Berberidaceae

Berberis L.

1. *Berberis heterobotys* E. Wolf

Strong, spiny shrub up to 3–4 m tall, sometimes growing as a small tree. Branches violet-brown when young, becoming pale brown with longitudinally fissured bark with age. Leaves up to 6 cm long, usually entire and obtuse. Inflorescences variable in the size, varying from 3.5 to 12 cm within the same individual. Berries ca. 1 cm long, reddish-black to black.

An altimontane species, with a bicentric distribution. The larger and more rich northern part of its range covers Middle Asia (Tadzhikistan and Khyrgystan) extending in the north to lat. 42°N, whereas the southern part covers eastern Afghanistan and slightly north-western Pakistan extending in the south to lat. ca. 33°N. The occurrence of the species further to the east in north-eastern Pakistan and Kashmir is doubtful.

Berberis heterobotrys is a photophilous, somewhat mesophilous shrub which grows on the slopes in mountains in xerophytic shrubs (occasionally forming pure stands) as well as in open maple, birch and juniper woodlands. In Tadzhikistan it is widespread between 1000 and 2300 m, in Afghanistan at 2100–3300 m and in Pakistan it ascends up to 3500 m.

Sweet fresh and juicy or dried fruits of *B. heterobotrys* are eaten up by autochthons.

References: 177 (4), 218 (2), 297, 467.

Caprifoliaceae

Lonicera L.

2. *Lonicera korolkowii* Stapf

Erect, densely branched shrub up to 3, occasionally even to 4, m tall. The size, shape and pubescence of the leaves varies considerably. They are usually ovate to elliptic, to 4.5 cm long, typically glaucous-green and more or less pubescent on both surfaces to almost glabrous. Flowers are in pairs, pink or white, to 2 cm long and berries are globose, bright red to orange-red, 5–7 mm wide.

This shrub occurs mainly in Tadzhikistan, eastern Uzbekistan and western Khyrgystan in Middle Asia. Its northernmost occurrence is at lat. 43°N in the vicinity of Dzhambul of southern Kazakhstan. In South-West Asia the species is rare and restricted in its distribution to few localities in central Afghanistan (Bamian and Baghlan districts) and north-western Pakistan (Chitral district).

Lonicera korlkowii is a mesophilous and photophilous mountain shrub. It grows predominantly in river valleys, on scree and sandy, gravelly or even clayey slopes, as well as in rock crevices. It occurs singly or in groups in birch or willow brushwoods or eventually in very thin deciduous forests, most often between 1000 and 2500 m, although in Tadzhikistan its altitudinal range extends from 650 to 3750 m, in Afghanistan from 1250 to 2650 m and in Pakistan from 1500 to 3650 and occasionally even to 4000 m. It is an ornamental shrub, mainly because of its glaucous leaves, intense blooming, and colourful flowers and berries. Since the end of the 19th century it is cultivated in the Arnold Arboretum in the United States.

References: 177 (9), 218 (3), 225, 533, 574.

3. *Lonicera obovata* Royle ex Hook. f. & Thoms.

Prostrate or suberect, intricate shrub. Leaves obovate or elliptic, up to 12 mm long, glabrous or almost so, with very short petiole, ca. 3 mm long. Bracts linear, longer than ovaries. Corolla ca. 10 mm long, yellow. Berries subglobose, bluish-black, connate in pairs.

A Himalayan species distributed from eastern Afghanistan and northern Pakistan through Kashmir, north-western India and Nepal to Bhutan. It was also recorded from Tibet.

Lonicera obovata occurs in temperate and subalpine zones in the Himalayas. It grows on rocks, on both dry and moist slopes, in valleys of altimontane rivers and at foot of glaciers, usually above 2500 m but as a rule above 3000 m, only sometimes descending below 2500 m. Its highest localities are known from Afghanistan, Pakistan and Kashmir at 4000 m and in Nepal even at 4400 m.

References: 58, 225, 533, 574, 669.

4. *Lonicera stenantha* Pojark.

An erect shrub up to 2–2.5 m tall, glabrous to more or less hairy. Leaves up to 5 cm long, elliptical to ovate-oblong, acute or subacute, often subcordate, bilaterally more or less pubescent, glaucescent-green, coriaceous. Flowers in pairs, yellow, 14–20 mm long, gibbous at base. Berries connate, up to 14 mm long, dark blue.

An altimontane species having the main centre of its occurrence in Tadzhikistan, Khyrgyzstan and eastern Kazakhstan as well as in north-western China (Dzhungaria and Kashgaria). In Southwest Asia some scattered localities are known from eastern Afghanistan, especially from Wakhan, and the northernmost part of Pakistan. Moreover this shrub occurs in northern Kashmir. Its northernmost localities are in north-eastern Kazakhstan at lat. ca. 49°N.

Lonicera stenantha is a mesophytic and photophilous shrub. It grows mainly in the subalpine zone, singly or in small groups, in river valleys, on the pebbles and scree, in thickets and low forests dominated with species of *Betula*, *Populus* and *Hippophaë* and accompanied by roses, berberries and currant bushes. Occasionally, it grows at margins or in brushwoods of coniferous forests. In Tadzhikistan the species is widespread at 1500–3450 (3800) m, whereas in Southwest Asia it occurs at elevations between 2600 and 3500 m. The highest locality at 4200 m is known from north-eastern Afghanistan.

References: 177 (9), 181, 218 (3), 225, 533, 574, 702.

Celastraceae

Euonymus L.

5. *Euonymus fimbriatus* Wallich ex Roxb.

Syn.: ***Euonymus lacerus* Buch.-Ham.**

Small tree up to 5–7 m tall or strong erect shrub with dark grey bark and reddish-brown branchlets. Leaves elliptic or broadly ovate up to 10 cm long, glabrous, shortly acuminate, serrulate. Flowers in umbelliform cymes and the capsules are 2–5–merous with long tapering wings. Seeds enclosed in a bright red aril. In its leaves, inflorescences and fruits *E. fimbriatus* resembles *E. latifolius* (L.) Miller from southern Europe.

A Himalayan species with an elongated distribution area extending from Nuristan in eastern Afghanistan, where it is very rare, through northern Pakistan, Kashmir and north-western India to central Nepal.

