IDENTIFICATION AIDS FOR *CICER* (*LEGUMINOSAE, CICEREAE*) TAXA

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Identification aids for *Cicer* (*Leguminosae, Cicereae*) taxa are presented. A DELTA format dataset was generated for 42 *Cicer* taxa, on the basis of observation of 214 herbarium specimens and information obtained from the literature. Using the programs KEY, EXPLORE and CONFOR, a dichotomous key, a tabular key, an interactive key and brief descriptions were produced and are presented.

Keywords. Chickpea, DELTA, taxonomy, wild relatives.

INTRODUCTION

The genus *Cicer* L. (*Leguminosae, Cicereae*) comprises nine annual and 33 perennial species which have a centre of diversity in south-western Asia, with remote, endemic species found in Morocco and the Canary Islands (van der Maesen, 1987). The genus is the member of the monogeneric tribe *Cicereae* Alef., subfamily *Papilionoideae*, family *Leguminosae*. It was historically included in the legume tribe *Vicieae* Alef., but Kupicha (1977) presented detailed taxonomic evidence to support the tribal distinction of the genus from the other *Vicieae* genera, *Vicia* L., *Pisum* L., *Lens* Adans., *Lathyrus* L. and *Vavilovia* A. Fed. To this end Kupicha (1977) reinstated the monogeneric tribe *Cicereae* Alef. originally proposed by Alefeld (1859) and provided a detailed generic description (Kupicha, 1981). The genus was revised by van der Maesen (1972), who largely adhered to the classification of Popov (1929). The latter divided the species into two subgenera, *Pseudononis* M. Pop. and *Viciastrum* M. Pop.; four sections, *Monocicer* M. Pop., *Chamaecicer* M. Pop., *Polycicer* M. Pop. and *Acanthocicer* M. Pop.; and 14 series. The major taxonomic divisions were made on the basis of flower size, life span, growth habit, whether the plants are woody or herbaceous and the form of leaf apex, terminating in a tendril, spine or leaflet.

Only one of the 42 species currently recognized is cultivated on a large scale, the chickpea (*Cicer arietinum* L.). Today it is cultivated in a total of 35 countries (Singh, 1990) from the Mediterranean Basin to India, Ethiopia, East Africa and Mexico. It is a major crop in Asia and Africa, which combined account for 96% of total world production. In the period 1985–87, the world production of chickpea was 7.1 million tonnes, from 10 million ha of land. These figures show that the chickpea accounts for almost 15% of the total land area used for cultivation of pulses (Singh, 1990).

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In recent years there has been increasing demand for higher yielding, as well as disease-, insect-, wilt- and drought-resistant, cultivars. Chickpea breeders have increasingly looked to the wild relatives to supply genes to meet this demand, which in turn has stimulated collection and conservation activities of wild *Cicer* species. Interest in the conservation of all *Cicer* species has stimulated the description of three new species, *C. reticulatum* Ladiz. (Ladizinsky, 1975), *C. canariense* A. Santos & G.P. Lewis (Santos Guerra & Lewis, 1985), which was sufficiently distinct to warrant the erection of the monospecific subgenus *Stenophylloma* A. Santos & G.P. Lewis, and *C. luteum* Rassulova & B.A. Sharip. (Rassulova & Sharipova, 1992). The current interest and addition of new taxa has resulted in the need to revise the identification aids to enable accurate identification of the currently described *Cicer* taxa.

METHODS AND RESULTS

A total of 214 herbarium specimens representing 34 of the 42 described *Cicer* species were taken on loan from the herbaria of BM, E, K, RNG and WAG. A character list was drawn up based on the literature (Linczevski, 1948; Ball, 1968; Davis, 1970, 1988; Contandriopoulos et al., 1972; van der Maesen, 1972, 1979, 1987; Zohary, 1972; Townsend & Guest, 1974; Ladizinsky, 1975; Kusmanov, 1976; Jafri, 1980; Santos Guerra & Lewis, 1985; Strid, 1986; Maxted, 1993), and personal observation of specimens. In total 103 characters were used (60 vegetative, 20 inflorescence, 6 legume, 13 seed, 3 phytogeographical, 1 cytological), and for each species each character was scored from herbarium specimens and where this was not possible from the literature. For the eight species where specimens could not be traced or loaned the character states that could be found in the literature were included in the dataset.

The dataset obtained was then converted into DELTA (DEscriptive Language for TAxonomy) format (Dallwitz, 1980; Dallwitz et al., 1996). Subsequently, the dataset was manipulated using the programs KEY (Dallwitz, 1974), CONFOR (Dallwitz, 1980) and EXPLORE (Crust & Maxted, unpublished). KEY was used to generate the dichotomous and tabular keys (see Appendices 1 and 2 respectively). Of the 103 characters recorded (where possible) for each taxon, not all were used in production of the identification aids here presented; 48 characters were used to produce the dichotomous and tabular keys. CONFOR was used to generate the natural language descriptions (see Appendix 3). Geographical distribution and altitudinal range data were collated and have been appended to each description.

The dataset was also incorporated into the experimental interactive identification program EXPLORE. This program holds the identification character matrix in the form of a table of taxa against characters. To identify a new specimen, the user selects a character which is present for the unidentified specimen, records the character state, and all those taxa which do not have that state are eliminated from the table. The

user repeats the process of character selection, scoring and eliminating taxa until one taxon remains and the identification is made.

DISCUSSION

It proved difficult to find 'good' diagnostic characters to include in the identification aids presented here that could be consistently and accurately used to identify the *Cicer* taxa. This was especially true for sect. *Polycicer*. The taxa of this section are obviously closely related and their specific relationships warrant further study.

One of the advantages of multi-access keys over traditional dichotomous keys is that the user is not forced to obtain the identification by passing through the character set in a specific pre-ordained sequence. This allows the user to ignore particular characters or sets of characters and still obtain an identification. For example, if the specimen lacks fruits or seed the identification can be based on vegetative and flower characters alone. Although a printed multi-access key in the form of a tabular key is included (Appendix 2), these keys are now more commonly presented as interactive computer programs. DELTA datasets can be used with any interactive identification program that is DELTA compatible, and in this case the *Cicer* DELTA dataset has been incorporated into the experimental interactive identification program EXPLORE. Unfortunately, the use of the program with the dataset cannot be demonstrated in a printed paper. It can be said, however, that it is effective and useful for the identification of *Cicer* specimens. A copy of the program with the dataset can be obtained by contacting the senior author.

Even though there has been much recent conservation activity focused on *Cicer* taxa, there remains a shortage of available dried material for many species and especially for the rarer taxa from Central Asia. Several species remain known only from their type collection (*Cicer stapfianum* Rech.f. and *C. subaphyllum* Boiss.), and for others very few specimens exist (*C. grande* (M. Pop.) Korotkova, *C. incanum* Korotkova, *C. balcaricum* Galushko, *C. baldshuanicum* (M. Pop.) Lincz.). Confirmation of the continued existence of these species is urgently required, and collection trips to the type localities should be given priority. The existence of other taxa, such as *C. rassuloviae* recorded by Czerepanov (1981) but for which no descriptions could be traced (van der Maesen, 1987), requires verification. Each of these species is poorly known in the taxonomic and ecogeographic sense, and therefore they are difficult to conserve and utilize at present.

Following the second author's attempts to systematically collect *Cicer* taxa from Central Asia (Maxted, 1990; Maxted & Sperling, 1991), it seems likely that each of the recognized species recorded from the region has a much broader geographical distribution than is currently recognized and that there remain several species yet to be described. More collection of specimens and accompanying distribution data is urgently required from this region. The general need for more detailed study of *Cicer* taxa may be illustrated by the case of *C. cuneatum* Hochst. ex Rich., which was thought to be endemic to Ethiopia, until collected from Saudi Arabia in 1982 by

Collenette (*Collenette* 3559, 19 iv 1982, K). Likewise, *C. montbretii* Jaub. & Spach had a known distribution in S Albania, SE Bulgaria and European and Aegean Turkey, and it therefore seemed likely that it would also occur in the adjacent, but relatively unexplored, areas of northern Greece. This hypothesis has recently been confirmed, when a specimen from the region was so determined by the senior author and Per Lasson (*Phitos et al.* 25 vi 1973, UPA).

It can be concluded, however, that Central Asia should be given priority for further collection activities. A shortage of material available from the former USSR, particularly within the new Southern republics, was especially noted during our investigations. Furthermore, it is unlikely that all the species endemic to this region have yet been discovered and described.

