

Kyrgyzian Umbelliferae as part of a critical revision of the Asian representatives of the family

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In Kyrgyzstan 193 species of the Umbelliferae, representing 65 genera, have been recorded. A list of Kyrgyzian Umbelliferae is presented. There are no endemic Umbelliferae genera. The number of endemic species is 27, belonging to 11 genera. The concentra-

tion of species and genera is presented according to the three floristic provinces and 15 floristic districts of Kyrgyzstan. Biomorphologic groups of species and their distributional patterns are presented.

Introduction

A book of the Umbelliferae of Kyrgyzstan (Pimenov and Kljuykov 2002) was recently published in Russian. This paper summarises the main results of the research on the Umbelliferae of Kyrgyzstan done over many years.

Kyrgyzstan is situated in the centre of the Eurasian continent occupying 198 000 km². Geographically it occupies the northwestern part of the world's largest mountain system, which includes Tibet, the Himalayas and the Middle Asian mountains. Kyrgyzstan is a typical mountainous country. Most of the territory lies in the Tianshan Mountains and the remainder in the northern part of the Pamiro–Alai system, varying in altitude from 450 m above sea level to more than 7 000 m. The highest peak, Khan Tengri, is 7 433 m and is located in Central Tianshan on the Chinese border. Biogeographically, Kyrgyzstan is situated at the border between the Ancient Mediterranean and Central Asiatic floristic regions. This makes it botanically particularly interesting. There are deep natural contrasts in Kyrgyzstan which are determined mainly by the level of precipitation and the altitude. In the humid areas precipitation is up to 2 500 mm per year and in arid territories 100–200 mm. There are deserts (low and high mountainous), true steppes, high grassy meadows with a dominance of various umbellifers, xerophyllous scrub, mesophyllous deciduous forests with *Juglans regia* and *Malus* species as dominants, spruce and fir forests, juniper stands, and alpine and subalpine meadows. Above 3 500 m there are low grass meadows with *Carex* and *Cobresia* being dominant. Hammads (stony deserts), screes and rocks are widely distributed in the mountains (Kamelin 2002).

Diversity of Umbelliferae in Kyrgyzstan

The Kyrgyzian flora is considered to be rich and numbers c. 4 000 species. The family Umbelliferae is one of the largest in the flora (Flora of Kirghyz SSR, 1952–1965). Our treatment of Kyrgyzian Umbelliferae (Pimenov and Kljuykov 2002) is a part of a larger critical revision of the Asian representatives of the family. We have been investigating Kyrgyzian Umbelliferae since 1969 and visited numerous localities including those previously poorly investigated. In total, 193 species of the Umbelliferae belonging to 65 genera have been recorded in the Kyrgyzian territory on the basis of a critical evaluation of all large herbarium collections of Middle Asiatic states, as well as in Moscow and St Petersburg (see Appendix 1). This is a high number when compared to the whole Middle Asia, where 92 genera and 403 species of Umbelliferae are present (Pimenov's database ASIUM, pers. comm. 2003). During this project, 22 new species were described. In Pimenov and Kljuykov (2002) keys for identification of genera and species are provided as well as nomenclatural data, typification, morphological descriptions, chromosome numbers, distribution, ecological and phytosociological characteristics, and economic importance including active secondary metabolites. We regard fruit structure as being very important in the taxonomy of the Umbelliferae, and original illustrations of mericarp transections of all genera were prepared. For the large genera we gave illustrations of the fruits of several species (Figure 1). The data obtained, even for such a comparatively limited region as Kyrgyzstan, show a large diversity of carpological types. Pimenov and Kljuykov (2002) also compiled dot maps for all species of Kyrgyzian Umbelliferae (Figure 2).