Euonymus fimbriatus is a fairly common species. It prefers shady habitats in shrubs on hillsides, on river banks and in the undergrowth, especially in cedar forests dominated with *Cedrus deodara* (D. Don) G. Don. The optimum of the occurrence it has at an elevation of 1800–3000 m, although locally it descends to 1500 m. Its highest stations are known from Nepal.

References: 58, 179, 223, 225, 481, 493, 498.

Chenopodiaceae

Sueda Forssk. ex Scop.

6. *Sueda vera* J. F. Gmelin

An evergreen, erect, profusely branched shrub, about 1 m tall. Old branches with fissured and flaking bark. Leaves up to 1.5 (2.0) cm long and ca. 1 mm wide, numerous, linear, more or less sessile, glabrous and fleshy. Flowers minute, bracteolate, solitary or in dense clusters.

A circum-Mediterranean, strictly littoral species. In the western part of its range *Sueda vera* surpass this area and along the coastal regions of Portugal and western France extends to southern England as far as lat. 53°N. In addition. it is known from the Canary Islands and Madeira in the west. In the east it occurs in Albania, Greece (incl. the Aegean Islands and Crete), Cyprus, Lebanon and Israel but is absent from Anatolia. In Northeast Africa it is found in Libya (Cyrenaica) and Egypt. The occurrence of this species in southern Egypt and in the Arabian Peninsula is doubtful and its localities reported from these areas certainly refer to another species. On the other hand, localities in Lebanon are of only historical value and the species is probably extinct in this state.

Sueda vera grows near the sea, mostly on sand shores and drier salt-marshes, usually singly accompanied by other halophilous species of the genera *Salsola, Atriplex, Limonium*, etc., but in places it forms a separate association, Suedetum verae. In Negev Desert of Israel and in central Sinai the species is represented by a separate variety, var. *desertii* Zoh. & Baum.

References: 105 (3), 123 (5), 151 (2), 163 (1), 188, 258 (2), 259 (1), 510, 638, 750.

Convolvulaceae

Convolvulus L.

7. *Convolvulus fruticosus* Pallas

Small shrub, usually 40–50 cm tall, sometimes taller up to 1 m, with spinescent upper branches. Spines, branches and leaves appressedly pilose. Flowers single, pink. Sepals 6–10 mm long and corolla ca. 20 mm long. Capsules hairy above.

An Irano-Turanian species. Its geographical range extends from long. ca. 51°E in western Iran through Middle Asia and western China estwards to western and southern Mongolia at long. ca. 110°E. The species is rather scattered throughout this wide area. In Middle Asia *Convolvulus fruticosus* occurs primarily in Turkmenistan, Khyrgystan and Kazakhstan where its northernmost stations are at lat. ca. 51–52°N. On the other hand, in South-West Asia this species is much rarer and it is known from few stations in northern, central and southern Iran and western Afghanistan. A single, highly disjunct station is also noted from Baluchistan in Pakistan.

Convolvulus fruticosus is a photophilous and xerophilous shrub occurring in steppe and desert areas where it grows on stony and gravelly, limestone hillsides together with species of *Atraphaxis*, *Eurotia*, *Salsola*, *Anabasis* and *Artemisia*. It appears also in thin communities of almond and pistachio. The altitudinal range of the species extends from 450 to 1700 m in Middle Asia and from 1000 to 2300 m in Iran.

References: 177 (7), 218 (3), 610, 670, 728, 777.

Elaeagnaceae

Elaeagnus L.

8. *Elaeagnus angustifolia* L. s.l.

Syn.: ***Elaeagnus orientalis* L.; *E. hortensis* M. Bieb.; *E. turcomanica* Kozlovskaja; *E. caspica* (Sosn.) Grossh.**

Incl. *Elaeagnus oxycarpa* Schlecht.

A small tree up to 8–10 (12) m tall with the stem up to 30–50 cm in diameter. The stem is usually crooked and relatively low branched, with dark brown bark, vertically and fibrously cracked. Branches unarmed or spinose, often more or less pendulous, at first silvery lepidote, later reddish-brown and lustrous. Leaves elliptic-lanceolate to ovate-elliptic, 7 (10) cm long, entire, densely and silvery lepidote beneath, when the upper surface is becoming green with age. Flowers 1–3 in the leaf axils, hermaphrodite or polygamous, small, internally yellow, sweet-scented. Fruits (drupe like) ovoid-ellipsoidal or almost subglobose, ca. 2 cm long, lepidote, fleshy, edible but insipid.

The species is very variable with regard to the length and width of leaves as well as the size and colour of fruits. The leaf size and the degree of their covering with scales depends considerably on age (old trees vs. young seedlings), type of shoots (long shoots reach up to 1 m in one year) and root sucker. They vary also in different seasons of the year. The spines appear usually on long shoots and are often foliated. The size of fruits is mostly conditioned by selection of the species which is cultivated since a long time by autochtons for consumption. Moreover, due to abundantly produced flowers *E. angustifolia* has been cultivated as an ornamental and melliferous plant by roadsides and ditches, both in villages and towns. Also, the resistance for the low temperature (to -30°C) and salinity of soils

as well as the drought-tolerance have contributed much to the considerable extension of areas of its cultivation and naturalization in numerous states. The species is considered to be introduced in southern and central Europe and the natural character of its stations in Anatolia is also questioned.

All the aforementioned problems much contributed to the intricate taxonomy of this species, especially with regard to two Linnaean taxa – *E. angustifolia* s.str. and *E. orientalis*, which are considered either as two independent species or only as varieties of *E. angustifolia*. Morphological characters typical of these taxa and their geographical range are often evaluated in a controversial way by different students. For that reason a broad taxonomic concept of *E. angustifolia* is accepted in the present treatment including also *E. oxycarpa* as a subspecies – subsp. *oxycarpa* (Schlecht.) Browicz, *comb. nov.* [Basionym: *Eleagnus oxycarpa* Schlecht., Linnaea 30: 344. 1859], because of the presence of numerous intermediates (hybrids?).

