

A TAXONOMIC REVISION OF COUSINIA, SECT. CYNAROIDES (ASTERACEAE, CARDUEAE) IN THE FLORA OF IRAN

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In this study, a taxonomic revision of the genus *Cousinia* Cass. sect. *Cynaroides* Bunge for the flora of Iran is presented. Ten new species, *C. shiraziana*, *C. denaensis*, *C. lurestanica*, *C. ardalensis*, *C. pasargadensis*, *C. sahandica*, *C. gaharensis*, *C. silvanica*, *C. arakensis* and *C. kurdestanica* are described and illustrated. *Cousinia anoplophylla*, *C. mozaaffarianii*, *C. lactiflora*, *C. shulabadensis*, *C. aligudarzensis*, *C. zardkuhensis*, *C. disfulensis*, *C. jacobsii*, *C. kermanshahensis*, *C. kirrindica*, *C. mobayenii*, *C. eriocephala*, *C. zagrica*, *C. qaradaghensis*, *C. grantii*, *C. shebliensis*, *C. rhombiformis*, *C. phyllocephala*, *C. khorramabadensis*, *C. iranica*, *C. straussii*, *C. hamadanensis*, *C. fursei*, *C. millefontana*, *C. caroli-henrici*, *C. sardashtensis*, *C. kornhuberi*, *C. elwendensis*, *C. ecbatanensis*, *C. parsana*, *C. farsistanica*, *C. perspolitana*, *C. khansaricus*, *C. stroterolepis*, *C. sefidiana*, *C. sabalanica*, *C. behboudiana*, *C. nana*, *C. sanandajensis*, *C. dalahuensis*, *C. bornmulleri* and *C. monocephala* are known as distinct species comparing to the last published revision of the section. A complete description of *C. lordeganensis* is also given. An identification key to all Iranian taxa, description of all species including some data on type materials, synonyms and distribution are provided. The photographs of capitulum, achenes and bracts of some species are given in order to provide an exact comparison between the species. Based on the present study the number of the species of the section in Iran is 77 which among them 66 taxa are endemic to Iran.

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مروری تاکسونومیکی بر بخش سینارویدس از جنس کوزینیا (تیره کاسنی) در ایران

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بخش سینارویدس از جنس کوزینیا (تیره کاسنی) مورد بازنگری تاکسونومیکی قرار می‌گیرد. تاکسون‌های زیر به عنوان تاکسون‌های جدید شرح داده می‌شوند.

Cousinia shiraziana, *C. denaensis*, *C. lurestanica*, *C. pasargadensis*, *C. sahandica*, *C. gaharensis*, *C. silvanica*, *C. arakensis*, *C. kurdestanica*, *C. ardalensis*.

تاکسون‌های زیر یکبار دیگر در مقایسه با آخرین مطالعه گروه به عنوان تاکسون‌های مستقل شناخته می‌شوند.

Cousinia shiraziana, *C. anoplophylla*, *C. mozaaffarianii*, *C. lactiflora*, *C. shulabadensis*, *C. aligudarzensis*, *C. zardkuhensis*, *C. disfulensis*, *C. jacobsii*, *C. kermanshahensis*, *C. kirrindica*, *C. mobayenii*, *C. eriocephala*, *C. zagrica*, *C. qaradaghensis*, *C. grantii*, *C. shebliensis*, *C. rhombiformis*, *C. phyllocephala*, *C. khorramabadensis*, *C. iranica*, *C. straussii*, *C. hamadanensis*, *C. fursei*, *C. millefontana*, *C. caroli-henrici*, *C. sardashtensis*, *C. kornhuberi*, *C. elwendensis*, *C. ecbatanensis*, *C. parsana*, *C. farsistanica*, *C. perspolitana*, *C. khansaricus*, *C. stroterolepis*, *C. sefidiana*, *C. sabalanica*, *C. behboudiana*, *C. nana*, *C. sanandajensis*, *C. dalahuensis*, *C. bornmulleri*, *C. monocephala*.

شرح گونه *C. lordeganensis* تکمیل می‌شود. همچنین کلید شناسایی، اطلاعاتی در مورد تیپ‌ها، مترادف‌ها و پراکنش گونه‌ها ارائه می‌گردد.

تصاویر کپه‌ها، براکته‌ها و فندقه‌های تعدادی از گونه‌ها برای مقایسه ارائه می‌شود. برپایه تحقیق حاضر تعداد گونه‌های این بخش در ایران به

۷۷ می‌رسد که از میان آنها تعداد ۶۶ تاکسون اندمیک ایران است.

INTRODUCTION

Phytogeography, distribution and diversity centers

The genus *Cousinia* was first described by Cassini (1827), probably in honor of Louis Cousin (a French academician), including a species named *C. carduiiformis* Cass. (Tscherneva 1962). Adams (1805) had already described this species as *Carduus orientalis*. Koch (1851) made a new combination and applied the name "*Cousinia orientalis* (Adams) C. Koch." for this species which is the type species of the genus (Tscherneva 1962).

Cousinia with about 700 species (Tscherneva 1962, Rechinger 1972, 1979 & 1986, Attar & Ghahreman, 2006, Susanna & Garcia-Jacas 2006) is one of the most diverse genera in Central and SW Asia. *Cousinia* is not only of the largest genus of *Asteraceae* but also the largest in the *Arctium* group of the tribe *Cardueae*, subtribe *Carduinae* (Mabberley 1990, Haffner 2000, Susanna *et al.* 2003).

Cousinia with more than 400 species in SW Asia has the most concentration in the Flora Iranica area, out of which 379 are endemics, distributed in mountainous regions of Iran, Afghanistan and Turkmenistan (Rechinger 1986, Knapp 1987).

Four diversification centers of the genus are Pamir-Alaj (with 169 species, 130 endemics), W Tianshan (with 62 species, 41 endemics), NE and NW Afghanistan (with 80 species, 44 endemics). In addition, there are four other important diversity centers in west region such as the mountainous areas of Kopetdagh (59 and 33 species in Iran and Turkmenistan respectively), Elbourz mountains (66 species), northern part of Zagros mountains (44 species) and Azerbaijan (36 species). Likewise, in the eastern parts the number of the species is sharply decreased toward the Turanian lowlands, in the western centers of diversity the number of the species is also rapidly reduced (Tscherneva 1962, 1974, Rechinger 1986, Knapp 1987).

Section *Cynaroides* Bunge with 89 species (Tscherneva 1962, Rechinger 1972, 1979, Huber-Morath 1975) is the largest section of the genus. All species belong to the section are Irano-Turkestanian elements (Rechinger 1986) and mostly have a very limited distribution area and occupy very small isolated places. Towards the west, the number of species of the section decreases, so that Iraq and Turkey each has 17 and 8 species respectively. Therefore, Iran with 77 taxa, of which 66 are endemics, seems to be the centre of diversity of the section (Attar & Ghahreman 2006). Most of the Iranian species are found in mountains ranges of Elbourz, Zagros and remote mountains of central part of Iran. Towards the east, the number of species is so sharply reduced in a way that, in Khorasan

province and lowlands of Semnan province the number of species is very low (Attar & Ghahreman, 1999). In the desertic area of central Iran members of *Cousinia* are completely absent (Knapp 1987). After Iran, Iraq with 17 species and Pakistan with only one species are the richest and the poorest countries regarding the species richness in the section *Cynaroides*.

Historical review

Based on involucre bracts forms, De Candolle (1837) explained 34 species of the genus in three groups: 1) bracts linear and recurved, 2) bracts linear but erect, 3) bracts appendiculate (leaf-shaped or not). According to the Rechinger's classification (Rechinger 1972, 1979), the third group, including nine species, corresponds to the section *Cynaroides* Bunge.

Based on plant duration (annual or perennial) and some morphological characters like receptacle bristles (smooth or scabrous), achene's surface (smooth or costate), anther tube (hairy or glabrous), involucre bracts status (imbricate, spread or recurved), bracts form (appendiculate or exappendiculate), species of the genus were divided into two series and four subseries, including 14 sections (Boissier 1875). One of these sections was the section *Cynaroides* Bunge, including 27 species, all with appendiculate bracts. Among these species, *C. adnata* Bunge, has not distinct section in Rechinger's classification, *C. squarrosa* Boiss., was considered as a synonym of *C. calocephala* Jaub. & Spach and *C. xiphiolepis* Boiss., was transferred to the section *Sphaerocephalae* Bunge.

Winkler (1892, 1897) grouped the genus into three subgenera based on status of hilum; *Cousinia* subgenus *Oligochaete* with straight hilum, subgenera *Eucousinia* and *Dichantia* with oblique hilum. The second subgenus *Eucousinia*, was divided into 19 sections based on receptacle bristles' and length proportion of bristle to achene. In recent taxonomic treatments, most species of the three sections, *Foliaceae*, *Appendiculatae* and *Constrictae*, are grouped to the section *Cynaroides* Bunge.

Tscherneva (1962) in Flora of U.S.S.R placed 272 species into the ca. 50 sections, without presenting any identification key for the sections. Indeed, she used mainly Yuzepchuk's classification from Tajikistan (1940), which is a part of her unpublished manuscript. In this classification, characters like plant duration (annual, biennial, perennial), basal leaves (present or absent), receptacle bristles (smooth or scabrous), involucre form, corolla color, bracts form (appendiculate or exappendiculate) have been used.

Huber-Morath (1975) in Flora of Turkey classified 38 species of the genus and grouped them into five sections. The most important morphological characters

were used are as follows: corolla length, corolla color, bracts form (erect, spread or recurved), bract's appendages (appendages present or absent), plant indumentum (glandular, hairy and papillose or glabrous). Out of these species, nine species included in section *Cynaroides* Bunge.

In Rechinger's classification (1972, 1979), 353 species of the genus belonging to the Flora Iranica area were studied. According to the characters like: plant habit, duration, annual or perennial, spiny or not, leaves decurrent or not, median bracts appendiculate or not, bracts margin spinulose or smooth, flower numbers per heads, leaf segments form, corolla color, the species were placed into 12 groups including 53 sections. Species with decurrent leaves and appendiculate bracts were placed in section *Cynaroides* Bunge. However, in this classification, two species namely *Cousinia orthoclada* Hausskn. & Bornm and *C. meshhedensis* Bornm. & Rech. f., with decurrent leaves and appendiculate bracts do not fit into in any sections. Although, *C. meshhedensis* morphologically seems to belong to the section *Cynaroides* Bunge, but, the base chromosome number in this species is $x=13$ (Ghaffari, 1984), which is different from the other species of the section *Cynaroides* Bunge, $x=12$ (Aryavand 1975, Afzal-Rafii 1980, Tscherneva 1985, Ghaffari 1984, 1986, 1987, Ghaffari *et al.* 2000, Susanna *et al.* 2003b, Ghaffari *et al.* 2006). Study of the genus *Cousinia* started by the authors from 1996 and is still going on up to now. Taxonomy of Sect. *Cynaroides* was a part of the first author's work in the Ph. D project (Attar 2000).

Mehregan & Kadereit (2008) in an extensive taxonomic revision of *Cousinia* sect. *Cynaroides*, reduced the number of species of this section from 110 into almost one third i.e. 31 species. They based their studies mostly on an extension of morphological differences among the species and widening the geographical distribution of the species. Therefore, many different distinct species considered as synonymy. Whereas, with considering that the involucre characters (including the number, shape and texture of bracts, which varies considerably) play an important role in the taxonomy of the genus as well as the section (Rechinger 1986). Extension of morphological differences and synonymy of several species do not seem logical. Moreover, as the papus in *Cousinia* is brittle and cannot be completely dispersed, it causes the extremely limited area of many species (Rechinger 1986). With this knowledge, synonymy of several species, belonging to different habitats (inside or outside of oak forests or in semi-desert steppes in different elevations) and different ecological requirements is controversial.

The first author in a joint project has been preparing the draft of *Cousinia* sect. *Cynaroides* and some other sections for the Flora of Iran (Assadi 1987). The aim of this paper is to present a taxonomic revision of the section including key to the species, describing new species, presenting short description of the species and selected specimens.

Morphology of sect. *Cynaroides*

Section *Cynaroides* has various morphological characters. Two main morphological characters of the section are decurrent leaves and appendiculate bracts. More other characters are as follows:

Duration. Almost all of the species of sect. *Cynaroides* are monocarpic biennial or perennial, but there are few polycarpic species as well (*C. farsistanica* Bornm.).

Leaf. Leaves are always spiny, i.e. bear short or long spines at the margins. The basal leaves are variable in shape, entire or pinnatisect in some species (even in one population). Leaves in some species for example *C. phyllocephala* Bornm. & Gauba, *C. cymbolepis* Boiss. and *C. inflata* Boiss. & Hausskn., are dimorphic [*C. koezeana* Bornm. (with pinnatisect basal leaves) is considered as a synonym of *C. phyllocephala* Bornm. & Gauba (with simple basal leaves)]; stem leaves are decurrent, forming wide to narrow continuous (*C. barbeyi* C. Winkl., *C. grantii* Rech. f., *C. eriocephala* Boiss. & Hausskn) or interrupted wings (*C. elwendensis* Bornm., *C. kornhuberi* Heimerl); upper leaves in most species are gradually diminished (*C. concinna* Boiss. & Hausskn., *C. fursei* Rech. f., *C. grantii* Rech. f) but in some species (*C. phyllocephala* Bornm. & Gauba, *C. sagittata* C. Winkl. & Strauss., *C. khorramabadensis* Bornm., *C. iranica* C. Winkl. & Strauss.) are very similar to involucre bracts, surrounding the heads.

Indumentum. Stem, leaf and heads are usually tomentose-arachnoid. Leaves are mostly grayish-arachnoid on both sides, but beneath more densely, sometimes becoming glabrous. Sometimes plant totally seems to be glabrous. In some species such as *C. inflata* Boiss. & Hausskn. and *C. lactiflora* Rech. f., even in a small habitat, both two forms (hairy and glabrous) are found close to each other.

Heads (capitulum). Heads are single, terminally, vary from 1.5 (*C. noeana* Boiss. and *C. subinflata* Bornm.) to 9 cm (*C. grandiceps* Bunge, *C. onopordioides* Ledeb.) in diam., heads in some species (*C. grandis* C. A. Mey. and *C. concinna* Boiss. & Hausskn.) are glabrous. However, in most species (*C. eriocephala* Boiss. & Hausskn. and *C. rhombiformis* C. Winkl. & Strauss.) are densely hairy.

Involucre. Involucre's form ovate-elliptic or globular, flat or completely depressed at base: bracts vary in

number from 40-50 (*C. grandis* C. A. Mey., *C. grandiceps* Bunge and *C. gigantolepis* Rech. f.) to 150-170 (*C. stereolepis* Rech. f.); imbricate (*C. concinna* Boiss. & Hausskn., *C. keredjensis* Bornm. & Gauba, *C. pergamacea* Boiss. & Hausskn., *C. kornhuberi* Heimerl, *C. millefontana* Rech. f. and *C. inflata* Boiss. & Hausskn.) or spread-recurved (*C. bornmulleri* C. Winkl., *C. calocephala* Jaub. & Spach, and *C. lurorum* Bornm.).

Bracts form. All species of the section have appendiculate bracts, appendages constricted above the base, but becoming wide, so finally terminating to a sharp-pointed spine at apex. Bracts are usually triangular, auriculate, hastate, trapezium or rhombic, outer bracts have usually wider appendages, appendages in inner bracts are narrow, so in the innermost ones are completely linear; appendages margin smooth (*C. millefontana* Rech. f. and *C. hamadanensis* Rech. f.) or spiny [*C. cynaroides* (M. B.) C. A. Mey. and *C. calocephala* Jaub. & Spach].

Flowers. Flower number per heads is variable even in one individual species (50-120 in *C. grantii* Rech. f.). Corolla vary in length from 15 mm (*C. noeana* Boiss. based on Rechinger 1972) to 40-50 mm or even more (*C. grandiceps* Bunge and *C. onopordioides* Ledeb.), glabrous, glandular or hairy on dorsal surface, white, pink, purple or yellow, concolor or discolor with the anther tube.

Receptacle bristles. Receptacle bristles are found in two forms; smooth or scabrous. This character is one of the most important characters used by Boissier (1875) for dividing the species into two main groups. The length of the bristles in one head is also variable.

Achenes. Achenes are inversely ovate or prism form, vary from 3-7 mm long, usually attenuate toward the base, wide at the apex, marginate or not, smooth or dentate above, surface \pm longitudinally ribbed, shallowly or deeply areolate, bright brown-blackish, usually dark maculate. According to Rechinger (1986) fruit morphology, a less known character, is very important for assigning the realistic place of individual species, therefore, in this paper the morphology of achenes is used for comparison of different species.

MATERIALS AND METHODS

This study is mainly based on extensive field investigations as well as observation of many herbarium specimens. Almost all species collected from the type localities were studied in details. Collected specimens preserved in TUH and IRAN. The specimens determined by using standard Floras (Rechinger 1972, 1979, Tscherneva 1962, Huber-Morath 1975). The specimens in the Herbaria TARI, FUHM, K and herbarium of Sanandaj province were

also reviewed. Images of the type materials prepared at the Herbaria Vienna (W) and Leningrad (LE) as well as Berlin Herbarium (B) (available on <http://ww2.bgbm.fu-berlin.de/herbarium/default.cfm>) studied. Abbreviations of TARI, IRAN, FUMH, K, W and TUH are according to Holmgren & Holmgren 1998.

RESULTS AND DISCUSSION

Cousinia Cass. Sect. *Cynaroides* Bunge

Monocarpic biennial, rarely perennial. Stem leaves interruptedly or continuously decurrent, forming a narrow or wide wing on the stem; uppermost leaves remote or close to heads, sometimes in form of involucre bracts. Heads single, terminal, constricted above or not; bracts 40 to 180 in number, appendiculate; appendages of median bracts triangular, hastate, rhomboid, trapezoid, inflated, imbricate, spreading or recurved. Receptacle bristles smooth or scabrous. Flowers vary in number i.e. 40 to 400 per head. Corolla white, pink, purple or yellow, 15-50 mm long. Anther tube concolor or discolor, glabrous. Pappus white or milky, twisted, caducous.

Key to species of sect. *Cynaroides*

1. Appendage of median bracts completely appressed at least in lower half 2
 - Appendage of median bracts spreading or recurved 39
2. Appendage of median bracts entire at margin or at most with 1-2 fine spines 3
 - Appendage of median bracts with numerous spines at margin 27
3. Corolla yellow or pale yellow; appendage of median bracts hastate, appressed up to tip 4
 - Corolla white, milky-white, pink or purple; appendage of median bracts triangular, lanceolate, inflated, hastate, free to tip, or slightly spreading at tip 7
4. Appendage of median bracts 10 mm wide at base or more; capitulum 2.5-3 cm in diam. 1. *C. pergamacea*
 - Appendage of median bracts less than 10 mm wide at base; capitulum 2.4 cm in diam. 5
5. Corolla 17 mm long; plant grayish-canescens, densely tomentose-arachnoid; basal leaves strongly undulate at the margin 2. *C. caroli-henrici*
 - Plant not as above 6
6. Bracts arranged in ca. 8-seriate 3. *C. fursei*
 - Bracts arranged in ca. 14-seriate 4. *C. millefontana*
7. Corolla white or milky 8
 - Corolla pink or purple 13
8. Appendage of median bracts canaliculate, spreading-recurved at tip; upper leaves \pm involucre; plant robust 32. *C. khorramabadensis*

- Appendage of median bracts and upper leaves not as above 9
- 9. Corolla ca. 22 mm long; plant grayish-canescens; upper leaves close to the heads 39. *C. iranica*
- Corolla more than 25 mm long; plant greenish; upper leaves remote or rarely close to the heads 10
- 10. Appendage of bracts inflated, sharply acuminate 9. *C. inflata*
- Appendage of median bracts not inflated, acute 11
- 11. Plant glabrescent; upper leaves remote; achenes blackish 38. *C. straussii*
- Plant white-tomentose-arachnoid; upper leaves approximating to the capitulum; achene pale brown-yellowish to crème 12
- 12. Appendage of median bracts trapezoid 31. *C. elwendensis*
- Appendage of median bracts sagittate; flowers ± 120 36. *C. sagittata*
- 13. Basal and lower leaves oblong, entire, herbaceous; corolla 26-28 mm long 8. *C. anoplophylla*
- Plant not as above 14
- 14. Upper leaves completely involucrent 33. *C. phyllocephala*
- Upper leaves not as above 15
- 15. Appendage of bracts inflated 9. *C. inflata*
- Appendage of bracts not as above 16
- 16. Appendage of bracts completely appressed up to tip; capitulum constricted above 17
- Appendage of bracts appressed, spreading at tip 20
- 17. Matured involucre stramineous; sometimes tip of bracts and leaves teeth terminating to a yellow sharp 1 cm long 4. *C. hamadanensis*
- Plant not as above 18
- 18. Corolla pink, 16 mm long; bract margin smooth 7. *C. concinna*
- Corolla purple, 17-20 mm long; bract margin spinulose 19
- 19. Bracts 60-70, with 1-2 fine spines at the margin 25. *C. chlorosphaera*
- Bracts ca. 110, with numerous rigid spines at the margin 28. *C. ardalensis*
- 20. Appendage of bracts swollen, with long sharp acumen 37. *C. lurestanica*
- Appendage not swollen, with acute acumen 21
- 21. Plant humile, up to 20 cm; corolla 17 mm long; capitulum spherical; appendage of median bracts appressed, with spreading tip 68. *C. sanandajensis*
- Plant taller; corolla more than 17 mm long 22
- 22. Involucre densely arachnoid 23
- Involucre tomentose 24
- 23. Flowers ca. 130 22. *C. zagrica*
- Flowers ca. 260 21. *C. eriocephala*
- 24. Plant thin; stem leaves narrow, completely decurrent 6. *C. subinflata*

- Plant robust; stem leaves broad, interruptedly decurrent 25
- 25. Flowers ca. 70; corolla purple 24. *C. araneosa*
- Flowers 80-200; corolla white 26
- 26. Corolla 18-23 mm long; plant up to 30 cm 42. *C. ecbatanensis*
- Corolla more than 23 mm long; plant 30-60 cm 41. *C. kornhuberi*
- 27. Corolla pink or purple 28
- Corolla milky or yellow 29
- 28. Appendage of median bracts completely appressed; bracts 67; appendage of median bracts with fine 1-3 spines at margin; plant belongs to oak forest 18. *C. dalahuensis*.
- Appendage of median bracts appressed, sometimes recurved; bracts ca. 140; appendage of median bracts with numerous pectinate spines at margin; plant occur in mountainous region 26. *C. gaharensis*
- 29. Bracts 120 or more 30
- Bracts 100 or less 33
- 30. Corolla white – milky 31
- Corolla yellow 32
- 31. Bracts ca. 120; flowers ca. 100, tube longer than limb; plant distributed in Dena slopes 14. *C. denaensis*
- Bracts ca. 130; flowers ca. 130; tube shorter than limb; plant distributed in central Elburz 27. *C. keredjensis*
- 32. Bracts 140-150; stem branched from the base; basal leaves ca. 30-35 × 6-10 cm, pinnatisect 15. *C. sardashtensis*
- Bracts ca. 120; branches few; basal branches smaller 17. *C. qandilica*
- 33. Flowers 40-80; bracts 40-45; plant covered by yellow or dark glands; appendage of median bracts wide, leaf-like 19. *C. grandis*
- Plants not as above 34
- 34. Appendage of bracts rhomboid; upper leaves near the capitulum, gradually transformed to bracts 35
- Appendage of bracts in other shape; upper leaves remote 36
- 35. Appendage of median bracts with 1-2 spines at margin 37
- Appendage of median bracts smooth at margin 23. *C. rhombiformis*
- 36. Plant up to 30 cm tall; appendage of median bracts with 1-2 fine spines at margin 29. *C. zardkuhensis*
- Plant up to 80 cm high; appendage of median bracts with 1-2 valid spines at margin 30. *C. lordeganensis*
- 37. Appendage of median bracts triangular to lanceolate; receptacle bristles smooth 38
- Appendage of median bracts sagittate, spinulose-dentate at margin; receptacle bristles scabrous 40. *C. parsana*

38. Capitulum distinctly spherical; bracts completely appressed; appendage of median bracts with 1-2 spines at margin; flowers \pm 60; bracts \pm 75 16. *C. khansaricus*
- Capitulum subspherical; bracts terminating to a long sharp acumen; appendage of median bracts with numerous spines at margin; basal leaves lyrate; flowers 40-50; bracts 40-70 72. *C. farsistanica*
39. Corolla yellow 40
- Corolla white, milky, pink or purple 48
40. Appendage of median bracts smooth at margin, outers spinose 41
- Appendage of median bracts spinose at margin 43
41. Bracts ca. 180; appendage of bracts squarrose, lanceolate 65. *C. stroterolepis*
- Bracts fewer; appendage of bracts lanceolate or leaf like 42
42. Appendage of bracts leaf like; receptacle bristles smooth 34. *C. macrocephala*
- Appendage of bracts lanceolate, not leaf like; receptacle bristles scabrous 52. *C. gilliatti*
43. Plant covered by yellow or dark glands, especially in capitulum 51. *C. sahandica*
- Plant not glandulose 44
44. Appendage of median bracts with 2 spines at margin, regularly squarrose 64. *C. behboudiana*
- Appendage of median bracts not as above 45
45. Capitulum large, 7-8 cm in diam., ca. 300-flowered 35. *C. silvanica*
- Capitulum smaller, \pm 110-flowered 46
46. Corolla ca. 20 mm long 50. *C. bobeckii*
- Corolla longer 47
47. Corolla ca. 27 mm long; appendage of median bracts 5 mm wide; anther tube pink 54. *C. cynaroides*
- Corolla 23-26 mm long; appendage 8 mm wide; anther tube pale yellow 53. *C. algurdina*
48. Corolla white or white-milky 49
- Corolla pink or bright pink 56
49. Corolla 32-60 mm long; capitula up to 85 cm 43. *C. onopordioides*
- Corolla up to 28 mm long; capitula smaller 50
50. Plant humile; appendage of median bracts leaf-like; flowers 40-50; bracts ca. 40 47. *C. kermanshahensis*
- Plant not as above 51
51. Bracts ca. 50; lower half of bracts appendages regularly curved downwards; the other half curved upwards, as long as capitulum and flowers 12. *C. pasargadensis*
- Bracts not as above 52
52. Appendage of median bracts broad, ovate, acute; flowers ca. 115 75. *C. lactiflora*
- Appendage of median bracts lanceolate; flowers fewer 53
53. Plant occurs in salty plains; bracts 55-60 57. *C. nana*
- Plant not as above 54
54. Corolla ca. 28 mm long 71. *C. bornmulleri*
- Corolla ca. 22 mm long 55
55. Spines of bract margin numerous, valid 73. *C. perspolitana*
- Spines of bract margin 3, fine 66. *C. kirrindica*
56. Corolla more than 30 mm long, bright pink 57
- Corolla less than 30 mm long, pink or rarely white 58
57. Bracts ca. 50; inner bracts not purple outside 45. *C. monocephala*
- Bracts more numerous; inner bracts purple outside 44. *C. verbascifolia*
58. Appendage of bracts regularly squarrose 59
- Appendage of bracts not squarrose 60
59. Bracts 55-60; appendage of median bracts regularly spinose at margin; flowers 80-90 60. *C. calocephala*
- Bracts 120-150; appendage of median bracts smooth at margin; flowers ca. 130 61. *C. kopi-karadaghensis*
60. Appendage of median bracts smooth at margin 61
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62. Corolla ca. 25 mm long, purple, sometimes white 10. *C. barbeyi*
- Corolla ca. 20 mm long, pale pink 11. *C. schiraziana*
63. Appendage of median bracts terminating to a long yellow sharp acumen; basal leaves pinnatifid or pinnatisect 67. *C. mobayenii*
- Appendage not as above 64
64. Roots fusiform; plants from the margin of oak forest 65
- Plant not as above 66
65. Bracts ca. 40; corolla ca. 25 mm long 46. *C. disfulensis*
- Bracts ca. 110; corolla 27 mm long; basal leaves lyrate 48. *C. jaccobsii*
66. Plant up to 15 cm high 67
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67. Flowers ca. 30; appendage of median bracts lanceolate, 5 \times 4 mm, with 1-2 fine spines at margin 59. *C. noeana*
- Flowers ca. 70; appendage of median bracts long lanceolate, 20 \times 4 mm, with 3 fine spines at margin 66. *C. kirrindica*
68. Plant grayish-canescens 77. *C. qaradaghensis*
- Plant green 69
69. Appendage of bracts broadly triangular 70
- Appendage of bracts long or shortly lanceolate 71
70. Bracts 70-75; flowers 120-150; appendage of median bracts 5-9 \times 7-17 mm 76. *C. aligudarzensis*
- Bracts ca. 100; flowers ca. 200; appendage of median bracts 7-12 \times 25 mm 49. *C. shulabadensis*

71. Appendage of median bracts shortly lanceolate, small, 3×5 mm; bracts smooth at margin; corolla 20 mm long 72
 - Appendage of median bracts long lanceolate 73
 72. Receptacle bristles smooth 56. *C. sabalanica*
 - Receptacle bristles scabrous 69. *C. turorum*
 73. Appendage of median bracts long lanceolate, 30-40 mm long; capitulum 6-9 cm in diam 74
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 74. Flowers ca. 200; appendage of median bracts 35-40 mm long 58. *C. shebliensis*
 - Plant not as above 75
 75. Appendages of median bracts lanceolate, with numerous 2-7 mm long spine at margin 62. *C. arakensis*
 - Appendages of median bracts rhombic, with 1-2 minute spine at margin 74. *C. sarzehensis*
 76. Bracts ca. 70; flowers 40-50; appendage of median bracts lanceolate $3-4 \times 15-20$ mm 55. *C. kotschyi*
 - Plant not as above 77
 77. Plant green; flowers ca. 60; appendage of median bracts triangular-hastate, recurved, covering the outer bracts appendages 63. *C. sefidiana*
 - Plant olivaceous; appendage of median bracts lanceolate, spreading 70. *C. kurdistanica*

1. *C. pergamacea* Boiss. & Hausskn. in Boiss., Fl. Or. 3: 513 (1875).