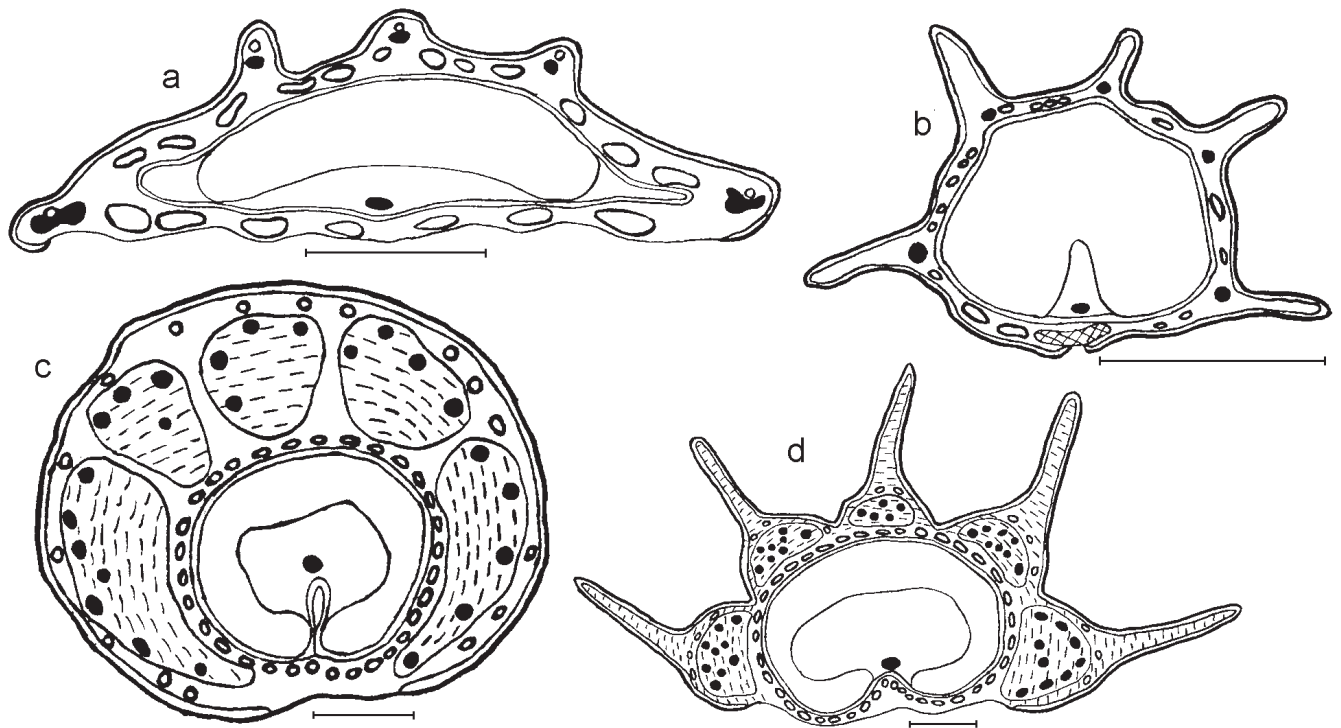


Figure 1: Examples of mericarp transections of Kyrgyzian Umbelliferae to show the diversity of structure. (a) *Paralogisticum discolor*, (b) *Aulacospermum simplex*, (c) *Prangos cachroides*, (d) *Prangos lipskyi*

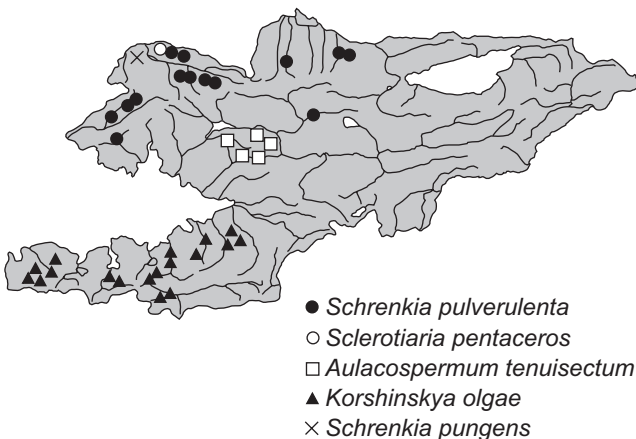


Figure 2: Example of a distribution map of some species of Kyrgyzian Umbelliferae