An Irano-Turanian species widely distributed in Southwest Asia. Its geographical range is difficult for evaluation owing to the impossibility to separate natural and naturalized stations. In the east the range extends from Kashmir and north-western India and most probably it does not exceeds long. 77°E and 86°E in Kazakhstan and north-western India. The western limit is unclear because, as stated above, *E. angustifolia* is probably only cultivated in Anatolia. Thus, the range of this species covers the Caucasus, Iran (scattered localities), northern and eastern Afghanistan and Pakistan and in Middle Asia also Turkmenistan, Uzbekistan, Tadzhikistan, Khyrgyzstan and Kazakhstan. In the latter area, occupied by subsp. *oxycarpa*, there occur the northernmost stations in northwestern Kazakhstan at lat. ca. 51°N.

Elaeagnus angustifolia is a moderately mesophytic and photophilous species growing singly or in groups and also forming bushes and groves of its own, especially in river valleys in flood waters. It grows together with trees and shrubs of the genera *Populus*, *Salix*, *Tamarix*, *Hippophaë*, *Lycium*, *Clematis*, and others. Its altitudinal range extends from the lowland areas from nearly sea level to about 1200 m in Anatolia, 1500–1800 m in Tadzhikistan, 2300 m in Pakistan, 2400–2600 m in Iran and Afghanistan and even 2900 m in Kashmir.

References: 64 (7), 103 (6), 107, 177 (6), 218 (3), 228 (4,1), 252, 484, 486, 701, 764, 765, 766, 774.

Juglandaceae

Juglans L.

9. *Juglans regia* L.

A tree up to 25–30 m tall, reaching in the extreme situations (in the eastern part of its range) up to 35 m and 2 m in diameter. The bark is grey, smooth when young and becoming not deeply fissured with age. Leaves imparipinnate, 20–50 cm long, composed of 5–9 and occasionally even 11 leaflets. Leaflets obovate to oblong-obovate, entire, glabrous, aromatic. Flowers dioecious; male flowers in solitary, pendent catkins, female in few-flowered racems. Fruit a large, indehiscent drupe, 3–4 cm in diameter (in culture up to 6 cm), subglobose, with fleshy and aromatic exocarp and thick, irregularly furrowed endocarp (nut).

Juglans regia has a disjunct, bicentric geographical range. Its western part extends from southern Turkmenistan (south-western Kopet-Dagh), through northern (Ciscaspian) and western Iran, north-eastern Iraq, south-eastern Azerbaijan (Talish Mts.) westwards to Anatolia (especially its eastern part) and northern Lebanon. The occurrence of this species in the natural habitats in the Balkan Peninsula of Europe is doubtful. It is also true for the Caucasus where *J. regia* has become naturalized in the result of the destruction of human settlements and neglecting orchards during numerous and lasting for centuries Persian and Turkish wars. Consequently, the walnut-tree spread in the forests and nowadays it is an essential constituent of them. In Turkey *J. regia* is presumably native only in north-eastern and eastern Anatolia, but widely planted and naturalized elsewhere. As well, the natural character of its

stations in Iraq and Lebanon is criticized. If true, one can assume that the western part of its range can be considered as of anthropogenic origin.

The eastern part of the range of *Juglans regia* covers Tadzhikistan, Uzbekistan, Khyrgyzstan and southern Kazakhstan as well as eastern Afghanistan, northern Pakistan, Kashmir and north-western India in Southwest Asia. In the east the range of *J. regia* extends along the Himalayas to Bhutan and Assam where its populations are recognized as a separate variety, var. *kamaonia* C. DC., which is sometimes treated as a distinct species, *Juglans kamaonia* (C. DC.) Dode. The true systematic value of this taxon remains still unclear.

Juglans regia is a mesophytic tree which grows on rich, slightly moist and deep soils on mountain slopes, in ravines and in the valleys of rivers and streams. The trees grow singly or in groups in deciduous forests or form pure stands. Such forests are widely distributed mainly in southern Khyrgyzstan (Chatkalskiy and Ferganskiy Khrebets) and Uzbekistan (Pskemskiy and Ugamskiy Khrebets). A small forest composed of the walnut-tree is also reported from eastern Anatolia (Ovacik-Tunceli). The elevational range of *J. regia* extends in Turkey up to 1550 m, in Tadzhikistan and Afghanistan to 2600 m, and in Pakistan to 2700 m, but the optimum of its occurrence is at elevations of 1000–2200 m. Occasionally, the species reaches up to 3000 m or more, but it only rarely fructifies there because its buds get frozen.

Juglans regia is an important economic fruit-tree and is widely cultivated, both within and far outside its geographical range in Eurasia, North America and North Africa. There are numerous cultivars of this tree differing in the size, the shape of the nut and the thickness of the nutshell. The tree is mostly cultivated for its very tasty and nutritious seeds which are rich in lipids, proteins and microelements and are eaten fresh or used in food industry. They are also used in the folk medicine. The young and green nuts contain much vitamin C and are used for production of special jam. Apart from the nuts, *J. regia* sets a high value for its hardwood which is used for furniture manufacturing, especially for veneering furniture. This considerably contributed to the impoverishments of its natural stations.

References: 30, 44, 58, 64 (7), 134, 135, 163 (1), 177 (3), 179, 214, 218 (1), 228 (1), 252, 397, 610, 757, 758, 762, 772, 774, 776.

Labiatae

(J. Zieliński)

Phlomis L.

10. *Phlomis bourgaei* Boiss.

Shrub to 1.5 m tall, glandular puberulent. Leaves with loose stellate indumentum above, densely greyish or whitish stellate-tomentose beneath. Flowers yellow, sessile in 1–2 verticillasters. Calyx densely hispid-viscid with subulate teeth 3–7 mm long. Bracteoles subulate, densely long-viscid.

This is an east-Mediterranean species with the range limited to a rather small area in southwestern Anatolia. The species occurs there in the provinces of Denizli, Mugla, Burdur and first of all Antalya. Out of Turkey it is known from the nearby Greek islets of Ro and Mejisti in the Kastellorizo Archipelago. It grows in sunny dry places, on eroded rocky and stony hillsides, on roadside escarpments, in loose degraded maquis, in *Quercus* scrub, at forest margins, sometimes in *Pinus brutia* woods, most often on limestone and serpentine. It has ben usually noted between sea level and 1000 m but its highest situated sites are at 1300 m in Takhtali Dag.

References: 64 (7), 300.