Stem up to 50 cm high, single or branched from base, slightly araneose-floccose. Leaves tomentose on both sides; basal leaves ca. 20×10 cm, lanceolate, sessile, deeply or shallowly pinnate; median leaves decurrent; uppermost leaves distant from the heads. Heads single, ca. 2.5-3 cm in diam., ca. 100-flowered, with loose arachnoid hairs above; bracts ca. 130 in number, imbricate; appendages of median bracts ca. 11×11 mm, trapezium, abruptly attenuate toward the apex forming a short or long spine, smooth or rarely with 1-2 minute spines at margin; innermost bracts ca. 25 mm long, distinctly exceeded from involucre, white or pale yellow. Receptacle bristles scabrous. Corolla yellow, ca. 25 mm long; limb shorter than tube. Anther tube pink or purple. Achenes ca. 5×2.5 mm, inversely ovate, attenuate toward base, light brown, scabrous on surface, with transversal pits and longitudinally wrinkled ribs, distinctly dentate above. [Plates 1 (A), 6 (A), 8 (G)]

General distribution. Iran and Iraq.

Habitat. Oak forests of Zagros Mountains in Kurdistan.

Selected specimens seen. Kurdistan: Baneh to Saqqez, Pour-Mohammadi 22571 (TUH); Mahabad, 83-86 km

S Mahabad, 1840-1930 m, Pabot 9180 (IRAN, 5504 Pabot). Azerbaijan: 25 km Sardasht to Baneh, 1400 m, Runemark & Mozaffarian 25936 (TARI).

Taxonomic remarks. *C. pergamacea* is a distinct species, close to *C. fursei* and *C. millefontana*, but differs from them by larger heads and wider appendages base.

2. *C. caroli-henrici* Attar & Ghahreman, Rostaniha 7 (supplement 2): 317 (2006).

Stem up to 60 cm high, single, densely leafy, densely floccose-tomentose, branched from base, corymbosely branched above; branches monocephalous. Leaves interruptedly or continuously decurrent, forming broad wings, densely tomentose-floccose-arachnoid on both sides; basal leaves sessile, oblong, ca. $12-17 \times 5-7$ cm; median leaves similar to basal leaves but long decurrent; upper and uppermost leaves gradually diminished; the uppermost leaves close to the heads. Heads ca. 80-flowered. Involucre nearly spherical, constricted above; bracts ca. 110 in number, imbricate; appendages of median bracts ca. 9×5 mm, sagittate, with numerous spines on each side, gradually acuminate; innermost bracts linear, acuminate, exceeded from involucre. Receptacle bristles scabrous. Corolla yellow, ca. 17 mm long, limb longer than tube. Anther tube white but pink at tip. Mature achenes unknown. [Plate 1 (D)].

General distribution. Endemic to Iran.

Habitat. Oak forests of Zagros Mountains in Kurdistan.

Specimens seen. Kurdistan: Baneh, Attar & Ghahreman 22455 (TUH, holotype).

Taxonomic remarks. *Cousinia caroli-henrici* is related to *C. pergamacea*, both distributed in Kurdistan province and have the same habitat, but it is readily distinguished by densely tomentose-arachnoid persistent indumentum (not grayish-glaucous, glabrescent) and spinulose appendages (not smooth appendages).

Erratum. This is to be noted that in a paper (Attar & Ghahreman 2006) which was already published in Rostaniha 7 (suppl. 2: 318), the name of plant in the legend of Fig. 1., is wrongly written as *C. neorechingeri*, while the correct name is *C. caroli-henrici*.

3. *C. fursei* Rech. f., Flora Iranica, 90: 247 (1972).

Stem ca. 50 cm high, green or almost grey, slightly arachnoid, branched from base. Leaves tomentose on both sides; basal leaves not seen; lower stem leaves ca. 13×4 cm, stem leaves continuously or interruptedly decurrent; upper leaves gradually reduced. Heads ca. 2-2.5 mm in diam., 95-120-flowered. Involucre loosely arachnoid above, ca. 2.5 cm long; bracts ca. 120 in number, 8-seriate, imbricate; appendages of median

bracts 6-9 × 5.5-7.5 mm, triangular or rhombic, smooth at margin, gradually attenuate forming a yellowish sharp-pointed spine at apex; innermost bracts 23-24 mm long, pale yellow or ivory white, gradually attenuate. Receptacle bristles scabrous. Corolla yellow, limb shorter than tube. Anther tube pink or purple. Achenes (on the basis of type specimen description) 5 × 1.5 mm, grey, linear or almost prism-shaped, attenuate toward base, dentate above, longitudinally ribbed, with dark scattered points. [Plates 1 (B), 6 (C)].

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros Mountains in Kurdistan.

Selected specimens seen: Kurdistan: Marivan to Sanandaj, old road, Garan pass, 1400-1850 m, Ghahreman & Mozaffarian 18314 (TUH); 20 km E Marivan (Dez Shahpur), 1800 m, Furse 3421 (K, holotype); 80 km W Sanandaj to Marivan (Dez Shahpur), 1700 m, Rechinger 42895 (K). Kermanshah: Parou mountain, 1200-2200 m, Mousavi & Sateei 9005 (IRAN, 33913-E); 47 km W Bijar to Divan-Darreh, 2000 m, Rechinger 42653 (IRAN).

Taxonomic remarks: *C. fursei* is close to *C. pergamacea*, but differs from it by smaller heads, strongly constricted above and narrower appendages base. It is also noticeable that the two species have a very limited distribution area, near to each other, but never overlapped.

4. *C. millefontana* Rech. f., Flora Iranica 90: 248 (1972).

Stem 30-45 cm high, arachnoid, branched from base. Leaves arachnoid-tomentose on both sides; basal leaves 13-14 × 7-18 mm, ovate, with a petiole ca. 4 mm long; stem leaves continuously decurrent; upper leaves diminished, distant from the heads. Heads single, up to 2.5 cm in diam., ca. 70-flowered. Bracts ca. 100 in number, 14-seriate; appendage of median bracts ca. 7 × 6 mm, hastate or rhombic, smooth at margin, gradually attenuate, terminating to a short spine at the apex; innermost bracts ca. 20 mm long, prominently exceeded from involucre, white or yellow. Receptacle bristles scabrous. Corolla yellow, ca. 23 mm long; limb shorter than tube. Anther tube pink (especially at the tip). Mature achenes unknown [Plates 1 (C), 6 (B), 8 (H)].

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros Mountains in Kurdistan.

Selected specimens seen: Kurdistan: Marivan to Baneh, 70 km Baneh, 1900 m, Ghahreman & Attar 19673 (TUH); between Marivan and Baneh, 3 km Ghamchyn to Chenareh, 2050 m, Mozaffarian 87390 (TARI); Chehel Cheshmeh, 44 km NE Marivan (Dez Shahpur), in *Quercus brantii* forest, 2000 m, Rechinger

(K, isotype). Azerbaijan: 37 km Sardasht to Mahabad, 1350 m, Siami & Zehzad 3443; 36 km S Mahabad, 1750 m, Rechinger 49060 (K).

Taxonomic remarks: This species is distinguishable from *C. fursei* by the number of bracts series (bracts 14-seriate, not 8-seriate).

5. *C. concinna* Boiss. & Hausskn. in Boiss., Fl. Or. 3: 513 (1875).

Stem 30-60 cm high, mostly branched from the middle; branches long and tiny. Basal leaves ca. 7 × 1.5 cm, lanceolate, shallowly pinnate, lower surface densely arachnoid; median leaves completely decurrent. Heads ovate, 1.5-2 cm in diam., ca. 40-flowered. Bracts ca. 100 in number, imbricate; appendage of median bracts hastate, ca. 4 × 2 mm, smooth at margin; innermost bracts exappendiculate, ca. 15 mm long, erect, sharply attenuate toward the apex, apiculate, completely exceeded from involucre, straw-colored. Receptacle bristles scabrous. Corolla pink, ca. 16 mm long; limb as long as tube. Anther tube pink. Achenes 3-4 × 1.5 mm, inversely ovate, brown-blackish, with transversal ribs, irregularly maculate, indistinctly marginate at the apex. [Plates 1 (E), 6 (D), 8 (I)].

General distribution: Endemic to Iran.

Habitat: Submountainous steppes in Kurdistan.

Selected specimens seen: Kurdistan: 15 km after Sanandaj to Divan Darreh, Ghahreman & Attar 20562 (TUH); Bijar to Sanandaj, 1950 m, Termeh 9003 (IRAN); Sanandaj, Salavat-abad pass, 2100 m, Mozaffarian 74767 (TARI); 11 km to Kamyaran via Sanandaj, 1800-2000 m, Assadi 60654 (TARI); 42 km S Sanandaj, Morvarid pass, 1800-1970 m, Hamzeh 1160 (TARI).

6. *C. subinflata* Bornm., Österr. Bot. Zeitschr. 63: 291 (1913); Bornm., Beih. Bot. Centrbl. 32, 2: 406 (1914).

Stem up to 75 cm high, with long and tiny branches, arachnoid. Leaves tomentose on both sides; uppermost leaves diminished, distant from the heads. Heads ovate, ca. 1.5 cm in diam., 40-80-flowered. Bracts ca. 100 in number, with yellow sessile glands on dorsal surface; appendage of median bracts rhombic, ca. 5 × 1 mm, with 1-2 spines on each side, acuminate, erect, covering inner bracts; innermost bracts exappendiculate, gradually attenuate, acuminate, exceeded from involucre, on dorsal surface at above the middle covered with minute erect hairs. Receptacle bristles scabrous. Corolla purple, 16-20 mm long. Anther tube purple. Immature achenes almost compressed, with minute dents above [Plates 1 (F), 8 (J)].

General distribution: Endemic to Iran.

Habitat: Mountainous areas.

Specimens seen: Kermanshah: Parou mountain, 1200-2200 m, Mousavi & Sateei 9243 (IRAN, 33912-E).

Hamadan: Nahavand, Garin mountain, Strauss s.n. (B, holotype).

7. *C. hamadanensis* Rech. f., Flora Iranica 139A: 142 (1979).

Stem up to 45 cm high, arachnoid-tomentose. Leaves loosely arachnoid; basal leaves not seen; median leaves continuously decurrent; uppermost leaves slightly smaller than median leaves, very near to heads. Heads 1.5-2 cm in diam., 65-80-flowered. Involucre straw yellow-colored; bracts 80-90 in number; appendage of median bracts ca. 10 × 8 mm, triangular, auriculate, apiculate, smooth at margin; innermost bracts ca. 22 mm long, exappendiculate, terminating to a sharp long spine at the apex, exceeded from involucre. Receptacle bristles scabrous. Corolla pink, ca. 20 mm long; limb slightly longer than tube. Anther tube pink. Achenes ca. 5 × 2.5 mm, inversely ovate, dark brown, with scabrid surface, longitudinally ribbed, with transversally shallow pits, minutely dentate above [Plate 1 (G)].

General distribution: Endemic to Iran.

Habitat: In stony and sandy slopes of Garin Mountain.

Selected specimens seen: Hamadan: Nahavand, Garin mountain, 1800 m, Attar 20551 (TUH). Lorestan: Nour-abad to Nahavand, Eslam-abad, Garin mountain, 2100-2600 m, Assadi & Mehregan 89006 (TARI).

Taxonomic remarks: *Cousinia hamadanensis* which has been recently considered as a synonymy of *C. chlorosphaera* (Mehregan & Kadereit 2008), is now known as a distinct species, differs from *C. chlorosphaera* by straw yellowish bracts, completely smooth along margin (not with 1-2 distinct spines on each side) and pink anther tube (not purple).

8. *C. anoplophylla* Rech. f., Flora Iranica 139A: 140 (1979).

Stem more than 40 cm high. All parts of the plant covered with soft tomentose hairs, but becoming completely glabrous. Stem leaves continuously-interruptedly decurrent; uppermost leaves more diminished, completely distinguished from involucral bracts. Heads 2.5-3 cm in diam., ca. 80- flowered. Involucre spherical, deeply depressioned at base, intensely constricted above, green-straw yellowish, glabrescent; bracts ca. 140 in number; appendage of median bracts ca. 12 mm wide, hastate, smooth at margin, terminating to a 3-5 mm long spine at the apex; innermost bracts ca. 2 mm wide, membranous, pale-colored, twisted-curved, completely exceeded from involucre, erect, narrow and subulate. Corolla pink, 22-28 mm long, tube as long as limb. Anther tube pink. Mature achenes unknown [Plate 1 (H)].

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros Mountains in Kurdistan and Kermanshah.

Selected specimens seen: Kermanshah: Shalan to Dalahoo, 1020-1800 m, Iranshahr & Termeh 5048 (IRAN, 34012-E, holotype). Kurdistan: 50 km Baneh to Sardasht, 1510 m, Runemark & Mozaffarian 29256 (TARI).

Taxonomic remarks: *Cousinia anoplophylla*, a rare species, which has been recently considered as a synonym of *C. inflata* (Mehregan & Kadereit 2008) is now known as a distinct species. Tiny, herbaceous and entire leaves (or minutely spinulose at margin) is the main morphological characters of *C. anoplophylla*, and well separate it from *C. inflata* as well as the other members of the section. Whereas, leaves in *C. inflata* are pinnatifid-pinnatisect and distinctly spinose.

9. *C. inflata* Boiss. & Hausskn. in Boiss., Fl. Or. 3: 512 (1875).

Stem 35-60 cm high, branched from base, arachnoid. Leaves light green-grayish or green-bluish, arachnoid-tomentose on both sides; basal leaves dimorph, sometimes lyre-shaped, sometimes lanceolate, profoundly pinnatisect; stem leaves oblong or lanceolate, continuously decurrent; upper leaves gradually diminished. Heads up to 4 cm in diam., 100-130- flowered. Bracts 140-160 in number; appendage of median bracts 9-13 × 10-14 mm, imbricate, hastate, concave, attenuate toward apex, forming long sharp-pointed spine at apex, more rarely with one spine on each side, recurved; innermost bracts up to 30 mm long, apiculate, with minute hairs on dorsal surface, slightly exceeded from involucre. Receptacle bristles scabrous. Corolla white, purple-pinkish or yellow, 25-27 mm long. Anther tube pale purple. Immature achenes ca. 6 × 1.5 mm, brown, with indistinct longitudinally ribs, dentate above, narrowly marginate [Plates 1 (I), 6 (E), 8 (K)].

General distribution: Iraq and Iran.

Habitat: Inside or at margin of oak forests on slopes of gypsy mountains.

Selected specimens seen: Kermanshah: Paveh to Bayegan, 14 km Bayengan, 1800 m, Ghahreman & Attar 20561 (TUH); 5 km after Paveh to Nousoud, 1500 m, Attar & Mehdigholi 22375 (TUH); Paveh, hills around Sarab-e Houli, 1500-1800 m, Hamzeh 1221 (TARI); Mountains around Paveh, 1700 m, Assadi 60705 (TARI); 44 km N Kerend-e Gharb, Dalahoo, Kalalan mountain, 1940-2100 m, Hamzeh & Hatami 1383 (TARI). Kurdistan: 45 km after Dezli, 2400 m, Ghahreman & Attar, 22479 (TUH); Marivan to Hani Geremle, 45 km after Dezli, 2400 m, Attar & Mehdigholi 23465 (TUH).

10. *C. barbeyi* C. Winkl., Acta Horti Petrop. 12: 274 (1893).

Stem ca. 30 cm high, tomentose-arachnoid. Leaves tomentose-arachnoid on both sides; basal leaves ca. 10

× 3 cm, pinnatisect; stem leaves interruptedly decurrent; upper leaves diminished. Heads ca. 6 cm in diam., ca. 100-flowered. Involucre 1.5-2 cm in diam., tomentose-loosely arachnoid; bracts ca. 80 in number; appendage of median bracts ca. 24 × 10-15 mm, hastate-triangular, gradually attenuate toward apex, with 1-2 spines at margin, erect or slightly recurved; innermost bracts ca. 22 mm long, attenuate toward apex. Receptacle bristles smooth. Corolla purple, ca. 25 mm long; limb shorter than tube. Anther tube purple. Immature achenes ca. 3.5 × 1.2 mm, compact, brownish, longitudinally narrowly costate, irregularly areolate or somewhat smooth, minutely dentate above [Plate 1 (J)].

General distribution.: Endemic to Iran.

Habitat.: On sandy slopes of mountains.

Selected specimens seen.: Koh Gilouyeh and Boyer Ahmad: Saverz mountain, 2200 m, Ghahreman, Attar & Mehdigholi 26304 (TUH); between Yasouj and Deh Dasht, Giluyeh mountain, near to Sadat mountain, 2300 m, Barbey 46457 (IRAN); Yasouj, Sisakht, Bijan pass, Dena protected region, 2450-3170 m, Djavadi, Ghanbari & Torabi 53865 (IRAN). Fars: Fahlian, Hosein-abad, 1100-2100 m, Iranshahr & Mousavi 8783 (IRAN, 33921-E).

Note.: This is to be noted that in Flora Iranica (Rechinger 1972), specimen No. 13345-E has been erroneously brought under No. 13435.

11. *Cousinia schiraziana* Attar, sp. nov. (Fig. 1).

Holotypus.: Fars: Shiraz, Attar & Ghahreman 22519 (TUH).

Perennis, ca. 40 cm alta, pluricaulis, araneosa, glabrescentia. Caulis ramosus, alatus. Folia basalia ignota; folia caulina discoloria, glabrescentia, oblongo-lanceolata, incomplete decurrentia; folia summa a capitulis remota. Capitula singula, terminalia, ca. 60 flora, ca. 6 cm diametro. Involucrum absque spinis ca. 2.5 × 2.5 cm; phylla ca. 80, appendiculata; appendices phyllorum intermediarum 15-20 × 6-8 mm, triangulares, auriculati, remote breviter spinulosi, in spinam ca. 10 mm longam excurrentes. Receptaculi setae laeves. Corolla rosea, ca. 20 mm longa, tubo limbum aequante. Achaenia ignota.

Perennial, ca. 40 cm high, totally finely arachnoid, then glabrescent. Stems numerous, branched, winged. Basal leaves unknown. Stem leaves discolored, lower surface gray-tomentose, upper surface green, glabrescent, oblong-lanceolate, long decurrent, interrupted in upper part, dentate-spinose at margin, terminating to a rigid ca. 5 mm long spine, cuneate at base; upper leaves far from the heads. Heads single, terminal, ca. 60-flowered, ca. 6 cm in diam. Involucre excluding spines ca. 2.5 × 2.5 cm, spherical, glabrescent; bracts ca. 80

in number, appendiculate; appendage of outer bracts triangular, gradually attenuate at tip in long sharp spine, spinose at margin, reflexed; appendage of median bracts 15-20 × 6-8 mm, triangular, auriculate at base, terminating to a long sharp ca. 10 mm long spine, spinose at margin, reflexed or straight, as long as head; inner bracts with triangular straight appendage; innermost bracts exappendiculate, acuminate. Receptacle bristles smooth. Corolla pink, ca. 20 mm long; limb as long as tube; lobes 3-5 mm long. Achene unknown [Plate 1 (K)].

General distribution.: Endemic to Iran.

Other specimens seen.: Firouzabad, Meymand, Sefidar mountain via Tang-e Riz, 71459 (TARI); 25 km to Firouz-abad from Farrashband road, Mozaffarian 71406 (TARI).

Taxonomic remarks.: *Cousinia schiraziana* is very close to *C. barbeyi* and the other new species, *C. pasargadensis*. The morphological differences of the three species are summarized in Table 1.

12. *Cousinia pasargadensis* Attar, sp. nov. (Fig. 2).

Holotypus.: Fars: Shiraz, mountains around Dasht-e Arjan, 1892 m, Attar & Zamani 36294 (TUH).

Perennis, ca. 30 cm alta, araneosa, glabrescens. Caulis a basi ramosus. Folia herbacea, concoloria; basalia 8 × 2 cm, oblonga, lyrata; caulina perfecte decurrentia, oblongo-lanceolata, basi cuneata; summa sensim decrescentia. Capitula singula, terminalia, globosa, ca. 50-flora, 3.5-4.5 cm diametro. Involucrum absque spinis usque ad 2 × 2 cm; phylla ca. 90, appendiculata; phylla intermedia appendice plano-triangularia, margine integra, in spinam terminalem erectam usque ad 8-10 mm longam attenuata; spina terminali involucro appressa; phylla intima exappendiculata, acuminate. Receptaculi setae laeves. Corolla straminea, ca. 15 mm longa, tubus limbo circiter aequilongus, laciniis 3-5 longis. Antherarum tubus concolor. Achaenia ignota.

Perennial, ca. 30 cm high, arachnoid-glabrescent. Stem branched from base. Leaves concolored, herbaceous; basal leaves ca. 8 × 2 cm, lyrate, terminal lobe oblong, subrounded, with ca. 5 mm long spine; stem leaves completely decurrent, oblong-lanceolate, cuneate at base, spinose at margin; upper leaves gradually reduced. Head single, terminal, ca. 50-flowered, 3.5-4.5 cm in diam. Involucres spherical, ca. 2 × 2 cm; bracts ca. 90 in number, appendiculate; appendage of outer bracts small, triangular, acuminate, reflexed, spinulose at margin; appendage of median bracts flat, triangular, entire at margin, gradually attenuate to a 8-10 mm long sharp spine, straight, imbricate, covering the small inner bracts and flowers, as long as head; innermost bracts exappendiculate, acuminate. Receptacle bristles smooth. Corolla pale yellow, ca. 15 mm long; limb as long as tube, lobes 3-5 mm long.

Table 1: Morphological comparison of *Cousinia barbeyi*, *C. schiraziana* and *C. pasargadensis*.

Species	Flower number	Bracts form and number	Corolla length and color	Leaf base	Stem leaves
<i>C. barbeyi</i>	more than 100	ca. 80, flat-concave	25 mm, longer than involucre, purple	subcordate	interruptedly decurrent
<i>C. schiraziana</i>	ca. 60	ca. 80, flat	20 mm, longer than involucre, pink	cuneate	interruptedly decurrent
<i>C. pasargadensis</i>	ca. 50	ca. 90, flat	15 mm, equal or slightly shorter than involucre, pale yellow	cuneate	completely decurrent

Anther tube concolored. Mature achenes unknown [Plate 1 (L)].

General distribution. Endemic to Iran.

Habitat. On rocky mountains.

Taxonomic remarks: *Cousinia pasargadensis* is related to *C. schiraziana* and *C. barbeyi* but separates from them by the characters shown in Table 1:

13. *C. mozaffarianii* Attar, Assadi & Ghahreman, Pakistan Journ. Bot. 32 (2): 293-294.

Stem up to 30 cm high, arachnoid. Leaves arachnoid on both sides, beneath more densely, whitish, basal leaves not seen; stem leaves oblong-lanceolate, continuously decurrent. Heads up to 7.5 cm in diam., ca. 85-flowered. Involucre up to 6 cm in diam., constricted above, arachnoid, especially above; bracts ca. 60 in number; appendage of median bracts ca. 25 × 10 mm, triangular, with round auricles at base, gradually attenuate, acuminate, smooth at margin, spreading; innermost bracts exappendiculate, up to 25 mm long, exceeded from involucre, with minute hairs outside. Receptacle bristles smooth. Corolla purple, ca. 23 mm long; limb as long as tube, papillose outside. Anther tube purple. Achenes ca. 5 × 3 mm, bright brown-grey, surface rugose, longitudinally ribbed, marginate above, membranous, dentate, attenuate toward base.

General distribution. Endemic to Iran.

Habitat. Slope of mountains.

Specimens seen. Fars: between Nour-abad and Kare Kan, 1600 m, Mozaffarian 71266 (TARI, holotype).

Taxonomic remarks: *Cousinia mozaffarianii* is very close to *C. barbeyi*, differs from it by the following characters: appendage of outer bracts distinctly recurved (not spreading), appendage of median bracts erect-slightly recurved, with 1-2 spines at margin (not spreading and completely smooth).

14. *Cousinia denaensis* Attar & Djavadi, *sp. nov.* (Fig. 3).

Holotypus: Kohkyloyeh and Boyer Ahmad, Yasouj to Meymand, 14 km Meymand, Attar, Ghahreman & Mehdigholi 22495 (TUH).

Perennis, ca. 45 cm alta, araneoso-tomentosa. Caulis a basi ramosus. Folia concoloria; basalia 15 × 4 cm, lanceolata, pinnatisecta, raro pinnatifida; caulina perfecte decurrentia, oblongo-lanceolata, basi cuneata; summa sensim decrescentia. Capitula singula, terminalia, spherica, ca. 100-flora, ca. 4 cm diametro. Involucrum absque spinis usque ad 4 × 3.5 cm; phylla ca. 120, appendiculata; phylla intermedia appendice triangulari, margine spinulosa, in spinam terminalem erectam usque ad 8-10 mm longam attenuata, spina terminali longiora; phylla intima exappendiculata, acuminata. Receptaculi setae scabrae. Corolla lactea, ca. 24 mm longa, tubo limbo longiore, laciniis ca. 5 mm longis. Antherarum tubus concolor. Achaenia ca. 4 × 2 mm, brunnea.