The Umbelliferae species grow in Kyrgyzstan up to an altitudinal limit of 4 200m above sea level. Only two species, viz. *Hymenolaena pimpinellifolia* Rupr. and *Hymenidium nanum* (Rupr.) Pimenov & Kljuykov, reach this altitudinal limit. In comparison, the Umbelliferae reach 4 800m above sea level in Tajikistan and 4 900m in Yunnan in China. The maximum richness in Umbelliferae is observed in the Kyrgyzian mountains at altitudes between 1 400m and 2 200m, where 82–98 species were recorded

in each 100m altitudinal belt.

The largest genera of the family in Kyrgyzstan are *Ferula* (36 spp.), *Seseli* (21 spp.), *Bupleurum* (10 spp.), *Elaeosticta* (10 spp.), *Aulacospermum* (10 spp.), *Prangos* (8 spp.) and *Bunium* (5 spp.). Thirty-six genera are represented in Kyrgyzstan by a single species (Appendix 1). There are no endemic Umbelliferae genera in Kyrgyzstan; *Fergania*, *Mogoltavia*, *Pastinacopsis* and *Sclerotiaria* could be considered as subendemics. The number of endemic species is rather considerable — 27 (Appendix 1), belonging to 11 genera. The local concentration of species and genera of the Umbelliferae within Kyrgyzstan is presented (Figure 3) for each unit of the latest classification of floristic regions proposed by Kamelin (2002). The territory of Kyrgyzstan is subdivided into three floristic regions (Middle Asian, Dzhungar–Tianshan–Alai and Kashgar provinces) and 15 districts. The highest numbers of species are distributed in the Middle Asian province — in West Tianshan and the North Pamiro–Alai Mountains. It is necessary to note, in particular, that in the comparatively small Alai mountain region, extending about 400km from west to east, 45 genera and 96 species of Umbelliferae are recorded, including nine endemics (Pimenov *et al.* 1986).

According to the structure of biormorphs (Korovin 1961–1962), the species of Umbelliferae could be subdivided into groups (Table 1) — annuals (13 species), tuberous geophytic ephemeroïds (33), other ephemeroïds (45), perennials with vertical or short horizontal rhizomes (87), and perennials with long horizontal rhizomes (6).

In the West Kyrgyzian regions, species of the Ancient

Table 1: The biormorphs of Kyrgyzian Umbelliferae

	Kyrgyzstan in total	Middle Asian province	Dzhungar–Tianshan– Alai province	Kashgar province
Annuals	13	13	3	–
Tuberous geophytic ephemeroïds	33	27	6	1
Other ephemeroïds	45	38	9	1
Ephemeroïds in total	78	65	15	2
Perennials with vertical or short horizontal rhizomes	87	81	45	13
Perennials with long rhizomes	6	4	3	–