11. *Phlomis lycia* D. Don

Shrub to 1.5 m tall, eglandular. Leaves densely adpresed yellowish stellate-tomentose, especially beneath. Flowers, yellow in 1–2 verticillasters. Calyx densely white-lanate with triangular-subulate teeth to 1 mm long. Bracteoles linear-lanceolate, densely spreading white-lanate.

An east-Mediterranean species occurring mainly in southwestern Anatolia within a narrow coastal belt between Termessos and Söke. Out of Anatolia it grows on the Greek islands of Dodekanese (Tilos, Simi, Kalymnos) and Kastellorizo Archipelago. It grows often gregariously in open, insolated dry places in degraded maquis, in *Quercus* scrub, in pine woods, at forest margins, on limestone or serpentine. It is a lowland species occurring from sea level to 600 m, exceptionally higher, as above Mugla, where it has been collected at 900 m.

References: 64 (7), 188, 300.

12. *Phlomis viscosa* Poir.

Shrub 1.0 (–1.5) m tall very similar to *Phlomis bourgaei* from which it differs by broader bracteoles, pedicellate flowers and entirely different geographical range.

An east-Mediterranean species. Its range, restricted to the easternmost part of the Mediterranean region, stretches from northwestern Jordan through Israel and Lebanon to southern Anatolia. Like other woody representatives of the genus *P. viscosa* is a heliophilous species growing usually in open places, on ereoded rocky hillsides, on radside escarpements, in loose scrub, on forest margins, in *Quercus coccifera* woods, sometimes in loose pine forests. It seems to prefer schistose and limestone substrata. The species has been hitherho collected between 300 and 1550 m, maximum elevation being known from northern Amanus.

References: 64 (7), 163 (3), 175, 184, 259 (3).

13. *Teucrium creticum* L.

Loose, divaricate shrub 0.75–1.0 (–2.0) m tall. Young branches harply angled. Leaves linear, strongly revolute-margined, green, white– or grey-tomentose beneath. Flowers mauve in racemoid inflorescences.

Teucrium creticum is an east-Mediterranean species with the range confined to the Near East (northwestern Jordan, northern Israel, western Syria), southern Anatolia and to Cyprus, where the species is most abundantly represented. In spite of the specific name, suggesting that the species grows also on Crete, there are not relaible data about its occurrence on the island.

Teucrium creticum grows usually singly or in small groups in open places, on rocky eroded hillsides, on roadside escarpments, in low maquis, in *Quercus* scrub, at forest margins, in loose pine woods, usually on the calcareous substratum. Most often it occurs between sea level and 300 m, but on Cyprus it ascends occasionally to 1000 m.

It has been observed that the species is very attractive to bees, so it could be used as honey-yield plant.

References: 64 (7), 145, 151 (2), 163 (3), 175, 184, 259 (3).

Leguminosae

Ammothamnus Bunge

14. *Ammothamnus gibbosus* (DC.) Boiss.
Syn.: *Sophora gibbosa* (DC.) Yakovlev

Erect shrub up to 45–50 cm tall, profusely branched from the base, densely sericeous. Leaves up to 15 cm long, imparipinnate, with 6–10 pairs of silvery-silky leaflets. Flowers creamy-white to yellowish, ca. 15 mm long in terminal racems, more or less so long as leaves. Fruits contorted with dark brown seeds.

A Mesopotamian species restricted in its distribution mainly to the north-eastern part of central Iraq. It is common in the area between Euphrates, Tigris and Jabal Hamrin, approximately between lat. 33°N and 35°N. In addition, *A. gibbosus* was reported from a few stations in eastern Syria. The species occurs in lowland and desert areas at an elevation from 20 to 200 m.

References: 163 (2), 228 (3), 558, 756.

15. *Ammothamnus lehmannii* Bunge
Syn.: *Sophora lehmannii* (Bunge) Yakovlev

Shrub up to 80 (–100) cm tall with rod-shaped shoots, densely white pilose. Leaves up to 17 cm long, imparipinnate, with 7–13 pairs of leaflets. Inflorescences loose racemose, up to 35 cm long with numerous, white flowers. Legumes up to 10 cm long, narrow, contorted, with 1–3 yellowish seeds.

An Irano-Turanian species having the main centre of its occurrence in Middle Asia (southern Turkmenistan, Uzbekistan and south-western Tadzhikistan). In South-West Asia it is only known from the south-easternmost part of Iran and north-western Afghanistan. In the south its range reaches approximately lat. 34°N in Afghanistan, while in the north it extends to lat. ca. 43°N in Peski Kyzyl-Kum. Nonetheless, both in Iran and Afghanistan the species is rare and scattered and is known only from a few stations.

Ammothamnus lehmannii is a photophilous xerophyte occurring in the plains and submontane hills, on submobile sands, loess and loam-pebble. It grows singly or in groups in communities dominated by species of *Artemisia*, *Salsola* and *Haloxylon*. It occurs usually at an elevation of 300–800 m and its highest locality has been recorded in the environs of Herat in Afghanistan at 1000 m.

References: 177 (5), 218 (3), 558, 610, 756.

Polygonaceae

Calligonum L.

The genus *Calligonum* contains aphyllous desert shrubs 50–200 (–300) cm tall with characteristic thin and flexuose, white or glaucous branches. In South-West Asia the genus consists of 15–18 species which are still poorly known taxonomically. Recognition of species in this genus is based mainly on the shape and structure of fruits. Distribution data for the species, if correct, are usually scanty and therefore the delimitation of their geographical

ranges seems to be futile at the moment. For this reason only one species is considered below. It is best known in the genus and has very wide geographical range.

16. *Calligonum polygonoides* L.

Shrub up to 150–200 cm tall, with younger shoots green, glabrous and flexible and older branches whitish, swollen at the nodes and more or less tortuous. Leaves are minute, soon deciduous and usually absent. Flowers are small and clustered, 5–6–merous. Fruits – an indurate achene – is 7–10 mm long, ribbed, white or reddish, covered with stiff bristles.