Monocarpic perennial plant. Stem up to 45 cm high, green-grayish, arachnoid-tomentose, branched from base or middle, interruptedly winged. Leaves white arachnoid-tomentose on both sides, nervation pinnate-reticulate; basal leaves ca. 15 × 4 cm, lanceolate, pinnatisect-pinnatifid-lobate, densely spinulose along margin; lateral spines up to 10 mm long, sometimes as long as terminal spine, alternately with short spine; midrib prominent; stem leaves ca. 7.5 × 2.5 cm, spatulate, attenuate toward base; upper leaves more diminished; uppermost leaves far from the heads. Heads ca. 7 cm in diam., ca. 100-flowered. Involucre spherical, ca. 4 × 3.5 cm, arachnoid-tomentose; bracts ca. 120 in number, appendiculate; appendages triangular-sagittate-auriculate, with prominent midrib, excurrented into a ca. 10 mm long spine at apex, spinulose along margin; outer bracts recurved-spread, basal part partially short; median bracts erect, somehow imbricate, basal part longer; inner bracts membranous, exappendiculate, minutely lacerate along margin, papillose outside, terminating to a sharp-pointed spine at apex. Receptacle bristles scabrous. Corolla milky, ca. 24 mm long; limb 11 mm; tube 13 mm, lobes 5 mm long. Anther tube milky, glabrous. Achenes ca. 4 × 2 mm, brown, with distinct longitudinal yellowish ribs, slightly attenuate toward base, with inconspicuous dentate margin above [Plate 1 (M)].

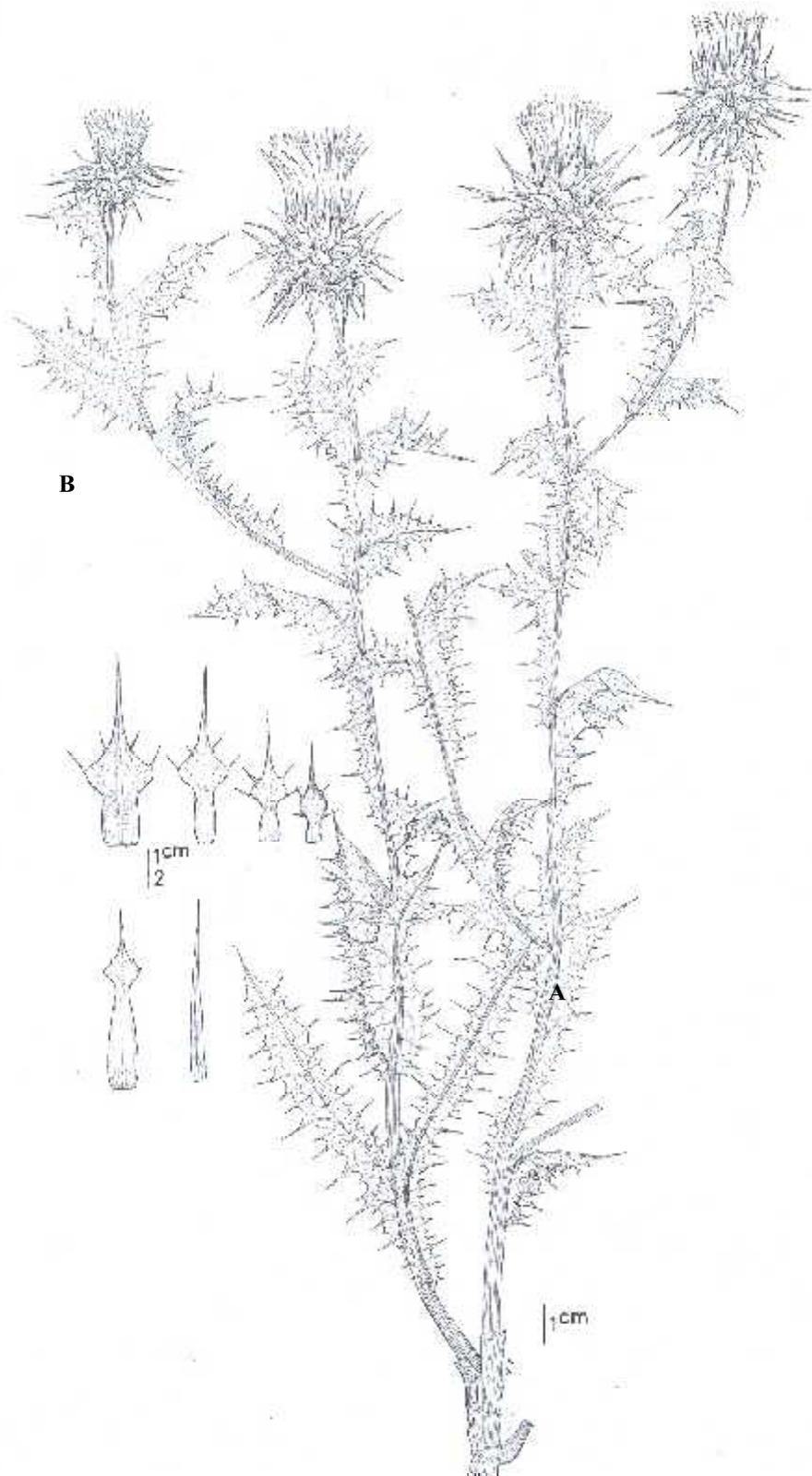


Fig. 1. *Cousinia schiraziana*, A: habit, B: bracts.

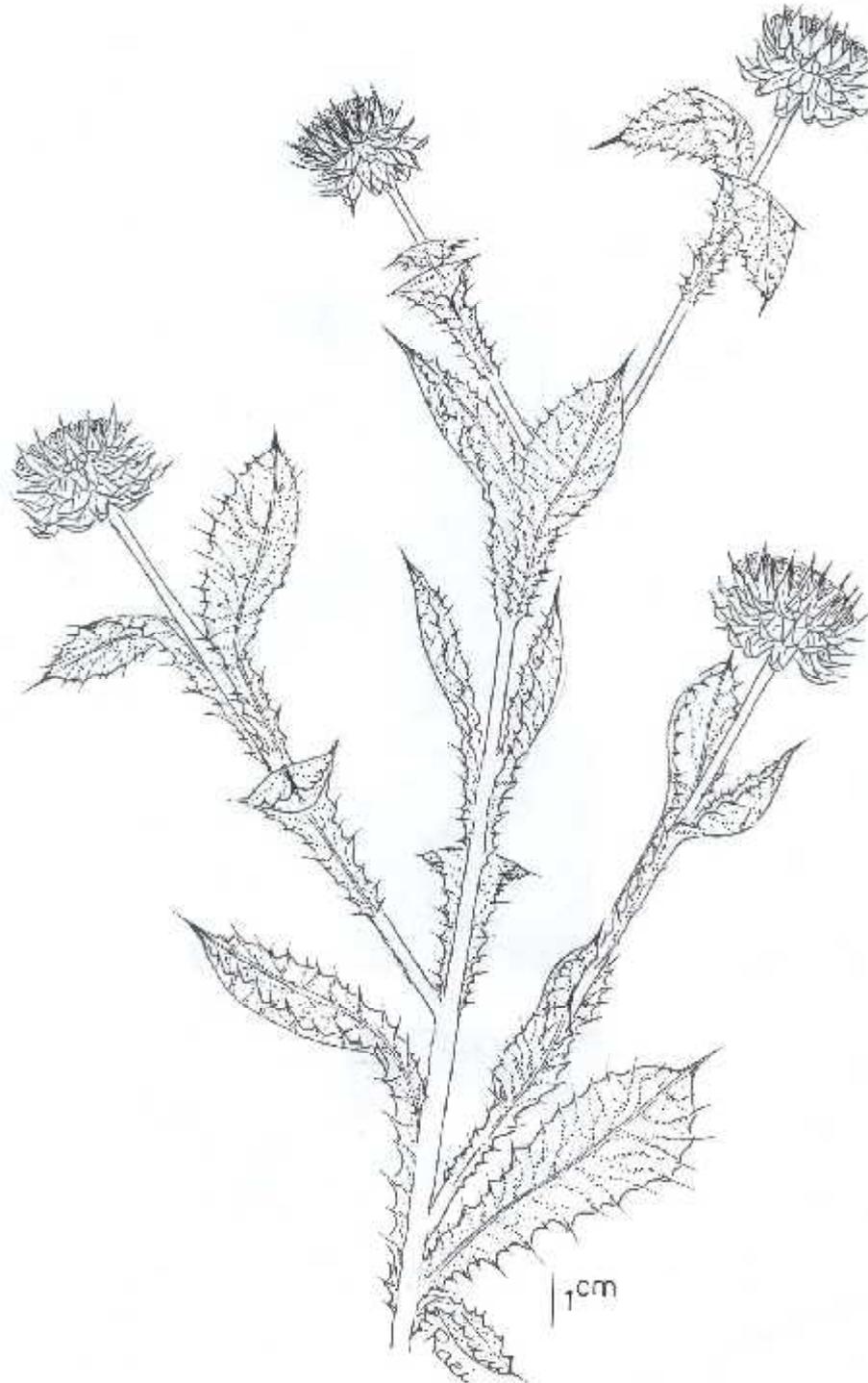


Fig. 2. *Cousinia pasargadensis*.

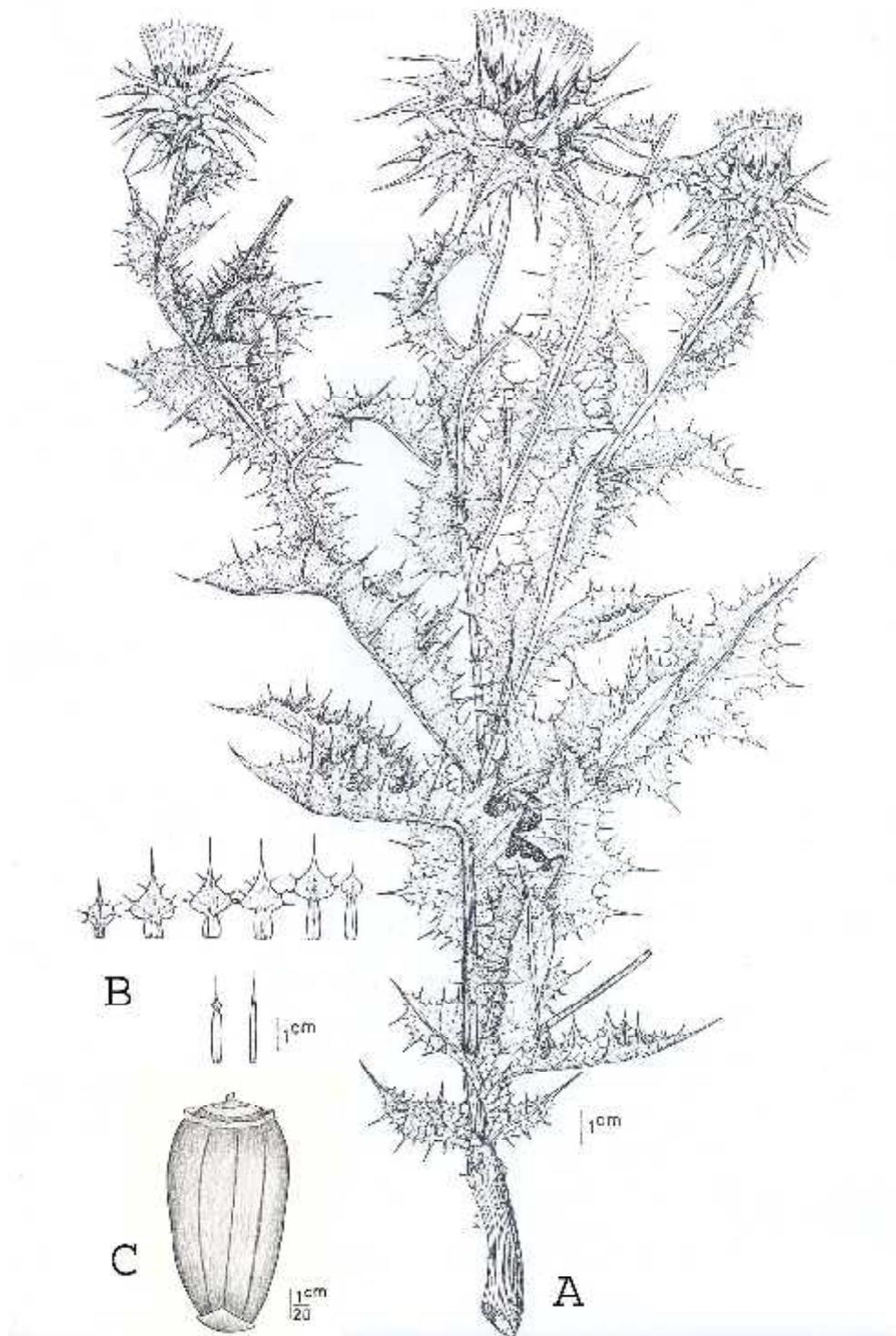


Fig. 3. *Cousinia denaensis*, A: habit; B: bracts, C: achene.

General distribution. Endemic to Iran.

Other specimens seen: Koh Gilouyeh and Boyer Ahmad: Yasouj, Sisakht, Bijan pass, Dena protected region, 2450-3170 m, Djavadi, Ghanbari & Torabi 53860 (IRAN); Yasouj, Bijan pass, 2800 m, Ghahreman & Attar 22501 (TUH). Esfahan: Northern slopes of Dena mountain, Nogol 46072 (TARI); Ferydon Shahr, Vahdat-abad village, Attar & Zamani 36207 (TUH).

Taxonomic remarks: *Cousinia denaensis* is very close to *C. barbeyi*, but differs from it by the following characters: corolla milky (not pink-purple), bracts ca. 120 in number (not ca. 80), in 16 series (not ca. 11 series), spread-almost recurved (not outer bracts absolutely recurved, other bracts erect), outer and median bracts spinulose along margin (not smooth or sometimes with 1-2 spines on each side). It is noticeable that this species shows some variations mainly in leaves form (pinnatisect- pinnatifid- lobate-dentate, forming continuously-interruptedly wings, cunneate-cordate at base), leaves texture (coriaceous-herbaceous) and indumentum (densely-loosely arachnoid-tomentose).

15. *C. sardashtensis* Rech. f., Flora Iranica 139A: 139 (1979).

Syn.: *C. pergamacea* Boiss. & Hausskn. subsp. *sardashtensis* (Rech.f.) Mehregan, Willdenowia 38: 331 (2008).

Stem 30-35 cm high. Basal leaves 30-35 × 6-10 cm, lanceolate, shallowly pinnate; stem leaves continuously decurrent; upper leaves completely reduced. Heads 2-2.5 cm in diam., ca. 100-flowered. Bracts 140-150 in number; appendage of median bracts ca. 8 × 7 mm, wide, completely imbricate, rhombic-spathulate, with some minute spines at margin; innermost bracts ca. 26 mm long, exappendiculate, attenuate toward apex, straw-colored, exceeded from involucre. Receptacle bristles scabrous. Corolla yellow, 22-24 mm long. Anther tube yellow, slightly pinkish at tip. Achenes ca. 4 × 2.5 mm, ovate, slightly attenuate toward base, light brown-blackish, with dark spots, minutely dentate above.

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros Mountains.

Specimens seen: Azerbaijan: 40 km Mahabad to Sardasht, 1600 m, Mozaffarian 70049 (TARI). Kurdistan: Sardasht, 1500 m, Rechingner 49113 (K, isotype).

Taxonomic remarks: *C. sardashtensis* is close to *C. fursei*, *C. millefontana* and *C. pergamacea*, but distinctly differs from them by smaller heads and bracts with numerous spines at margin (not smooth at margin). It is also comparable with *C. caroli-henrici* by having spinulose bracts, but differs from it by having arachnoid habit (not densely floccose-tomentose) and uppermost leaves which are more diminished and distant from heads (not less diminished and very close to heads).

16. *C. khansarica* Attar & Ghahreman, Nord. Journ. Bot. 23 (5): 592 (2005).

Syn.: *C. kotschyi* subsp. *khansarica* (Attar & Ghahreman) Mehregan, Willdenowia, 38: 340 (2008).

Stem up to 45 cm high, arachnoid-tomentose, densely leafy, branched from base. Leaves continuously decurrent, tomentose-canescens; basal leaves not seen; stem leaves oblong-lanceolate, lobate-dentate, cuneate at base, continuously decurrent; uppermost leaves gradually diminished. Heads 3-4 cm in diam., ca. 60-flowered. Involucre 2-2.5 cm in diam., constricted above, umbilicate at base, loosely arachnoid-floccose, glabrescent; bracts ca. 75 in number, coriaceous; appendages of median bracts 3-4 × 15-20 mm, hastate-rhomboid, acuminate, with 1-2 spines on each side; innermost bracts exappendiculate, acuminate, indistinctly lacerate at margin, papillose on dorsal. Receptacle bristles smooth. Corolla white, 20-22 mm long, tube as long as limb. Anther tube white. Achenes ca. 3.5 × 2.5 mm, dark brown, oblong, longitudinally striate, indistinctly scrobiculate [Plate 1 (N)].

General distribution: Endemic to Iran.

Habitat: Stony slopes.

Specimens seen: Esfahan, Khansar, 2400 m, Ghahreman & Attar 20037 (TUH, holotype); Bakhtiari, Ghoshchi to Gandoman, Iranshahr & Mousavi 9054 (IRAN, 33916-E); Boroujen to Lordegan, above Abvanak tunnel, 1800 m, Ghahreman & Attar s.n. (TUH); 6 km Lordegan to Boroujen, 1885 m, Djavadi, Ghanbari & Torabi 53863 (IRAN); Lordegan to Boroujen, 3 km before Al-ghadir (Abvanak) tunnel, 1985 m, Djavadi, Ghanbari & Torabi 53862 (IRAN); Gandoman, Vastegan, 2280 m, Djavadi, Ghanbari & Torabi 53861 (IRAN).

17. *C. gandilica* Rech. f., Flora Iranica 90: 223 (1972).

Stem up to 40 cm high, with distinct longitudinal ribs, arachnoid, glabrescent. Leaves tomentose on upper surface, more densely on beneath; basal leaves ca. 20 × 10 cm, with a ca. 4 cm petiole; stem leaves decurrent; upper leaves smaller, close to involucre, but completely distinct from involucral bracts. Heads 3-4.5 cm in diam., ca. 80-120-flowered. Involucre ca. 2.5 cm in diam., spherical or ovate, loosely arachnoid, glabrescent; bracts ca. 120 in number; appendages of median bracts ca. 12 × 6 mm, erect, rhombic, covering inner bracts, spinulose at margin, attenuate toward apex into a sharp-pointed spine; innermost bracts ca. 22 mm long, exappendiculate, yellow-colored. Receptacle bristles scabrous. Corolla yellow, ca. 22 mm long; tube almost as long as limb. Anther tube yellow. Achenes ca. 5 × 2 mm, pyramidal-oblong, attenuate toward base, brown-grey, dark maculate, with alternately thick and thin longitudinal ribs, similar to wings, with shallow pits between and on the ribs, minutely dentate above [Plate 1 (O)].

General distribution. Iraq and Iran.

Habitat. Margin of oak forests on calcareous soils.

Specimens seen. Azerbaijan: between Piran Shahr and Sardasht, 30 km Piran Shahr, 1300 m, Ghahreman & Attar 22009 (TUH).

Taxonomic remarks. *C. gandilica* is a rare distinct species belonging to the group having erect and imbricate bracts with numerous spines at margin. Of this group, except this species, only *C. keredjensis* is distributed in Iran.

18. *C. dalahuensis* Attar & Ghahreman, Iran Journ. Bot. 8 (2): 264 (2000).

Stem ca. 35 cm high, arachnoid. Leaves loosely arachnoid-tomentose above; median leaves oblong, continuously decurrent; uppermost leaves reduced, distant from heads. Heads ca. 2 cm in diam., ca. 65-flowered. Involucre ovate-oblong; bracts ca. 70 in number, papillose outside; appendage of median bracts ca. 6.5 × 7.5 mm, triangular, gradually attenuate, with only one minute spine on each side, imbricate; innermost bracts up to 18 mm long, exappendiculate, acute, straw-colored, exceeded from involucre, membranous. Receptacle bristles scabrous. Corolla purple, ca. 20 mm long, tube as long as limb. Anther tube purple. Achenes ca. 4.5 × 2 mm, inversely ovate, attenuate toward base, brown-blackish, scabrous, longitudinally striate, truncate-denticulate above [Plate 2 (A)].

General distribution. Endemic to Iran.

Specimens seen. Kermanshah: Tang-e Khamoush, 1500 m, Attar & Mirtadzadini 19918 (TUH, holotype); Mahi Dasht, Boujan pass, 1300 m, Attar & Mirtadzadini 19929 (TUH, paratype).

Taxonomic remarks. *C. dalahuensis* is close to *C. sardashtensis*, but differs from it by the number of flower per head (ca. 65, not 140-150), number of bracts (ca. 70, not 140-150), median bracts appendage (mostly with one spine on each side, not with numerous spines), corolla length (ca. 20 mm, not 22-24 mm) and color (purple, not yellow).

19. *C. grandis* C. A. Mey. in DC., Prodr. 6: 557 (1838). Syn.: *C. wetsteiniana* Bornm., Verh. Zool.-Bot. Ges. Wien 60:137 (1910).

Stem up to 80 cm high, branched from base, slightly arachnoid, with yellow or brown transparent sessile glands, almost glabrous. Leaves glabrous on both sides, with yellow-brown transparent sessile glands; basal leaves ca. 25 × 15 cm, widely ovate; stem leaves ovate, entire, dentate-spinulose, cordate-cuneate at base, asymmetric, interruptedly decurrent, forming 2-3 cm wide wings; upper leaves smaller. Heads 4-8 cm in diam., 50-100-flowered. Involucre covered with distinct yellow-brownish sessile transparent glands; bracts ca. 75 in number; outer bracts leaf-shaped, usually covering median bracts; appendages of median bracts 14-15 × 8-9

mm, ovate, erect, covering inner bracts, gradually attenuate toward apex, smooth at margin or with only one minute spine on each side; inner bracts triangular, attenuate toward apex, smooth at margin; innermost bracts ca. 22 mm long, gradually attenuate toward apex. Receptacle bristles scabrous. Corolla yellow, 17-20 mm long; limb twice as long as tube. Anther tube yellow, but pink at tip. Achenes ca. 5 × 2 mm, grey with scattered dark spots, longitudinally costate, indistinctly dentate above, inversely pyramidal [Plates 2 (B), 6 (F), 8 (L)].

General distribution. Iran and Turkey.

Selected specimens seen. Azerbaijan: Tabriz To Ahar, 30 km Tabriz, old bridge of Talkh-e Roud, 1600 m, Ghahreman & Attar 20577 (TUH); near Tabriz, Dik Dag, Gilliat-Smith 2103 (K); near Tabriz, Gilliat-Smith 2367 (K); Tabriz, Osko, Kandovan, Anish, Nour mountain, 2200-2350, Termeh & Mousavi 15188 (IRAN); 16 km S Urmieh, 1350 m, Rechinger 42100 (IRAN).

20. *C. grantii* Rech. f., Flora Iranica 90: 245 (1972).

Stem up to 60 cm high, branched from base, arachnoid, glabrescent. Leaves almost glabrous on both sides; basal leaves not seen; lower stem leaves 10-15 × 5-6 cm, oblong, sessile; median stem leaves interruptedly decurrent, forming up to 2 mm wide wings, cuneate at base; upper leaves gradually reduced. Heads 4-6 cm in diam., ca. 130-flowered. Involucre 1.5-2 cm in diam., loosely arachnoid-tomentose; bracts ca. 120 in number; appendage of median bracts ca. 20 × 11 mm, attenuate into a long spine at apex, smooth at margin, rarely with only one minute spine on each side, erect-spread-recurved; appendage of inner bracts linear-sickle like; innermost bracts ca. 32 mm long, exappendiculate, acuminate, exceeded from involucre. Receptacle bristles scabrous. Corolla pink-whitish, 25-27 mm long; limb shorter than tube. Anther tube pink. Achenes inversely ovate, ca. 5.5 × 2.5 mm, grey, with dark reticulate lines, longitudinally ribbed, surface rugose, minutely dentate above [Plates 2 (C), 6 (G), 8 (M)].

General distribution. Endemic to Iran.

Selected specimens seen. Azerbaijan: 25 km W Urmieh, Targevar, before Movana, 1700 m, Ghahreman & Attar 20578 (TUH); Urmieh, Balanesh, Iranshahr 2027 (IRAN); Urmieh, Ashk island, 1300-1400 m, Mousavi & Zargani 49806 (IRAN); Urmieh to Bonab, Iranshahr 9027 (IRAN); Bonab to Azar Shahr, 35 km to Azar Shahr, 1550 m, Termeh 9029 (IRAN); 20-30 km Sero to Salmas, Eskandari, A. Javadi & Torabi 11768 (IRAN).

21. *C. eriocephala* Boiss. & Hausskn. in Boiss., Fl. Or. 3: 504 (1875).

Syn.: *Arctium eriocephalum* (Boiss. & Hausskn.) O. Kuntze, Revis. Gen. 1: 307 (1891).

Stem up to 60 cm high, striate, densely white arachnoid-tomentose. Leaves arachnoid-tomentose on both sides,

white-colored; basal leaves oblong-lanceolate, 12-20 × 7 cm, lobate, petioles short; stem leaves lanceolate, cuneate at base, decurrent. Heads 4-6 cm in diam., ca. 260-flowered. Involucre ca. 3.5 cm in diam., densely white-arachnoid; bracts ca. 140 in number; appendage of median bracts ca. 17 × 3 mm, spatulate or narrowly rhombic, attenuate into a long spine at apex, rarely with 1-2 minute spines at margin; innermost bracts ca. 24 mm long, acuminate, yellowish, exceeded from involucre. Receptacle bristles scabrous. Corolla pink, 25-26 mm long; limb shorter than tube. Anther tube pink. Achenes 5-6 × 2-2.5 mm, dark brown, ovate, longitudinally striate, dentate above (based on type specimen description). [Plate 2 (D)].

General distribution: Iran and Turkey.

Specimens seen. Azerbaijan: Khoy, Razi, Attar & Mehdigholi 22442 (TUH); Makou, Kandi church, 2500 m, Siami 7634.

Taxonomic remarks: Three species, *C. qaradaghensis* Rech. f., *C. eriocephala* and *C. zagrica* Attar, Ghahreman & Assadi which were considered as synonymies of *C. canescens* DC. (Mehregan & Kadereit 2008), are morphologically different from *C. canescens* and from each other. The uppermost leaves in *C. qaradaghensis* are far from the heads, heads 6-7 (-9) cm in diam., densely araneose at base, involucre consist of 50-60 bracts, median bracts longer than inners. Whereas in *C. eriocephala*, the uppermost leaves are near to heads, involucre consist of ca. 140 bracts, bracts erect-appressed-spreading, median bracts shorter than inners. This species is the nearest ally to *C. zagrica*, but differs from it by its habit and number of flowers per head (Attar & al. 2002). It is noticeable that *C. zagrica* with having dense tomentose-arachnoid involucre and flat reflexed bracts and *C. canescens* with having laxe-almost glabrous involucre and erect-spread bracts are differentiated from each other.

22. *C. zagrica* Attar, Ghahreman & Assadi, Sendtnera 8: 5 (2002).