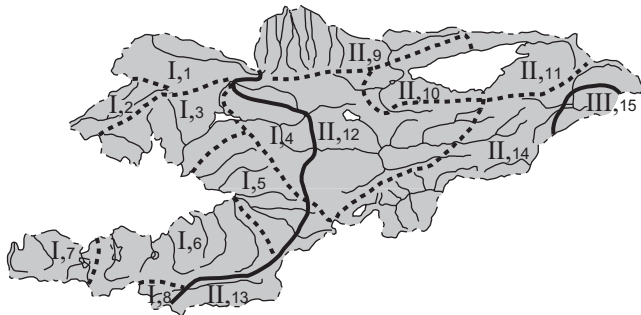


Figure 3: Floristic regions in Kyrgyzstan according to Kamelin (2002). I — Middle Asian province (165 species, 60 genera): (1) Talass district (61 species, 34 genera); (2) Chandalasch district (60/32); (3) Chatkal district (90/34); (4) Kokomeren district (67/35); (5) East Fergana district (81/44); (6) Fergano–Alai district (93/47); (7) Turkestan district (65/37); (8) Daraut–Kurgan district (36/26). II — Dzhungar–Tianshan–Alai province (86/44): (9) Kyrgyz district (62/37); (10) West Issykkul (38/25); (11) East Issykkul district (30/26); (12) Inner Tianshan district (45/24); (13) Zaalai district (28/24); (14) Syrt district (16/12). III — Kashgar province (14/9): (15) — Central Tianshan district (14/9)

Mediterranean floristic region predominate. Among them are tuberous geophytes (27 species) (Figure 4) and other ephemeroïds (38 species); for example, *Prangos*, *Dorema* and *Ferula* are especially interesting. They grow in early spring and become dormant towards the middle of summer. Some *Ferula* species, such as *F. kuhistanica*, reach considerable sizes, up to 2–3m high, while other species are smaller plants. The roots of some *Ferula* species can have masses of up to 25–30kg. Peculiar and numerous Umbelliferae grow on the saline low mountain hills, screes and rock cliffs.

A considerable decrease in species numbers of Umbelliferae is observed on the inner and eastern Tianshan mountains. In these regions the family is represented mainly by perennials with vertical or short horizontal rhizomes (Figure 5). The species compositions of Umbelliferae in the inner regions of Kyrgyzstan are similar to those of the Central Asiatic floristic region.

A comparison of species of Kyrgyzian Umbelliferae with those of adjacent countries has been made (Figure 6). It shows that the greatest similarities are with Uzbekistan (123 species in common), followed by Tajikistan (105), South Kazakhstan (96) and Xinjiang in China (63).

Most Kyrgyzian Umbelliferae (131 species or 67.9%) are



Figure 4: Examples of geophytic species of Kyrgyzian Umbelliferae. (a) *Galagania ferganensis*, (b) *Hyalolaena intermedia*, (c) *Oedibasis apiculata*

endemic to the Middle Asian floristic region and the majority of these species are associated with the West Tianshan and Pamiro–Alai mountain ranges.