At present a rather wide concept of *Calligonum polygonoides* is accepted and the species is divided into three subspecies which are linked between one another by a number of intermediates. Nonetheless, they are also considered to be species of their own. The geographical range of the type subspecies covers south-western part of the species range, subsp. *comosum* (L'Her.) Soskov (=*Calligonum comosum* L'Her.) is distributed almost throughout the whole range of the species, and subsp. *laristanicum* (Rech. f. & Schim.-Czeika) Soskov (=*Calligonum laristanicum* Rech. f. & Schim.-Czeika) is known to occur in southern Iran.

A Saharo-Sindian species reaching far in the north to the Caucasus (Armenia, Nakhichevan), north-eastern Anatolia (environs of Mt. Ararat) and northern Iran. The species has the widest geographical range of all species of the genus *Calligonum*, extending from Morocco and Algeria in the west to long. 72°E in Pakistan in the east. In South-West Asia the species is distributed in eastern and southern Iraq, almost throughout Iran, in southern Afghanistan and in Pakistan. This shrub is also known from almost the whole Arabian Peninsula as well as from Israel and Jordan where it occurs on both sides of Wadi Araba and on the Dead Sea. It was also reported from the vicinity of Palmyra in Syria but this record needs confirmation since it is likely to concerns another species *Calligonum tetrapterum* Jaub. & Spach.

Calligonum polygonoides is a xerophyte and psammophyte. It is a markedly photophilous shrub of desert areas growing on deeper sand. It forms various communities in which it either dominates or co-dominates with species of the genera *Artemisia* and *Haloxylon*. It occurs from sea level (on the Dead Sea also on the depressions) to 600–800 m. The highest localities are known from Afghanistan – 1000 m, Saudi Arabia – 1200 m and Iran – 1500–1700 m.

References: 64 (2), 163 (1), 225, 228 (1), 258, 259 (1), 618, 649, 665, 671, 686, 750, 763, 771, 779.

Punicaceae

Punica L. (monotypic genus)

Until recently the genus *Punica* included the second species – *P. protopunica* Balf. f. from Socotra, but in 1980 it was placed in the separate monotypic genus *Socotria* Levin as *S. protopunica* (Balf. f.) Levin.

17. *Punica granatum* L.

A small tree usually with a few stems, 5–7 m tall, occasionally somewhat taller, or a strong shrub with smooth, sometimes spiny branches and root suckers. Leaves opposite, short-petioled, oblong to narrowly obovate, 6–8 cm long, glabrous and glossy. Flowers solitary or in small clusters, terminal, 3–5 cm in diameter, orange-yellow to scarlet, with numerous stamens and fleshy, tubular calyx. Petals 5–7. Fruits – berries – globose or subglobose, 3–5 cm in diameter (in cultivated forms up to 12–15 cm), from yellowish to red, crowned by persistent and erect sepals. Seeds very numerous, covered with juicy pulp.

It is very difficult to establish the limits of the natural range of this species because in many places it is natural-

ized. Pomgranate have been cultivated in the Middle East for over 5000 years. It was known in the ancient Egypt from about 4000–3000 B.P. and in the Mediterranean it was introduced by Phoenicians. In the Greek mythology its fruits were considered as a sybmol of fecundity and it was sacrificed to the Goddesses Aphrodite and Athena. In India its flowers were used for dying cloth red and the bark for tanning leather.

The range of *Punica granatum* may be only approximately presented. It is disjunct and in this respect it resembles ranges of the other two widely cultivated fruit species, *Prunus cerasifera* Ehrh. and *Juglans regia* L. Thus, the geographical range of *P. granatum* includes two distinct centres, western and eastern.

The western part of the range covers the eastern tip of Anatolia, the Caucasus, Iran (especially northern), southern Turkmenistan (south-western Kopet-Dag) and north-eastern Iraq. In main part it overlaps the range of *Cydonia oblonga* Miller and both species often grow together, for example in the Talish Mts. In this part of the range the northernmost occurrence of the species is at lat. ca. 43°N. In southern Europe, in the major part of Anatolia, in Cyprus, Syria and Lebanon it is widely cultivated for fruits and naturalized.

The eastern part of the range of *Punica granatum* extends from south-eastern Uzbekistan and southern Tadzhikistan through Afghanistan, northern Pakistan and Kashmir to north-western India and central Nepal. In this part the northern limit of the range runs through lat. 41°N in Tadzhikistan and 36°N in Afghanistan and Pakistan.

Punica granatum is a photophilous and moderately xerophytic species of lower montane elevations growing on dry, stony and scree slopes, especially on limestone, in rock fissures and in ravines, river valleys and on coastal dunes (for example on the Caspian Sea in Iran). It occurs singly or in small groups, although it forms sometimes larger pure stands in protected places in xerophytic bushes or thin forests (e.g. with *Pistacia*, *Quercus*, *Zelkova*, *Acer*, *Amygdalus*, *Cercis*).

Its altitudinal range extends from sea level (or sometimes in northern Iran from depressions below sea level) to more or less 1800–2000 m, but usually no higher than 1300 m. In Anatolia it occurs at an elevation 250–600 m, in Turkmenistan at 300–1000 m, Iraq – 1100–1300 m, Tadhzikistan – 600–1800 m, Afghanistan – 900–1500 m, Pakistan – 1000–2000 m, and the highest occurrences at 700–2700 m are known from Nepal. It should be added that at stations above 2000 m the species often freezes (below –15°C).

Punica granatum is cultivated primarily for its edible, juicy fruits which quench well thirst. They can be preserved in fresh condition for about half year. Juice of this species can be used for preparing special drinks (granadine), jelly and, after condensation, also sauce for meat and fish. The fruits are not only used as consumable goods, but also in folk medicine as well as in industry as tannin and dye.

There are numerous cultivars, often having only a local range, which differ from one another in the size, colour and weight (sometimes they reach to 1 kg) of their fruits and in the colour and sweetness of juice. The total production of fruits of pomgranate is about 800.000 tons in the world. *P. granatum* can be succesfully cultivated in semi-desert and tropical climates with cool winters and hot summers. Therefore in tropical areas fruit production is possible although it is low. Outside Eurasia the species is widely distributed in North Africa and in the Americas.

Punica granatum is also cultivated as an ornamental plant due to its coloured flowers and fruits and prolonged blooming. Of special value is the dwarf variety – var. *nana* (L.) Pers. which is also cultivated in houses and the full-blossomed form – 'Pleniflora'.