Stem up to 60 cm high, branched from middle, densely tomentose-arachnoid-canescens. Leaves tomentose-arachnoid on both sides; basal leaves oblong-lanceolate, pinnatifid-pinnatisect; stem leaves oblong-lanceolate, undivided, interruptedly decurrent; upper leaves small, cordate at base. Heads ca. 5 cm in diam., ca. 140-flowered. Involucre ca. 2.5 cm in diam., ovate, densely tomentose-arachnoid, constricted above; bracts ca. 100 in number; appendage of median bracts ca. 15 × 5 mm, triangular, acuminate, smooth at margin, flat, reflexed-spread; innermost bracts ca. 30 mm long, acute, erect, slightly exceeded from involucre. Receptacle bristles scabrous. Corolla pink, ca. 24 mm long; limb as long as tube. Anther tube pink. Mature achenes unknown [Plate 2 (E)].

General distribution. Endemic to Iran.

Specimens seen. Azerbaijan, Urmieh, Targevar, Hakki mountains, west of Darreh Rash village, 2100-2700 m, Mozaffarian 74871 (TARI, holotype).

Taxonomic remarks. *C. zagrica* is close to *C. eriocephala*, but differ from it by fewer flowers per head and cordate base of upper leaves.

23. *C. rhombiformis* C. Winkl. & Strauss, Acta Horti Petrop. 14: 232 (1897).

Stem tall, branched, white-arachnoid. Leaves coriaceous-membranous, completely decurrent; lower stem leaves oblong-lanceolate, lobate-dentate; uppermost leaves gradually transformed into bracts. Heads single, 3.5-5 cm in diam., ca. 80-flowered. Involucre ca. 2.5 × 2.5 cm, glabrescent, constricted above; bracts 80-90 in number; appendages of median bract erect, smooth at margin; innermost bracts membranous, straw-colored, linear-lanceolate. Receptacle bristles smooth. Corolla pink, 26-28 mm long. Anther tube pink. Achenes ca. 4.5 × 2.5 mm, compressed, brown, costate.

General distribution. Endemic to Iran.

Specimen seen. Lurestan: between Oshtoran kuh and kuh-e Sass, Sefid Ab, Strauss s.n. (B, isotype).

24. *C. araneosa* DC., Prodr. 6: 556 (1838).

Stem (20-) 40-60 cm high, densely leafy, branched from lower parts. Leaves thin leathery, sinuate-lobate-dentate, spiny, green-grayish; basal leaves not seen; stem leaves decurrent; upper leaves distant from the heads. Heads 3-5 cm in diam., ca. 70-flowered. Involucre 2.5-3 cm in diam., depressed at base, arachnoid, glabrescent; bracts ca. 120 in number; appendage of median bracts broadly spatulate, attenuate toward apex, acuminate; innermost bracts exceeded from involucre, membranous, pale-colored, erect, lanceolate. Receptacle bristles scabrous. Corolla purple, ca. 23 mm long, limb as long as tube. Anther tube purple. Achenes ca. 5 × 2.3 mm, pale brown, longitudinally striate, with minute papilla and pits, slightly attenuate toward base, with indistinct obtuse dents above.

General distribution. Endemic to Iran.

Specimen seen Koh Gilouyeh and Boyer Ahmad: Dena (Dinar) mountain, Kotschy 795 (K).

Taxonomic remarks: Recently, *C. kornhuberi* Heimerl, *C. elwendensis* Bornm, *C. ecbatanensis* Bornm., and *C. parsana* Ghahreman, Iranshahr & Attar were considered as synonyms of *C. araneosa* DC. (Mehregan & Kadereit 2008). Whereas, each shows main differences with *C. araneosa* and with each other in habit, bracts and achenes form. *C. ecbatanensis* is a relatively short plant, outer bracts recurved, median midrib of bracts is obvious, yellowish, carinate and inconspicuously spinulose at margin, whereas median and inner bracts are erect and completely smooth at margin. Therefore, the specimen (No. 13431-IRAN)

under the name of *C. ecbatanensis*, which has been recently determined as *C. araneosa* (Mehregan & Kadereit 2008), studied in details. With considering the size of plant, the form of bracts and leaves, the size of heads and with studying more specimens, *C. ecbatanensis* regards as a distinct species. *C. parsana* is characterized by having bracts appendage terminating to a long spine at apex, obviously spinulose-dentate at margin, outer bracts recurved, distinctly plicate at margin, but median bracts are spread-erect. These morphological characters are convenient enough to maintain this species as a distinct species.

25. *C. chlorosphaera* Bormm., Beih. Bot. Centrbl. 28, 2: 253 (1911) et 32, 2: 405 (1914).

Stem 30-60 cm high, striate, almost branched from base, white arachnoid, leafy in all length. Leaves arachnoid on both sides; basal leaves not seen; stem leaves decurrent. Heads 3-4 cm in diam., 75-80-flowered. Involucre 1.5-2 cm in diam., arachnoid; bracts 120 in number, appendage of median bracts rhombic, 12 mm long, 10 mm wide, with a single spine on each side, terminating to a long spine at apex, sometimes recurved, scabrous on dorsal surface in lower half, imbricate; innermost bracts ca. 22 mm long, exappendiculate, slightly exceeded from involucre, scabrous at margin, dentate-serrate. Receptacle bristles scabrous. Corolla purple, ca. 22 mm long; limb almost as long as tube. Anther tube purple. Achenes ca. 3.5 × 2.5 mm, brown, almost ovate, attenuate toward base, with indistinct longitudinal ribs, with inconspicuous pits, minutely dentate above [Plate 2 (F)].

General distribution. Endemic to Iran.

Specimens seen: Bakhtiari: Shahr-e Kord to Naghoun, N Soulgan, Shahpour Naz mountain, 2200-2700 m, Mozaffarian s.n. (TARI); Deh Cheshmeh, Salderan Kuh, west slope, 2200 m, Mozaffarian 57427 (TARI). Lurestan: Oshtoran Kuh, Strauss s.n. (B, holotype); Soreshjan, Mokhtar Heydari 26244 (TUH).

26. *Cousinia ardalensis* Attar & Djavadi, **sp. nov.** (Fig. 4).

Holotypus: Bakhtiari, Ardal, Naghan, 2050 m, Eskandari, Torabi & A. Javadi 53210 (IRAN).

Perennis, ca. 50 cm alta, araneoso-tomentosa. Caulis a medio ramosus. Folia concoloria; caulina complete decurrentia, oblongo-lanceolata, basi cuneata; summa prope capitula. Capitula singula, terminalia, ca. 50-flora, ca. 3 cm diametro. Involucrum 1.5-2.5 × 2-2.5 cm; phylla ca. 110, appendiculata; phylla intermedia appendice triangularia, margine spinulosa, in spinam

terminalem erectam usque ad 4 mm longam attenuata; phylla intima exappendiculata, acuminata. Receptaculi setae scabrae. Corolla purpurea, ca. 20 mm longa, tubo 11 mm, limbo 9 mm, laciniis ca. 4 mm longis. Antherarum tubus concolor. Achaenia 4-5 × 2 mm, brunnea.

Stem ca. 50 cm high, arachnoid-tomentose, densely covered with long continuous wings of decurrent leaves, branched from middle; branches usually long, furcate. Leaves arachnoid-tomentose on both sides, completely decurrent; basal leaves not seen; lower stem leaves lanceolate, free part of leaves ca. 4-5 cm long, dentate-spinulose at margin, with spines ca. 7 mm long; the rest forming up to 3 cm wide wings; upper and uppermost leaves similar to lower leaves, continuously decurrent, but with narrower wings, close to the heads. Heads single, up to 3 cm in diam., ca. 50-flowered. Involucre ovate, 1.5-2.5 cm wide, 2-2.5 cm long, depressed at base, constricted above; bracts ca. 110 in number, appendiculate, appendage of outer bracts green, arachnoid-papillose, spreading-reflexed, with 2-3 spines on each side, attenuate toward apex into a sharp-pointed spine; appendage of median bracts ca. 10 × 7 mm, triangular, spinulose (with 3-4 spines on each side), pectinate at margin, with distinct midrib excurrent into a up to 4 mm long spine at apex; inner bracts straw-colored, brown-purplish at margin, with convex appendage, lacerate-serrate at margin; innermost bracts ca. 22 mm long, membranous, purplish above, densely papillose on dorsal surface, exceeded from involucre. Receptacle bristles scabrous. Corolla purple, ca. 20 mm long, tube ca. 11, limb ca. 9, lobes ca. 4 mm long. Anther tube glabrous, purple with white distinct tip. Achenes 4-5 × 2 mm, with distinct longitudinal wing-like ribs and indistinct ribs [Plate 2 (G)].

General distribution. Endemic to Iran.

Other specimens seen: Bakhtiari: Farsan, Deh Cheshmeh, Pir Ghar, 2050 m, Eskandari, Torabi & A. Javadi 53230 (IRAN); Pir Ghar, 2060 m, Djavadi, Ghanbari & Torabi 53223 (IRAN); Farsan to Shahr-e Kord, Cholicheh, 2065 m, Djavadi, Ghanbari & Torabi 53225 (IRAN).

Taxonomic remarks: *Cousinia ardalensis* is close to *C. chlorosphaera* but differs from it by the following characters: margin of median bracts spinulose (not almost entire), appendage of median bracts triangular, ca. 7 mm at base, (not ca. 12 mm, rhombic).

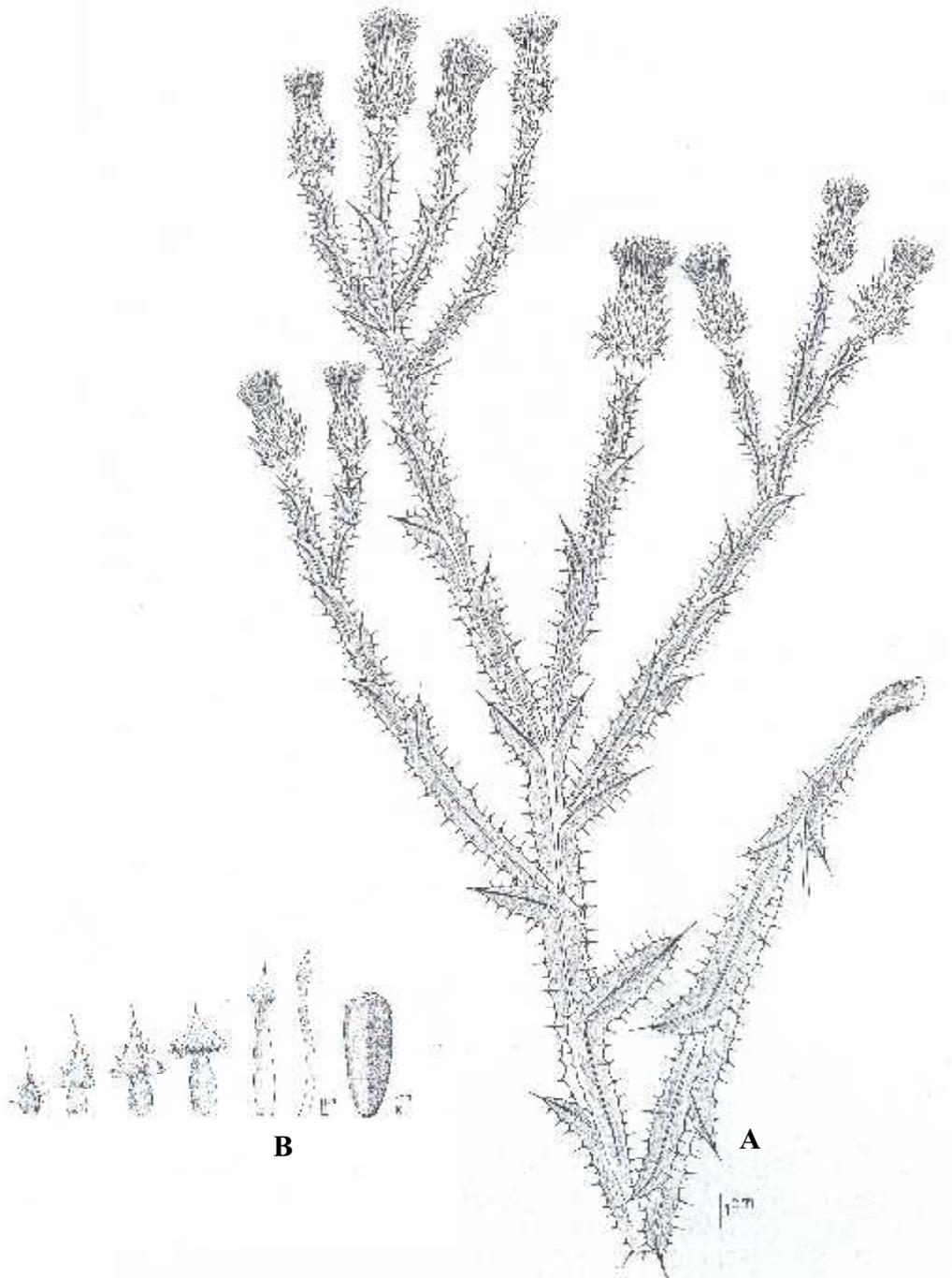


Fig. 4. *Cousinia ardalensis*, A. habit; B. bracts and achene.

27. *Cousinia gaharensis* Attar & Djavadi, sp. nov. (Fig. 5).

Holotypus: Lurestan: between Sepid Dasht and Shulabad, 2300 m, Attar & Ghahreman 38259 (TUH).

Perennis, ca. 50 cm alta, araneoso-tomentosa. Caulis a basi ramosus. Folia concoloria, lanceolata, pinnatifida; caulina perfecte decurrentia, oblongo-lanceolata, basi cuneata; summa sensim decrescentia. Capitula singula, terminalia, spherica, ca. 100-flora, ca. 3.5-5.5 cm diametro; phylla ca. 140, appendiculata; phylla intermedia appendice triangularia, margine pectinato-spinulosa, in spinam terminalem erectam usque ad 5 mm longam attenuata; phylla intima exappendiculata, linearia, acuminata. Receptaculi setae laeves. Corolla purpurea, ca. 27 mm longa; limbus tubo aequilongus. Antherarum tubus concolor. Achaenia ca. 6 × 2 mm, fusca.

Perennial. Stem up to 50 cm high, arachnoid-tomentose, furrowed, with short branches from base. Leaves continuously decurrent, forming wide wings, arachnoid-tomentose on both sides, lanceolate, pinnatifid, with numerous spines at margin, spines up to 5 mm long; basal leaves not seen; lower leaves forming ca. 3 cm wide wings; free part of leaves ca. 3 cm long; median leaves lobed, continuously decurrent; free part of leaves up to 5.5 cm long, terminating to a ca. 5 mm long spine at apex; upper leaves similar to other leaves but smaller, close to the heads. Heads single, 3.5-5.5 cm in diam., ca. 100-flowered. Involucre subspherical; bracts ca. 140 in number, appendiculate; appendage of outer bracts ca. 10 × 7 mm, triangular, with fine spines at margin, reflexed, terminating to a ca. 5 mm long spine; appendage of median bracts ca. 10 × 10 mm, triangular, pectinate-spinose at margin, terminating to a ca. 5 mm long spine at apex, imbricate; appendage of inner bracts similar to appendage of median bracts but smaller; inner bracts linear, up to 2.5 cm long. Receptacle bristles distinctly smooth. Corolla purple, ca. 27 mm long; limb as long as tube. Anther tube pale. Achenes ca. 6 × 2 mm, inversely pyramid, attenuate toward base, blackish, longitudinally striate and indistinctly dentate above [Plate 2 (H)].

General distribution. Endemic to Iran.

Taxonomic remarks: *C. gaharensis* is close to *C. acanthophysa* (endemic to Iraq), but distinguished from it by: outer bracts long triangular and reflexed (not leafy and appressed), appendage of median bracts up to 10 mm wide at base (not up to 15 mm), corolla ca. 27 mm (not ca. 30 mm), involucre ovate (not globose), receptacle bristles smooth (not scabrous).

28. *C. keredjensis* Bornm. & Gauba, Feddes Repert 36: 328 (1934).

Stem 30-55 cm high, branched from the middle or base, arachnoid. Leaves entire, dentate-spinulose at margin, arachnoid-tomentose on both sides; basal leaves ca. 25 × 5 cm, entire; stem leaves continuously decurrent. Heads up to 6 cm in diam., ca. 125-flowered. Involucre up to 3.5 cm in diam., tomentose; bracts 130 in number; appendages of median bracts ca. 15 × 10-12 mm, triangular-hastate, spinulose at margin, imbricate, gradually attenuate toward apex, terminating to a long, almost recurved spine; innermost bracts ca. 25 mm long, gradually attenuate, slightly exceeded from involucre, yellow-colored. Receptacle bristles scabrous. Corolla white-milky, up to 24 mm long; limb longer than tube. Anther tube white-milky. Achenes ca. 4-4.5 mm long, dark-colored, with marble pits, inversely pyramidal [Plates 2 (I), 6 (H)].

General distribution. Endemic to Iran.

Selected specimens seen: Tehran: 15 km Tehran to Karaj, Kuh Dashteh, 1550 m, Ghahreman & Attar 21807 (TUH); Karaj, above Botanical Garden, Vardavard, 1700 m, Wendelbo, Assadi & Shirdel Pour 12525 (TARI); NW Tehran, Soloughan, 1900 m, Assadi et al. 33614 (TARI); Karaj, 2 km S Khouzan Kala, 1750 m, Runemark, Rezaieyan & Pak Tinat 21705 (TARI); Karaj, after Amir Kabir dam, 1770 m, Djavadi 9050 (IRAN).

29. *C. zardkuhensis* Attar & Ghahreman, Iran Journ. Bot. 9 (2): 164 (2002).

Syn.: *C. silyboides* Jaub. & Spach subsp. *zardkuhensis* (Attar & Ghahreman) Mehregan, Willdenowia 38: 310 (2008).

Stem up to 30 cm high, branched, densely leafy. Leaves almost herbaceous, upper surface slightly but lower surface densely arachnoid-tomentose, grayish; basal leaves sessile, sinuate-dentate, spinose; stem leaves lanceolate, cuneate at base; uppermost leaves gradually transformed into involucral bracts. Heads up to 5 cm in diam., ca. 100-flowered. Involucre ca. 2.5 cm in diam., constricted above; bracts ca. 100 in number; median bracts appressed below, erect-spreading, with triangular-sagittate appendage, gradually attenuate toward apex, spinose at tip, with 1-2 spinules on each side; innermost bracts exappendiculate, gradually attenuate, straw-colored, papillose on dorsal, slightly exceeded from involucre. Receptacle bristles indistinctly scabrous or almost smooth. Corolla purple, 18-20 mm long; tube almost as long as limb. Anther tube white with purple tip. Mature achenes unknown [Plate 2 (J)].

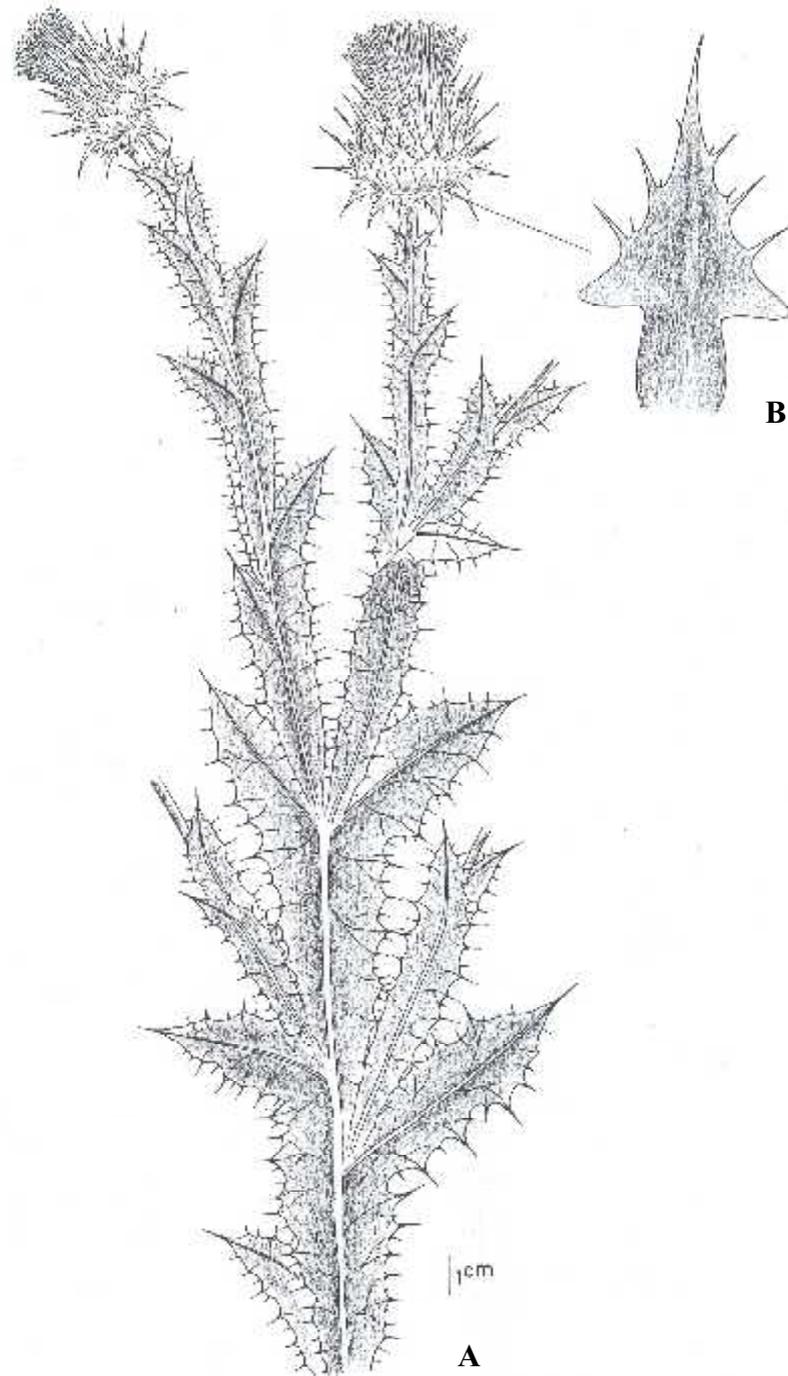


Fig. 5. *Cousinia gaharensis*, A. habit; B. bract

General distribution. Endemic to Iran.

Selected specimens seen: Esfahan: 50 km from Tiran to Shahr-e Kord, 1800 m, Ghahreman & Attar 20038 (TUH); between Tiran & Saman, 15 km to Saman, 2000 m, Mozaffarian & Maasoumi 77958 (TARI). Bakhtiari: Gandoman to Boroujen, 2250 m, Attar 21887 (TUH, holotype); 14 km Shahr-e Kord to Farsan, before Soreshjan, 2250 m, Djavadi, Ghanbari & Torabi 53198 (IRAN); between Sefid Dasht and Boroujen, Faradonbeh, 2150 m, Djavadi, Ghanbari & Torabi 53200 & 53199 (IRAN).

Taxonomic remarks: *C. zardkuhensis* is an endemic species restricted to middle elevations in Esfahan and Bakhtiari provinces. Although, its distribution area is close to those of *C. rhombiformis* and *C. chlorosphaera* and it shows some similarity in morphological characters with the two species, but it differs from *C. chlorosphaera* by its habit and almost smooth bristles. It is also distinguishable from *C. rhombiformis* by smaller size, more numerous flowers and bracts as well as corolla length. Comparing with *C. kotschyi* (syn.: *C. silyboides*), *C. zardkuhensis* has the following characters: uppermost leaves are very near to the heads, but not bract-like (whereas uppermost leaves in *C. kotschyi* are completely distant from the heads). Median bracts are imbricate-appressed, shorter than involucre, but innermost bracts are obviously longer than involucre, exceeded from it (in *C. kotschyi* median bracts are longer than involucre, usually reaches to the heads). Appendage of median bracts are sagittate, abruptly terminated to a sharp pointed spine at apex (not lanceolate and gradually acuminate), bracts ca. 100 in number (not ca. 70), heads excluding spines 2-2.5 cm in diam. (not 1-1.5 cm), anther tube white with purple tip (not completely pink).

30. *C. lordeganensis* Mehregan, Willdenowia 38: 341 (2008), Description completed.

Stem ca. 80 cm high, densely canescent-tomentose, usually simple or branched from middle or higher. Leaves leathery, silver arachnoid-tomentose on both sides; basal leaves oblong to lanceolate, shallowly pinnate; stem leaves sinuate-lobate, oblong-lanceolate, decurrent; uppermost leaves close to the heads, gradually transformed into bracts, nearly involucre. Heads ca. 60-flowered. Involucre densely white arachnoid; bracts ca. 80 in number; appendage of median bracts ca. 16 × 5 mm, rhombic, spinulose at margin, gradually attenuate toward apex into a sharp-pointed spine, imbricate, covering inner bracts; innermost bracts ca. 30 mm long, exappendiculate, yellow at apex, acuminate, distinctly exceeded from involucre. Receptacle bristles smooth. Corolla white, ca. 23 mm long; tube as long as limb. Anther tube pink or purple at apex. Achenes ca. 4.5 × 2.5 mm, compact,

dark brown, longitudinally striate, rounded at apex, slightly marginate-dentate, attenuate toward base (matured achenes unknown, the description is on the basis of type specimen) [Plates 2 (K), 6 (J)].

General distribution. Endemic to Iran.

Specimens seen. Bakhtiari: Gandoman to Lordegan, 1900 m, Ghahreman, Attar & Ghaffari 21884 (TUH); Lordegan, after Abvanak tunnel, 1900 m, Ghahreman & Attar 20567 (TUH); Lordegan to Boroujen, after Alghadir tunnel, 1880 m, Djavadi, Ghanbari & Torabi 53191 (IRAN).

Note: Description of type specimen of *C. lordeganensis* is based on an incomplete specimen. Therefore, the description completed by the specimen No. 20567 (TUH).

31. *C. elwendensis* Bormm., Beih. Bot. Centrbl. 28, 2: 255 (1911).

Stem 60-70 cm high, dirty white-grayish, branched from middle, arachnoid-tomentose. Basal leaves lanceolate, ca. 35 × 8 cm, pinnatisect, grey arachnoid on both sides, dentate at margin; stem leaves continuously decurrent; upper leaves diminished. Heads ca. 3.5 cm in diam., ca. 230-flowered. Involucre spherical, white-grey arachnoid; bracts ca. 130 in number; appendage of median bracts ca. 16 × 14 mm, trapezium, smooth at margin, attenuate toward apex; innermost bracts exappendiculate, ca. 30 mm long, with papillas and piles on dorsal surface, serrate at margin. Receptacle bristles scabrous. Corolla white, 25-26 mm long; limb shorter than tube. Anther tube white. Achenes inversely pyramidal, ca. 5 × 2.5 mm, brown, with dark spots, longitudinally striate, slightly attenuate toward base, dentate above [Plate 2 (L)].

General distribution. Endemic to Iran.

Selected specimens seen: Hamadan: Alvand mountain, 1800 m, Ghahreman & Attar 20566 (TUH); Alvand mountain, Strauss s.n. (B, holotype); Toyserkan, Shahrestank, 2300-2550 m, Mozaffarian & Masoumi 79645 (TARI); Hamadan to Toyserkan, 12 km to Ganjnameh, 2400 m, Termeh, Mousavi & Tehrani 9056 (IRAN).

Taxonomic remarks: The type description of *Cousinia elwendensis* was based on a poor defective specimen gathered by Strausse from Alvand mountain (Rechinger 1972). With new more collections, some morphological characters added to the description of the species. This species, which was considered as a synonymy of *C. araneosa* (Mehregan & Kadereit 2008), is now known as a distinct species. Because, firstly the type locality of *C. elwendensis* (Alvand mountain in Hamadan province) is far from the type locality of *C. araneosa* (Dena mountain in Fars province), secondly, *C. elwendensis* with having white corolla is readily differentiated from *C. araneosa*, which has purple

corolla. It is noticeable that *C. ehwendensis* is similar to *C. kornhuberi*, but it is distinguishable by having white corolla, trapezoid-shaped bracts, short-stemmed branches and fewer heads (Ghahreman & al. 1999).