References

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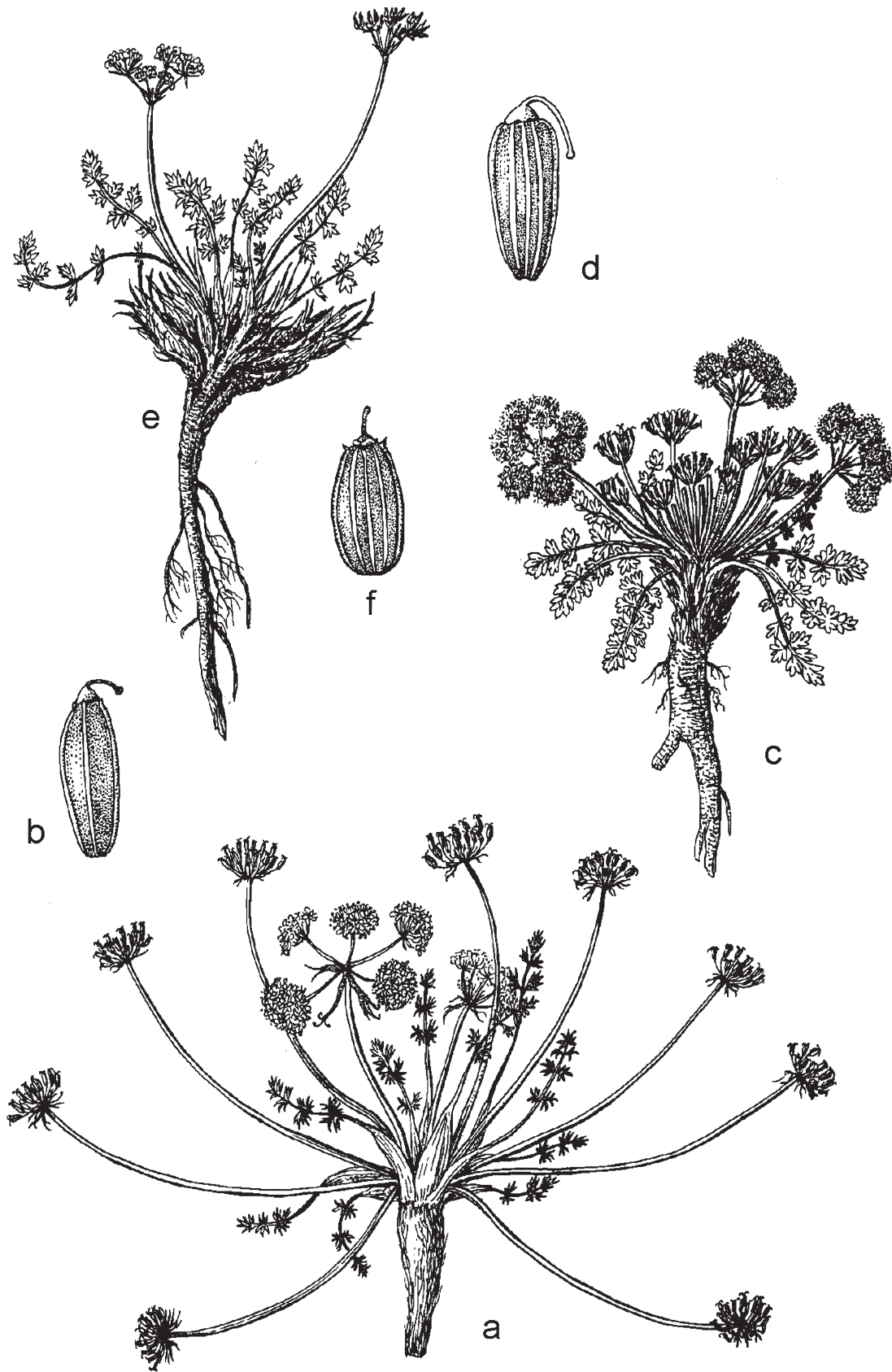


Figure 5: Examples of perennial species of Kyrgyzian Umbelliferae with vertical rhizomes. (a–b) *Schulzia prostrata*; (c–d) *Dimorphosciadium gayoides*; (e–f) *Lomatocarpa korovinii*

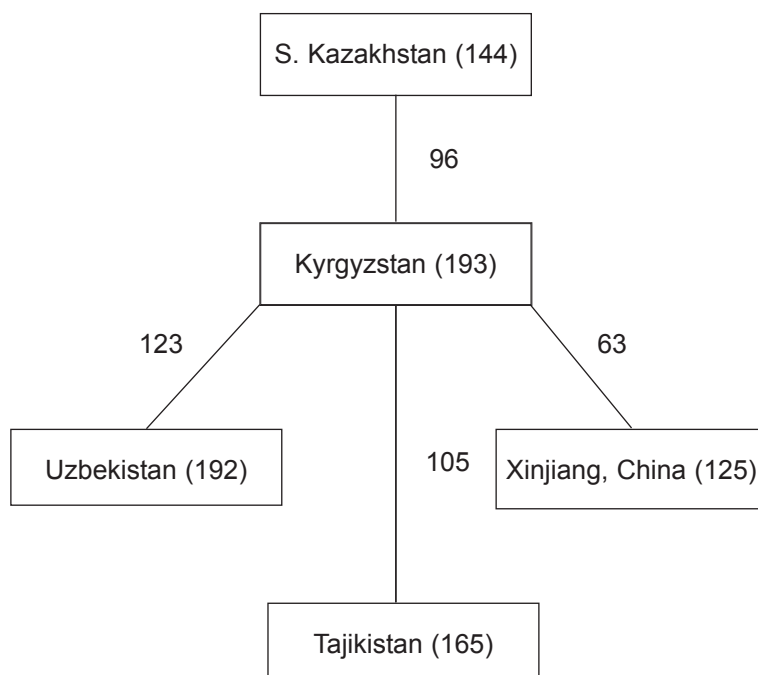


Figure 6: Numbers of Umbelliferae species shared between Kyrgyzstan and adjacent countries