References: 30, 51, 58, 64 (4), 103 (6), 134, 135, 157, 179, 218 (3), 223, 225, 228 (4,1), 252, 259 (2), 310, 364, 701, 760, 767, 768, 769, 774, 775, 778.

Rhamnaceae

Rhamnus L.

18. *Rhamnus virgata* Roxb.

Spinescent shrub or small tree up to 6 m tall with minutely pubescent young shoots and shining, smooth bark of the branches. Leaves up to 8 (–10) cm long, very variable in size and shape from narrowly elliptic-lanceolate to broadly ovate or even obovate, membranous, serrate-crenate.

A Himalayan species ranging from Kunar, Nangarhar and Paktia provinces of eastern Afghanistan and northern Pakistan through Kashmir, north-western India and Nepal to Bhutan and Burma. It is a mesophilous species growing in mixed forests and on open stony hills at an elevation (700–) 1000–3000 m with the optimum of the occurrence between 1500 and 2500 m. In Afghanistan this shrub occurs at 1300–2400 m and in Pakistan at 1500–2450 m. Its highest stations are known from Nepal.

References: 30, 58, 225, 372, 381, 526.

Zizyphus Miller

19. *Zizyphus oxyphylla* Edgew.

Almost glabrous, erect shrub or tree up to 7–9 m tall, with slightly recurved or straight, stipuled spines. Leaves ovate to lanceolate, oblique or cordate at the base, acuminate or cuspidate, 3–6 cm long. Flowers small in axillary cymes. Fruits up to 10 mm long, ovoid, fleshy, black when ripe, very acid. *Zizyphus oxyphylla* habitually resembles *Z. zizyphus* (L.) Meikle (=*Z. jujuba* Miller) which is often cultivated in numerous countries for its fruits.

A sub-Himalayan species with the main part of the range covering Kashmir and north-western India. Moreover, it occurs scattered in Pakistan and in eastern Afghanistan where is known from Kunar and Paktia provinces. In the east it reaches western Nepal.

Zizyphus oxyphylla grows on slopes of hills and mountains and in open places in brushwoods, usually above 1000 m, although sometimes it appears at lower elevations (600–900 m). In Nepal this species ascends to 1400 m and in Pakistan and Kashmir to ca. 1800 m.

References: 30, 179, 225, 372, 526.

Rosaceae

Cydonia Miller (monotypic genus)

20. *Cydonia oblonga* Miller

Syn.: ***Cydonia vulgaris*** Pers.

A strong shrub or small tree up to 6–8 m tall with twigs sparsely tomentose when young. Leaves broadly ovate-oblong, up to 8–10 cm long and 5 cm wide, entire, bilaterally tomentose at first, later above glabrous and dark green

but densely villous beneath. Flowers solitary, white or pinkish with spreading petals, ca. 4 cm in diameter. Fruit – a multi-seeded pome – 2.5–3.5 cm long, pyriform (fo. *oblonga* =fo. *pyriformis* Rehd.) or subglobose (fo. *maliformis* C. Schneider), in young state tomentose, when ripen glabrous, yellowish and aromatic. In cultivated plants all elements are generally larger – leaves up to 15 cm long, flowers up to 6 cm in diameter, fruits up to 12 cm long and to 1 kg or more weight.

A Hyrcanian species confined in its distribution to the coastal areas of the Caspian Sea. It is most frequent in Azerbaijan, especially in Talish, Dagestan and in northern Iran (Gilan, Mazandaran and Asterabad Provinces) as well as in southern Turkmenistan where its occurs in south-western Kopet-Dag. It is doubtful, however, if the latter localities are natural. The same is also true for localities in north-eastern Iraq and western Iran which are far-away from the sea. *C. oblonga* is cultivated throughout Anatolia but it is likely that some localities here are natural.

A mesophytic species which is, however, drought-tolerant but then its leaves are rolled and fruits are very small. It occurs in thickets and at margins of or eventually in oak forests. It usually grows singly in river valleys and on the shore of the Caspian Sea. It usually ascends to about 1000 m and only occasionally higher to 1200–1300 m.

Cydonia oblonga is a valuable fruit-shrub. Its fruits are sometimes eaten when fresh and often used for making various types of jam, compote and jelly. There are many cultivars of this species which differ in the size, shape, taste and weight of fruits. They are cultivated within its natural geographical range as well as far beyond it, for instance in Afghanistan, Tadzhikistan, India, throughout the Mediterranean and in western Europe as well as in North America and Japan. The monospecific plantations of *Cydonia oblonga* are rarely found (e.g. by Volos in Greece), and usually single plants or small groups of them are planted in the vicinity of houses or in apple orchards. It is also used as a stock for dwarf pears and sometimes is cultivated as an ornamental plant.

References: 51, 64 (4), 103 (5), 177 (4), 218 (2), 610, 761, 774.

Prunus L.

21. *Prunus cerasifera* Ehrh. s.l.

Syn.: ***Prunus divaricata*** Ledeb.; ***P. monticola*** K. Koch.

A shrub or small tree up to 6–8 (10) m tall, often of bushy form. Twigs lustrous, branches sometimes spiny. Leaves ovate-elliptic to oblong-obovate, 4–6 (10) cm long, crenato-serrate, acute, dark green, glabrous to pubescent, petiolate. Flowers mostly solitary, 20–25 mm in diameter, white, appearing before the leaves. Fruits 2–3 cm in diameter, globose, subglobose to ovoid-oblong, distinctly pedicellate, green, yellow, pink, red to dark violet, juicy.

This species is very variable in size and pubescence of the leaves and size and the colour of the fruit which warranted the recognition of a great array of small, often very local forms, varieties or subspecies which are often poorly defined and difficult to distinguish from one another. The situation has become more complicated in some regions owing to the special selection of these variants both in wild orchards and in culture. In southern and central Europe such variants can often spread secondarily beyond the plantations.

In various treatments one can find two names for this species – *Prunus cerasifera* Ehrh. and *P. divaricata* Ledeb. It is likely the the former should be used for cultivated plants, while the latter should be applied for wild populations. In such situation perhaps the following distinction would be appropriate: *P. cerasifera* Ehrh. subsp. *cerasifera* and *P. cerasifera* Ehrh. subsp. *divaricata* (Ledeb.) C. Schneider.