32. *C. khorramabadensis* Bornm. in Koeie, Danish Scient. Invest. Iran 4, Beitr. SW. Iran 1: 25 (1945).

Stem branched from lower part. Leaves arachnoid on both sides, dentate at margin; basal leaves shallowly or profoundly lobate, 14-23 × 4-7 cm; stem leaves decurrent; uppermost leaves close to the heads, similar to involucral bracts. Heads 5-6 cm in diam., 190-200-flowered. Involucre 3.5-4 cm in diam., glabrous or loosely arachnoid; bracts ca. 160 in number; appendage of median bracts 9-14 × 12 mm, rhombic, carinate, attenuate into a recurved sharp-pointed spine at apex, smooth at margin, rarely with one minute spine on each side; innermost bracts exappendiculate, ca. 28 mm long, exceeded from involucre, yellow-colored. Receptacle bristles scabrous. Corolla white, milky when dried, 23-24 mm long, limb almost as long as tube. Anther tube white. Achenes 7-8 × 3 mm, inversely pyramidal, milky with dark spots [Plates 2 (M), 6 (K), 8 (N)].

General distribution. Endemic to Iran.

Selected specimens seen: Lurestan: Doroud to Azna, 5 km Azna, Darre Takht, 1900 m, Ghahreman & Attar 21851 (TUH); Doroud, between Saravan and Gahar lake, 2300-3500 m, Mozaffarian & Sardabi 42345 (TARI); Oshtoran Kuh protected region toward Gahar, 2000 m, Djavadi & Ghanbari 29550 (IRAN); 39 km Khorramabad to Noujian and Keshvar, 2300-2550 m, Runemark & Lazari 26124 (TARI).

Taxonomic remarks: *Cousinia khorramabasensis*, a new synonymy of *C. sagittata* subsp. *sagittata* (Mehregan & Kadereit 2008) has the following differences with *C. sagittata*. very tall and robust plant, with few branches, heads very large, absolutely constricted above, uppermost leaves surrounding the heads, bracts obviously recurved, carinate. This species is also differentiated from *C. sagittata* by the distributional area.

C. khorramabasensis Bornm var. *purpurea* Attar & Ghahreman, Iran Journ. Bot. 9 (2): 166 (2002).

Specimens seen: Lurestan: between Shulabad and Aligudarz, Dalani region, Ghahreman, Attar & Mehdigholi 27591 (TUH, holotype).

Note: This variety that has purple corolla, grows in a small area together with typical *C. khorramabasensis* which has white corolla.

33. *C. phyllocephala* Bornm. & Gauba, Feddes Repert. 36: 330 (1934).

Syn.: *C. koeieana* Bornm., Danish Scient. Invest. Iran 4; Beitr. SW Iran 4: 26 (1945) incl. var. *adenoloba* Bornm., l. c. 29.

Stem up to 32 cm high, branched from base. Leaves tomentose on both sides; basal leaves dimorph, entire or pinnatisect, elliptic, 11-13 × 5-6.5 cm, acuminate, obtuse, apiculate, minutely spinulose at margin; stem leaves decurrent, continuously winged; upper leaves similar to median leaves, forming cup-shaped involucre, surrounding the heads. Heads 3-5 cm in diam., 90-150-flowered. Involucre 2-2.5 cm in diam., up to 2 cm long, loosely arachnoid above; bracts ca. 105 in number; appendages of median bracts 13-18 × 10-15 mm, triangular, auriculate at base, gradually attenuate toward apex into a long recurved spine, rarely with 1-2 minute spines at margin; innermost bracts 21-27 mm long, attenuate toward apex, exceeded from involucre, yellow-colored. Receptacle bristles scabrous at apex. Corolla purple, 26-27 mm long; limb 12-13 mm, tube 14 mm long. Anther tube purple. Achenes ca. 7 × 3 mm, narrowly oblong, attenuate toward base, with 4 indistinct longitudinal ribs, minutely dentate above, grey, dark maculate [Plates 2 (N), 9 (A)].

General distribution. Endemic to Iran.

Selected specimens seen: Lurestan: 15 km Khorramabad, in Keshvar road, in oak forests, 1500 m, Ghahreman & Attar 21827 (TUH); Khorramabad, Sefid Dasht road, after Azna Kerit, 1850 m, Ghahreman & Attar 21838 (TUH); Khorramabad, Noujian, 1820 m, Eskandari, Torabi & A. Javadi 9188 (IRAN); Doroud to Khorramabad, Zagheh pass, 1950 m, Ghahreman & Attar 21825 (TUH); Doroud, Oshtoran Kuh protected region, Djavadi & Ghanbari 29549 (IRAN); 27 km Khorramabad to Andimeshk, Noujian, Mozaffarian 80403 (TARI); 40 km S Doroud, 1250-1600 m, Assadi & Mozaffarian 37024 (TARI); Bisheh, 50 km Khorramabad, 1200-1400 m, Reching 5760 (K, Typus *C. koeieana*).

Taxonomic remarks: *C. phyllocephala* is readily distinguishable from *C. sagittata* by the following characters: uppermost leaves surrounding the heads (not near to heads), bracts leaf-shaped and herbaceous.

34. *C. macrocephala* C. A. Mey., Verz. Pfl. Cauc. 231 (1831).

Syn.: *C. gigantolepis* Rech. f., Flora Iranica 90: 257 (1972).

Stem up to 40 cm high, branched from base, arachnoid. Leaves arachnoid on both sides, more densely on lower surface, white-colored; basal leaves lanceolate, sessile, pinnatisect, ca. 9 × 4.5 cm; stem leaves interruptedly decurrent. Heads up to 9 cm in diam. Involucre up to 3.5 cm in diam.; bracts 57-70 in number; appendage of median bracts 25 × 12 mm, ovate, smooth at margin, erect-spread, sharp-pointed at apex; innermost bracts ca. 30 mm long, purple on dorsal, covered with papillas, glands and short hairs, exceeded from involucre, acuminate. Receptacle bristles smooth.

Corolla yellow (rarely pink), rarely slightly purple above, papillose outside, 25-33 mm long; tube as long as limb or longer. Anther tube yellow, rarely purple. Mature achenes unknown [Plate 2 (O)].

General distribution.: Iran, Talish and Transcaucasus.

Selected specimens seen.: Azerbaijan: 25 km Kaliabar from Ahar, 1700 m, Ghahreman & Attar 35017 (TUH); Ahar, Garmadouz, Termeh 9012 (IRAN, 13197-E); Ahar, Assadi & Shahsavari 65915 (TARI); between Meshgin Shahr and Ahar, Noudouz, Wendelbo & Assadi 27886 (TARI); Arasbaran, between Tula Ali and Vinegh, 900 m, Assadi & Vosoughi 24574 (TARI); Sabalan mountain, Shah Bil, 2650 m, Foroughi & Assadi 13871 (TARI).

35. *Cousinia silvanica* Attar, sp. nov. (Fig. 6).

Holotype.: Azerbaijan: Rezayieh, Targevar region, Boze Sina, 2500 m, Pour Mohammadi 24064 (TUH).

Biennis vel monocarpica. Planta tota dense arachnoideo-tomentosa, alba. Caulis albus. Folia basalia lanceolata, pinnatifida, 17 × 3 cm; folia caulina lanceolata, incomplete decurrentia, superiora sensim decrescentia. Capitula singula, terminalia, ca. 310-flora, 7-8 cm diametro; involucrem absque spinis 3.5 × 3.5 cm; phylla ca. 120, appendiculata; phylla intermedia herbacea; appendices ca. 30 mm longa, basi usque ad 6 mm lata, sparse spinulosa, recurva-squarrosa. Receptaculi setae scabrae. Corolla flava, ca. 28 mm longa, tubus limbo paulo breviora, laciniis 5-8 mm longis. Antherarum tubus concolor. Achaenia ignota.

Monocarpic, ca. 30 cm high, white-tomentose-arachnoid. Stem white, thick, branched from base, interruptedly winged. Basal leaves lanceolate, 17 × 3 cm, with ca. 5 cm long petiole, pinnatifid-lobed, each lobe terminating to a ca. 5 mm long spine; midrib broad, prominent, white; nervation pinnate; stem leaves lanceolate, interruptedly long decurrent; free part large; upper leaves near to the head. Heads single, terminal, ca. 310-flowered, 7-8 cm in diam. Involucre spherical, 3.5 × 3 cm; arachnoid; bracts ca. 120 in number, appendiculate; appendage of outer bracts lanceolate, ca. 35 × 9 mm, spinulose at margin, gradually attenuate into a yellow spine at apex, spreading-reflexed; appendage of median bracts ca. 30 × 6 mm, spreading-reflexed-squarrose, spinulose at margin, attenuate towards apex; inner bracts lanceolate, ca. 25 × 4 mm, entire or rarely spinulose at margin; innermost bracts lanceolate, exappendiculate, exceeded from involucre. Receptacle bristles scabrous, up to 22 mm long. Corolla yellow, ca. 28 mm long; tube 13, limb 15 and lobes 5-8 mm long. Anther tube concolor, glabrous. Mature achenes unknown [Plate 3 (A)].

General distribution.: Endemic to Iran.

Taxonomic remarks.: *C. silvanica* is easily distinguishable from *C. macrocephala* by having narrower and long recurved squarrose bracts, the number of flower per head and scabrous bristles.

36. *C. sagittata* C. Winkl. & Strauss., Acta Horti Petrop. 14: 233 (1897).

Stem 27-40 cm high, branched from base. Leaves arachnoid-tomentose on both sides; basal leaves ca. 15 × 5.5 cm, lanceolate, lobate; stem leaves lanceolate, decurrent, forming up to 30 mm wide wings; upper leaves smaller than median leaves, close to the heads. Heads 6.5-10 cm in diam., ca. 120-flowered. Involucre up to 5 cm in diam., almost globose, tomentose, loosely arachnoid above; bracts 75-150 in number, appendiculate; appendage of median bracts 18-30 × 8-20 mm, acuminate, smooth at margin or rarely with one spine on each sides, imbricate or spread above; innermost bracts 28-36 mm long, exappendiculate, acuminate. Receptacle bristles scabrous. Corolla white, 24-30 mm long; tube almost as long as limb or slightly longer. Anther tube white. Achenes ca. 5 × 1.5 mm, inversely ovate, brown-blackish, scabrous, with wing-shaped longitudinal ribs, slightly attenuate toward base, with dentate margin above [Plates 3 (B), 6 (L)].

General distribution.: Endemic to Iran.

Selected specimens seen.: Markazi: Arak, Chehel Kkatoun mountain, near to Emarat, 2050 m, Ghahreman & Attar 21880 (TUH); Arak, Senejan, 1830 m, Ghahreman & Attar 21819 (TUH); Sultanabad near Mowdar, Strausse s.n. (B, type); Anjedan, 2000-2400 m, Mozaffarian 63784-A (TARI); Khomain to Arak, Emarat road, 2100 m, Ghahreman & Attar 21879 (TUH). Esfahan: Golpayegan, Hendeh, 2200-2800 m, Iranshahr 6184 (IRAN, 13463-E); Lurestan: between Azna and Doroud, 1700 m, Djavadi & Ghanbari 29560 (IRAN). Hamadan: above Ecbatan dam, 1900 m, Ghahreman & Attar 22371 (TUH); Oshtoran Kuh, Strausse s.n. (K, type).

Taxonomic remarks.: In the recent accomplished survey (Mehregan & Kadereit 2008), two new subspecies were considered for *C. sagittata* subsp. *sagittata* and subsp. *iranica* (C. Winkl. & Strauss) Mehregan. Four species namely *C. rhombiformis*, *C. phyllocephala*, *C. khorramabadensis* and *C. koeieana* Bornm. were regarded as synonym and placed under the first subspecies. *Cousinia straussii* was considered as a synonym of the second subspecies. However, with considering the form of achenes and bracts, corolla color, uppermost leaves (involucrant or not) and distribution of the species, all mentioned taxa are known as distinct species (refer to description and illustration of each taxa).

37. *Cousinia lurestanica* Attar & Djavadi, sp. nov. (Fig. 7).

Holotypus: Iran: Lurestan, at the junction of Aligoudarz to Khomain, Attar 21824 (TUH).

Perennis, ca. 40 cm alta, araneoso-tomentosa. Caulis a medio ramosus. Folia concoloria, lanceolata, pinnatifida; basalia ignota; caulina complete decurrentia, oblongo-lanceolata, basi cuneata, sensim decrescentia. Capitula singula, terminalia, ca 130-flora, ca. 6 cm diametro; phylla ca. 40, appendiculata; appendices valde inflatae, concavae, imbricatae; intermedia triangularia, margine integra; phylla intima exappendiculata, linearia. Receptaculi setae scabrae. Corolla pallide rosea, ca. 24 mm longa, tubo limbum circiter aequante. Antherarum tubus concolor. Achaenia ca. 6×3.5 mm, brunnea.

Monocarpic perennial plant. Stem ca. 40 cm high, covered with arachnoid-tomentose-tuft hairs, densely leafy, branched from middle. Leaves all sessile, decurrent, pinnatifid, forming continuously wings completely covering stem and branches, lobate-dentate-spinulose, arachnoid-tomentose on both sides, more densely on beneath, white; lateral spines up to 3 cm long, alternately with short spines, yellowish; terminal spine ca. 6 mm long; nervation pinnate-reticulate, prominent on both sides; basal leaves not seen; stem leaves lanceolate, inconspicuously reduced upward; uppermost leaves very close to heads but not in a form of involucre bracts. Heads ca. 6 cm in diam., ca. 130-flowered. Involucre ca. 3.5 cm long, ca. 4 cm wide, arachnoid; bracts ca. 40 in number, appendiculate, appendages swollen, completely embossed, sagittate-auriculate, araneose-tomentose, smooth at margin; outer bracts patent-spread, acuminate at apex; median bracts imbricate, erect, sharply acuminate toward apex; inner bracts membranous, linear, exappendiculate. Receptacle bristles scabrous. Corolla pale pink, ca. 24 mm long; limb 12 mm, tube 12 mm, lobes 8 mm long. Anther tube pale pink, glabrous. Achenes ca. 6×3.5 mm, brown, with indistinct longitudinal wings, attenuate toward base, slightly dentate above [Plate 3 (C)].

General distribution: Endemic to Iran.

Taxonomic remarks: *C. lurestanica* is related to *C. inflata*, but differs from it by the following characters: very limited distributional area (compared with distribution of *C. inflata*, widespread inside as well as margin of oak forests in Kermanshah province), bracts ca. 40 in number (not 140-160), involucre densely arachnoid-tomentose (not glabrous-rarely covered with lose arachnoid hairs), also shape of achenes differ in two specie.

Note: *C. lurestanica* consists of populations distributed in a very limited area around the road of Aligudarz to

Khomain, shows some morphological variations as follows: leaves and involucre covered with dense-loose indumentum, leaves with short or long spine at margin (5-10 mm long), median bracts appendages sharp pointed to a short-long spine at apex (5-10 mm long).

38. *C. straussii* Hausskn. & C. Winkl., Acta Horti Petrop. 14: 235 (1897).

Stem ca. 25 cm high, branched from base, arachnoid, glabrescent. Basal leaves lanceolate or oblong, ca. 5×2.5 cm, sessile; stem leaves lanceolate, decurrent; upper leaves distant from the heads. Heads ca. 6.5 cm in diam., ca. 90-flowered. Involucre up to 3.5 cm in diam, arachnoid; bracts 130 in number, appendiculate; appendages sagittate, acuminate; appendage of median bracts ca. 10 mm wide, smooth at margin or with 1-2 spines on each side; innermost bracts yellowish, exceeded from involucre. Receptacle bristles scabrous. Corolla white, ca. 28 mm long; limb as long as tube; lobes 4-7 mm long. Anther tube white. Achene ca. 6×3 mm, inversely ovate, dark brown, dark maculate, longitudinally striate, attenuate toward base [Plate 3 (D)].

General distribution: Endemic to Iran.

Specimens seen: Markazi: Arak, Gerdou, 1700-1800 m, Djavadi & Ghanbari 29558 (IRAN); Gerdou, 1900 m, Ghahreman & Attar, 21882 (TUH); Shazand (in mountains), 1700-1800 m, Djavadi & Ghanbari 29557 (IRAN); Shazand, Strauss s.n. (B); Arak to Sefid Khani, Ghahreman 9182 (IRAN); Arak, Kelet 13432 (IRAN).

39. *C. iranica* C. Winkl. & Strauss., Acta Horti Petrop. 14: 233 (1897).

Syn.: *C. sagittata* Hausskn. & Winkl. subsp. *iranica* (C. Winkl. & Strauss.) Mehregan, Willdenowia 38 328 (2008).

Stem up 25 cm high, arachnoid-tomentose. Leaves lobate-dentate-arachnoid-tomentose on both sides, more densely on beneath, white-colored; basal leaves ca. $9 \times 4.5-5$ cm, lanceolate, shallowly pinnatisect, sessile; stem leaves decurrent; upper leaves similar to involucre bracts, surrounding the heads. Heads ca. 6.5 cm in diam., ca. 170-flowered. Involucre ca. 3.5 mm in diam., densely arachnoid-tomentose; bracts ca. 115 in number; appendage of median bracts 25×12 mm, hastate-rhombic, with long sharp-pointed spine at apex, erect-imbricate; innermost bracts exappendiculate, straw-colored, acuminate, ca. 30 mm long. Receptacle bristles scabrous. Corolla white, ca. 22 mm long; limb shorter than tube. Anther tube milky. Immature achenes ca. 5×2.5 mm, with 4-5 longitudinal ribs and irregular oblique wrinkles and pits, dentate above.

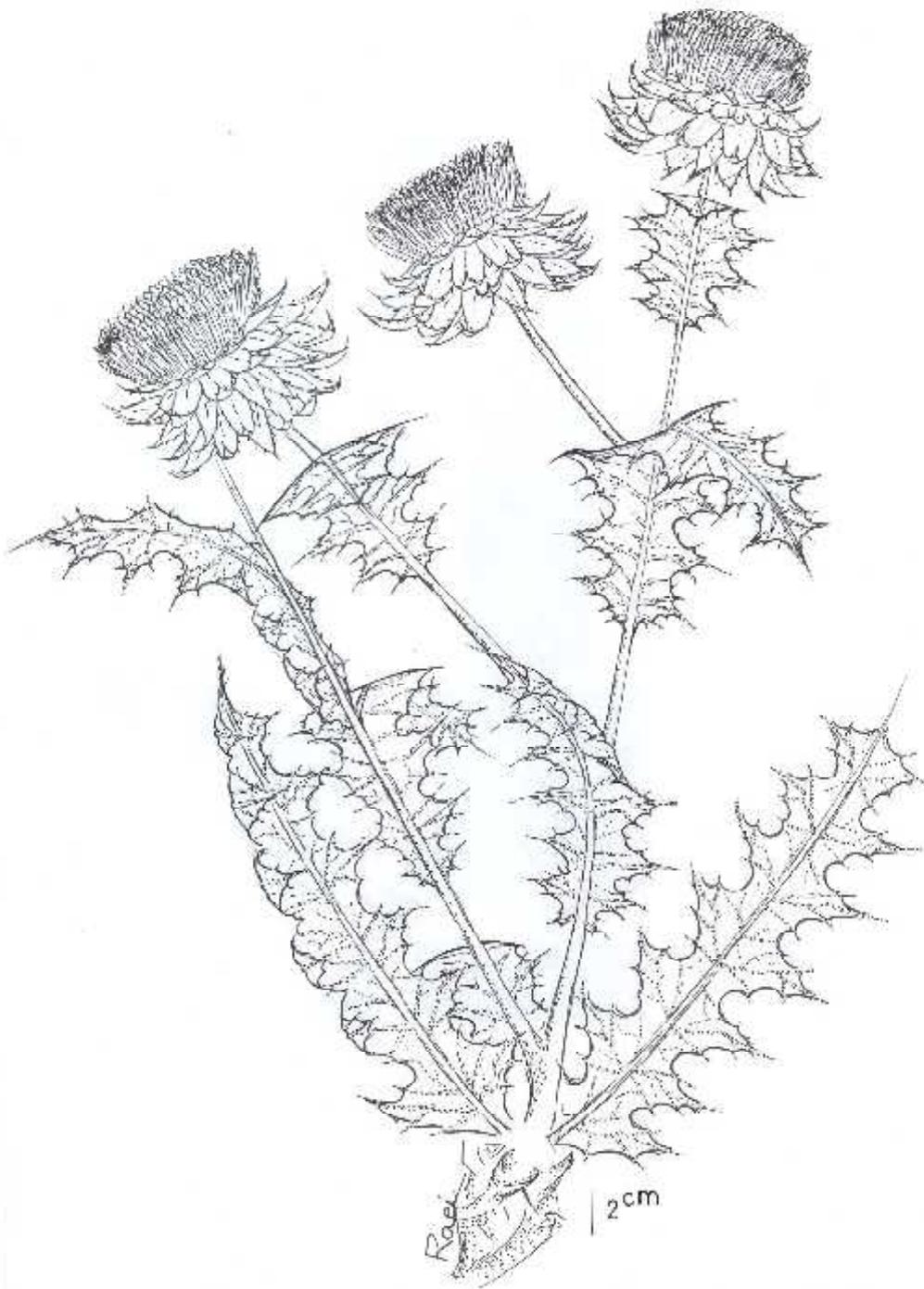


Fig. 6. *Cousinia silvanica*.

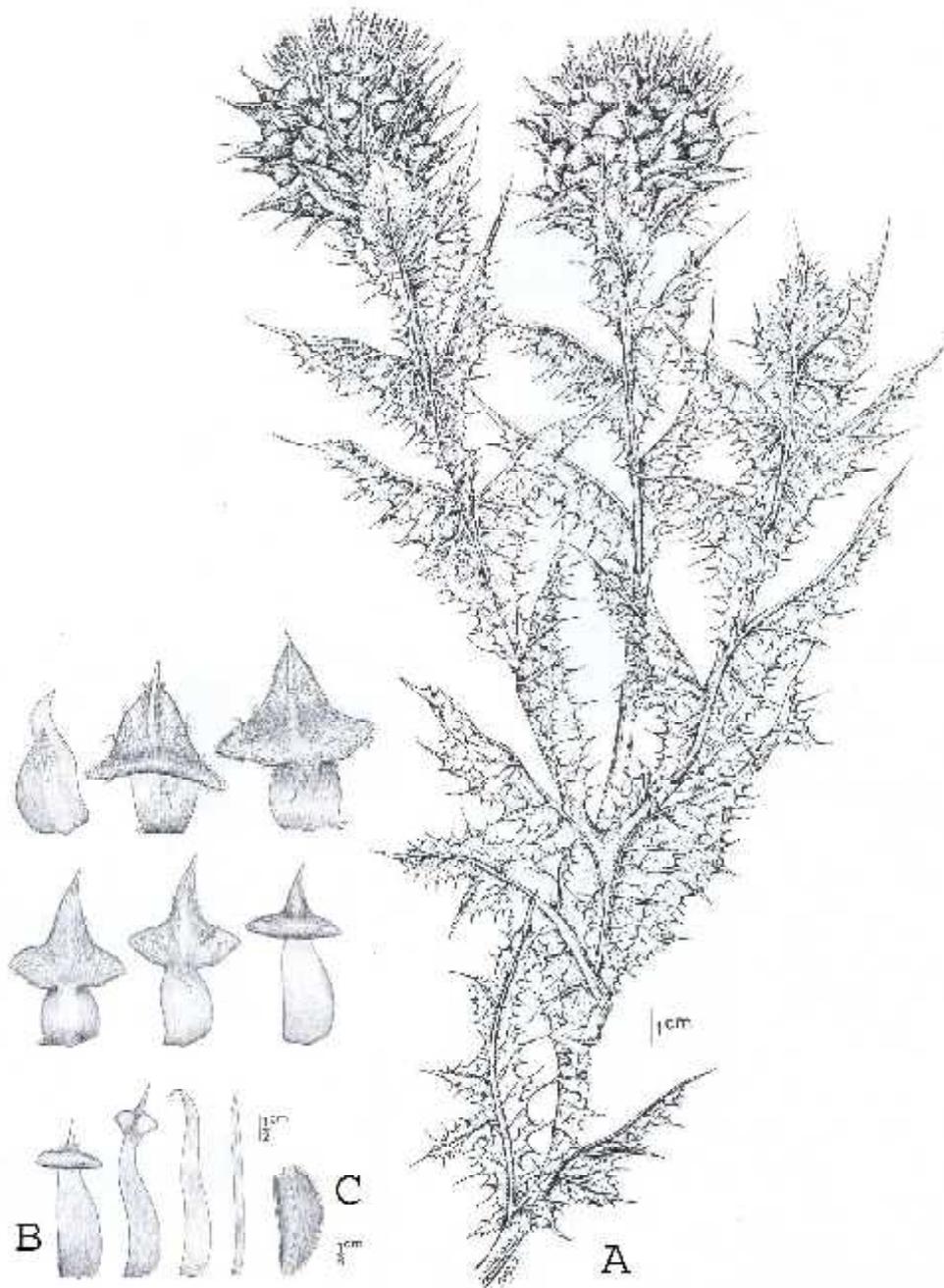


Fig.7. *Cousinia lurestanica*, A: habit; B: bracts; C: achene.

General distribution. Endemic to Iran.

Specimens seen. Markazi: Arak, Abbas-abad, Raswand mountains, 2500-2800 m, Assadi 75038 (TARI); Shazand, Abbas-abad, 2050 m, Ghahreman & Attar 21881 (TUH); Arak, Soltanabad, Raswand mountains near to Chehel Khatoun, *Strauss* (typus B).

40. *C. parsana* Ghahreman, Iranshahr & Attar, Iran Journ. Bot. 8 (1): 16 (1999).

Stem white, up to 44-50 cm high, branched from base, Leaves arachnoid-tomentose on both sides; basal leaves ca. 14 × 6 cm, oblong-lanceolate, pinnatisect, lower and median stem leaves up to 5 × 3 cm, interruptedly decurrent. Heads 4-6 cm in diam., ca. 110-flowered.

Involucre globular, slightly constricted above, arachnoid-tomentose; bracts ca. 100 in number, appendage of median bracts 12-17 × 10-15 mm, imbricate-spreading, innermost bracts exappendiculate, ca. 25 mm long, erect, serrate at margin, papillose outside, linear, membranous, acuminate, not exceeded from involucre. Receptacle bristles scabrous. Corolla milky, 18-20 mm long, limb almost as long as tube. Anther tube milky. Mature achenes ca. 5 × 2 mm, inversely pyramidal, compressed, attenuate toward base, striate, dark brown, truncate at apex, indistinctly dentate, with numerous longitudinal ribs and black spots [Plates 3 (E), 6 (M), 9 (B)].

General distribution. Endemic to Iran.

Specimens seen. Hamadan: road of Malayer, 20 km to Hamadan, Ecbatan dam, 1800 m, Ghahreman, Attar & Ghahremani-nejad 20553 (TUH, holotype); Nahavand, Gamasiab, Garien mountains, 1920 m, Djavadi and Ghanbari 21919 (IRAN).

Taxonomic remarks. *C. parsana* is very close to *C. ehwendensis*, but differs from it by the following characters: plant 40-50 cm high (not 60-70 cm), number of flower per head ca. 110 (not ca. 230), corolla 18-20 mm long (not 25-26 mm), limb as long as tube (not shorter), bracts ca. 100 in number (not ca. 130), median bracts appendage distinctly spinulose at margin, (not smooth), stem leaves interruptedly decurrent (not continuously decurrent), terminal spine of leaves ca. 5 mm long (not 15-16 mm long).