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APPENDIX 1

A dichotomous key to Cicer *species*

1a. Annual ——— 2
1b. Perennial ——— 10

2a. Leaves imparipinnate; tendrils absent ——— 3
2b. Leaves paripinnate; rachis terminating in a branched tendril ——— **7. C. cuneatum**

3a. Leaf with 3 flabellate leaflets, with only the apex serrate ——— **9. C. chorassanicum**

3b. Leaf with (3–)5–17, oblong-obovate, obovate or elliptic leaflets, with a margin two-thirds to one-half serrate ____ 4

4a. Seeds echinate ____ 5
4b. Seeds not echinate ____ 6

5a. Leaf with 7–11(–14) leaflets; stipules perular; peduncle 6–11(–15)mm, occasionally ending in an arista, 0.1–1(–2)mm long; seeds obovate ____ **4. C. echinospermum**
5b. Leaf with (3–)5(–7) leaflets; stipules ovate-lanceolate or flabellate; peduncle (1–)3–7mm, ending in an arista 1–3mm long; seeds subglobular ____ **3. C. bijugum**

6a. Corolla length 7–13mm; seeds obovoid or globular, not bilobed, with a circumference of 15–19mm ____ 7
6b. Corolla length 4–9mm; seeds deltoid, bilobed, with a circumference of 7–12mm ____ 8

7a. Plant height 12–50(–100)cm; leaf with (7–)11–17 leaflets; stipules 3–6(–11) × (1–)2–4(–7); arista 0.2–3(–5)mm; seeds smooth or scabrous, not reticulate, colour very variable ____ **1. C. arietinum**
7b. Plant height 20–35cm; leaf with 7–11 leaflets; stipules 1–3 × 1–4mm; arista absent; seeds scabrous, always reticulate, brown to grey ____ **2. C. reticulatum**

8a. Peduncular arista (5–)10–20mm long; stipules perular ____ **8. C. yamashitae**
8b. Peduncular arista 0.5–3(–5)mm long; stipules triangular, ovate-lanceolate or ovate 9

9a. Leaf petiole length 5–12mm; leaflets doubly incised; calyx 4–8mm long; seeds weakly bilobed, 3–4mm long, circumference 7–10mm ____ **5. C. judaicum**
9b. Leaf petiole length (5–)10–17mm; leaflets not doubly incised; calyx 3–6mm long; seeds strongly bilobed, 3–6mm long, circumference 8–12mm ____ **6. C. pinnatifidum**

10a. Leaflets entirely laminate ____ 11
10b. Leaflets mostly spiniform ____ 42

11a. Tendrils present ____ 12
11b. Tendrils absent ____ 29

12a. Leaflets linear, 15–32 × 0.5–1mm; peduncular arista absent (Canary Islands) ____ **12. C. canariense**
12b. Leaflets flabellate, obovate, oblong-obovate, elliptic, oblong or rotundate, up to 27 × 17mm; peduncular arista present ____ 13

13a. Stipules equal to or larger than leaflets ____ 14
13b. Stipules smaller than leaflets ____ 16

14a. Flowers solitary; corolla glabrous; peduncular arista with a small flabellate leaflet at the tip ____ 15
14b. Flowers 1–3 in raceme, corolla pubescent or glabrous; peduncular arista without flabellate leaflet, or very rarely with a clavate leaflet at the tip ____ 16

15a. Flowers purple; peduncle 30–70mm long; pedicel 3–7mm ____ **31. C. fedtschenkoi**
15b. Flowers yellow; peduncle 26–50mm long; pedicel 2–3mm ____ **32. C. luteum**

16a. Leaf (28–)35–60(–75)mm long, with (8–)12–18 leaflets; peduncular arista without leaflet or very rarely with a clavate leaflet at the tip; racemes 1–2-flowered, corolla pubescent ____ **35. C. songaricum**

16b. Leaf (38–)50–140mm long, with (8–)14–28(–37) leaflets; peduncular arista always lacking leaflet at the tip; racemes 1–3-flowered, corolla pubescent or glabrous ——— **36. C. microphyllum**

17a. Plants with minute bracts usually c.1mm; peduncular arista spinose or not, never with a leaflet at the tip; leaflet margins two-thirds to one-half serrate ——— 18
17b. Plants with large flabellate bracts, c.4mm; peduncular arista with a clavate leaflet at the tip, leaflet margins entirely serrate, except at the extreme base ——— 28

18a. Corolla small, 10–15mm long ——— 19
18b. Corolla larger, (10–)15–27mm long ——— 20

19a. Stems sparsely pubescent; leaflets remote; racemes 1–2(–4)-flowered, corolla violet, pubescent or glabrous ——— **15. C. spiroceras**
19b. Stems densely pubescent; leaflets close; racemes 1–2-flowered, corolla cream, glabrous ——— **14. C. oxyodon**

20a. Stems densely pubescent ——— 21
20b. Stems sparsely pubescent ——— 25

21a. Leaf with (3–)8–24(–28) leaflets, each (2–)6–14(–20)mm long ——— 22
21b. Leaf with 8–12 leaflets, each 10–25(–27)mm long ——— **26. C. grande**

22a. Leaf rachis ending in a simple or branched tendril, leaflet or tendrilous leaflet; leaflets crowded; stipules of medium size, (1–)2–7(–14) × (1–)2–7(–12)mm; corolla purple ——— 23
22b. Leaf rachis always ending in a simple tendril; leaflets remote; stipules perular, 1–2 × 0.5–1mm; corolla white or pink ——— **13. C. kermanense**

23a. Plants with glandular and eglandular hairs; (6–)11–20(–28) leaflets per leaf; leaflets not crowded; seeds obovoid ——— 24
23b. Plants with glandular hairs only; (3–)8–14(–18) leaflets per leaf; leaflets crowded; seeds subglobular or obovoid ——— **17. C. anatolicum**

24a. Stems flexuous; leaf ending in a simple or branched tendril (occasionally a leaflet); stipules ovate or flabellate; racemes 1–3-flowered ——— **25. C. flexuosum**
24b. Stems straight; leaf ending in a simple or branched tendril or tendrilous leaflet; stipules triangular; racemes 1–2-flowered ——— **30. C. nuristanicum**

25a. Pubescence eglandular and glandular ——— 26
25b. Pubescence glandular only ——— 27

26a. Plant 30–60cm high; hairs mostly eglandular; leaf ending in a simple or branched tendril, or a leaflet with a tendrilous midrib; 8–16 leaflets per leaf; leaflets rotundate, obovate or flabellate, (5–)10–20(–22) × 4–15mm; calyx 7–9mm ——— **24. C. baldshuanicum**
26b. Plant 60–80cm high; hairs eglandular and glandular; leaf ending in a simple or branched tendril; 16–22 leaflets per leaf; leaflets flabellate, (2–)3–7 × 2–8mm; calyx 10–12mm ——— **29. C. mogoltavicum**

27a. Stems flexuous; leaf ending in a simple tendril or leaflet; number of leaflets 12–16(–18); racemes 2-flowered ——— **18. C. balcaricum**
27b. Stems straight or slightly flexuous; leaf ending in a simple tendril (upper leaflets), leaflet (lower leaves), or a spiny curl; number of leaflets 10–13; racemes 1-flowered ——— **28. C. korshinskyi**

28a. Plants 19–60cm high; pedicels 2–10mm long; racemes 1–6-flowered; seeds globular (Greece) ——— **20. C. graecum**

28b. Plants 10–35cm high; pedicels (4–)7–10(–12)mm long; racemes 1–5-flowered; seeds subglobular (Turkey) — **19. C. floribundum**

29a. Leaf terminating in a leaflet — 30
29b. Leaf terminating in a sturdy spine — 36

30a. Leaflets large, (7–)13–35 × (4–)7–18mm, margin serrate except extreme base; peduncular arista with a clavate leaflet at the tip; racemes 1–6-flowered; corolla white or pale yellow — 31
30b. Leaflets small, (2–)4–13 × 1–7mm, two-thirds to one-half of margin serrate; peduncular arista without clavate leaflet at tip; racemes 1(–2)-flowered; corolla purple, pink or light blue — 33

31a. Stems sparsely pubescent; leaf with 7–13 leaflets; racemes 1–3(–4)-flowered — **22. C. isauricum**
31b. Stems densely pubescent; leaf with (8–)11–19 leaflets; racemes (1–)2–6-flowered — 32

32a. Plant 25–45cm high; racemes (1–)2–5-flowered; corolla white with a purple blotch — **23. C. montbretii**
32b. Plant 40–70cm high; racemes 2–6-flowered; corolla pale yellow **21. C. heterophyllum**

33a. Plant 10–35cm high; leaflets obovate; calyx strongly gibbous; corolla length (13–)16–22mm — 34
33b. Plant 4–16(–25)cm high; leaflets obovate or flabellate; calyx weakly dorsally gibbous; corolla length 5–11(–15)mm — 35

34a. Leaf (19–)22–40mm long, with 7–10 leaflets, ending in a foliate spine or leaflet; stipules flabellate and smaller than leaflets; peduncle 13–20mm long — **34. C. paucijugum**
34b. Leaf (30–)60–130mm long, with 19–35(–41) leaflets, ending in a leaflet; stipules triangular or ovate, equal to or larger than leaflets; peduncle 27–40(–70)mm long — **33. C. multijugum**

35a. Leaf 6–16mm long, with (3–)5–7(–9) leaflets; corolla 5–8(–12)mm long (Greece, Turkey, Syria, Lebanon, Iran, USSR) — **10. C. incisum**
35b. Leaf (5–)15–30mm long, with (3–)9–15 leaflets; corolla 11–15mm long (Morocco) — **11. C. atlanticum**

36a. Stipules mostly spiniform — 37
36b. Stipules entirely laminate — 38

37a. Stipules with double spines, one long, one short, (1–)6–25(–33)mm; leaflets obovate or flabellate; peduncular arista 3–10(–25)mm long; corolla pubescent or glabrous — **40. C. macracanthum**
37b. Stipules with single spines 2–8(–15)mm long, or perular at plant base; leaflets obovate; peduncular arista (4–)10–20(–28)mm long; corolla glabrous — **41. C. acanthophyllum**

38a. Stems sparsely pubescent; leaf rachis grooved or flattened above; leaflets (8–)10–18(–20), rotundate, flabellate or obovate — 39
38b. Stems densely pubescent, leaf rachis grooved above; leaflets 4–12, obovate — 41

39a. Leaf rachis grooved above or not; leaflets rotundate; leaflets crowded; corolla 9–15mm long, pubescent or not — **38. C. rechingeri**
39b. Leaf rachis not grooved above; leaflets flabellate or obovate; leaflets not crowded; corolla 10–25mm long, pubescent — 40

40a. Plant height 15–26cm; branches 6–16(–20)mm long; leaflets 1–3 × 1–3mm, remotely spaced on a 40–50(–60)mm long leaf; peduncular arista 2–7(–9)mm; racemes 1-flowered ——— **42a. C. tragacanthoides** var. **tragacanthoides**