Prunus cerasifera can be considered as a Euxino-Hyrcanian species which has secondarily spread outside this area, especially in Europe. This species, in a broad sense, has a clearly bicentric geographical range. The main and larger centre extends from southern Turkmenistan in the east (Kopet-Dag) through northern Iran, the Caucasus and Anatolia (except for its central and southernmost part) to the Balkan Peninsula in the west where it covers Bulgaria, southern and central Greece, the former Yugoslavian Macedonia and Albania. Moreover, this centre includes also western Syria, Lebanon and northern Israel. In this wide area no less than three subspecies of *P. cerasifera* can be

recognized, namely (1) subsp. *cerasifera* with the leaves glabrous or hairy only on the main midrib – it occupies the major part of this range; (2) subsp. *caspica* (Kovalev & V. Ekim) Luneva [=*P. caspica* Kovalev & V. Ekim; *P. divaricata* subsp. *caspica* (Kovalev & V. Ekim) Browicz] with the leaves velutinous beneath and the pubescent petioles and pedicels – it occurs along the coasts of the Caspian Sea from Dagestan and Talish to northern Iran; and (3) subsp. *ursina* (Kotschy) Browicz, comb. nov. [Basionym: *Prunus ursina* Kotschy, Verh. Zool. Bot. Ges. Wien 14: 435. 1864; *P. divaricata* Ledeb. subsp. *ursina* (Kotschy) Browicz] with the shoots and leaves more or less pubescent and the short pedicels – this subspecies occurs mainly in south-eastern Anatolia, Syria, Lebanon and Israel. There are numerous intermediates between these subspecies which considerably impede their recognition.

The second centre of the distribution of *P. cerasifera* includes Tadzhikistan, Uzbekistan and southern Khyrgyzstan and the species is here represented by the fourth subspecies – subsp. *sogdiana* (Vassilcz.) Cinovskis (=*P. sogdiana* Vassilcz.). This subspecies includes smaller plants with globose fruits and most probably the populations from north-western Afghanistan should be placed in it.

Prunus cerasifera has a wide ecological tolerance. Generally, it can be considered as a photophilous mesophyte which, however, can tolarate moderate shading. It occurs singly or in small groups in deciduous, especially oak and beech, as well as coniferous forests dominated with fir. It frequently grows in pure stands or together with *Prunus spinosa* and species of *Crataegus*, *Rosa* and *Pyrus*. It grows in open and relatively dry places, especially at forest margins. Its altitudinal range extends from sea level or even depression areas (in Iran) to 1300 m in Greece, 1400 m in Iraq, 1500 m in Bulgaria, 1700 m in Lebanon, 1800 m in Syria, 2000 m in the Caucasus and Afghanistan and up to 2400–2500 m in Turkey, Iran and Tadzhikistan.

The species is widely cultivated both within and outside its geographical range, especially in the north. Its edible fruits contain much vitamin C and pectins and are locally used to produce compote, marmalade or jelly. Such cultivars are generally called "Myrabolan Plum" (Mirabelle). Additionally, *P. cerasidfera* is used by orchardists as a stock for plum and peach. Some ornamental variants are often cultivated in the gardens, parks and along the streets, for example 'Atropurpurea' (=*P. pissardii* Carr.) with large purple-brown leaves, 'Woodii' with smaller, dark red leaves or `Nigra' with pink flowers and dark red leaves.

References: 51, 64 (4), 103 (4), 163 (2), 166 (1), 177 (4), 218 (2), 236, 252, 258 (2), 259 (2), 610, 774, 781, 782, 783, 784.

Solanaceae

Solanum L.

22. *Solanum asiae-mediae* Pojark.

A shrub or subshrub up to 1 m tall, more or less climbing, with shoots somewhat hairy when young and becoming glabrous, woody and yellow-brown with age. Leaves ovate-lanceolate to oblong-ovate, 5–10 cm long, sometimes longer, with one or two obtuse lobes at the base. Inflorescences corymbose-paniculate, terminal, profusely branched, composed of 15–30 (45) flowers. Flowers ca. 2 cm in diameter, violet. Fruits (berries) globose, red, 5–8 mm in diameter.

Solanum asiae-mediae occurs in north-eastern Afghanistan, Tadzhikistan, Uzbekistan and southern Khyrgyzstan, at lat. ca. 34–42°N. A strongly isolated and disjunct station is known from Khurasan Province in north-eastern Iran.

It is a photophilous and oligotrophic shrub found primarily in riverside thickets, especially tamaricaceous, and on banks of watercourses. The species is salt-tolerant. In Tadzhikistan it is found at an elevation from about 900 m to 2200 (2300) m, whereas the highest occurrence is in Badakshan in Afghanistan at 1350–2600 m.

References: 134, 177 (8), 218 (3), 659, 701, 773.

Zygophyllaceae

Nitraria L.

23. *Nitraria retusa* (Forssk.) Aschers.

Syn.: ***Nitraria tridentata*** Desv.; ***N. sericea*** Jaub. & Spach

A profusely branched shrub up to 2 m tall. Branches and short shoots are terminated with thorns. Leaves are to 2 cm long, spatulate, entire, retuse or tridentate at apex, glaucous. Flowers geenish-white, 4–5 mm long, fragrant. Fruit (a drupe) 5–6 mm long, red, ovoid.

A Saharo-Arabian (or even Saharo-Sindian) species penetrating into Southwest Asia. Major part of its range covers West (Senegal, Mauritania) and North Africa (Algeria, Tunis, Libya, Egypt); it is also reproted from Ethiopia. In Southwest Asia it is known to occur in Israel, Jordan, northern Saudi-Arabia, Kuwait, north-eastern Iraq and rarely in Syria where it extends as far north as lat. 34–36°N. The species is also reported, but without closer locality data, from Makran Province of southern Pakistan. The southern limit of its occurrence in the Arabian Peninsula and Africa is incompletely known.

