	Ph	SS	Xe, Ps	Ls	3, 5	SW, S, SE
Tamaricaceae						
Reaumuria alternifolia (Labill.) Britten subsp. *alternifolia*	Ch	IT	Xeh, Hgh	Sg		NW, N, NE, W, C, E, S
R. alternifolia subsp. *panjgurica* (Blatt. & Hallb.) Qaiser	Ch	SS	Xeh,	Sg		SE
R. fruticosa Boiss.	Ph	IT	Xeh, Hgh	Sg		NE, C
R. oxiana (Ledeb.) Boiss.	Ch	IT	Xeh, Hgh	Ls, Sg		NE, C
R. persica (Boiss.) Boiss.	Ch	IT	Xeh, Hgh	Ls, Sg		NW, C
R. stocksii Boiss.	Ch	SS	Xeh	Ls, Sg		S, SE
Tamarix androssowii Litv.	Ph	IT	Xeh	Sg	5, 6	NE, C, E
T. aphylla (L.) H.Karst.	Ph	SS	Xeh, Psh	Sg	3, 4, 5, 6	C, SW, S, SE
T. aralensis Bunge	Ph	IT	Xeh	Sg	5, 6	N, NE, C, S
T. arceuthoides Bunge	Ph	IT	Xeh	Sg	5, 6	NW, NE, W, C, SE
T. aucheriana (Decne. ex Walp.) B.R.Baum	Ph	IT, SS	Xeh	Sg	5, 6	C, E, SW, SE
T. dioica Roxb. ex Roth	Ph	Str (ow)	Xeh	Sg	3, 5, 6	E, S, SE
T. dubia Bunge	Ph	IT	Xeh	Sg	5, 6	C, E, SE
T. florida Bunge	Ph	IT	Xeh	Sg	5, 6	NE, C, E
T. hispida Willd.	Ph	IT	Xeh	Sg	5, 6	C, S
T. hohenacheri Bunge	Ph	IT	Xeh	Sg	5, 6	NW, NE, C
T. humboldtiana Akhani, Borsch & N.Samadi	Ph	SS (En)	Xeh	Sg	5, 6	S
T. karelinii Bunge	Ph	IT	Xeh	Sg	5, 6	NE, C, E

Table 1 (contd)

T. kermanensis B.R.Baum	Ph	SS	Xeh	Sg	5, 6	S, SE
T. korolkowii Regel & Schmalh.	Ph	IT	Xeh	Sg	5, 6	NE, C
T. kotschyi Bunge	Ph	IT	Xeh	Sg	5, 6	NW, N, NE, C
T. leptopetala Bunge	Ph	IT	Xeh	Sg	5, 6	C, E, SW, S, SE
T. macrocarpa (Ehrenb.) Bunge	Ph	IT, SS	Xeh	Sg	5, 6	NE, C, SW
T. mascatensis Bunge	Ph	SS	Xeh	Sg	5, 6	C, E, SW, S, SE
T. meyeri Boiss.	Ph	IT	Xeh	Sg	5, 6	NW, NE, C, E
T. octandra (M.Bieb.) Bunge	Ph	IT	Xeh	Sg	5, 6	NW
T. passerinoides Delile ex Desv.	Ph	IT, SS	Xeh	Sg	5, 6	NW, NE, C, E, SW, S, SE
T. pycnocarpa DC.	Ph	IT	Xeh	Sg	5, 6	NE, C
T. ramosissima Ledeb.	Ph	IT, SS	*T.*	Sg	3, 5, 6	NW, N, NE, W, C
T. rosea Bunge	Ph	IT	Xeh	Sg	5, 6	C
T. smyrnensis Bunge	Ph	IT, M	Xeh	Sg	5, 6	NW, W, C
T. stricta Boiss.	Ph	SS	Xeh	Sg	5, 6	S, SE
T. szowitsiana Bunge	Ph	IT	Xeh	Sg	5, 6	NW, NE, C, SE
T. tetragyna Ehrenb.	Ph	IT, M	Xeh	Sg	5, 6	C, E
Tetradiclidaceae						
**Peganum harmala* L.	He	IT, M, SS	Xe		3	NW, N, NE, W, C, E, SW, S, SE
**Malacocarpus crithmifolius* (Retz.) Fisch. & C.A.Mey.	Ph	IT	Xe	Ls	5	NE, C
Tetradiclis tenella (Ehrenb.) Litv.	Th	IT	Xeh	Ls		NW, NE, C
Typhaceae						
**Typha angustifolia* L.	Cr	Tem/Str	Hh		3, 5, 7	NW, N, NE, W, C
**T. domingensis* Pers.	Cr	Str/Tr	Hh		3, 5, 7	NW, N, NE, W, C, E, SW
**T. latifolia* L.	Cr	Tem/Str	Hh		3, 5, 7	NW, N
Verbenaceae						
**Phyla nodiflora* (L.) Greene	He	Str/Tr	Hg		3, 5	N, C, SW, S, SE
Zosteraceae						
**Zostera noltii* Hornem.	Cr	ES, IT, M	Hy		2	N
Zygophyllaceae						
**Tetraena propinqua* (Decne.) Ghaz. & Osborne subsp. *propinqua*	Ch	SS	Ps	Ls	2, 3	S
**Tribulus terrestris* L.	Th, He	Tem/Str/Tr(ow)	Xe		3	NW, N, NE, W, C, E, S, SE
**Zygophyllum fabago* L.	He	IT, M	Xe	Ls	3	NW, N, NE, C
Z. hamiense Schweinf.	Ch	SS	Psh	Ls	2, 3	SW, S, SE
**Z. oxianum* Boriss.	Ch	IT	Xe	Ls	3	NW, N, NE
Z. pinnatum Cham. & Schltdl.	Ch	IT	Xeh	Ls	2, 3	C
Z. qatarense Hadidi	Ch	SS	Psh	Ls	2, 3	SW, S, SE
Z. simplex L.	Th	SS	Psh, Xeh	Ls	1, 2, 3	S, SE

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