Kljuykov EV (eds) *The Umbelliferae of Kyrgyzstan*. KMK Scientific Press, Moscow, pp. 5–18
 Korovin EP (1961–1962) *Vegetation of Central Asia and Southern Kazakhstan*, Vols 1–2. Tashkent

Pimenov MG, Kljuykov EV (2002) *The Umbelliferae of Kyrgyzstan*. KMK Scientific Press, Moscow, 287pp
 Pimenov MG, Kljuykov EV, Baranova JV, Vassiljeva MG, Lavrova TV, Tomkovich LP (1986) *The Umbelliferae of the Alai Mountain Ridge*. *Botanicheskii Zhurnal* **71**: 487–499k

Appendix 1: List of species of Umbelliferae of Kyrgyzstan (* = endemic species)

- Aegopodium kashmiricum* (Stewart ex Dunn) Pimenov, *A. tadshikorum* Schischk. *Angelica brevicaulis* (Rupr.) B. Fedtsch., *A. decurrens* (Ledeb.) B. Fedtsch., *A. komarovii* (Schischk.) V.N. Tikhom., *A. multicaulis* Pimenov, *A. ternata* Regel & Schmalh., *A. tschimganica* (Korovin) V.N. Tikhom.
- Anthriscus cerefolium* (L.) Hoffm., *A. glacialis* Lipsky, *A. sylvestris* (L.) Hoffm.
- Aphanopleura capillifolia* (Regel & Schmalh.) Lipsky
- Apium graveolens* L., *A. nodiflorum* (L.) Lag.
- Aulacospermum alaicum* Pimenov & Kljuykov*, *A. gonocaulum* Popov, *A. gracile* Pimenov & Kljuykov*, *A. plicatum* Pimenov & Kljuykov*, *A. popovii* (Korovin) Kljuykov, Pimenov & V.N. Tikhom., *A. roseum* Korovin, *A. simplex* Rupr., *A. tenuisectum* Korovin, *A. tianschanicum* (Korovin) C. Norman, *A. turkestanicum* (Franch.) Schischk.
- Berula erecta* (Huds.) Coville
- Bunium chaerophylloides* (Regel & Schmalh.) Drude, *B. intermedium* Korovin, *B. persicum* (Boiss.) B. Fedtsch., *B. salsum* Korovin, *B. setaceum* (Schrenk) H. Wolff
- Bupleurum densiflorum* Rupr., *B. exaltatum* M. Bieb., *B. ferganense* Lincz., *B. gulczense* O. & B. Fedtsch., *B. isphairamicum* Pimenov*, *B. krylovianum* Schischk. ex Kryl., *B. lipskyanum* (Koso-Pol.) Lincz., *B. longifolium* L., *B. rosulare* Korovin ex Pimenov & Sdobn., *B. rotundifolium* L., *B. thianschanicum* Frey
- Carum carvi* L.
- Caucalis platycarpus* L.
- Cicuta virosa* L.
- Cnidocarpa alaica* Pimenov
- Conioselinum tataricum* Fisch. ex Hoffm.
- Conium maculatum* L.
- Cuminum setifolium* (Boiss.) Koso-Pol.
- Daucus carota* L.
- Dimorphosciadium gayoides* (Regel & Schmalh.) Pimenov
- Dorema microcarpum* Korovin
- Echinophora sibthorpiana* Guss.
- Elaeosticta alaica* (Lipsky) Kljuykov, Pimenov & V.N. Tikhom., *E. allioides* (Regel & Schmalh.) Kljuykov, Pimenov & V.N. Tikhom., *E. ferganensis* (Lipsky) Kljuykov, Pimenov & V.N. Tikhom., *E. hirtula* (Regel & Schmalh.) Kljuykov, Pimenov & V.N. Tikhom., *E. knorringiana* (Korovin) Korovin, *E. polycarpa* (Korovin) Kljuykov, Pimenov & V.N. Tikhom., *E. samarkandica* (Korovin) Kljuykov, Pimenov & V.N. Tikhom., *E. transitoria* (Korovin) Kljuykov, Pimenov & V.N. Tikhom., *E. tschimganica* (Korovin) Kljuykov, Pimenov & V.N. Tikhom., *E. ugamica* (Korovin) Korovin