40b. Plant height 11–35cm; branches 15–30(–40)mm; leaflets (1–)2–5 × (1–)2–5mm, not remote, on a (25–)30–60(–90)mm long leaf; peduncular arista (2–)7–15mm; racemes 1–2-flowered ——— **42b. C. tragacanthoides** var. **turcomanicum**

41a. Leaf with 4–6(–10) leaflets; tooth of leaflet midrib pronounced; stipules smaller than leaflets ——— **37. C. pungens**

41b. Leaf with 8–12 leaflets; tooth of leaflet midrib not pronounced; stipules equal to or larger than leaflets ——— **27. C. incanum**

42a. Stems glabrous; leaf terminating in a spiny curl; leaflets remote, all spiniferous ——— **16. C. subaphyllum**

42b. Stems sparsely pubescent; leaf terminating in a spine; leaflets crowded, mostly spiniferous, occasionally with 1–2 pairs of flabellate (3–)5–10 × 3–7mm leaflets on the basal leaves ——— **39. C. stapfianum**

APPENDIX 2

A tabular key to Cicer *species*

Characters 1–12

Species	1	2	3	4	5	6	7	8	9	10	11	12
arietinum	A	12 50(–100)	A/C	A	C	A	25–75	A	C	B	N/A	(7–)11–17
reticulatum	A	20–35	A	A	C	A	15–28(–40)	A	C	B	N/A	7–11
bijugum	A	10–30	A/B/C	A	C	A	(13–)18–25(–44)	A	C	B	N/A	(3–)5(–7)
echinospermum	A	20–35	A	A	C	A	(20–)30–40(–46)	A	C	B	N/A	7–11(–14)
judaicum	A	10–40	A	A	C	A	(14–)20–35(–43)	A	C	B	N/A	7–14
pinnatifidum	A	10–20(–40)	B	A	C	A	(12–)20–40	A	C	B	N/A	5–15
cuneatum	A	20–40(60)	C	A	A	B	30–70(–90)	A	B	A	B	(8–)14–22
yamashitae	A	(10–)21 30	B	A	A	A	10–30	A	C	B	N/A	3–7
chorassanicum	A	5–12(–15)	B/C	A	C	A	12–18(–22)	A	C	B	N/A	3
incisum	B	5–16(–25)	A	A	C	A	6–16	A	C	B	N/A	(3–)5 7(9)
atlanticum	B	4–10	C	B	A	A	(5–)15–30	A	C	B	N/A	(3–)9–15
canariense	B	50–200	C	B	A	B	(40–)70–110	A	B	A	A	32 63
kermanense	B	30–50	B/C	A	C	B	70–100(–130)	A	B	A	A	(6–)16 24
oxyodon	B	20–55	B/C	A	A	B	38–100(–140)	A	B	A	A/B	(4–)10–14(–16)
spiroceras	B	25–75	C	B	A	B	30–90(–120)	A	B	A	A	(5–)8–14(–22)
subaphyllum	B	30–40	B	C	N/A	B	40–100(–140)	A	A	B	N/A	4 14(20)
anatolicum	B	15–45(–60)	A/B	A	C	A/B	(20–)50–70(–110)	A	B/C	A	A/B	(3–)8–14(–18)
balcaricum	B	30–60	C	B	A	A/B	60–100	U	B/C	A	A	12–16(–18)
floribundum	B	10–35	B/C	A	C	A/B	(24–)50 80(–105)	A	B/C	A	A/B	(8–)10–16(–19)
graecum	B	19–60	C	A	C	A/B	(30–)50–100	A	B/C	A	A/B	(6–)11 19
heterophyllum	B	40–70	C	A	A	A	(50–)80–120	A	C	B	N/A	(9–)11–17
isauricum	B	20–40	B/C	B	A	A	30–80	A	C	B	N/A	7–13
montbretii	B	25–45	A/B/C	A	A	A	(42–)60–90(–100)	A	C	B	N/A	(8–)11–19
baldshuanicum	B	30–60	A/B	B	C	B	50–100(150)	A	B/C	A	A/B	8 16
flexuosum	B	30 70	C	A	A	A/B	50–100(–150)	A	B/C	A	A/B	6 20
grande	B	20–50	A/B	A	A	B	60–110	A	B/C	A	A/B	8 12
incanum	B	20–30	C	A	C	B	25–40	U	A	B	N/A	8–12
korshinskyi	B	50–80	A/B	B	A	A/B	40 80	A	A/B/C	A	A	10–13
mogoltavicum	B	60–80	A/C	B	C	B	50–160	A	B	A	A/B	16 22
nuristanicum	B	20–45	A	A	A	A/B	(30–)72–100(–140)	A	B/C	A	A/B	(9–)11–20(–28)
fedtschenkoi	B	14–25(–35)	A	A	C	A/B	30–80(100)	A	B/C	A/B	A	(7–)11–19(–30)
luteum	B	24–29	U	A	A	B	45–110	U	C	B	N/A	6 18
multijugum	B	10–30	B/C	A	A	B	(30–)60–130	A	C	B	N/A	19–35(–41)
paucijugum	B	18 35	A	A	A	B	(19–)22 40	A	A/C	B	N/A	7 10
songaricum	B	15–60	A/B/C	A	A	B	(28–)35 60(–75)	A	B/C	A	A	(8–)12–18
microphyllum	B	20(–40–60)	A/B	A	A	B	(38–)50 140	A	B/C	A	A	(8–)14–28(–37)
pungens	B	15 40	C	A	C	B	(7–)12 30(55)	A	A	B	N/A	4 6(–10)
rechingeri	B	20 40	B/C	B	C	B	(22–)30 50(90)	A/B	A	B	N/A	(8–)10–18(–20)
stapfianum	B	25	C	B	A	B	(20–)30–55	A	A	B	N/A	(4–)6–10
macracanthum	B	(10–)20–50(–60)	C	A	A	B	(13–)25–40(–70)	A	A	B	N/A	(6–)10–18(–22)
acanthophyllum	B	(15–)20–35(–50)	A/C	A	C	B	(20–)32–55(–65)	A	A	B	N/A	8–20
tragacanthoides var.												
tragacanthoides	B	15–26	C	B	C	B	40 50(–60)	B	A	B	N/A	(8–)14–16
tragacanthoides var.												
turcomanicum	B	11–35	C	B	C	B	(25–)30–60(–90)	B	A	B	N/A	(8–)10–16(20)

Characters 13–24

Species	13	14	15	16	17	18	19	20	21	22	23	24
arietinum	C	A	B/D	(5–)10 16(–21)	(3–)7 14	B	A	A	A/B	N/A	3 6(–11)	(1–)2–4(7)
reticulatum	B/C	A	B	4 11	2–4	B	A	A	B	N/A	1–3	1 4
bijugum	C	A	B/C	(5–)7–12(–18)	3–8	B	A/B	A	C/D	N/A	2–5	1–2
echinospermum	C	A	B	4–11(–14)	2–5	B	A/B	A	E	N/A	2–4	1–3
judaicum	C	A	B/C	4–9	1.5–5(–8)	B	B	A	A/B/C	N/A	1 3	1–2(–3)
pinnatifidum	B	A	B	3–8(12)	1.5–5(–7)	B	B	A	C/D	N/A	2–5(–7)	1–2
cuneatum	C	A	B/D	5 9(–12)	1 5	B	A	A	D	N/A	2–7	1 4
yamashitae	C	A	A/B/D	5–17	2–5(–6)	B	B	A	E	N/A	1 2.5	0.5–1(2)
chorassanicum	B	A	E	5–8(10)	3–6(–9)	C	B	A	E	N/A	0.5–1	0.5(–1)
incisum	C	A	C/E	(2–)4 10	1–6	C	B	A	B/D	N/A	2–5	1–3
atlanticum	C	A	C/E	5 10	3–5	C	B	A	A/B	N/A	1–3	2
canariense	C	A	G	15 32	0.5–1	N/A	N/A	A	A	N/A	4–7	1.5–3
kermanense	A	A	E	2–9	5–8(–15)	B/C	A/B	A	E	N/A	1–2	0.5–1
oxyodon	B	A	E	5–10(17)	4–10(–17)	B	A	A	A/B/D	N/A	(1–)2–5	1–3(5)
spiroceras	A	A	E	(2–)4 7(11)	(2–)4 9(–15)	C	A	A	D/E	N/A	1–5	0.5–1
subaphyllum	A	B	N/A	2–8	U	N/A	N/A	A	E	N/A	1–4	0.5 1(–2)
anatolicum	C	A	C/D	6–14(20)	4–13	B	A	A	A	N/A	1–6(–14)	(1–)3 7(–12)
balcaricum	U	A	B/C/E	10 15	U	B	U	A	C	N/A	5–7	U
floribundum	C	A	B/D	(6–)10–16(20)	4–8(–10)	A	A	A	A/D	N/A	(3–)5 9(–12)	2–6(–10)
graecum	B/C	A	A/C/D	6–16(–22)	3–7(10)	A	A/B	A	A/B	N/A	4 8(–12)	2–8
heterophyllum	B	A	A/C/D	16 35	6 18	A	A/B	A	A	N/A	3–6	2 3
isauricum	C	A	A/B	7 25	(5–)9–12(–16)	A	A/B	A	A/E	N/A	2–5	1–2(–3)
montbretii	C	A	A/B/D	(8–)13 22(27)	(4–)7–10(–13)	A	A/B	A	A/B	N/A	(3–)5–8(–10)	3–6(–8)
baldshuanicum	B	A	C/E/F	(5)10–20(–22)	4–15	B/C	B	A	D	N/A	4–8	U
flexuosum	B	A	C/D/E	4–11(–15)	(2–)4–8(–12)	B	A/B	A	B/D	N/A	2–5(7)	2–4(–8)
grande	C	A	B/D	10–25(–27)	6–12	B	U	A	D/E	N/A	5–10	5–9
incanum	U	A	C	2–6	4–5	U	B	A	U	N/A	3 7	U
korshinskyi	C	A	C/D	(5–)10 17(–20)	(4–)6 10(–13)	B	U	A	B/D	N/A	5–10	5–12
mogoltavicum	A	A	E	(2)3 7	2 8	C	A	A	D/E	N/A	2–4	1 4
nuristanicum	B	A	C	(5)8 14(–18)	(4)6 10(–13)	B	A/B	A	A	N/A	(1–)2–5(–7)	9 12
fedtschenkoi	C	A	C	5 10(–15)	3 7(–10)	B	A	A	A/B	N/A	7–12(–15)	5–8(–13)
luteum	U	A	C	5 11	U	B	U	A	A	N/A	9–15	U
multijugum	C	A	C	(3–)5–13	(2–)4–7	B	A	A	A/B	N/A	5–13	3–9
paucijugum	C	A	C	4–11	3–6	B	A	A	D	N/A	2–7	2 7
songaricum	B/C	A	C	(2)6 10(–15)	(2)4–8	B/C	A/B	A	A/B/D	N/A	(3–)5–11	(2–)6–12
microphyllum	C	A	C/D	4 10(–14)	3–7(–10)	B	A/B	A	B/C	N/A	3–10(16)	(2–)4–10(–15)
pungens	B/C	A	C	(3–)6–11	3–7(–9)	C	A	A	B/E	N/A	2 6(–8)	(0.5–)2 5
rechingeri	B/C	A	F	1–5	1–5	C	A	A	E	N/A	2–6	0.5 1(–2.5)
stapfianum	C	A/B	E	3 9	(3–)5–10	B	U	A	E	N/A	2–5	1–3
macracanthum	B/C	A	C/E	1.5–6(–8)	1.5–5	C	A	B	N/A	B	(1)6–25(–33)	0.5
acanthophyllum	B	A	C	2–6(–8)	(1–)3 5	B/C	A	B	N/A	A	2–8(–15)	0.5–1(2)
tragacanthoides var.												
tragacanthoides	A	A	C/E	1–3	1–3	C	A/B	A	E	N/A	1 3	1–2
tragacanthoides var.												
turcomanicum	B	A	C/E	(1–)2–5	(1–)2–5	C	A/B	A	E	N/A	1–3(4)	0.5–2