It is a sub-desert or desert shrub growing on sandy hummocks, especially on saline ground near the seashores and wadis banks accompanied by halophytes of such genera as *Haloxylon*, *Halocnemum*, *Zygophyllum*, *Arthrocnemum*, *Hammada*, *Salsola*, *Sueda* and *Tamarix*. Sometimes it occurs in the mangrove vegetation. In some places *Nitraria retusa* occurs in abundance forming a separate association, *Nitrarietum retusae*, for example at the southern end of the Dead Sea, in the Arava Valley or on the coast of the Red Sea in Egypt extending as far south as Gebel Elba. In the Sinai Peninsula it is widespread along its western and eastern coasts.

Nitraria retusa is a lowland species and its altitudinal range extends from sea level to 600 m. In the depression of the Dead Sea it occurs from sea level to –370 (380) m.

In treeless regions *Nitraria retusa* is used by autochtons as fuel. Its sweet fruits are edible.

References: 163 (2), 166 (1), 175, 176, 228 (4,1), 259 (2), 500, 510, 633, 642, 649, 686 (1), 750, 754.

24. *Nitraria schoeberi* L. s.l.

Incl. *Nitraria roborowskii* Komarov; *N. pamirica* Vassil.

A much branched and spiny shrub with whitish bark, 1–2 m tall, but at altimontane stations merely 25–30 cm tall. Leaves alternate or fasciculate, entire, spatulate, up to 4 cm long, sessile, fleshy. Inflorescences – loose cymes – numerous. Flowers white or greenish-yellow, ca. 4 mm long, shortly pedicellate. Fruit – a fleshy drupe – ovoid-conical, ca. 1 cm long, reddish-purple, edible.

An Irano-Turanian species having a wide range extending in an east-west direction but with stronly scattered localities within it. It covers south-western China (Dzhungaria, Kashgaria), Middle Asia (Kazakhstan, Khyrgyzstan, Tadzhikistan, Uzbekistan, Turkmenistan), Afghanistan, Iran and the southern and eastern Caucasus. Moreover, some isolated stations are known from Pakistan and Turkey, where the westernmost, highly disjunct stations are in central Anatolia on the salt lake Tuz Gl. Some isolated, relictual localities of this species are known from Europe in the southern Crimea, the Volga Lowland in south-eastern Russia as well as south-eastern Romania. The northernmost occurrence of *N. schoeberi* is in southern Siberia at lat. ca. 52°N, whereas in the south its range slightly exceeds lat. 30°N.

Nitraria schoeberi is a photophilous, meso-xerophytic species. In occurs in desert and desert-steppe areas and grows on saline soils with a high level of ground water, in flood-terraces of rivers, at edges of seasonal springs, in the lowland, submontane and, in the eastern part of its range, at altimontane sites. It forms either pure stands or grows

together with other halophilous shrubs and subshrubs of the genera *Halocnemum*, *Salsola*, *Zygophyllum*, *Reaumuria*, *Calligonum*, and others.

In Anatolia *Nitraria schoeberi* was found at an elevation of 900 m, in Iran between 900 and 2250 m, in Afghanistan at 1500–2400 m, and in Baltistan of northern Pakistan even at 3450 m. However, the greatest elevational amplitude the species has in Tadzhikistan, from whence it is recorded at elevations between 600 and 2500 m. The maximum elevation of the species is in Pamir – 4200–4300 m (as *N. pamirica*).

References: 64 (2), 103 (6), 177 (6), 200, 218 (3), 397, 518 (4), 610, 642, 701, 754.

Zygophyllum L.

24. *Zygophyllum atriplicoides* Fisch. & C. A. Mey. s.l.

Syn.: ***Z. eurypterum*** Boiss. & Buhse; ***Z. gontscharowii*** Boriss.; ***Z. eurypterum*** Boiss. & Buhse subsp. ***gontscharowii*** (Boriss.) Hadidi; ***Z. atriplicoides*** Fisch. & C. A. Mey. subsp. ***eurypterum*** (Boiss. & Buhse) Popov.; ***Z. megacarpum*** Boiss.; ***Z. atriplicoides*** (Fisch. & C. A. Mey.) var. ***megacarpum*** (Boriss.) Akhiani; ***Halimiphyllum atriplicoides*** (Fisch. & C. A. Mey.) Boriss.; ***H. eurypterum*** (Boiss. & Buhse) Boriss.; ***H. gontscharowii*** (Boriss.) Boriss.; ***H. megacarpum*** (Boriss.) Boriss.

Shrub up to 2–2.5 m tal, but usually lower, profusely branched, with greyish bark. Leaves simple, entire, spathulate to suborbicular, up to 3 cm long, thick, fleshy. Flowers 4–5–merous, ca. 1 cm wide, solitary or geminate, pale yellow. Fruits very characteristic, 4–5–angled or winged capsule, 2–4 cm long. The species is very variable regarding the size and shape of the leaves and fruits. The presence of 4– or, eventually, 5–winged capsules served to recognition several narrow species which sometimes are also considered as subspecies or varieties, but there are serious discrepancies between the students of this species regarding the true taxonomic value of these taxa.

An Irano-Turanian species. The main part of its range covers Iran, Afghanistan and Middle Asia (Turkmenistan, Uzbekistan, Tadzhikistan and Khyrgyzstan) where it extends to lat. 42°N and long. 74°E. In addition, this species occurs in south-western Pakistan and in the southern Caucasus (Armeniya, Nakhichevan) with the highly disjunct stations in Iraq and Syria.

Zygophyllum atriplicoides is a photophilous, xerophytic and oligotrophic shrub which grows in desert and semi-desert areas on hot rocky slopes and amongst boulders on hillsides, on banks of dried-up river-beds, on clay, loess, sandy and gravelly soil with various degree of salinity. Its most frequent associates include species of the genera *Artemisia*, *Anabasis*, *Salsola*, *Hammada*, *Calligonum*, *Amygdalus* (especially spinescent species of subgenus *Dodecandra*), and even *Pistacia*.

Zygophyllum atriplicoides is most often widespread at an elevation between 500 and 1700 m, but extremely it appears also at 100 and above 2000 m. Its highest localities have been recorded in Middle Asia – 2275 m, Iran – 2480 m and Afghanistan – 2700 m. On the other hand, in Iraq this species is found at much lower elevation of 100–400 m.

References: 81, 163 (2), 166 (1), 177 (6), 218 (3), 225 258, 518, 610, 642, 652, 755, 759.