- Eremodaucus lehmannii* Bunge
- Eryngium Biebersteinianum* Nevski, *E. coeruleum* M. Bieb., *E. macrocalyx* Schrenk
- Falcaria vulgaris* Bernh.
- Fergania polyantha* (Korovin) Pimenov
- Ferula akitschkensis* B. Fedtsch. ex Koso-Pol., *F. alaica* Pimenov & Melibaev*, *F. angrenii* Korovin, *F. czatkalensis* Pimenov*, *F. diversivittata* Regel & Schmalh., *F. fedoroviorum* Pimenov*, *F. ferganensis* Lipsky ex Korovin, *F. foetida* (Bunge) Regel, *F. foetidissima* Regel & Schmalh., *F. inciso=serrata* Pimenov & J.V. Baranova*, *F. karatavica* Regel & Schmalh., *F. karataviensis* (Regel & Schmalh.) Korovin, *F. kelleri* Koso-Pol., *F. kirialovii* Pimenov*, *F. kokanica* Regel & Schmalh., *F. korshinskyi* Korovin, *F. kuhistanica* Korovin, *F. leiophylla* Korovin, *F. lipskyi* Korovin, *F. ovina* (Boiss.) Boiss., *F. pallida* Korovin, *F. penninervis* Regel & Schmalh., *F. renardii* (Regel & Schmalh.) Pimenov, *F. rubroarenosa* Korovin, *F. samarkandica* Korovin, *F. schtschurowskiana* Regel & Schmalh., *F. subtilis* Korovin*, *F. tenuisecta* Korovin, *F. transiliensis* (Herder) Pimenov, *F. tschimganica* Lipsky ex Korovin, *F. tschuiensis* Bajt., *F. ugamica* Korovin, *F. varia* (Schrenk) Trautv., *F. vicaria* Korovin
- Galagania ferganensis* (Korovin) M. Vassiljeva & Pimenov, *G. fragrantissima* Lipsky, *G. tenuisecta* (Regel & Schmalh.) M. Vassiljeva & Pimenov
- Heracleum dissectum* Ledeb., *H. lehmannianum* Bunge
- Hyalolaena bupleuroides* (Schrenk) Pimenov & Kljuykov, *H. intermedia* Pimenov & Kljuykov*, *H. issykkulensis* Pimenov & Kljuykov, *H. trichophylla* (Schrenk) Pimenov & Kljuykov, *H. viridiflora* Kljuykov*
- Hymenidium nanum* (Rupr.) Pimenov & Kljuykov
- Hymenolaena pimpinellifolia* Rupr.
- Korshinskya olgae* (Regel & Schmalh.) Lipsky
- Kosopoljanskia hebecarpa* Pimenov & Kamelin*, *K. turkestanica* Korovin
- Kozlovia paleacea* (Regel & Schmalh.) Lipsky
- Krasnovia longiloba* (Kar. & Kir.) Popov
- Lomatocarpa albomarginata* (Schrenk) Pimenov & Lavrova, *L. korovinii* Pimenov
- Mediasia macrophylla* (Regel & Schmalh.) Pimenov
- Mogoltavia narynensis* Pimenov & Kljuykov*, *M. sewerzowii* (Regel) Korovin
- Oedibasis apiculata* (Kar. & Kir.) Koso-Pol., *O. platycarpa* (Lipsky) Koso-Pol., *O. tamerlanii* (Lipsky) Korovin ex Nevski
- Paraligusticum discolor* (Ledeb.) V.N. Tikhom.
- Pastinacopsis glacialis* Golosk.
- Paulita alaica* (Pimenov & Kljuykov) Pimenov & Kljuykov*
- Physocaulis nodosa* (L.) W.D.J. Koch
- Pilopleura tordyloides* (Korovin) Pimenov
- Pimpinella peregrina* L., *P. puberula* (DC.) Boiss.