Characters 25–36

Species	25	26	27	28	29	30	31	32	33	34	35	36
arietinum	1(–2)	(5–)13–18(–30)	A	0.2–3(–5)	B	B	A/B	(5)8 11(–14)	B	A/C/D/F	7 9(13)	B
reticulatum	1	(3–)6 11	B	N/A	N/A	N/A	A	3–13	B	D	8–12	B
bijugum	1	(1–)3–7	A	1–3	B	B	A	5–8	B	C/D	5 10	B
echinospermum	1	6–11(–15)	A/B	0–1(–2)	B	B	A	(5–)7–12	B	D	(5)7 12	B
judaicum	1(–2)	(3–)7–20	A	0.5–3	B	B	A	(3–)5–9	B/C	D/F	4 6	B
pinnatifidum	1	(3)5 20(–30)	A	0.5 3(5)	B	B	A	4–10	B	C/D	5–9	B
cuneatum	1	(6–)10–20(–30)	A	1–6(–12)	B	B	A	3–7	B	C/D	7 10	B
yamashitae	1	4–9(–15)	A	(5–)10–20	B	B	A	2 5	B/C	C	7	B
chorassanicum	1(–2)	(1.5–)2–6	A	2 10	B	B	A	2 6	B	A/C	3–6	B
incisum	1(–2)	7–20(40)	A/B	0.5–2(4)	B	B	A	8–16(–27)	B	C/D/F	5–8(–12)	B
atlanticum	1	5–15	A	2–5	B	B	A	3–7	B	C/D	11–15	B
canariense	1–4(–7)	35–100	B	N/A	N/A	N/A	B	5 15	B/C	C/E	12 20	B
kermanense	1–2	20 30(–60)	A	4 10(–20)	A	B	A	6 11	A	A/C	18	U
oxyodon	1 2	(10–)15–40(70)	A	(2–)6–10 (–20)	B	B	A/B	(2–)4–8(–10)	A	B/G	10 15	B
spiroceras	1–2(–4)	(9)15–25(–40)	A	(2)6 13	A	B	A	4 7(10)	B	E	10–13(–15)	A/B
subaphyllum	1–2	(10)20–36(–46)	A	3–15	A	B	A	5–10	B	U	8–11	B
anatolicum	1 2	(12–)25–50	A	3–10(–14)	A/B	B	A	4–10(–13)	A	D	(10)16–25	A
balcaricum	2	35–45	A	5 11	A	B	U	3 10(–12)	B	D	20–25	A/B
floribundum	1–5	(17)45 67	A	2–7	B	C	C	(4–)7–10(12)	A	D/E	12–18	B
graecum	1 6	30–68	A	4–8(–13)	B	C	C	2–10	A	D	11–25	B
heterophyllum	2–6	36 100	A	6 15	B	C	A	7 10	A	G	18–20	B
isauricum	1–3(–4)	25–30(38)	A	4–12	A/B	C	A/B	4–10	A	A	9–21	B
montbretii	(1)2–5	30–52(–60)	A	(7–)11–16	B	C	A	(4–)7–12	A	A	16–20(–28)	B
baldshuanicum	1–2	30–60	A	5–10	B	B	A	6–11	A/B	D	20	U
flexuosum	1–3	11 30(–80)	A	5 15(–18)	A	B	A/B	5 12	A	D	15–27	A
grande	1–2	30 40	A	3	A	B	A	7–10	A	U	23	A
incanum	1–2	15–25	A	U	A	B	U	U	A/B	U	20	A
korshinskyi	1	25–60	A	4–9	A	U	U	U	A/B	U	20	U
mogoltavicum	(1)2	25–55	A	5–12	B	B	A	5–10	A	E	15 20(–22)	A
nuristanicum	1–2	30 50	A	7 16	A/B	B	A	(2)6 12	A	D	15–25	A
fedtschenkoi	1	30–70	A	(2–)8–11	B	A	A	3 7	A	D	(18–)20 25 (–30)	B
luteum	1	26 50	A	U	B	A	B	2–3	A	G	20–28	B
multijugum	1	27 40(70)	A	(2–)6–9	B	B	A	(3–)5–9	A	D/E	16–22	B
paucijugum	1	13–20	A	6–7	B	B	A	5–11	A	D	(13–)18–23	B
songaricum	1–2	16–25(–45)	A	(1–)7–16	B	B/C	A/B	6–11	A	D	19 25(31)	A
microphyllum	1–3	(14–)19 45(–66)	A	(1–)5 14	A/B	B	A	(4–)7–12	A	D	(17–)20–25	A/B
pungens	1(2)	(12–)15–30(–50)	A	7–15(–20)	A	B	B	(2–)6–10(–14)	A	D	(11–)16–25	A
rechingeri	1–2	(14–)24–30(–40)	A	(5–)9–15	A	B	A	3 7(–10)	A	D	9 15	A/B
stapfianum	1–2	20 30	A	5–12	A	B	U	7	B	U	18	B
macracanthum	1(–3)	12–23(–50)	A	3–10(–25)	A	B	A	5 13	A	D	12–25	A/B
acanthophyllum	1(–2)	(15–)26–42(–70)	A	(4–)10–20 (–28)	A	B	A	6–10(–15)	A	D	10 22	B
tragacanthoides var.												
tragacanthoides tragacanthoides var.	1	15–25	A	2 7(–9)	A	B	A	4 7	A	D	10 22	A
turcomanicum	1–2	(12)20 25	A	(2–)7 15	A	B	A	6–11(15)	A	D/E	14–25	A

Characters 37–47

Species	37	38	39	40	41	42	43	44	45	46	47
arietinum	B/D	A/B	4–14	17	B	B	A/B	4–8(–15)	A	5–12	B
reticulatum	B	B	5–9	15–19	B	A	A/B	U	A	3–8	B
bijugum	C	B	4–8	7–12	A	B	A/B	5–8	A	4–8	B
echinospermum	B	B	7	U	A	B	A	U	A	4–9	B
judaicum	E	B	3–4	7–10	B	B	A	5–12	A	4–8	A
pinnatifidum	E	B	3–6	8–12	B	B	B	(5–)10–17	A	3–6	A
cuneatum	D	B	3–4	9–10	B	B	B	U	A	4–10	B
yamashitae	E	B	4–5	8–12	B	B	B	U	A	4–8	A
chorassanicum	B	B	4–6	9–12	B	B	B	10–23	A	3–6	B
incisum	B/C	B	3–4	10	B	B	B	U	A	5–8	B
atlanticum	A	B	U	U	B	B	B	U	A	6–10	B
canariense	C/D	B	3–5	9–12	B	B	B	U	A	9–13	B
kermanense	B	B	4–6	9–11	B	B	B	U	A	6–13	U
oxyodon	B/C/D	B	5–6	U	B	B	B	10–35	A	7–15	B
spiroceras	B/C	B	4–6	12	B	B	B	U	A	6–15	B
subaphyllum	B	B	5	U	B	U	U	U	A	8–14	B
anatolicum	B/C	B	3–7	12–13	B	B	B	3–5	A	5–16	B
balcaricum	B	B	4–5	U	U	U	B	U	A	11–14	B
floribundum	C	B	3–4	3–4	B	B	B	U	A	10–16	B
graecum	D	U	4	4	B	U	B	U	A	8–15	B
heterophyllum	U	U	U	U	U	U	B	U	A	10–12	U
isauricum	C	B	U	U	U	U	B	U	A	8–14	U
montbretii	B	B	3–6	11–12	B	B	A/B	3–4	A	9–17	B
baldshuanicum	U	U	U	U	U	U	B	U	A	7–9	U
flexuosum	B	B	4–7	12–13	B	B	B	U	A	7–14	B
grande	B	B	7	U	B	B	B	U	A	7–10	B
incanum	U	U	U	U	U	U	B	U	B	7–10	U
korshinskyi	U	U	U	U	U	U	A/B	U	A	15	U
mogoltavicum	B	B	5	U	B	B	B	U	A	10–12	B
nuristanicum	B	B	5.5	U	B	B	B	U	A	6–13	B
fedtschenkoi	E	B	4	U	B	B	B	U	B	8–15	A
luteum	U	U	U	U	U	U	B	U	B	13–14	U
multijugum	E	B	3	U	B	B	B	U	B	5–13	B
paucijugum	U	U	U	U	U	U	B	U	A	8–13	U
songaricum	B	B	5–7	U	B	B	B	U	B	8–15	B
microphyllum	B	B	3–5	10–12	B	B	B	U	B	7–16	B
pungens	B	B	5–6	11–13	B	B	B	U	A	7–10	B
rechingeri	U	U	U	U	U	U	B	U	A	8–11	U
stapfianum	B	B	5	U	U	U	B	U	A	10	B
macracanthum	B	B	3–5	11–12	B	B	B	U	N/A	5–11	B
acanthophyllum	B	B	4–5	10	B	B	B	U	N/A	5–10	B
tragacanthoides var.											
tragacanthoides	C	B	5–6	U	B	B	B	U	A	4–8	B
tragacanthoides var.											
turcomanicum	C	B	5–6	11	B	B	B	U	A	5–10	B