41. *C. kornhuberi* Heimerl, Denkschr. Akad. Wiss. Wien Math.-Nat. Kl. 50: 62 (1885).

Syn.: *C. medorum* Bornm. & Gauba, Feddes Repert. 40: 345 (1936).

Stem 30-60 cm high, arachnoid-tomentose. Leaves arachnoid-tomentose on both sides, more densely on beneath, white-colored; basal leaves sessile, 15-17 × 5-5.5 cm, lanceolate, shallowly pinnate; stem leaves decurrent, forming continuously-interruptedly wings. Heads 3-5.5 cm in diam., 80-200-flowered. Involucre 2-3 cm in diam., loosely arachnoid-tomentose; bracts 90-110 in number; appendage of median bracts 8-15 × 6-11 mm, hastate -rounded, smooth at margin, abruptly constricted above in a form of sharp-pointed spine, erect or slightly recurved at apex; innermost bracts 22-27 mm long, sharp-pointed at apex, exceeded from involucre. Receptacle bristles scabrous. Corolla white, 23-25 mm long; limb as long as tube. Anther tube pink-purplish. Achenes ca. 4 × 2 mm, compressed, brownish, with long longitudinal ribs, smooth on surface, rounded above, minutely dentate, attenuate toward base [Plates 3 (F), 6 (N)].

General distribution. Endemic to Iran.

Specimens seen. Hamadan: Silvan, Alvand mountain, Gauba & Sabeti 643 (K, Typus *C. medorum*); Alvand

mountain, near to Shahrestaneh, Attar 20550 (TUH); Alvand mountain, Pichler s.n. (K).

Taxonomic remarks. *C. kornhuberi*, a new synonymy of *C. araneosa* (Mehregan & Kadereit 2008), is now considered as a distinct species according to their distribution, (type locality of *C. kornhuberi* is from Alvand mountain in Hamadan province, whereas the type locality of *C. araneosa* is from Dena mountain in Koh Gilouyeh and Boyer Ahmad province) and corolla color (white not purple).

42. *C. ecbatanensis* Bornm., Österr. Bot. Zeitschr. 62: 184 (1912).

Syn.: *C. pichleriana* Bornm. ex Rech. f., Flora Iranica 139A: 141 (1979).

Stem up to 30 cm high, branched from base, striate, covered with arachnoid hairs. Leaves tomentose-arachnoid on both sides; basal leaves lanceolate, sessile, shallowly or profoundly pinnatisect; stem leaves lanceolate, decurrent; upper leaves smaller, close to the heads. Heads 3.5-5 cm in diam., 75-140-flowered. Involucre ca. 2 cm in diam., loosely arachnoid; bracts ca. 100 in number; appendage of median bracts 10-16 × 7-10 mm, trapezium-shaped or rhombic, smooth at margin, abruptly constricted above into a short spine, apiculate, imbricate or only spread at tip; innermost bracts 21-25 mm long, exappendiculate, completely exceeded from involucre. Receptacle bristles scabrous. Corolla white, 18-23 mm long, limb as long as tube. Anther tube white, pink at tip. Achenes ca. 4 × 2 mm, compact, striate, brown, round at apex, indistinctly dentate above [Plates 3 (G), 9 (C)].

General distribution. Endemic to Iran.

Specimens seen. Hamadan: Malayer road, above Ecbatan dam, 1900 m, Ghahreman, Attar & Mehdigholi 22368 (TUH); Hamadan to Malayer, 5 km Hamadan, 1900 m, Termeh, Delghandi and Karavar 13434 (IRAN); 15-20 km Hamadan, Yalfan, 1950-2200 m, Termeh, Delghandi & Karavar 13431 (IRAN); Nahavand, Barekat-abad, 1630 m, Mozaffarian 64477 (TARI).

Taxonomic remarks. *C. ecbatanensis*, another new synonymy of *C. araneosa* (Mehregan & Kadereit 2008), is now considered as a distinct species. Besides, the type locality of the two species completely is far from each other (type locality of *C. ecbatanensis* is from Alvand mountain in Hamadan province, whereas the type locality of *C. araneosa* is from Koh Gilouyeh and Boyer Ahmad mountain in Fars province), the two species are differentiated from each other by the corolla color (corolla in *C. araneosa* is purple, but in *C. ecbatanensis* is white).

43. *C. onopordioides* Ledeb. in Eichw., Pl. Nov. It. Casp. Cauc. 40 (1831-33).

Syn.: *C. albicaulis* Boiss. & Buhse, Nouv. Mém. Soc. Nat. Mosc. 12 (18): 128 (1860). *C. grandiceps* Bunge, Mém. Acad. Scienc. Petersbg. 7 Sér., 9, 2: 54 (1865). *C. sabzevarensis* Rech.f., Flora Iranica 139 A: 134 (1979). *Arctium polyacanthum*, *A. albicaule* et *A. karelinii* O. Kuntze, Revis. Gen. 1: 307-308 (1891).

Stem up to 100 cm high, branched from base, densely arachnoid. Leaves white-arachnoid on both sides; basal leaves ca. 25 × 5 cm, lanceolate, lobate, or shallowly pinnatisect, with short petioles; stem leaves ovate-lanceolate-triangular, decurrent. Heads up to 8.5 cm in diam., 80-400-flowered. Involucre up to 3.5 cm in diam., arachnoid; bracts 75-100 in number, with erect-short hairs on dorsal, papillose or sometimes with yellowish glands; appendage of median bracts 22-27 × 7-10 mm, triangular-rhombic, gradually attenuate toward apex into a sharp-pointed spine, spinulose at margin, spread-recurved; innermost bracts up to 42 mm long, wide, attenuate toward apex. Corolla white, 32-50 mm long. Anther tube pink at tip. Achenes 5-7.5 mm long, inversely pyramidal, striate, smooth on surface, not dentate above [Plates 3 (H), 7 (A)].

General distribution: Talish, Iran, Turkmenistan, Afghanistan, Pakistan, East Transcaucasus, Aralo-Caspian, Kara-Kum.

Selected specimens seen: Khorasan: between Tabas and Birjand, 30 after Tabas, Dayhouk, 1370 m, Ghahreman & Attar 21735 (TUH); Ghouchan to Bajgiran, Daregaz road, 1800 m, Ghahreman & Attar 21923 (TUH); Shahroud, Chehel Dokhtar to Malekaran, Tang-e Olang, Iranshahr & Zargani 9158 (IRAN, 33858-E); Touran protected region, Payghanbar mountain, 1400 m, Freitag 13709 (TARI); Payghabar mountain, S of Zaman-abad, 1280 m, Iranshahr 9165 (IRAN, 33979-E). Semnan: 70 km N Shahroud, Khosh Yeylagh (Khash Aylan), 2000 m, Rechinger 5495 (K); between Firouz Kuh and Bashm, 1900-2200 m, Rechinger 1966 (K); Nizva, near Shahmirzad, 2200 m, Wendelbo 9163 (IRAN, 1379 Wendelbo); Firouz Kuh, Gadouk, Behboudi & Aellen 9169 (IRAN, 5477-E). Tehran: Kavir protected region, Siah Kuh, E slope, 1800-2000 m, Wendelbo & Assadi 16046 (TARI). Yazd: Tezer Jan, 2410 m, Foroughi 4386 (TARI). Balouchestan, Taftan mountain, S slope, above Torsh Ab, 1900-2300 m, Runemark, Assadi & Sardabi 22626 (TARI). Kerman: Joupur mountain, 2800 m, Mirtadzadini 21345 (TUH).

44. *C. verbascifolia* Bunge, Mém. Acad. Scienc. Petersbg. 7 Sér., 9, 2: 52 (1865).

Syn.: *C. lyrata* Bunge, Mém. Acad. Scienc. Petersbg. 7 Sér., 9, 2: 53 (1865). *C. caesia* C. Winkl., Acta Horti Petrop. 14: 238 (1897). *Arctium lyratum* O. Kuntze, Revis. Gen. 1: 308 (1891).

Stem 15-40 cm high, simple or branched from base, white arachnoid. Leaves discolor, upper surface arachnoid-tomentose, beneath more densely, whitish; basal leaves ca. 10 × 6-7 cm, oblong-ovate-elliptic or lyrate, with 3.5-5 cm long petiole; median leaves interruptedly decurrent, elliptic, cuneate-cordate at base. Heads 3-7 cm in diam., 150-220-flowered. Involucre 2-2.5 cm in diam.; bracts 50-75 in number; appendage of median bracts ca. 19 × 7 mm, triangular, with long spine at apex, spinulose at margin, spread; innermost bracts exappendiculate, 23-35 mm long, attenuate toward apex, exceeded from involucre, dark purple, with white lanate hairs on dorsal surface. Receptacle bristles slightly scabrous. Corolla light pink, 22-30 mm long; limb as long as tube or slightly longer. Anther tube bright pink. Mature achenes unknown, immature achenes ca. 5 × 2 mm, slightly attenuate toward base, inversely ovate, striate, wrinkled [Plates 3 (I), 7 (B), 9 (D)].

General distribution: Iran, Afghanistan and Turkmenistan.

Habitat: On the slopes of sandy mountains, sometimes along side of farms.

Selected specimens seen: Khorasan: Sarakhs, 500 m, Ghahreman & Attar 21912 (TUH); Mashhad to Sarakhs, Abrovan, 1000 m, Ghahreman & Attar 21907 (TUH); Mashhad to Sarakhs, 5 km after Mozdouran (Mozdavand), 970 m, Djavadi, Eskandari & Torabi 43504 (IRAN); Neyshabour to Mirabad, 1240 m, Djavadi & Ghanbari 29256 (IRAN); 92 km Sabzevar to Neyshabour, 1300 m, Assadi & Maassoumi 21241 (TARI); 66 km N Mashhad to Kalat-e Naderi, 1150 m, Assadi & Massoumi 21398 (TARI); Daregaz to Imam Gholi, Rahman Gholi Biak, 1050 m, Djavadi, Eskandari & Torabi 43486 (IRAN).

45. *C. monocephala* Bunge, Mém. Acad. Scienc. Petersbg. 7 Sér., 9, 2: 52 (1865).

Stem up to 32 cm high, branched from base, arachnoid, with long hairs. Leaves tomentose on both sides, on lower surface more densely; basal leaves not seen; lower stem leaves lanceolate, slightly lobate at margin, spinulose, interruptedly decurrent. Heads 3-7 cm in diam., 80-120-flowered. Involucre 2-2.5 cm in diam., white arachnoid; bracts 50-80 in number, appendages ovate-triangular, slightly auriculate at base, spinulose at margin; spines 1-3 mm long; appendage of median bracts ca. 17 × 12 mm, spread or recurved; innermost bracts exappendiculate, ca. 30 mm long, attenuate toward apex in a form of long spine, exceeded from involucre, brown-purple on dorsal surface, with arachnoid hairs. Receptacle bristles slightly scabrous. Corolla bright pink, 28-30 mm long, almost papillose on dorsal; limb slightly longer than tube. Anther tube bright pink. Achenes 6-7 × 3-6 mm, 3-edged, with 4

narrow wings, pale brown with dark spots, shallowly areolate, with reticulate ribs, slightly attenuate toward base, minutely dentate above [Plate 3 (J), 9 (E)].

General distribution: Endemic to Iran.

Habitat: On the slopes of sandy mountains.

Specimens seen: Khorasan: Ghouchan to Sabzevar, 1600 m, Ghahreman & Attar 21931 (TUH); Esfarayen, Shah Jahan mountains, rocky region, Noushirvan village, 1400-2500 m, Mozaffarian 48564 (TARI).

Taxonomic remarks: *C. monocephala* is a rare species, differs from *C. verbascifolia* by the following characters: appendage of outer and median bracts ovate (not long lanceolate); inner bracts not exceeded from involucre, stramineous-purple (not purple and distinctly exceeded from involucre) and shape of achene.

46. *C. disfulensis* Bornm. in Koeie, Danish Scient. Invest. Iran 4, Beitr. SW. Iran 1: 23 (1945).

Syn.: *C. silybooides* Jaub. & Spach subsp. *disfulensis* (Bornm.) Mehregan, Willdenowia 38: 311 (2008).

Root fusiform. Stem ca. 35 cm high, branched from base, loosely arachnoid-tomentose. Leaves tomentose on both sides, on lower surface more densely; basal leaves ovate, sometimes lyrate, entire, with minute spines at margin, with 2.5-3 cm long petiole; stem leaves interruptedly decurrent. Heads ca. 8 cm in diam., ca. 70-flowered. Involucre up to 3.5 cm long, ca. 2 cm wide; bracts ca. 40 in number; appendage of median bracts ca. 27 × 14 mm wide, lanceolate, with long spine at apex, with numerous spines at margin, spreading or recurved from the middle; innermost bracts up to 23 mm long, sharp-pointed at apex, slightly exceeded from involucre. Receptacle bristles smooth. Corolla purple, milky when dried, ca. 23 mm long, with minute papillas on dorsal surface; limb as long as tube. Anther tube purple, milky when dried. Mature achenes unknown [Plates 3 (K), 7 (C)].

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros Mountains.

Specimens seen: Khuzestan: 60 km N Dezful, 1200 m, Koeie 793 (B, holotype). Lorestan: Khorramabad, Kuh Sefid, 1700 m, Veiskarami 26304 & 22600 (TUH).

Taxonomic remarks: *Cousinia disfulensis* was described based on immature specimen collected by Koeie from 60 km N Dezful. After gathering some complete specimens and comparing them with the type specimen of *C. disfulensis* and with the closest species, this species is now considered as a distinct species. *C. disfulensis* related to *C. jacobsii* and *C. kermanshahensis*, all have fusiform roots and foliate bracts. The morphological differences are presented in Table 2.

47. *C. kermanshahensis* Attar, Ghahreman & Assadi, Iran. Journ. Bot. 9 (1): 56 (2001).

Plant yellowish green. Root fusiform. Stem up to 20 cm high, branched from base, arachnoid or somewhat glabrous. Leaves glabrous on upper surface, on lower surface arachnoid; basal leaves ca. 5 × 1.5 cm, lanceolate, sessile, shallowly pinnatisect; stem leaves interruptedly decurrent; upper leaves distant from the heads. Heads up to 5 cm in diam., 40-50-flowered. Involucre up to 2.5 cm in diam.; bracts ca. 40 in number; appendages triangular, auriculate, glabrous, ciliate at margin in lower part; appendage of median bracts 10-25 × 6-15 mm, with numerous minute spines at margin, spread; innermost bracts up to 15 mm long, acuminate, exceeded from involucre. Receptacle bristles smooth. Corolla milky, 18-21 mm long, limb slightly longer than tube. Anther tube milky. Mature achenes unknown [Plates 3 (L), 7 (B)].

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros mountains.

Specimens seen: Kermanshah: Eslamabad-e Gharb, Mahidasht, Boujan pass, 1300 m, Attar & Mirtadzadini 19810 (TUH, holotype); 35 km Eslamabad-e Gharb to Ahvaz, Ghaleh Chehr mountain, 1550 m, Shoostari & Tavakkoli 2525 (TARI, paratype); Kerend Gharb, 1600 m, Shahsavari 69804 (TARI).

48. *C. jacobsii* Rech. f., Flora Iranica 90: 237 (1972).

Root fusiform. Stem up to 35 mm long, arachnoid, divergently branched. Leaves covered with grey tomentose hairs, on lower surface more densely; basal leaves 9-14 × 3-5 cm, lyrate, terminal segment ca. 9 × 5 cm; lower stem leaves slightly decurrent, elliptic; stem leaves continuously decurrent. Heads 4.5-5 cm in diam., ca. 85-flowered. Involucre ca. 3 cm in diam.; bracts ca. 100 in number; appendage of median bracts ca. 13 × 10 mm, triangular-auriculate, spinulose at margin or almost smooth, recurved from middle, acuminate; innermost bracts ca. 25 mm long, attenuate toward apex in a form of long straw-colored spine. Receptacle bristles scabrous. Corolla white, ca. 27 mm long. Anther tube pink-purple. Achenes 5-5.5 × 2 mm, inversely pyramidal, with longitudinally prominent ribs, grey, with dark spots, on surface rugose, minutely dentate above [Plate 3 (N)].

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros mountains.

Specimens seen: Ilam: Ilam, open forest dominated *Quercus persica* on slopes of rocky limestone, 1700-1900 (-2400) m, Jacobs 6834 (K, isotype); 30 km Ilam, before Evan-e Gharb, 1750 m, Ghahreman, Attar & Mehdigholi 22370 (TUH); Ilam to Darreh-Shahr, Tang-e Razianeh, Eskandari 51863 (IRAN); Kermanshah: 18 km W Kerend Gharb, Lotfeh village, 1760 m, Hamzeh & Hatami 1425 (TARI).

Table 2: Morphological comparison of *Cousinia kermanshahensis*, *C. disfulensis* and *C. jacobsii*.

Species	Flower number	Bracts form and number	Corolla length and color	Receptacle bristles	Plant color
<i>C. disfulensis</i>	ca. 70	ca. 40, lanceolate, long acuminate	ca. 23 mm, purple	smooth	green
<i>C. kermanshahensis</i>	ca. 40-50	ca. 40, triangular, auriculate at base	18-21 mm, milky	Smooth	yellowish green
<i>C. jacobsii</i>	ca. 85	ca. 100, triangular, auriculate	ca. 27 mm, purple	Scabrous	green

Taxonomic remarks: *C. jacobsii* which was considered as a synonymy of *C. silyboides* Jaub. & Spach subsp. *disfulensis* (Mehregan & Kadereit 2008), differs from *C. kotschyi* (syn.: *C. silyboides*) by these morphological characters: leaves and bracts herbaceous (not coriaceous), bracts wide, triangular-almost orbicular, spinulose-ciliate-smooth at margin (not with long lanceolate bracts), apiculate, sharply transformed into a yellowish beak at apex (not gradually acuminate), basal leaves and even lower stem leaves lyrate (not lanceolate). It is highly noticeable that *C. jacobsii*, *C. disfulensis* and *C. kermanshahensis* absolutely differ from *C. kotschyi* with regarding to plant habitat and habit, bracts decoration and form, bracts and leaves texture.

49. *C. shulabadensis* Attar & Ghahreman, Iran. Journ. Bot. 9 (2): 162 (2002).

Stem branched from base or above, completely winged. Leaves coriaceous, laxly arachnoid-tomentose on both sides; basal leaves lanceolate, pinnatifid or pinnatisect; median and upper leaves completely decurrent; uppermost leaves slightly distant from the heads. Heads 2.5-4 cm in diam., ca. 200-flowered. Involucre arachnoid; bracts ca. 100 in number, coriaceous; appendage of median bracts up to 25 × 7-12 mm, green, lanceolate-triangular, attenuate into a ca. 10 mm long spine, with 1-2 minute spines on each side or absolutely smooth, shining, with reticulate veins, spreading-reflexed; inner bracts erect, triangular-hastate; innermost bracts up to 30 mm long, linear, straw color, acuminate. Receptacle bristles slightly scabrous. Corolla 28-30 mm long; tube almost as long as limb. Anther tube pink. Mature achenes unknown [Plate 3 (N)].

General distribution: Endemic to Iran.

Habitat: Slopes of sandy mountains.

Specimens seen: Lurestan: Darreh Takht to Shulabad, 20 km Shulabad, 2600 m, Ghahreman & Attar 21874 (TUH, holotype); Azna, road of Shulabad, 2300 m, Ghahreman & Attar 27593 (TUH); Shulabad to Aligoudarz, 2500 m, Ghahreman, Attar & Mehdigholi s.n. (TUH); Aligudarz, Ghali-kuh, 2200-2400 m, Delghandi & Tehrani 51716 (IRAN); Aligudarz to

Sefid-dasht, 2200-2650 m, Delghandi & Tehrani 51715 (IRAN).

Taxonomic remarks: *Cousinia shulabadensis*, as a distinct species, is characterized by having completely decurrent leaves, with ca. 1-1.5 cm long yellowish rigid spine, alternately with rigid short spines (absolutely different with those of *C. kotschyi*), basal leaves long lanceolate, median bracts appendage with 1-2 indistinct minute spines on each sides or even absolutely smooth, apical spine rigid, yellowish, up to 1 cm long. In addition, the type specimen of *C. kotschyi* is from Dena mountain in Koh Gilouyeh and Boyer Ahmad province, far from the type locality of *C. shulabadensis* (Darreh Takht to Shulabad, a very poorly investigated area in Lurestan province). *C. shulabadensis* is related to *C. jacobsii*, but differs from it by more numerous flowers and bracts, robust habit and different habitat (not forested highland area). The two species are also distributing in different altitudes.

50. *C. bobekii* Rech. f., Flora Iranica 90: 238 (1972).

Stem 30-35 cm high, branched from base, covered with white-grey arachnoid hairs. Basal leaves not seen; lower stem leaves lanceolate, shallowly pinnatisect, interruptedly decurrent, upper surface arachnoid; lower surface more densely, whitish. Heads 3-4 cm in diam., 70-80-flowered. Involucre 1.5-2 cm in diam., arachnoid; bracts 60-65 in number; appendage of median bracts ca. 10 × 3 mm, lanceolate, irregularly ciliate-minutely spinulose at margin; innermost bracts ca. 20 mm long, exappendiculate, slightly exceeded from involucre, yellow-pale brown. Receptacle bristles smooth. Corolla yellow, ca. 18 mm long; limb 8 mm and tube 10 mm long, somewhat glandulous outside. Anther tube purple. Achenes inversely pyramidal, brown-grayish, with irregular purple spots and ribs, with four narrow wings, minutely dentate above [Plate 3 (O)].

General distribution: Endemic to Iran.

Habitat: sandy slopes of mountains.

Specimens seen: Azerbaijan: Urmieh, SW side of Urmieh lake, between Balansh and Rashkan, 1400 m, Ghahreman & Attar 22500 (TUH); SW side of Urmieh lake, 1300 m, Jaccobs 6362 (K); between Balanesh and Rashkan, 34 km S Urmieh, 1350 m, Rechinger 42121

(K); Balanesh to Rashakan, 1300 m, Iranshahr 8797 (IRAN); Urmieh, side track of Ghasemlou and Oshnaviyeh, Darre Rash road to Ziveh, 1800 m, Mozaffarian 70031 (TARI); between Oshnaviyeh and Naqadeh, 1500 m, Reching 49031 (K); 17-30 km to Tabriz from Ahar, 1600-2000 m, Assadi & Sardabi 24416 (TUH); Naghadeh, Attar & Zamani 38315 (TUH).

51. *Cousinia sahandica* Attar & Djavadi, *sp. nov.* (Fig. 8).

Holotypus: Azerbaijan: Urmieh, Oshnavieh, Darreh-e Khoroshow, 1400-1650 m, Delghandi & Abbasi 15185 (IRAN).

Perennis, ca. 25 cm alta, araneoso-tomentosa, tota flavo-glanduloso-punctata. Caulis a medio ramosus. Folia concoloria; lanceolata, pinnatifida; basalia ignota; caulina subdecurrentia, oblongo-lanceolata, basi cuneata, sensim decrescentia. Capitula singula, terminalia, ca 60-flora, ca. 4 cm diametro.; phylla ca. 50, appendiculata; intermedia apendice triangularia, margine spinulosa; phylla intima exappendiculata, linearia. Receptaculi setae laeves. Corolla lutea, ca. 20 mm longa, tubo limbum circiter aequante. Antherarum tubus concolor. Achaenia matura ignota.

Perennial. Stem ca. 25 cm high, arachnoid, tomentose, branched from middle, covered by sessile yellow-brownish glands, glabrescent, with arcuate branches. Leaves herbaceous, arachnoid-tomentose on both sides, lanceolate, lobate, interruptedly decurrent; basal leaves not seen; lower stem leaves ca. 3.5 × 1.5 cm; median leaves similar to lower leaves; free part of leaf ca. 3 × 1.5 cm; uppermost leaves reduced, distant from the heads. Heads single, terminal, ca. 4 cm in diam., ca. 60-flowered. Involucre ca. 12 mm in diam., ovate, arachnoid; bracts ca. 50 in number, 6-seriate, appendiculate; appendages of outer bracts ca. 10 × 3 mm, lanceolate, spinulose at margin, reflexed; appendage of median bracts ca. 12 × 8 mm, spreading, with 1-3 fine spines on each side, longitudinally plicate or flat, terminating to a ca. 4 mm long spine at apex; appendage of inner bracts ca. 7 × 6 mm, triangular, inflated, apiculate; innermost bracts linear, ca. 20 mm long. Receptacle bristles smooth. Corolla yellow, ca. 21 mm long; limb ca. 10 mm, tube ca. 11 mm and lobes ca. 3 mm long. Mature achenes unknown [Plate 4 (A)].

General distribution: Endemic to Iran.

Other specimen seen: Azerbaijan: Urmieh, Ghasemlou road to Oshnaviyeh, Ziveh side track, 1800 m, Mozaffarian 70031 (TARI).

Taxonomic remarks: *Cousinia sahandica* is related to *C. bobekii* and *C. cynaroides*, but it is mostly differentiated by some characters: all plant glandulose-punctate, (not eglandulose), bracts 50 (not 60-100),

median bracts appendage ovate-lanceolate, ca. 12 × 8 mm (not lanceolate, 10-20 × 3-5 mm).

52. *C. gilliatii* Rech. f., Flora Iranica 90: 244 (1972).

Stem up to 30 cm high. Basal leaves not seen; lower stem leaves lanceolate, interruptedly decurrent, densely white arachnoid on both sides; median stem leaves similar to lower leaves; uppermost leaves reduced. Heads 3-5.5 cm in diam., 30-80-flowered. Involucre 1.5-2 cm in diam., arachnoid-tomentose, white-colored; bracts 60-65 in number; appendage of median bracts lanceolate, ca. 15 × 5 mm, attenuate toward apex in a form of 6-7 mm long spine, rarely with only one spine at margin on each side, spread; innermost bracts ca. 22 mm long, erect, exceeded from involucre, brown at tip. Receptacle bristles smooth, rarely scabrous at tip. Corolla yellow, 21-22 mm long. Anther tube yellow, purple at tip. Achenes attenuate toward base, ca. 4 × 2 mm, dark brown, longitudinally costate, surface scabrous, indistinctly dentate above [Plates 4 (B), 7 (E)].

General distribution: Endemic to Iran.

Habitat: Along side of roads and on sandy slopes of mountains.

Specimens seen: Azerbaijan: 80 km N Meshgin Shahr, near to Kangarlou, Ghahreman & Attar 21967 (TUH); 40 km N Meshgin Shahr, near Moradlou, 1500 m, Assadi 73804 (TARI); 14 km Namin toward Cholan-e Darreh Sofla to Germe, after Abnar, 1600 m, Mozaffarian & Norouzi 34486 (TARI); 40 km Razi to Germe, 1700 m, Mozaffarian & Norouzi 34780 (TARI); near Tabriz, Gilliat-Smith 1955 (K, holotype); Tabriz, Gilliat-Smith 1753 (K); 8 km E Tabriz, 1650 m, Reching 43189 (B); Tabriz, Abaei & Mojib 9014 (IRAN).

53. *C. algurdina* Rech. f., Anz. Math.-Nat. Kl. Österr. Akad. Wiss. 101: 344 (1964).

Syn.: *C. cynaroides* (M. B.) C. A. Mey. var. *arlgirdensis* Blakelock, Kew Bull. 1949: 50 (1949).