Appendix 1 cont.

Prangos cachroides (Schrenk) Pimenov & V.N. Tikhom., *P. didyma* (Regel) Pimenov & V.N. Tikhom., *P. fedtschenkoi* (Regel & Schmalh.) Pimenov & V.N. Tikhom., *P. gyrocarpa* Kuzmina*, *P. lipskyi* Korovin, *P. ornata* Kuzmina, *P. pabularia* Lindl., *P. tschimganica* B. Fedtsch.
Pseudotrachydium dichotomum (Korovin) Pimenov & Kljuykov
Scandix pecten-veneris L., *S. stellata* Banks & Soland.
Schrenkia golickiana (Regel & Schmalh.) B. Fedtsch., *S. pulverulenta* Pimenov*, *S. pungens* Regel & Schmalh., *S. ugamica* Korovin, *S. vaginata* (Ledeb.) Fisch. & C.A. Mey.
Schtschurowskia meifolia Regel & Schmalh.
Schulzia albiflora (Kar. & Kir.) Popov, *S. prostrata* Pimenov & Kljuykov
Sclerotaria pentaceros (Korovin) Korovin
Semenovia dasycarpa (Regel & Schmalh.) Korovin ex Czer., *S. heterodonta* (Korovin) Manden., *S. transiliensis* Regel et Herd., *S. zaprjagae* Korovin
Seseli alaicum Pimenov*, *S. buchtormense* (Fisch. ex Spreng.) W.D.J. Koch, *S. eryngioides* (Korovin) Pimenov & V.N. Tikhom.*, *S. fasciculatum* (Korovin) Korovin ex Schischk., *S. giganteum* Lipsky*, *S. karateginum* Lipsky, *S. kaschgaricum* Pimenov & Kljuykov*, *S. korovinii* Schischk., *S. korschinskyi* (Schischk.) Pimenov*, *S. lehmannianum* (Bunge) Boiss., *S. luteolum* Pimenov*, *S. mucronatum* (Schrenk) Pimenov & Sdobn., *S. nemorosum* (Korovin) Pimenov, *S. pelliotii* (H. Boissieu) Pimenov & Kljuykov, *S. schrenkianum* (C.A. Mey. ex Schischk.) Pimenov & Sdobn., *S. sessiliflorum* Schrenk, *S. talassicum* (Korovin) Pimenov & Sdobn., *S. tenellum* Pimenov*, *S. tenuisectum* Regel & Schmalh., *S. unicaule* (Korovin) Pimenov, *S. valentinae* Popov
Seselopsis pusilla Pimenov & Lavrova*
Sium medium Fisch. & C.A. Mey., *S. sisaroides* DC.
Sphaenolobium tianschanicum (Korovin) Pimenov
Tetrataenium olgae (Regel & Schmalh.) Manden.
Torilis arvensis (Huds.) Link, *T. leptophylla* (L.) Reichenb.
Turgenia latifolia (L.) Hoffm.
Vicatia atrosanguinea (Kar. & Kir.) P.K. Mukh. & Pimenov
Zosima korovinii Pimenov