Characters

1. Life cycle: A, annual; B, perennial.
2. Plant height (cm).
3. Stem orientation: A, straight; B, slightly flexuous; C, flexuous.
4. Stem pubescence: A, pubescent; B, sparsely pubescent; C, glabrous.
5. Plant pubescence: A, glandular; B, eglandular; C, glandular and eglandular.
6. Leaves: A, imparipinnate (with a terminal leaflet); B, paripinnate (without a terminal leaflet).
7. Rachis length (mm).
8. Rachis: A, grooved above; B, not grooved above.
9. Rachis terminating in a: A, spine; B, tendril; C, leaflet.

10. Tendrils: A, present; B, absent.
11. Tendril form: A, simple; B, branched.
12. Number of leaflets on rachis.
13. Leaflets: A, remote; B, neither remote nor crowded; C, crowded.
14. Leaflets: A, laminate; B, spiniferous.
15. Lamina shape: A, oblong; B, oblong-obovate; C, obovate; D, elliptic; E, flabellate; F, rotundate; G, linear.
16. Leaflet length (mm).
17. Leaflet width (mm).
18. Leaflet margin: A, entirely serrate; B, top two-thirds serrate; C, only apex serrate.
19. Tooth of leaflet midrib: A, pronounced; B, not pronounced.
20. Stipules: A, laminate; B, spiniferous.
21. Stipule shape: A, triangular; B, ovate; C, ovate-lanceolate; D, flabellate; E, perular (scale-like).
22. Spiny stipule form: A, single spine; B, double spine.
23. Stipule length (mm).
24. Stipule width (mm).
25. Flower raceme number or range.
26. Peduncle length (mm).
27. Peduncle type: A, ending in arista; B, not ending in arista.
28. Arista length (mm).
29. Arista form: A, spinose; B, not spinose.
30. Arista form: A, with tiny flabellate leaflet at tip; B, without leaflet at tip; C, with clavate leaflet at tip.
31. Bract shape: A, triangular, less than or equal to 1mm; B, triangular, more than 1mm; C, flabellate, large, c.4mm, dentate.
32. Pedicel length (mm).
33. Calyx base: A, strongly dorsally gibbous; B, weakly dorsally gibbous; C, not dorsally gibbous.
34. Corolla colour: A, white; B, cream; C, pink; D, purple; E, violet; F, light blue; G, pale yellow.
35. Corolla length (mm).
36. Corolla pubescence: A, pubescent; B, glabrous.
37. Seed shape: A, ovoid; B, obovoid; C, subglobular; D, globular; E, deltoid.
38. Seed coat texture: A, smooth; B, rough.
39. Seed length (mm).
40. Seed circumference (mm).
41. Seed surface: A, echinate; B, not echinate.
42. Seed surface: A, reticulate; B, not reticulate.
43. Leaflet dentation: A, doubly incised; B, not doubly incised.
44. Rachis petiole length (mm).
45. Laminate stipules: A, smaller than leaflets; B, equal to or larger than leafets.
46. Total calyx length (mm).
47. Seeds: A, bilobed; B, not bilobed.

U, unknown; N/A, not applicable.

APPENDIX 3

Short species descriptions with ecogeographic notes

1. C. arietinum L., Sp. Pl. 2: 738 (1753). Type: Spain or Italy, Hortus Cliffortianus 370 (lecto. BM).

Erect annual, 12–50(–100)cm tall. *Leaves* imparipinnate, 25–75mm long, with (7–)11–17 oblong-obovate to elliptic leaflets, (5–)10–16(–21) × (3–)7–14mm. *Stipules* triangular to ovate, 3–6(–11) × (1–)2–4(–7)mm. *Racemes* 1(–2)-flowered, corolla white, pink, purple or light blue. *Seeds* obovoid or globular, smooth or rough but never reticulate or echinate, large, very variable in colour. Whole plant very variable. Cultivated species (chickpea). $2n = 14$, 16, 24, 32, 33. Widespread in cultivation in the semi-arid tropics and warm temperate zones at (0–)110–2400m. Not found naturally outside cultivation, but escapes occur.

2. C. reticulatum Ladiz. in Notes RBG Edinb. 34: 201–202 (1975). Type: Turkey, Mardin Prov., near Dereici, c.9km E of Savur on gulley, edge of vineyard, *Ladizinsky* s.n. (holo. HUJ).

Prostrate to erect annual, 20–35cm tall. *Leaves* imparipinnate, 15–28(–40)mm, with 7–11 oblong-obovate sometimes doubly incised leaflets, 4–11 × 2–4mm. *Stipules* ovate, 1–3 × 1–4mm. *Racemes* 1-flowered, arista absent, corolla purple. *Seeds* obovoid, large, circumference 15–19mm, reticulate. Flowering May–June. $2n = 16$. Turkey; 650–1100m.

3. C. bijugum Rech.f. in Ark. Bot., n.s. 1: 510 (1952). Type: Syria, Azaz, *Haradjian* 4442 (holo. G).

Prostrate to erect annual, 10–30cm tall. *Leaves* imparipinnate, (13–)18–25(–44)mm long, with (3–)5(–7) oblong-obovate or obovate leaflets, (5–)7–12(–18) × 3–8mm. *Stipules* ovate-lanceolate or flabellate, 2–5 × 1–2mm. *Racemes* 1-flowered, corolla pink or purple. *Seeds* subglobular, circumference 7–12mm, echinate. Flowering (April–)May–June. $2n = 16$. N Iran, N Iraq, N Syria, SE Turkey; 500–1300m.

4. C. echinospermum P.H. Davis in Notes RBG Edinb. 29: 312 (1969). Type: Turkey, Urfa, Tel Pinar, *Sintenis* 747 (holo. K).

Prostrate or erect annual, 20–35cm tall. *Leaves* imparipinnate, (20–)30–40(–46)mm long, with 7–11(–14) oblong-obovate leaflets, 4–11(–14) × 2–5mm. *Stipules* perular, 2–4 × 1–3mm. *Racemes* 1-flowered, corolla purple. *Seeds* obovoid, echinate. Flowering May. $2n = 16$. N Iraq, Turkey; 600–1100m.

5. C. judaicum Boiss., Diagn. Pl. Orient., Ser. 2(9): 130 (1849). Type: Palestine, Jerusalem, *Boissier* s.n. (holo. G).

Prostrate to erect annual, 10–40cm tall. *Leaves* imparipinnate, (14–)20–35(–43)mm long, with 7–14 doubly incised, obovate or oblong-obovate leaflets, 4–9 × 1.5–5(–8)mm. *Stipules* triangular, ovate or ovate-lanceolate, 1–3 × 1–2(–3)mm. *Racemes* 1(–2)-flowered, corolla purple or light blue. *Seeds* deltoid, circumference 7–10mm, weakly bilobed. Flowering March–May. $2n = 16$. Israel, Lebanon; 0–500m.

6. C. pinnatifidum Jaub. & Spach in Ann. Sci. Nat. sér. 2(18): 227 (1842). Type: Asia Minor, *Montbret* s.n. cultiv. at Paris (P).

Prostrate to erect annual, 10–20(–40)cm tall. *Leaves* imparipinnate, (12–)20–40mm long, with 5–15 oblong to obovate leaflets, 3–8(–12) × 1.5–5(–7)mm. *Stipules* ovate-lanceolate or flabellate, 2–5(–7) × 1–2mm. *Racemes* 1-flowered, corolla pink or purple. *Seeds* deltoid, circumference 8–12mm, strongly bilobed. Flowering March–June. $2n = 16$. Armenia, N Iraq, N Syria, Turkey; 250–1500m.

7. C. cuneatum Hochst. ex A. Rich., Tent. Fl. Abyss. 1: 195 (1847). Type: Ethiopia, near Gapdiam in Tigre, Schimper Sect. 2: 810 (lecto. P).

Erect or climbing annual, 20–40(–60)cm tall. *Leaves* paripinnate, 30–70(–90)mm long, terminating in a ramified tendril (the only annual species with tendrils), with (8–)14–22 oblong-obovate or elliptic leaflets, 5–9(–12) × 1–5mm. *Stipules* flabellate, 2–7 × 1–4mm. *Racemes* 1-flowered, corolla pink or purple. *Seeds* globular, circumference 9–10mm. Flowering October–November in Ethiopia, January–February in Egypt. $2n = 16$. Egypt, Ethiopia, Saudi Arabia; 1000–2200m.