Stem ca. 40 cm high, prominently ribbed, tomentose, glabrescent, covered with dark glands. Leaves tomentose on both sides, glabrescent, shining, with broad and prominent midrib on lower surface, sessile; median leaves smaller, interruptedly decurrent; upper leaves gradually diminished. Heads ca. 8 mm in diam., more than 100-flowered. Involucre 2.5-3 cm in diam., globular, loosely arachnoid; bracts ca. 60 in number; appendage of median bracts 25 × 8 mm wide, lanceolate, sometimes rounded at base, spinulose at margin, sometimes turn downward around the midrib, slightly keeled, erect-spread; innermost bracts narrow, acuminate, up to 30 mm long, exceeded from involucre. Receptacle bristles scabrous. Corolla milky, yellowish when dried, ca. 25 mm long; limb as long as tube. Anther tube pale yellow. Mature achenes unknown.

General distribution: Iraq and Iran.

Habitat: Sandy slopes of mountains.

Specimens seen: Azerbaijan: Tabriz, 10 km Basmenj to lighvan, 1800 m, Mozaffarian 30533 (TARI).

54. *C. cynaroides* (M. B.) C. A. Mey., Verz. Pfl. Cauc. 230 (1831).

Syn.: *Carthamus cynaroides* M. B., Besch. Länd. Terek Kasp. 195 (1800). *Onobroma cynaroides* (M. B.) Spreng., Syst. Veg. ed. 3: 392 (1826). *Arctium cynaroides* (M. B.) O. Kuntze, Revis. Gen. 1: 307 (1891).

Stem ca. 45 cm high, arachnoid. Basal leaves not seen; lower stem leaves lanceolate, decurrent; upper surface loosely arachnoid; lower surface densely white arachnoid; upper leaves reduced. Heads 4-6.5 cm in diam., ca. 120-flowered. Involucre ca. 2 cm in diam., white arachnoid; bracts ca. 100 in number; appendage of median bracts ca. 20 × 5 mm, lanceolate, with 1-2 spines on each side, gradually attenuate toward apex into a long spine, spread; innermost bracts ca. 25 mm long, exappendiculate, with a long sharp-pointed spine at apex. Receptacle bristles scabrous. Corolla yellow, ca. 25 mm long; limb slightly longer than tube. Anther tube pink. Achenes 4.5-5 × 1.5 mm, compact, longitudinally ribbed, dentate above [Plates 4 (C), 7 (F)].

General distribution: Talish, Iran, Turkmenistan and E Transcaucasus.

Habitat: On foothills and along side of roads.

Specimens seen: Azerbaijan: Ardebil, 10 km after Yamin toward Hyran pass, 1250 m, Attar & Mehdigholi 22568 (TUH); between Ardebil and Sarien, 1650 m, Ghahreman & Attar 22584 (TUH).

55. *C. kotschyi* Boiss., Diagn. Pl. Or. Nov. Ser. 1, 6: 120 (Juli 1846).

Syn.: *Cousinia silyboides* Jaub. & Spach, Ill. Pl. Or. 2: 94 (Juli 1846).

Stem 15-37 cm high, arachnoid. Leaves tomentose on both sides; basal and lower stem leaves dimorphic, ca. 7 × 2 cm, lanceolate, shallowly-profoundly divided, or entire, elliptic; stem leaves elliptic, ovate or lanceolate, cuneate at base, decurrent; upper leaves reduced, distant from the heads. Heads ca. 4 cm in diam., 65-100-flowered. Involucre 1-1.5 cm in diam., loosely arachnoid; bracts 65-75 in number; appendage of median bracts 15-20 × 3-4 cm, lanceolate-rhombic, minutely spinulose at margin, gradually attenuate toward the apex into a long spine, spread; innermost bracts ca. 24 mm long, straw-colored, slightly exceeded from involucre. Receptacle bristles scabrous. Corolla pale pink-whitish, 22-23 mm long; limb almost as long as tube. Anther tube pink. Achenes 3.5-4 × 2-2.5 mm, 4-edged, attenuate toward base, with dark spots, longitudinally ribbed, ribs wide, wing-shaped, with indistinct secondary ribs between longitudinal main ribs, minutely dentate above, dents indistinct [Plates 4 (D), 7 (G), 9 (F)].

General distribution: Endemic to Iran.

Habitat: Dry and sandy grounds.

Specimens seen: Koh Gilouyeh and Boyer Ahmad: near Dez Gerd, Dinar (Dena) mountain, Kotschy 568 (K holotype). Fars: near Emamzadeh Sabz Pushan, Stapf 2383 (K). Hamadan: Kaboudar Ahang, 5 km to Kaboudar Ahang, 1690 m, Ghahreman & Attar 20552 (TUH); after Kaboudar Ahang, between Molla Boulagh and Chopoghlu, 1900 m, Attar 20558 (TUH); Kaboudar Ahang to Shirinsou, 1400 m, Djavadi & Ghanbari 20386 (IRAN). Zanjan: 25 km S Zanjan, Termeh 9057 (IRAN, 33993-E). Kurdistan: Bijar, Hamzeh Arab mountain, 2100-2550 m, Iranshahr & Dezfoulia 8936 (IRAN, 13131-E). Khuzestan: between Agha Jari and Behbahan, Pabot 8935 (IRAN, 489 Pabot).

Taxonomic remarks: *C. silyboides* was considered as a synonym of *C. kotschyi* by Boissier (1875). Because, both species had the same morphological characters, except *C. silyboides* had a little larger heads and partially longer and wider leaves. This synonymy was confirmed by Rechinger (1972). It is also noticeable that the type specimen of *C. silyboides* was from an area near Esfahan (collected by Aucher-Eloy), that was far from the type locality of *C. kotschyi* [Dena (Dinnar) mountain in Koh Gilouyeh and Boyer Ahmad province]. The type specimen of *C. kotschyi* was studied at K herbarium by the second author. Also, a specimen which had been collected from Daran [near Esfahan, 2350 m, Iranshahr, 5058 (IRAN, 34024-E), indeed the isotype of *C. lactiflora* Rech. f. in IRAN herbarium] was studied more in details. It seems that, this specimen is *C. kotschyi*, but with larger heads, collected with real type specimen of *C. lactiflora*, preserved at W herbarium (Tab. 138 in Flora Iranica, No. 139a). Recently, *C. silyboides* was considered as a distinct species and divided into three subspecies (Mehregan & Kadereit 2008): 1) *C. silyboides* subsp. *silyboides* (including *C. lactiflora*, *C. shulabadensis* and *C. aligudarzensis*), 2) subsp. *zardkuhensis* (*C. zardkuhensis* was regarded as a synonym of this subspecies) and 3) subsp. *disfulensis* (including *C. disfulensis*, *C. jacobsii* and *C. kermanshahensis*). Whereas, *C. lactiflora*, *C. shulabadensis*, *C. aligudarzensis*, *C. zardkuhensis*, *C. disfulensis*, *C. jacobsii* and *C. kermanshahensis* are distinct species, showing different morphological characters and have different ecological requirements (please pay attention to the taxonomic remarks under each species). Studying the specimen no. 29546/3-IRAN (*C. lactiflora*), which was determined as *C. silyboides* subsp. *silyboides* (Mehregan & Kadereit 2008, Fig 5A, pp.309), seeing the type image of *C. silyboides* (available at TARI) and also studying the type specimen of *C. kotschyi* at Kew, explicitly resulted that *C. silyboides* is a synonymy of

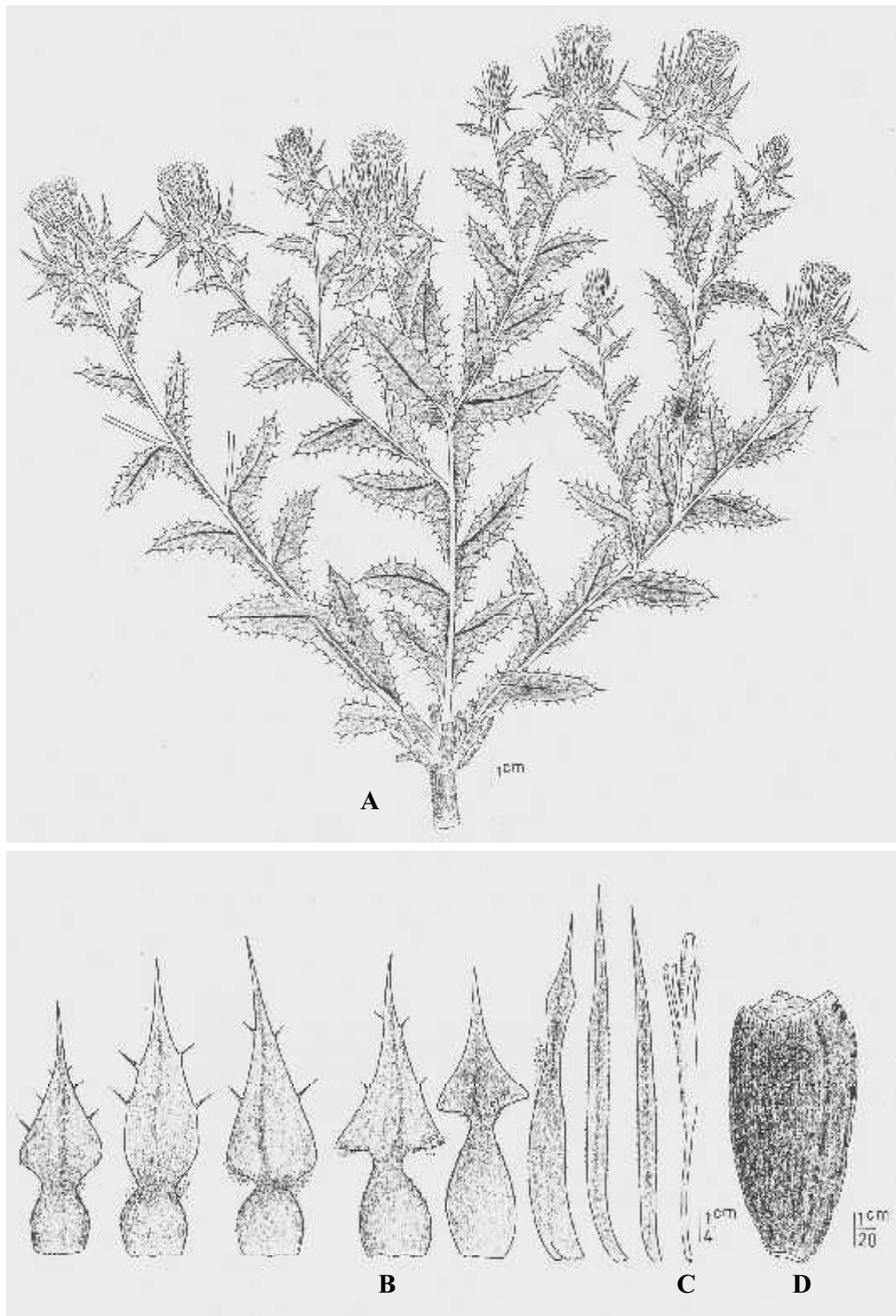


Fig. 8. *Cousinia sahandica*, A: habit; B: bracts; C: corolla; D: achene.

C. kotschyi and *C. lactiflora* is a distinct species, differs from *C. kotschyi* on morphological point of view.

56. *C. sabalanica* Attar, Ghahreman & Assadi, Nord. Journ. Bot. 20 (6): 699 (2000).

Stem up to 40 cm high, branches corymbose, arachnoid. Leaves tomentose on both sides; lower stem leaves ca. 8 × 2 cm, lanceolate, lobate-pinnatisect; stem leaves lanceolate, interruptedly decurrent; upper leaves smaller, near to heads. Heads 2-2.5 cm in diam., ca. 90-flowered. Involucre 1-1.5 cm in diam., arachnoid; bracts ca. 70 in number; appendage of median bracts ca. 7 × 3 mm, with 1-2 minute spines on each side, gradually attenuate toward the apex into a long spine, spread-recurved; innermost bracts ca. 16 mm long, acuminate. Receptacle bristles smooth. Corolla purple, ca. 20 mm long, limb almost as long as tube. Anther tube purple. Achenes 2.5-4 × 1.5 mm, bright brown, ovate, attenuate toward base, coarsely dentate above, transversally areolate, surface scabrous, longitudinally wrinkled [Plate 4 (E)].

General distribution: Endemic to Iran.

Habitat: On sandy foothill along side roads.

Selected specimens seen: Ardebil, between Ardebil and Sarien, 1300 m, Attar & Mehdigholi 22572 (TUH, holotype); 10 km after Sarab to Ardebil, 1400-1500m, Mehregan 32286 (TUH).

Taxonomic remarks: *Cousinia sabalanica* is closely related to *C. kotschyi*, but differs from it by the following characters: receptacle bristles smooth (not scabrous), corolla and anther tube purple (not pale pink-whitish), appendage on median bracts short, ca. 7 mm long (not 15-20 mm long) and different distributional area. This species is a distinct species, differs from *C. calocephala* by not squarrose bracts, with 1-2 minute spines at margin (not squarrose, clearly spinulose at margin).

57. *C. nana* Attar, Ghahreman & Assadi, Nord. Journ. of Bot. 20 (6): 698 (2000).

Stem ca 20-40 cm high, arachnoid. Basal leaves ca. 6 × 3 cm, lanceolate, sessile; stem leaves entire, interruptedly or continuously decurrent, arachnoid above, more densely beneath. Heads 5-6 cm in diam., ca. 90-flowered. Involucre 2-3 cm in diam., arachnoid; bracts 55-60 in number; appendage of median bracts ca. 26 × 5 mm, lanceolate-rhomboid, gradually attenuate toward apex, spreading, with numerous spines at margin; innermost bracts ca. 25 mm long, acuminate. Receptacle bristles scabrous. Corolla milky-white, ca. 20 mm long; limb as long as tube. Anther tube milky-white or pinkish at tip. Achenes ca. 6 × 2 mm, inversely ovate-pyramidal, blackish-brown, longitudinally striate, winged, coarsely dentate above, attenuate toward base; marginal achenes convex; central achenes straight [Plates 4 (F), 7 (H), 9 (G)].

General distribution: Endemic to Iran.

Habitat: Desert regions.

Specimens seen: Markazi: Arak, Kavir-e Mighan, 9-10 km E of Aibak-abad to Davoud-abad, 1650 m, Mozaffarian 64185 (TARI); 8 km E of Aibak-abad to Davoud-abad, Djavadi 9005 (IRAN).

Taxonomic remarks: *C. nana* differs from *C. calocephala* by the following characters: bracts spreading (not squarrose), bracts 55-60 (not 90-125), median bracts appendage ca. 26 mm long (not 5-10 mm), corolla and anther tube white-milky (not purple). Therefore, with these morphological differences, *C. nana* is known as a distinct species, distributed in a very restricted salty area. This species shows the closest affinity with *C. kotschyi*, but differs from it by having white-slightly pink anther tube (not obviously pink), bracts appendages ca. 26 mm (not 15-20 mm) and different habitat.

58. *C. shebliensis* Ghahreman, Iranshahr & Attar, Iran Journ. Bot. 8 (1): 19 (1999).

Stem 40-60 cm high, densely leafy. Leaves interruptedly decurrent; basal leaves not seen; stem leaves oblong, cuneate at base, arachnoid on both sides, decurrent. Heads 6-8 cm in diam., ca. 180-flowered. Involucre ca. 2.5 cm in diam., arachnoid; bracts ca. 120 in number; median bracts appendage 25-40 × 5-6 mm, lanceolate, with numerous spines at margin, spread-recurved, attenuate, terminating to a 4-5 mm long spine at apex; innermost bracts ca. 23 mm long, exappendiculate, serrate at margin, papillose outside, slightly exceeded from involucre. Receptacle bristles smooth. Corolla pale pink-white, ca. 22 mm long; limb as long as tube, papillose outside. Anther tube white, pink at tip. Achenes ca. 4 × 2 mm, inversely pyramidal, grey, dark-maculate, surface scabrous, attenuate toward base [Plates 4 (G), 7 (I), 9 (H)].

General distribution: Endemic to Iran.

Habitat: Sandy slopes of mountains.

Specimens seen: Azerbaijan: 20 km to Tabriz, Shebli pass, 1830 m, Ghahreman, Attar & Ghahremani-nejad 20580 (TUH, holotype).

Taxonomic remarks: *C. shebliensis* differs from its nearest relative, *C. gilliatii*, by the following characters: stem up to 60 cm high (not up to 30 cm), number of flowers (180 not 30-80), number of bracts (120 not 60-65), median bracts appendage spinulose at margin (not smooth), up to 40 mm long (not to 15 mm). With these morphological differences, *C. shebliensis* is regarded as a distinct species and can not be considered as a synonymy of *C. gilliatii* (Mehregan & Kadereit 2008).

59. *C. noëana* Boiss., Diagn. Pl. Or. Nov. Ser. 2, 3: 57 (1856).

Stem ca. 15 cm high, arachnoid. Basal leaves not seen; stem leaves all continuously decurrent, white arachnoid

on both sides, glabrescent; upper leaves almost reduced. Heads 1.5-2.5 cm in diam., ca. 30-flowered. Involucre 7-12 mm in diam., ovate, white arachnoid; bracts ca. 70 in number, appendage of median bracts ca. 5 × 4 mm, triangular, recurved with 2-3 mm long spines on each side, acuminate; innermost bracts exappendiculate, ca. 18 mm long, exceeded from involucre. Receptacle bristles scabrous. Corolla purple, 15-17 mm long; limb longer than tube. Anther tube pink-purplish. Achenes ca. 5.5 × 2 mm, inversely pyramidal, bright brown, with dark spots, attenuate toward base.

General distribution: Endemic to Iran.

Habitat: Inside and at margin of oak forests.

Specimens seen: Bakhtiari, Bazoft valley, Movarz, 1750 m, Mozaffarian 58049 (TARI).

Note: The description is on the basis of Flora Iranica (Rechinger 1972).

60. *C. calocephala* Jaub. & Spach, Ill. Pl. Or. 2: 96 (1846).

Syn.: *C. squarrosa* Boiss., Diagn. Pl. Or. Nov. Ser. 1, 10: 102 (1849). *C. adnata* Bunge, Mém. Acad. Scienc. Petersbg. 7 Sér., 9, 2: 50 (1865).

Stem up to 60 cm high, tomentose-arachnoid. Basal leaves oblong-lanceolate, entire-pinnatisect, with a petiole up to ca. 6 cm long or sometimes completely sessile; stem leaves oblong or lanceolate, completely decurrent. Heads 2.5-3.5 cm in diam., 50-100-flowered. Involucre 1.5-2 cm in diam., loosely arachnoid; bracts 90-125 in number; appendage of median bracts 5-10 × 2-5 mm, triangular-rhombic, attenuate toward apex, completely recurved, margin irregularly with two or more short or long yellowish spines on each side; innermost bracts 20-25 mm long, pale yellow, sharp-pointed at apex, exceeded from involucre. Receptacle bristles scabrous. Corolla purple, 18-24 mm long; limb as long as tube or slightly longer. Anther tube purple. Achenes 3.5-4 × 1.5-2 mm, slightly compact, with numerous longitudinal ribs, grey-pale brown, irregularly dark maculate, dentate above, attenuate toward base [Plate 4 (H), 7 (J), 9 (I)].

General distribution: Endemic to Iran.

Habitat: Sandy or rocky slopes of mountains, sometimes alongside of roads.

Selected specimens seen: Azerbaijan: Hashtroud to Maragheh, Nazar-Kahrizak, Mollajik, Attar & Zamani 38636 (TUH); between Shahin Dej and Takab, Qara Dash mountain, via Ghez Ghapan and Osh Darreh, 1400-2450 m, Mozaffarian 6988 (TARI); Khakhal, Abaei & Mojib 8826 (IRAN, 33995-E); between Mianeh & Kivi, Top Qara to Yaleh Gharshi, 1400-1600 m, Termeh, Mousavi & Habibi 8821 (IRAN, 39139-E). Tehran: 22 km Firouz Kuh to Roudehen, near to Chehel Cheshmeh, 2300 m, Renz & Iranshahr 8929 (IRAN,

16616-E); Chalous road, S slope of Kandovan, 2600 m, Ghahreman & Mozaffarian 509784 (TUH); Touchal, 2950 m, Attar 17078 (TUH); Taleghan to Gachsar, Qara Chah, 2200-2500 m, Termeh & Mousavi 8845 (IRAN); Gachsar, Loura valley, 2200 m, Bornmuller 7369 & 7370 (K); 5 km before the pass from Tehran to Chalous, 2400 m, Andersen & Petersen 175 (K); Karaj, Assemvarak, 2450 m, Wendelbo, Foroughi & Assadi 14462 (TARI); between Qazvin & Manjil, 1500 m, Wendelbo & Assadi 18274 (TARI). Bakhtiari: Kuh Rang, 2500 m, Pabot 8827 (IRAN, 2165 Pabot); Bazoft, 2 km to Samsami via Shahriari, 2050 m, Zare 17789 (TUH). Semnan: 35 km Shahmirzad to Foulad Mahalleh, 2350-2500 m, Iranshahr & Renz 8932 (IRAN, 16614-E); 23 km NW Semnan, 2100 m, Wendelbo & Foroughi 13008 (TARI). Zanjan: 7 km Soltaniyyeh to Gheydar, 1850 m, Termeh & Mousavi 8825 (IRAN, 33891-E); 38 km NE Mianeh, 1220 m, Pabot 8746 (IRAN, 3768 Pabot). Zanjan to Bijar, 1700 m, Termeh 8833 (IRAN, 33998-E). Markazi: 60 km Saveh, Chalasban; 2280 m, Assadi & Shirdelpour 13190 (TARI). Hamadan: Avaj, 2500 m, Attar 20547 (TUH); Esfahan: Akhoureh, Choghoyurt, Sayghalin Darreh mountain, 2420-2700 m, Mousavi & Sateei 8842 (IRAN, 33906-E). Kurdistan: 40 km Divan Darreh to Saqqez, 2100 m, Mozaffarian 77157 (TARI). Kermanshah: Zangan, near to Asad-abad, 1950 m, Foroughian & Hariri 4243 (TARI). Lorestan: Alighoudarz, Tiran village, Tamandar mountain, the pass between Farsash and Azna, 2200 m, Mozaffarian 77226 (TARI). Bakhtiari: Ardal, Chery to Dashtak, 2100 m, Iranshahr & Mousavi 8832 (IRAN, 33926-E).

61. *C. kopi-karadaghensis* Rech. f., Flora Iranica 90: 249 (1972).

Root fusiform or turnip-shaped. Stem 30-60 cm high, with thin, long and divergent branches. Leaves white arachnoid-tomentose on both sides; basal leaves lanceolate, sessile or not, lyrate-pinnatisect; stem leaves completely decurrent, sinuate-dentate, minutely spinulose; stem wings up to 12 mm wide; upper leaves reduced, distant from the heads. Heads 2.5-3.5 cm in diam., ca. 130-flowered. Involucre 1.5-2 cm in diam., constricted above, covered with loose arachnoid hairs; bracts 120-150 in number; appendage of outer and median bracts green, with yellowish reticulate nervation and prominent midrib only on beneath; outside covered with papillas and short hairs; appendage of median bracts ca. 9 × 4-6 mm, triangular, hastate or lanceolate, with 1-2 spines at margin, rarely smooth, terminated to a long spine at apex, recurved or slightly spread, auriculate at base; auricles slightly curved; innermost bracts erect, ca. 25 mm long, acuminate, exceeded from involucre. Receptacle bristles scabrous. Corolla purple, ca. 22 mm

long; tube as long as limb. Anther tube purple. Achenes ca. 3.5×1.5 mm, compact, pale-colored, smooth, longitudinally ribbed, dentate above [Plates 4 (I), 7 (K)].

General distribution: Iraq and Iran.

Habitat: Oak forests of Zagros Mountains in Kurdistan.

Specimens seen: Iran: Kurdistan: Saqqez, between Sente and Divan Darreh, Ghaleh, the pass between Bashmagh and Jafar-abad, 2300 m, Mozaffarian 70067 (TARI). Kermanshah, 1650 m, Corley 58 (K); 6 km N Divan Darreh, Rechinger 14737 (B).

62. *C. arakensis* Attar & Djavadi, **sp. nov.** (Fig. 9).

Holotypus: Markazi: 30 km Tafresh, 1870 m, Ghahreman, Attar & Ghaffari 21811 (TUH).

Perennis, 30-40 cm alta, araneosa. Caulis a medio ramosus. Folia concoloria; basalia lanceolata, pinnatisecta vel elliptica, ingegra; caulina interrupte decurrentia; summa sensim decrescentia. Capitula singula, terminalia, ca 100-flora, ca. 4-5 cm diametro; phylla ca. 80, appendiculata; apendice phyllorum intermediarum lanceolatae, ad marginem crebre pectinato-spinulosae; phylla intima exappendiculata, linearia, flavescentia. Receptaculi setae scabrae. Corolla rosea, ca. 20 mm longa, limbo quam tubo longiore. Antherarum tubus concolor. Achaenia 5×3 mm, superne dentata, maculata.

Stem 30-40 cm high, branched from middle, arachnoid. Leaves arachnoid on both sides; basal leaves dimorphic, lanceolate, pinnatisect or entire, elliptic, with ca. 1 cm long petiole; stem leaves interruptedly decurrent; upper leaves reduced. Heads 4-5 cm in diam., ca. 100-flowered. Involucre ca. 2 cm in diam., loosely arachnoid; bracts ca. 80 in number, appendiculate; appendage of median bracts 20×3 mm, lanceolate, with numerous 2-7 mm long spines at margin, attenuate, spread-recurved; innermost bracts exappendiculate, ca. 25 mm long, yellowish, exceeded from involucre. Receptacle bristles scabrous. Corolla pale pink, 24-25 mm long; limb longer than tube. Anther tube pink. Achenes ca. 5×3 mm, attenuate toward base, with three narrow wings, coarsely dentate above, with bright spots on surface, wrinkled [Plate 4 (J)].

General distribution: Endemic to Iran.

Other specimens seen: Markazi: Tafresh, Noghre Kamar pass, 1750 m, Mozaffarian 72092 (TARI); Tafresh, Noghre Kamar pass, Ashtian road, 2200-2400 m, Mozaffarian & Masoumi 48159 (TARI); Mahallat, Bagher-abad, Tang-e Badam, 1900-2100 m, Mozaffarian & Masoumi 47990 (TARI); Arak, Haftad Gholleh, Chek Ab, 2100-2500 m, Mozaffarian & Masoumi 47862 (TARI); Arak, Anjedan, 2000-2400 m, Mozaffarian 63784 (TARI); 83 km Saveh via Hamadan road, 1850 m, Assadi & Shirdelpour 13194 (TARI); 86

km Saveh via Tafresh road, 2000 m, Assadi & Shirdelpour 13145 (TARI); 50 km S Qom, Karmoigan, 1900 m, Amin & Bazargan 18960 (TARI); Qom, Ferdow, Margheh-Peymal, 2480 m, Mousavi & Tehrani 34278 (IRAN); Saveh, Nouran to Kahlou, 1635 m, Mozaffarian 72071 (TARI).

Taxonomic remarks: *C. arakensis* is close to *C. calocephala* but differs from it by the shape and the size of bracts (not squarrose) and also the size of heads.

63. *C. sefidiana* (Pau) Rech. f., Annales Jardin Botanico de Madrid, 47 (2): 371 (1990).

Syn.: *C. cymbolepis* Boiss. var. *sefidiana* Pau, Trab. Mus. Nac. Cienc. Nat. Ser. Bot. 14: 40 (1918).