8. C. yamashitae Kitam., Acta Phytotax. Geobot. 16: 135 (1956). Type: Afghanistan, between Sarobi and Kabul, *Yamashita & Kitamura* s.n. (holo. KY).

Prostrate or erect perennial, (10–)21–30cm tall. *Leaves* imparipinnate, 10–30mm long, with 3–7 oblong, oblong-obovate or oblong-elliptic leaflets, 5–17 × 2–5(–6)mm. *Stipules* perular, 1–2.5 × 0.5–1(–2)mm. *Racemes* 1-flowered, arista very long, (5–)10–20mm, corolla pink. *Seeds* deltoid, circumference 8–12mm, colour very variable. Flowering May–June. $2n = 16$. Afghanistan; 900–2800m.

9. C. chorassanicum (Bunge) Popov in Trudy Prikl. Bot. 21(1): 180 (1929). Type: Iran, Khorassan Mts near Ssabzewar, *Bunge* s.n. (holo. G).

Prostrate or erect annual, 5–12(–15)cm tall. *Leaves* imparipinnate, 12–18(–22)mm long, with 3 flabellate leaflets, 5–8(–10) × 3–6(–9)mm. *Stipules* perular, 0.5–1 × 0.5(–1)mm. *Racemes* 1(–2)-flowered, corolla white or pink. *Seeds* obovoid, circumference 9–12mm. Flowering (April–)May–July. $2n = 16$. N and C Afghanistan, N and NE Iran; 1400–3300m.

10. C. incisum (Willd.) K. Malý in Ascherson & Graebner, Syn. Mittel-Europ. Fl. 6(2): 900 (1909). Type: Crete, herb. Willdenow (holo. B).

Prostrate perennial, 5–16(–25)cm tall. *Leaves* imparipinnate, 6–16mm long, with (3–)5–7(–9) obovate or flabellate leaflets, (2–)4–10 × 1–6mm. *Stipules* ovate to flabellate, 2–5 × 1–3mm. *Racemes* 1(–2)-flowered, corolla pink, purple or light blue. *Seeds* obovoid or subglobular, circumference c.10mm. Flowering (May–)June–August(–September). $2n = 16$. Armenia, Greece (including Crete), Georgia, Iran, Lebanon, Syria, Turkey; 1400–2740m.

11. C. atlanticum Coss. ex Maire in Bull. Soc. Hist. Nat. Afr. Nord 19: 42 (1928). Type: Morocco, Mt Gourza, Goundafa, *Humbert & Maire* (lecto. P).

Prostrate perennial, 4–10cm. *Leaves* imparipinnate, (5–)15–30mm long, with (3–)9–15 obovate or flabellate leaflets, 5–10 × 3–5mm. *Stipules* triangular or ovate, 1–3 × 2mm. *Racemes* 1-flowered, corolla pink or purple. *Seeds* ovoid. Flowering June–August. Morocco; 2700–2900m.

12. C. canariense A. Santos Guerra & G.P. Lewis in Kew Bull. 40: 459–462 (1986). Type: Canary Islands, La Palma, Caldera de Taburiente, alluvial soils in pine forest near Lomo de Las Chozas, 1200m, *Santos & Feranadez* s.n. (holo. ORT).

Erect perennial, 50–200cm tall. *Stems* sparsely pubescent. *Leaves* paripinnate, (40–)70–110mm long, terminating in a simple tendril, with 32–63 linear leaflets, 15–32 × 0.5–1mm. *Stipules* triangular, 4–7 × 1.5–3mm. *Racemes* 1–4(–7)-flowered, arista absent, corolla pink or violet. *Seeds* subglobular or globular, circumference 9–12mm. Flowering August–September. $2n = 24$. Canary Islands; 900–1400m.

13. C. kermanense Bornm. in Bull. Herb. Boiss. sér. 2(5): 969 (1905). Type: Iran, Kerman Prov., Kuh-i-Dschupar, *Bornmüller* 3678 (lecto. JE).

Erect or shrubby perennial, 30–50cm tall. *Leaves* paripinnate, 70–100(–130)mm long, terminating in a simple tendril, with (6–)16–24, remote, flabellate leaflets, 2–9 × 5–8(–15)mm. *Stipules* perular, 1–2 × 0.5–1mm. *Racemes* 1–2-flowered, corolla white or pink. *Seeds* obovoid, circumference 9–11mm. Flowering May–June(–July). SE Iran; 2300–3300m.

14. C. oxyodon Boiss. & Hohen., Diagn. Pl. Orient., Ser. 1(9): 129 (1849). Type: Iran, Elburz Mt, Uston Bag near Passgala, *Kotschy* 287 (holo. P).

Erect perennial, 20–55cm tall. *Leaves* paripinnate, 38–100(–140)mm long, terminating in a simple or branched tendril, with (4–)10–14(–16) flabellate leaflets, 5–10(–17) × 4–10(–17)mm. *Stipules* triangular, ovate or flabellate, (1–)2–5 × 1–3(–5)mm. *Racemes* 1–2-flowered, corolla cream or pale yellow. *Seeds* obovoid to globular. Flowering (May–)June–July. Afghanistan, Iran, N Iraq; 500–2980m.

15. C. spiroceras Jaub. & Spach in Ann. Sci. Nat. sér. 2(18): 233 (1842). Type: Iran, Isfahan, *Aucher-Eloy* 1126 (holo. P).

Erect or shrubby perennial, 25–75cm tall. *Stems* sparsely pubescent. *Leaves* paripinnate, 30–90(–120)mm long, terminating in a simple tendril, with (5–)8–14(–22), remote, flabellate leaflets, (2–)4–7(–11) × (2–)4–9(–15)mm. *Stipules* flabellate or perular, 1–5 × 0.5–1mm. *Racemes* 1–2(–4)-flowered, corolla violet, pubescent or glabrous. *Seeds* obovoid, or subglobular, circumference c.12mm. Flowering May–July(–August). Iran; 1600–3500m.

16. C. subaphyllum Boiss., Diagn. Pl. Orient., Ser. 1(6): 44 (1845). Type: Iran, Fars Prov., Kuh-Ajub Mts, Mt Jobi near Persepolis, *Kotschy* 403 (holo. P).

Erect to shrubby perennial, 30–40cm tall. Plants glabrous except pedicels and calyx. *Leaves* paripinnate, 40–100(–140)mm long, terminating in a spiny curl. Tendrils absent, with 4–14(–20), spiniferous, remote leaflets, 2–8mm long. *Stipules* perular, 1–4 × 0.5–1(–2)mm. *Racemes* 1–2-flowered, arista spinose, pedicels and calyx pubescent. *Seeds* obovoid. Flowering May. Iran; 2000m.

17. C. anatolicum Alef. in Bonplandia 9: 349 (1861). Type: Turkey, in shrubs on the Boz dag, *Boissier* s.n. (holo. G).

Erect perennial, 15–45(–60)cm tall. *Leaves* imparipinnate or paripinnate, (20–)50–70(–110)mm long, terminating in a simple or branched tendril or leaflet with a tendrilous midrib, with (3–)8–14(–18), obovate or elliptic leaflets, 6–14(–20) × 4–13mm.

Stipules triangular, 1–6(–14) × (1–)3–7(–12)mm. *Racemes* 1–2-flowered, corolla purple, pubescent. *Seeds* obovoid to subglobular, circumference 12–13mm. Flowering May–August(–September). $2n = 14$, 16. Armenia, NW and W Iran, N Iraq, Turkey; 500–4200m.

18. C. balcaricum Galushko in Novosti Sist. Vyssh. Rast. 6: 174–176 (1970). Type: USSR-Balkarskaya ASSR, Balcaria, Caucasus, source of Baksan River, near Elbrus village, 25 viii 1964, *Galushko & Kurdjashova* (holo. LE).

Erect or shrubby perennial, 30–60cm tall. *Stems* sparsely pubescent. *Leaves* imparipinnate or paripinnate, 60–100mm long, terminating in a simple tendril or leaflet, with 12–16(–18), oblong-obovate, obovate, elliptic or flabellate leaflets, 10–15mm long. *Stipules* ovate-lanceolate, 5–7mm long. *Racemes* 2-flowered, corolla purple, pubescent or glabrous. *Seeds* obovoid. Flowering July–August. Armenia, Azerbaijan, Georgia; 2000m.

19. C. floribundum Fenzl, Pug. Pl. Nov. Syr. 1: 4 (1842). Type: Turkey, Taurus Mts, Gülek, *Kotschy* 167 (holo. W).

Erect perennial, 10–35cm tall. *Leaves* imparipinnate or paripinnate, (24–)50–80(–105)mm long, terminating in a simple or branched tendril, or leaflet, with (8–)10–16(–19) oblong to elliptic leaflets, (6–)10–16(–20) × 4–8(–10)mm. *Stipules* triangular or flabellate, (3–)5–9(–12) × 2–6(–10)mm. *Racemes* 1–5-flowered; arista with clavate leaflet at the tip; bracts flabellate, large (c.4mm) and dentate; corolla purple or violet. *Seeds* subglobular, circumference 3–4mm. Flowering June–July. $2n = 14$. S Turkey; 800–1700m.

20. C. graecum Orph., in Boiss., Diagn. Pl. Orient., Ser. 2(2): 43 (1856). Type: Greece above Trikkala, Mt Kyllene, *Orphanides* 578 (holo. P).

Erect perennial, 19–60cm tall. *Leaves* imparipinnate or paripinnate, (30–)50–100mm long, terminating in a simple or branched tendril, or a leaflet with a tendrilous midrib, with (6–)11–19 oblong or elliptic leaflets, 6–16(–22) × 3–7(–10)mm; margin entirely serrated except extreme base. *Stipules* triangular or ovate, 4–8(–12) × 2–8mm. *Racemes* 1–6-flowered, peduncle ending in an arista or bract; arista with a clavate leaflet at the tip; bracts flabellate, c.4mm, dentate; corolla purple. *Seeds* globular, circumference 4mm. Flowering June–July. Greece; 1000–1400m.

21. C. heterophyllum Contandr. et al., Biol. Gallo-Hellen. 4(1): 12–15 (1972). Type: Turkey, Antalya Prov., forests of *Pinus brutia* and *Quercus cerris* between Manavgat and Akseki, 3km S of Didere, N exposition, 1100m, sample 6-J-3 (holo. MARSSJ).

Erect perennial, 40–70cm tall. *Leaves* imparipinnate, (50–)80–120mm long, with (9–)11–17 oblong, obovate or elliptic leaflets, of two sizes, 25–35 × 6–12mm, or 15–25 × 12–18mm; leaflets entirely serrated except extreme base. *Stipules* triangular, 3–6 × 2–3mm. *Racemes* 2–6-flowered; arista with a clavate leaflet at the tip; corolla pale yellow. Flowering July. $2n =$ 16. Turkey; 1100m.

22. C. isauricum P.H. Davis in Notes RBG Edinb. 29: 311 (1969). Type: Turkey, Antalya Prov., Akseki, *Huber-Morath* 17174 (holo. Hb).

Erect perennial, 20–40cm tall. *Stems* sparsely pubescent. *Leaves* imparipinnate, 30–80mm long, with 7–13 oblong-obovate leaflets, 7–25 × (5–)9–12(–16)mm; leaflets entirely serrated except extreme base. *Stipules* triangular or perular, 2–5 × 1–2(–3)mm. *Racemes* 1–3(–4)-

flowered; arista with a clavate leaflet at the tip; corolla white. *Seeds* subglobular. Flowering June–July(–August). $2n=16$. S Turkey; 1000–1750m.

23. C. montbretii Jaub. & Spach in Ann. Sci. Nat. sér. 2(17): 229 (1842). Type: Turkey, Kaz Dag, (Mt Gargaro, Gassadagh), *Aucher-Eloy* 1146 (holo. P).

Erect perennial, 25–45cm tall. *Leaves* imparipinnate, (42–)60–90(–100)mm long, with (8–)11–19 oblong to oblong-obovate or elliptic leaflets, (8–)13–22(–27) × (4–)7–10(–13)mm; leaflets entirely serrated except extreme base. *Stipules* triangular or ovate, (3–)5–8(–10) × 3–6(–8)mm. *Racemes* (1–)2–5-flowered; peduncle ending in an arista with a clavate leaflet at the tip; corolla white with a purple blotch. *Seeds* obovoid, circumference 11–12mm. Flowering March–June(–August). $2n=16$, 24. S Albania, SE Bulgaria, N Greece, European and Aegean Turkey; 0–1200m.

24. C. baldshuanicum (Popov) Lincz. in Not. Syst. Herb. Inst. Bot. Acad. Sci. USSR 9: 112 (1949). Type: USSR-Tadzhik SSR, lower Darvaz Mts between Chovaling and Yakh-su rivers, from Zagara pass to Jakh-su River, *Michelson* 1428 (holo. LE).

Erect perennial, 30–60cm tall. *Stems* mostly eglandular pubescent. *Leaves* imparipinnate or paripinnate, 50–100(–150)mm long, terminating in a simple or branched tendril, or a leaflet with a tendrilous midrib, with 8–16, rotundate, obovate or flabellate leaflets, (5–)10–20(–22) × 4–15mm. *Stipules* flabellate, 4–8mm long. *Racemes* 1–2-flowered, corolla purple. Flowering April–July. Tadzhikistan; 1600–2000m.

25. C. flexuosum Lipsky in Acta Hort. Petrop. 23: 102 (1904). Type: USSR-Kazakh SSR, Kuletschek, Karatau, *Regel* 200 (lecto. LE).

Erect or shrubby perennial, 30–70cm tall. *Leaves* imparipinnate or paripinnate, 50–100(–150)mm long, terminating in a simple or branched tendril, or rarely a leaflet, with 6–20 obovate, flabellate or elliptic leaflets, 4–11(–15) × (2–)4–8(–12)mm. *Stipules* ovate or flabellate, 2–5(–7) × 2–4(–8)mm. *Racemes* 1–3-flowered, corolla purple, pubescent. *Seeds* obovoid, circumference 12–13mm. Flowering May–July. S Kirgizistan, Tadzhikistan, Uzbekistan; 500–2400m.

26. C. grande (Popov) Korotkova in Bot. Mater. Gerb. Inst. Bot. Zool. Acad. Nauk Uzbeksk. SSR 10: 18 (1948). Type: USSR-Uzbeck SSR, Pamir-alai, Kugitant, *Popov & Vvedensky* 494 (lecto. TAK).

Erect perennial, 20–50cm tall. *Leaves* paripinnate, 60–110mm long, terminating in a simple or branched tendril, or a leaflet with a tendrilous midrib, sparsely pubescent, with 8–12 oblong-obovate or elliptic leaflets, 10–25(–27) × 6–12mm. *Stipules* flabellate or perular, 5–10 × 5–9mm. *Racemes* 1–2-flowered, corolla pubescent. *Seeds* obovoid. Flowering June. Uzbekistan; 1000–2000m.

27. C. incanum Korotkova in Bot. Mater. Gerb. Inst. Bot. Zool. Acad. Nauk Uzbeksk. SSR 10: 17 (1948). Type: USSR-Tadzhik SSR, W Pamir-alai, Jakkabag-darja, *Botshantshev & Butkov* 720 (holo. TAK).

Erect perennial, 20–30cm tall. *Leaves* paripinnate, 25–40mm long, terminating in a spine, with 8–12 obovate leaflets, 2–6 × 4–5mm; teeth of leaflet midribs not pronounced. *Stipules* 3–7mm long, equal to or larger than the leaflets. *Racemes* 1–2-flowered, corolla pubescent. Flowering August. Tadzhikistan; 2000–3000m.

28. C. korshinskyi Lincz. in Not. Syst. Herb. Inst. Bot. Acad. Sci. USSR 9: 110 (1949). Type: USSR-Tadzhik SSR, Darvaz Mts, Imam-askara Mt., *Linczevski* 1179 (holo. LE).

Erect perennial, 50–80cm tall. *Stems* sparsely pubescent. *Leaves* imparipinnate or paripinnate, 40–80mm long, terminating in a spiny curl, simple tendril or a leaflet, with 10–13, obovate or elliptic leaflets, (5–)10–17(–20) × (4–)6–10(–13)mm. *Stipules* ovate or flabellate, 5–10 × 5–12mm. *Racemes* 1-flowered. Flowering June–August. Iran, Tadzhikistan; 2500–2600m.

29. C. mogoltavicum (Popov) Koroleva, Fl. Tadzhik. 5: 600 (1937). Type: USSR-Tadzhik SSR, Mogol-Tau Mts, Katar-Buluk, *Popov & Vvedensky*, Herb. As. Med. 264 (holo. TAK).

Shrubby perennial, 60–80cm tall. *Stems* sparsely pubescent. *Leaves* paripinnate, 50–160mm long terminating in a simple or branched tendril, with 16–22, remote, flabellate leaflets, (2–)3–7 × 2–8mm. *Stipules* flabellate or perular, 2–4 × 1–4mm. *Racemes* (1–)2-flowered, corolla violet, pubescent. *Seeds* obovoid. Flowering April–June. Tadzhikistan; 1500m.

30. C. nuristanicum Kitam. in Acta Phytotax. Geobot. 16: 136 (1956). Type: Afghanistan, Nuristan, Voma-Chatrass, *Kitamura* s.n. (holo. KY).

Erect perennial, 20–45cm tall. *Leaves* paripinnate or imparipinnate, (30–)72–100(–140)mm long, terminating in a simple or branched tendril, or a leaflet with a tendrilous midrib, with (9–)11–20(–28), obovate leaflets, (5–)8–14(–18) × (4–)6–10(–13)mm. *Stipules* triangular, (1–)2–5(–7) × 2–5mm. *Racemes* 1–2-flowered, corolla purple, pubescent. *Seeds* obovoid. Flowering June–July(–August). E Afghanistan, India (Kashmir), N Pakistan; 2134–4600m.

31. C. fedtshenkoi Lincz. in Not. Syst. Herb. Inst. Bot. Acad. Sci. USSR 9: 108 (1949). Type: USSR-Tadzhik SSR, Schugnan, Badzhan-kutal, 27 vii 1904, *Fedtschenko* (holo. LE).

Erect perennial, 14–25(–35)cm tall. *Leaves* imparipinnate or paripinnate, 30–80(–100)mm long, terminating in a simple tendril or a leaflet with a tendrilous midrib, with (7–)11–19(–30), obovate leaflets, 5–10(–15) × 3–7(–10)mm. *Stipules* triangular or ovate, 7–12(–15) × 5–8(–13)mm, equal to or larger than the leaflets. *Racemes* 1-flowered; arista with a small flabellate leaflet at the tip; corolla purple. *Seeds* deltoid. Flowering June–August. N and NE Afghanistan, Iran, S Kirghizistan, Tadzhikistan; 2500–4200m.

32. C. luteum Rassulova & B.A. Scharip. in Izv. Akad. Nauk Respubl. Tadzhik. Otd. Biol. Nauk. 1: 51–52 (1992). Type: USSR-Tadzhik SSR, Vachanici, Jschkaschim, between Kalik-Dara and Charvik, forest at 3900m, 4 viii 1962, *Kurbanbekov* 539 (holo. TAD).

Erect perennial, 24–29cm tall. *Leaves* imparipinnate, 45–110mm long, with 6–18, obovate leaflets, 5–11mm. *Stipules* equal to or longer than leaflets. *Racemes* 1-flowered; arista with a small flabellate leaflet at the tip; corolla yellow. Flowering July–August. Tadzhikistan; 3900–4000m.

33. C. multijugum Maesen in Meded. Landbouwhogeschool 72(10): 91 (1972). Type: Afghanistan, Koh-i-Baba, *Köie* 2630 (holo. C).

Erect perennial, 10–30cm tall. *Leaves* imparipinnate, (30–)60–130mm long, with 19–35(–41) obovate leaflets, (3–)5–13 × (2–)4–7mm. *Stipules* triangular or ovate, 5–13 × 3–9mm, equal to or larger than leaflets. *Racemes* 1-flowered, corolla purple or violet. *Seeds* deltoid. Flowering June–July(–August). Afghanistan; 3000–4200m.

34. C. paucijugum (Popov) Nevski in Acta Inst. Bot. Acad. Sci. USSR sér. 1(4): 260 (1937). Type: USSR-Servshan above Chodsha-i-fil village, Kugitang-tau, *Nevski* 485 (holo. LE).

Erect perennial, 18–35cm tall. *Leaves* imparipinnate, (19–)22–40mm long, terminating in a foliate spine or leaflet, with 7–10 obovate leaflets, 4–11 × 3–6mm. *Stipules* flabellate, 2–7 × 2–7mm. *Racemes* 1-flowered, corolla purple. Flowering June–July. E Kazakhistan, Tadzhikistan; 2900m.

35. C. songaricum Stephan ex DC, Mém. Légum. 8: 349 (1825). Type: USSR-Songaria (Dzhungarskyi Alatou), *Stephan* ex herb. Prescott (holo. OXF).

Erect or shrubby perennial, 15–60cm tall. *Leaves* paripinnate, (28–)35–60(–75)mm long, terminating in a simple tendril or a leaflet with a tendrilous midrib, with (8–)12–18, obovate leaflets, (2–)6–10(–15) × (2–)4–8mm. *Stipules* triangular, ovate or flabellate, (3–)5–11 × (2–)6–12mm, equal to or larger than leaflets. *Racemes* 1–2-flowered, arista without or rarely with a clavate leaflet at the tip, corolla purple, pubescent. *Seeds* obovoid. Flowering (May–)June–July(–August). E Kazakhistan, Kirghizistan, Tadzhikistan, Uzbekistan; 1000–4000m.

36. C. microphyllum Benth., in Royle, Ill. Bot. Himal. 200 (1839). Type: India, Himachal Pradesh, Shalkur (Hungarung), *Royle* s.n. (holo. K).

Erect perennial, (20–)40–60cm tall. *Leaves* paripinnate, (38–)50–140mm long, terminating in a simple tendril or a leaflet with a tendrilous midrib, with (8–)14–28(–37) obovate or elliptic leaflets, 4–10(–14) × 3–7(–10)mm. *Stipules* triangular, ovate, ovate-lanceolate or flabellate, 3–10(–16) × (2–)4–10(–15)mm, equal to or larger than the leaflets. *Racemes* 1–3-flowered, corolla purple, pubescent or glabrous. *Seeds* obovoid, circumference 10–12mm. Flowering June–July(–September). $2n = 14, 16$. E Afghanistan, China, India (Kashmir), Nepal, Pakistan, Tadzhikistan; (2000–)2500–4600(–5600)m.

37. C. pungens Boiss., Diagn. Pl. Orient., Ser. 2(2): 44 (1856). Type: Afghanistan, Yomutt near Kabul, *Griffith* 1608 (holo. K).

Flexuous, erect, spiny, perennial, 15–40cm tall. *Leaves* paripinnate, (7–)12–30(–55)mm long, terminating in a spine, with 4–6(–10) subsessile, obovate leaflets, (3–)6–11(–13) × 3–7(–9)mm. *Stipules* ovate or perular, 2–6(–8) × (0.5–)2–5mm. *Racemes* 1(–2)-flowered, corolla purple, pubescent. *Seeds* obovoid, circumference 11–13mm. Flowering (May–)June–July(–August). $2n = 14$. Afghanistan, W Tadzhikistan; (1800–)2300–4200m.

38. C. rechingeri Podlech in Mitt. Bot. Staatssamml. München 6: 587 (1967). Type: Afghanistan, Baghlan, Middle Andarab Valley, NE of Deh-Salah in the Upper Kasan Valley, 2400m, *Podlech* 11700 (holo. M).

Erect perennial, 20–40cm tall. *Leaves* paripinnate, (22–)30–50(–90)mm long, grooved above or not, terminating in a spine, with (8–)10–18(–20) rotundate leaflets, 1–5 × 1–5mm. *Stipules* perular, 2–6 × 0.5–1(–2.5)mm. *Racemes* 1–2-flowered, corolla purple, pubescent or glabrous. Flowering July–August. Afghanistan; 2400–3600m.

39. C. stapfianum Rech.f. in Bot. Jahrb. Syst. 75: 339 (1951). Type: Iran, Fars Prov., Kuh-e-Bul NNE of Shiraz, *Stapf* 625 (holo. W).

Shrubby perennial, c.25cm tall. *Stems* sparsely pubescent. *Leaves* paripinnate, (20–)30–55mm long, terminating in a spine, with (4–)6–10 spiniferous leaflets, 3–9mm long, sometimes with 1 or 2 pair(s) of glabrous, flabellate leaflets, (3–)5–10 × 3–7mm on basal leaves. *Stipules* perular, 2–5 × 1–3mm. *Racemes* 1–2-flowered, corolla glabrous. *Seeds* obovoid. Flowering August. Iran; 4000m.

40. C. macracanthum Popov in Bull. Univ. As. Centr. 15, suppl.: 16 (1927). Type: USSR-Tadzhik SSR, Pamir-alai, Guralash, *Popov* in Herb. As. Med. 205 (holo. TAK).

Erect perennial, (10–)20–50(–60)cm tall. *Leaves* paripinnate, (13–)25–40(–70)mm, terminating in a spine. Tendrils absent, with (6–)10–18(–22) obovate or flabellate leaflets, 1.5–6(–8) × 1.5–5mm. *Stipules* double spines, (1–)6–25(–33)mm long, (one long, one short). *Racemes* 1(–3)-flowered, corolla purple, pubescent or glabrous. *Seeds* obovoid, circumference 11–12mm. Flowering June–August. Afghanistan, India (Kashmir), Iran, N Pakistan, Tadzhikistan, Turkestan, Uzbekistan; (1200–)2743–4250m.

41. C. acanthophyllum Boriss. in Novosti Sist. Vyssh. Rast. 6: 167 (1970). Type: USSR-Tadzhik SSR: Pamir, Schach-Darja River, *Korshinky* s.n. (holo. LE).

Erect or shrubby perennial, (15–)20–35(–50)cm high. *Leaves* paripinnate, (20–)32–55(–65)mm long, terminating in a spine, with 8–20 obovate leaflets, 2–6(–8) × (1–)3–5mm. *Stipules* single spines, 2–8(–15)mm long, or perules on lower leaves. *Racemes* 1(–2)-flowered, corolla purple. *Seeds* obovoid, circumference c.10mm. Flowering July–August. Afghanistan, India (Kashmir), N Pakistan, Tadzhikistan; 2500–4000m.

42. C. tragacanthoides Jaub. & Spach in Ann. Sci. Nat. Bot. sér. 2(18): 234 (1842). Type: Iran, Elamout Mts, *Aucher-Eloy* 4337 (holo. P).

Erect perennial, 11–35cm tall. *Stems* sparsely pubescent. *Leaves* paripinnate, (25–)40–60(–90)mm long, not grooved above, terminating in a spine, with (8–)10–16(–20), flabellate or obovate leaflets, 1–5 × 1–5mm. *Stipules* perular, 1–3(–4) × 0.5–2mm. *Racemes* 1–2-flowered, corolla purple or violet, pubescent. *Seeds* subglobular, circumference c.11mm. Flowering June–July(–August). Afghanistan, Iran, S Turkmenia; 1500–3800m.

42a. C. tragacanthoides var. **tragacanthoides**

Erect perennial, 15–26cm tall. *Stems* sparsely pubescent. *Leaves* paripinnate, 40–50(–60)mm long, not grooved above, terminating in a spine, with (8–)14–16, remote, flabellate or obovate leaflets, 1–3 × 1–3mm. *Stipules* perular, 1–3 × 1–2mm. *Racemes* 1-flowered, corolla purple, pubescent. *Seeds* subglobular. Flowering June–July(–August). Afghanistan, Iran, S Turkmenia; 1500–3800m.

42b. C. tragacanthoides var. **turcomanicum** Popov in Trudy Prikl. Bot. 21(1): 232 (1929). Type: USSR-Turkman SSR, Kopet-dagh Mts, Karanka gorge near Ashkhabad, *Litwinow* 243 (lecto. LE).

Erect perennial, 11–35cm tall. *Stems* sparsely pubescent. *Leaves* paripinnate, (25–)30–60(–90)mm long, not grooved above, terminating in a spine, with (8–)10–16(–20), flabellate or obovate leaflets, (1–)2–5 × (1–)2–5mm. *Stipules* perular, 1–3(–4) × 0.5–2mm. *Racemes* 1–2-flowered, corolla purple or violet, pubescent. *Seeds* subglobular, circumference c.11mm. Flowering June–July(–August). Iran, S Turkmenia; 1500–3000m.

Species dubia

C. rassuloviae Lincz. (Czerepanov, 1981: 230).