Stem branched from base, indistinctly striate, arachnoid-tomentose. Leaves arachnoid-tomentose on both sides, at basal part elliptic, ca. 25×4 cm, sessile, pinnatisect, with large terminal segment, continuously decurrent, continuous wings up to 15 mm wide, sinuate-spinulose along margin; leaves upward reduced. Heads 2-5 cm in diam., 50-60-flowered. Involucre up to 3 cm long, 1-2 cm wide, loosely arachnoid; bracts 100-140 in number; appendage of median bracts $10-12 \times 2-5$ mm, triangular, auriculate, with 2-3 pairs of long spines at margin, recurved, covering outer bracts appendage; innermost bracts erect, exappendiculate, 23-24 mm long, sharp-pointed at apex, exceeded from involucre, yellowish. Receptacle bristles scabrous. Corolla purple, 20-23 mm long; limb longer than tube. Anther tube purple. Achenes ca. 5.5×2.5 mm, oblong, slightly attenuate toward base, on surface scabrous, with numerous longitudinal ribs, brown-blackish, with bright spots, minutely dentate above [Plate 9 (K)].

General distribution: Endemic to Iran.

Specimens seen: Bakhtiari: Lordegan, Sarkhon, Shalil to Doab-e Bazoft and Karoun, 1200 m, Mozaffarian 54903 (TARI). Khuzestan: Dehdaz to Karoun, Lir Siah, 1000 m, Mozaffarian 74481 & 74482 (TUH).

Taxonomic remarks: Differences between *C. sefidiana* with its nearest species, *C. cymbolepis* (distributed in Iraq) are as follows: flowers 50-60 in number (not 100), appendage of median bracts triangular, auriculate at base, ca. 12 mm long (not rhombic, ca. 17 mm long).

64. *C. behboudiana* Rech. f. & Esfand., Ann. Nat. Mus. Wien 57: 81 (1950).

Syn.: *C. calocephala* Jaub. & Spach var. *albiflora* Bornm. et f. *minor* Bornm. in Bull. Herb. Boissier, ser. 2, 7: 220 (1907). *C. calocephala* Jaub. & Spach var. *lachnolepis* Bornm. in Repert. Spec. Nov. Regni Veg. 41: 311 (1937). *C. calocephala* subsp. *behboudiana* (Rech.f. & Esfand.) Mehregan, Willdenowia 38: 347 (2008).

Stem up to 30 cm high, branched from base, covered with arachnoid hairs. Leaves tomentose-arachnoid on

both sides; basal leaves ca. 7×3 cm, lanceolate, pinnatisect, sometimes entire, sessile or with a short petiole; stem leaves interruptedly decurrent; upper leaves smaller. Heads 2.5-5 cm in diam., 45-125-flowered. Involucre ca. 1.5 cm in diam., loosely arachnoid; bracts 85-110 in number; appendage of median bracts $7-12 \times 2-3$ mm, lanceolate-linear, recurved, with 2 spines at margin, attenuate toward apex into a sharp-pointed spine; innermost bracts exappendiculate, ca. 20 mm long, gradually attenuate, sharp-pointed at apex, exceeded from involucre. Receptacle bristles scabrous. Corolla yellow, 17-18 mm long; limb slightly longer than tube. Anther tube yellow, pink at tip. Achenes dark, ca. 5×2 mm, ovate, outer achenes curved; inner achenes straight, on surface rugose and papillose, with wing-shaped ribs, dark maculate, coarsely dentate above [Plates 4 (K), 7 (L), 9 (J)].

General distribution: Endemic to Iran.

Habitat: Steppes and mountainous regions.

Selected specimens seen: Tehran: Darakeh, 2000-2200 m, Termeh & Mousavi 51937 (IRAN); Damavand, Rineh, 2500 m, Ghahreman & Attar 21970 (TUH); Rineh to Larijan, 2100 m, Djavadi & Ghanbari 8857 (IRAN); 12 km S Damavand, Mozaffarian 39872 (TARI); Ab Ali, Sar Polak, Mobayyen 11663 (TUH); Lashkarak, Ammame, 1900 m, Djavadi & Ghanbari 51936 (IRAN); 20 km E Tehran, above Afjeh, 2000 m, Assadi & Jamzad 55250 (TARI); Marounak, Behboudi 5049 (IRAN, 169-E). Semnan: 20 km NW Shahrud, above Nekarman village, Shahvar mountain, 3000-3700 m, Assadi & Mozaffarian 40826 (TARI); Qazvin: 16 km Qazvin to Alamout, 2000-2300 m, Assadi & Massoumi 50930 (TARI).

Taxonomic remarks: *C. behboudiana* is a distinct species, differs from *C. calocephala* by having yellow corolla and anther tube (not purple-pink), more limited distribution (not wide distribution).

65. *C. stroterolepis* Rech. f., Flora Iranica, 90: 250 (1972).

Stem 30-60 cm high, branched from middle, continuously decurrent, forming wide wings, spinulose. Leaves thin, coriaceous; upper surface green-yellowish; lower surface covered with loose grey arachnoid-tomentose hairs, green-bluish; basal leaves soon becoming withered; stem leaves sessile, wide at base, triangular, decurrent; uppermost leaves distant from the heads. Heads 2.5-3.5 cm in diam., 80-150-flowered. Involucre ca. 2 cm in diam., constricted above; bracts 150-170 in number; appendage of median bracts ca. 5 mm long, imbricate-spread, recurved at apex, sagittate, terminated to a 3 mm long spine at apex, gradually attenuate toward apex, smooth at margin, coriaceous, green, with indistinct reticulate veins; midrib slightly prominent on dorsal surface, glabrescent; innermost

bracts pale, membranous, gradually lanceolate-linear, terminating to a sharp-pointed spine at apex. Receptacle bristles scabrous. Corolla yellow, ca. 20 mm long, tube as long as limb. Anther tube pink. Mature achenes unknown [Plate 4 (L)].

General distribution: Endemic to Iran.

Habitat: Oak forests of Zagros Mountains in Kurdistan.

Specimens seen: Kurdistan: 114 km N Marivan (Dezh Shahpur) to Saqqez, 1580 m, Rechinger 43086-b (K, isotype); 8 km N Mirabad via Piranshahr, near to the large lake, 1300-1400 m, Runemark & Mozaffarian 21148 (TARI).

Taxonomic remarks: *Cousinia stroterolepis* differs from *C. calocephala* by having yellow corolla (not purple-pink) and entire bracts (not spinulose at margin).

66. *C. kirrindica* Bornm. & Rech. f., Feddes Repert. 48: 141 (1940).

Syn.: *C. luronum* Bornm. var. *recurvata* Bornm., Feddes Repert. 40: 347 (1936). *C. luronum* Bornm. var. *lancigera* Bornm., l. c. : 348 (1936).

Stem up to 30 cm high, branched from base, densely arachnoid. Leaves tomentose-arachnoid on both sides, more densely on beneath, spinulose; basal leaves oblong-lanceolate; midrib wide and white; stem leaves elliptic-triangular, cuneate at base, decurrent; upper leaves gradually reduced. Heads 3-7 cm in diam., ca. 70-flowered. Involucre ca. 1.5 cm in diam., arachnoid, glabrescent; bracts ca. 75 in number; appendage of median bracts ca. 20×4 mm, lanceolate, with numerous spines at margin, attenuate toward apex into a recurved-spread spine; innermost bracts ca. 22 mm long, with a long sharp-pointed spine at apex, exceeded from involucre. Receptacle bristles smooth. Corolla white-pinkish, ca. 20 mm long; limb as long as tube. Anther tube pink. Achenes ca. 6×2 mm, oblong, grey-bright brown, dark maculate, surface rugose, with prominent longitudinally ribs, irregularly dentate above [Plates 4 (M), 8 (C), 9 (L)].

General distribution: Endemic to Iran.

Habitat: At margin of oak forests and also along the roads.

Specimens seen: Kermanshah: Eslamabad –e Gharb, Zavareh Mountain, 1600 m, Ghahreman & Attar 19962 (TUH); 43 km SW Kermanshah, Pabot 1873 (TARI).

Taxonomic remarks: *C. kirrindica* was considered as a synonymy of *C. noëana* (Mehregan & Kadereit 2008). But, it differs from *C. noëana* by the following characters: appendage of median bracts squarrose (not spreading), hastate-lanceolate, truncate (not triangular-rhombic), with numerous spines at margin, heads including spines 3.5-6.5 cm in diam. (not 2-3 cm), number of flower per head ca. 75 (not 20-25), corolla length 20-22 mm (not 15 mm). Therefore, *C. kirrindica* is considered as a distinct species.

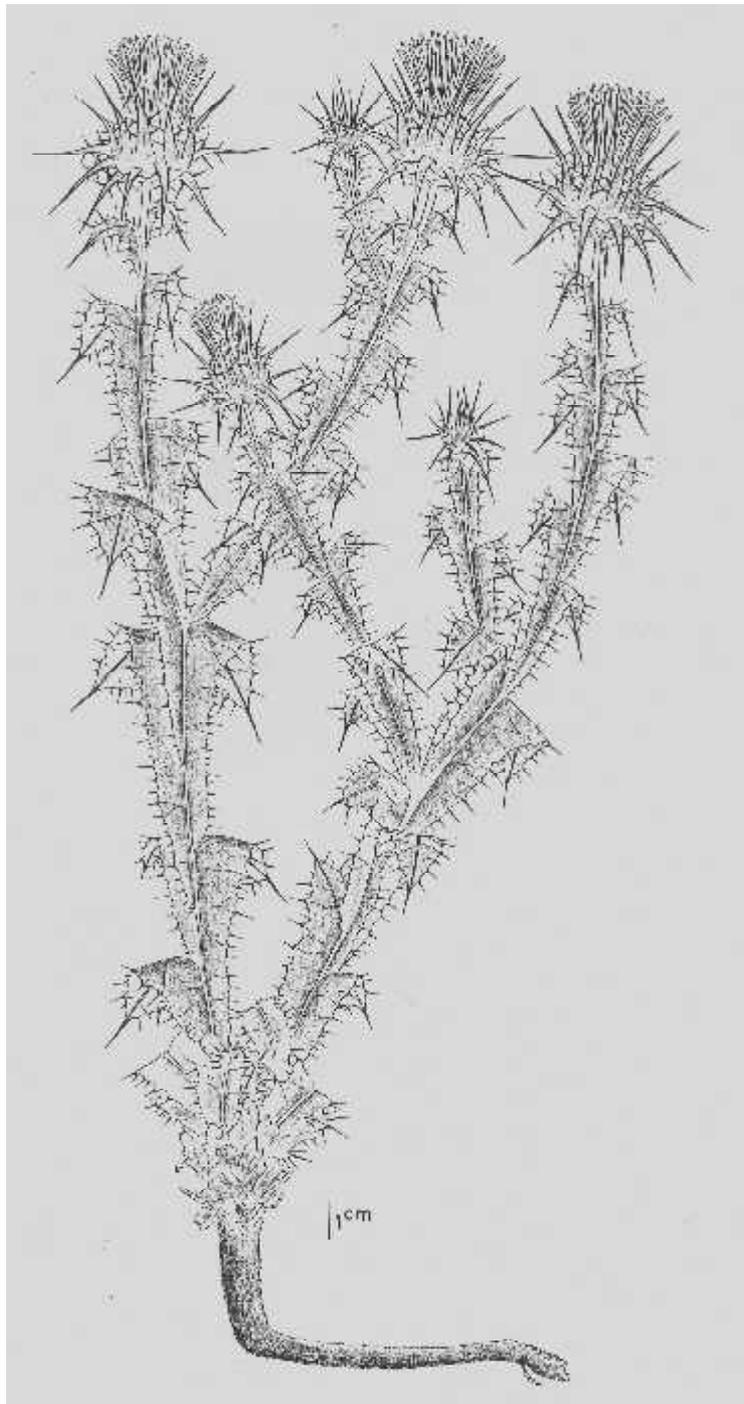


Fig. 9. *Cousinia arakensis*.

67. *C. mobayenii* Ghahreman & Attar, Iran Jour. Bot. 8 (2): 260 (2000).

Root fusiform. Stem up to 40 cm high, divaricately branched from base, arachnoid, densely leafy, totally

winged. Leaves herbaceous, persistently tomentose on both sides; stem leaves oblong, decurrent, wings dentate, spiny, up to 8 mm wide; uppermost leaves gradually reduced. Heads ca. 7 cm in diam., ca. 120-

flowered. Involucre ca. 2.5 cm in diam., constricted above, loosely arachnoid; bracts ca. 165 in number; appendage of median bracts 18-22 × 3-6 mm, triangular, with 2-3 spines on each side, gradually attenuate into long rigid spine, patent-recurved; innermost bracts exappendiculate, membranous, erect, exceeded from involucre. Receptacle bristles scabrous. Corolla purple, ca. 21 mm long; limb almost as long as tube. Anther tube purple. Achenes ca. 5 × 2.5 mm, attenuate toward the base [Plates 4 (N), 8 (A)].

General distribution: Endemic to Iran.

Habitat: Inside and at the margin of oak forests, along the farms, rarely along the roads.

Specimens seen: Kermanshah: between Kermanshah and Kerend-e Gharb, 3 km after Firouz-abad village, 1490 m, Ghahreman & Attar 20569 (TUH, holotype); between Kermanshah and Eslamabad, 1500 m, Ghahreman & Attar 22378 (TUH); 18 km N Kerend-e Gharb, Lotfeh village, S and SW slopes, 1700 m, Hamzeh & Hatami 1425 (TARI); mountains above Kerend, Dalahou road, 1700-2000 m, Assadi 60789 (TARI); 17 km to Gahvareh, Attar, Maaroufi & Zamani 36378 (TUH).

Taxonomic remarks: *C. mobayenii* was regarded as a synonymy of *C. noëana* (Mehregan & Kadereit 2008). Whereas, it is differentiated from *C. noëana* by the following characters: stem robust, ca. 40 cm high (not up to 15 cm), heads including spines ca. 7 cm in diam. (not ca. 1.5-2.5 cm), flower number per head ca. 120 (not 30), bracts ca. 165 (not ca. 70), median bracts appendage spread, long triangular, 18-22 × 3-6 mm (not 5 × 4 mm), terminating to a ca. 12 mm long spine at apex. This species is comparable with its closest affinity, *C. kirrindica*, but differs from it by these characters: bracts ca. 165 (not ca. 75), number of flower per head ca. 120 (not 70), receptacle bristles scabrous (not smooth).

68. *C. sanandajensis* Rech. f., Flora Iranica 90: 235 (1972).

Stem up to 20 cm high, arachnoid. Leaves tomentose on both sides, more densely on beneath, whitish; basal leaves 7-8 × 1.5-2 cm, lanceolate-oblong, shallowly or profoundly pinnatisect, sessile, dentate-spinulose at margin; stem leaves interruptedly decurrent. Heads 1.5-3 cm in diam., 40-70-flowered. Involucre 1-2.5 cm in diam.; bracts 80-90 in number; appendage of median bracts 8.5-10 × 8 mm, rhombic-hastate, spinulose at margin, attenuate toward apex, imbricate, slightly spread at tip; innermost bracts exappendiculate, 19-20 mm long, attenuate toward apex, exceeded from involucre, arachnoid outside above the middle. Receptacle bristled scabrous. Corolla white-purplish or purple, 17-20 mm long; limb almost as long as tube. Anther tube pink-purple. Achenes ca. 4 × 2.5 mm, dark,

ovate, attenuate toward base, on surface scabrous, with longitudinal ribs forming wings, narrowly costate between wings, dentate above [Plates 4 (O), 8 (B), 9 (M)].

General distribution: Iran.

Habitat: Dry and sandy slopes of mountains.

Specimens seen: Kurdistan: 30 km S Sanandaj, 1676 m., Furse 3304 (K, holotype); Divandarreh to Bijar, 1710 m, Ghahreman & Attar 20559 (TUH). Hamadan: Asad-abad pass, 2100 m, Ghahreman & Attar 20571 (TUH); Asad-abad pass, 2100 m, Attar, Dadjou & Mehdigholi 14200 (TUH); Asad-abad pass to Gharavol Khaneh mountain, 2500-2700 m, Mozaffarian 64994 (TARI).

Taxonomic remarks: *C. sanandajensis*, a new synonymy of *C. lurorum* (Mehregan & Kadereit 2008), is closely related to *C. lurorum*, but differs from it by having different habit, hard leathery bracts, appendages of median bracts imbricate or slightly spread at tip (not distinctly spread), spinulose at margin (not with 1-2 minute spine on each side).

69. *C. lurorum* Bornm., Feddes Repert. 40: 346 (1936).

Syn.: *C. cymbolepis* Boiss. var. *subintegriloba* Bornm., Beih. Bot. Centrbl. 32, 2: 407 (1914).

Stem ca. 30 cm high, branched from base, tomentose-arachnoid. Leaves tomentose on both sides, at margin sinuate-dentate-spinulose; basal leaves lanceolate, profoundly pinnatisect, sessile; stem leaves continuously decurrent; upper leaves smaller. Heads ca. 3 cm in diam., ca. 35-flowered. Involucre ca. 1.5 cm in diam., loosely arachnoid; bracts ca. 60 in number; appendage of median bracts 8-10 × 4.5-5 mm, triangular, with 1-2 minute spines at margin, attenuate into a curved hook-shaped spine at apex, with prominent white midrib; innermost bracts ca. 19 mm long, white, exceeded from involucre. Receptacle bristles scabrous. Corolla purple, ca. 21 mm long; limb longer than tube. Anther tube purple. Achenes ca. 5.5 × 2.5 mm, flattened or 3-edged, attenuate toward base, brownish, dark maculate, with rugose reticulate surface, transversally areolate with deep pits, with longitudinal wing-shaped ribs, coarsely dentate above [Plates 5 (A), 8 (D), 9 (N)].

General distribution: Endemic to Iran.

Habitat: Along the farms.

Specimens seen: Kermanshah: Sahneh, between Kangavar and Kermanshah, Strauss s.n. (B, holotype); between Kermanshah and Ealamabad, Mahidasht, Boujan pass, 1450 m, Ghahreman & Attar 20568 (TUH); Kermanshah to Kamyaran, Tang-e Chalpeh, 1850 m, Hamzeh & Asri 87706 (TARI).

70. *Cousinia kurdistanica* Attar, sp.nov. (Fig. 10).

Holotypus: Kurdistan: Marivan, Zarivar lake, 1500 m, Kaffash 3232 (Sanandaj herbarium, Research Center of Agricultural and Natural resources of Kurdistan).

Perennis, ca. 30 cm alta, olivacea, parte inferior ignota, araneoso-tomentosa. Caulis a medio ramosus. Folia concoloria; lanceolato-pinnatifida; caulina complete decurrentia; summa sensim decrescentia. Capitula singula, terminalia, ca. 70-flora, ca. 4-4.5 cm diametro; phylla ca. 110, appendiculata; intermedia apendice lanceolata, margine pauci-spinuloso-ciliata; phylla intima exappendiculata, linearia. Receptaculi setae scabrae. Corolla rosea, ca. 20 mm longa, tubo limbum subaequilongum. Antherarum tubus concolor. Achaenia 3 × 2 mm, fusca, superne denticulata.

Plant up to 30 cm high, olivaceous-green, basal part not seen. Stem branched from middle, striate, arachnoid-tomentose, continuously winged. Leaves arachnoid-tomentose on both sides, basal leaves not seen; lower leaves ca. 9 × 3 cm, lanceolate, continuously decurrent, sessile, pinnatifid-lobate, dentate at margin; dents terminating to a ca. 3 mm long spine; median leaves similar to lower leaves but smaller, continuously decurrent; free part of leaves up to 3 cm long, upper leaves gradually reduced, with free part ca. 2.5 cm long, distant from the heads. Heads single, terminal, 4-4.5 cm in diam., ca. 70-flowered. Involucre ca. 2 × 2 cm, arachnoid; bracts ca. 110 in number, appendiculate, 10-seriate; appendage of outer bracts ca. 5 × 1.5 mm, lanceolate, reflexed, spinulose at margin; appendage of median bracts ca. 10 × 2 mm, lanceolate, attenuate toward apex, with prominent midrib, spreading, with one minute spine on each side; appendage of inner bracts 3-9 × 5-6 mm, rhombic, apiculate; innermost bracts linear, up to 2.5 cm long. Receptacle bristles scabrous. Corolla pink, ca. 20 mm long; limb as long as tube. Anther tube pink. Achenes ca. 3 × 2 mm, blackish, inversely pyramidal, truncate above, longitudinally striate, narrowly winged, irregularly denticulate above [Plate 5 (B)].

General distribution: Endemic to Iran.

Taxonomic remark: *C. kurdistanica* is related to *C. lurorum*, but distinguished from it by the following characters: heads 4-4.5 cm in diam. (not ca. 3 cm), number of flower per head ca. 70 (not ca. 35), bracts ca. 110 in number (not ca. 60), median bracts appendages lanceolate, ca. 10 × 2 mm (not triangular, 8-10 × 4.5-5).

71. *C. bornmulleri* C. Winkl., Acta Horti Petrop. 14: 235 (1897).

Stem up to 40 cm high, branched from middle, arachnoid. Leaves tomentose on both sides; basal leaves not seen; stem leaves interruptedly decurrent; upper leaves smaller. Heads 7-8 cm in diam., ca. 70-

flowered. Involucre 2-2.5 cm in diam., arachnoid; bracts 60-100 in number, outside in lower half covered with short hairs, hairs bubble-shaped and swallowed at base; appendage of median bracts 7-12 × 5 mm, triangular, concave, spinulose at margin, attenuate into a sharp spread-recurved spine at apex; innermost bracts up to 25 mm long, acuminate, straw-colored, on the outside covered with short erect hairs and yellowish-dark glands. Receptacle bristles smooth. Corolla milky, ca. 28 mm long, limb as long as tube or longer, with sparse papillas on dorsal surface. Anther tube milky. Mature achenes unknown [Plate 5 (C)].

General distribution: Endemic to Iran.

Habitat: Lowlands, rocky and sandy slopes of mountains.

Specimens seen: Markazi: Arak to Qom, 1350 m, Rechinger 43272 (B); Mahallat, Bozijan, Cheshmeh Deraz, 2200-2500 m, Mousavi & Tehrani 9166 (IRAN). Esfahan: Delijan, 1420 m, Sabeti 2901 (TARI); Natanz, Karkas mountain, 3000-3300 m, Foroughi & Assadi 18086 (TARI); near Meymeh, 2200 m, Ghahreman & Attar 22532 (TUH); Natanz, Karkas mountain, 2700 m, Foroughi 4376 (TARI); Ardestan, Varian, 2000 m, Foroughi & Assadi 18042 (TARI); between Shareza and Semirom, 10 km S Kahrouyeh, Iranshahr 34034 (IRAN); Kashan, Qamsar to Ghahroud, after Reza-abad, 3100 m, Assadi, Jamzad & Azizian 80046 (TARI); Golpayegan, Strauss s.n. (B). Fars: Bamou Protected region, Darreh Chap, 1650-1900 m, Wendelbo & Foroughi 17528 (TARI); 25 km SE Fasa, Salu village, mt. Raz, 1600-2200 m, Mozaffarian 46814 (TARI). Kerman: Jupar mountain, 3400m, B 3456 (B, holotype)

Taxonomic remarks: *C. bornmulleri*, a new synonymy of *C. onopordioides* Ledeb. (Mehregan & Kadereit 2008) differs from *C. onopordioides* by the following morphological characters: heads excluding spines 2-2.5 cm in diam. (not 3.5 cm), flower number per head ca. 70 (not 80-400), corolla length up to 28 mm long (not up to 50 mm). With these morphological differences, *C. bornmulleri* regards as a distinct species.

72. *C. farsistanica* Bornm., Österr. Bot. Zeitschr. 62: 185 (1912).

Syn.: *C. pariziana* Parsa, Fl. De l'Iran 10:110 (1980).

Stem up to 60 cm high, branched from base, arachnoid. Leaves tomentose on both sides, at margin dentate-spinulose, terminal spine up to 8 mm long; basal leaves 6-10 × 2-4 cm ovate, elliptic-lanceolate-spathulate, entire or lyrate or shallowly-profoundly pinnatisect; stem leaves triangular-lanceolate, cuneate-cordate at base, continuously-interruptedly decurrent. Heads 3.5-5.5 cm in diam., 40-50-flowered. Involucre 1.5-2.5 cm in diam.; bracts 40-70 in number; appendages of median bracts 18-23 × 14-18 mm, hastate, spinulose at

margin, abruptly attenuate into a up to 1.5 cm long spine at apex, imbricate, covering inner bracts, spread-recurved; innermost bracts exappendiculate, 25-27 mm long, attenuate toward apex, terminating to a sharp-pointed spine, exceeded from involucre. Receptacle bristles smooth. Corolla white, 20-23 mm long, limb slightly longer than tube. Anther tube white. Achenes 5-5.5 × 2-3 mm, oblong, with minute and large teeth at the tip, dark brown-black, with indistinct dark spots, on surface scabrous, with shallow or deep pits [Plates 5 (D), 8 (E), 9 (O)].

General distribution: Endemic to Iran.

Habitat: Dry and low slopes of mountains.

Selected specimens seen: Fars: Saadat Shahr, between Sourian and Fenjan, 30 km Sourian, 2560 m, Ghahreman, Attar & Mehdigholi 22514 (TUH); 50 km Abadeh from Deh Bid, 2200 m, Ghahreman & Attar 22504 (TUH); NW Perspolis, Siwand, Chah Siah mountain, Stapf 2812=2821 (K, isotype); Shiraz, Dasht-e Arjan, E slope of Task mountain via Bonour and Zangan, 2250-3000 m, Mozaffarian 71369 (TARI); Abadeh, Bavanat, Sourian, Termeh & Izadyar 8771 (IRAN, 14876-E); Dej Kord to Soghad, 2340 m, Djavadi, Ghanbari & Torabi 53859 (IRAN). Yazd: 50 km SW Marvast, Bagh-e Shadi, 2148 m, Assadi & Ranjbar 82945 (TARI). Kerman: between Shahr-e Babak and Javaz pass, Pour Mohammadi 21878 (TUH); 7 km East of Sirjan station, Mirtadzadini 28263 (TUH).

Taxonomic remarks: *C. farsistanica* which was considered as a synonymy of *C. kotschyi* (Mehregan & Kadereit 2008), is now regarded as a distinct species. It is mainly distinguished by sagittate appendage that abruptly terminating to a sharp-pointed spine at apex (not long lanceolate). It is noticeable that *C. farsistanica* consists of populations uniform in morphology of bracts, but varies in indumentum of whole plants, from persistent dense - loosely arachnoid-tomentose. In addition, stem leaves varies from continuously decurrent with up to 20 mm long rigid spines at margin - interruptedly short decurrent, cordate at base, tiny spinulose, spines up to 5 mm long.

73. *C. perspolitana* Attar & Ghahreman. Nord. Journ. Bot. 23 (5): 589 (2005).

Stem up to 25 cm high, totally arachnoid-tomentose, with long fusiform root and short branches. Leaves densely arachnoid-tomentose on both sides, sinuate-dentate; basal leaves lanceolate, pinnatifid; stem leaves dentate-sinuate, ovate-lanceolate, cuneate, strongly decurrent; uppermost leaves slightly decurrent. Heads up to 7 cm in diam., ca. 90-flowered. Involucre 2 × 2.5 cm; bracts ca. 60 in number, tomentose-canescens;

appendage of median bracts ca. 35 × 6 mm, lanceolate, spreading-reflexed, gradually attenuate toward apex, dentate-spinose at margin; spines up to 5 mm long; sometimes exceeded from involucre; innermost bracts exappendiculate, attenuate into a sharp tip, straw-colored, tomentose-canescens, papillose on dorsal surface. Receptacle bristles scabrous. Corolla pale yellow, ca. 22 mm long; limb shorter than tube. Achenes ca. 4 × 5 mm, inversely ovate, brown, black maculate, with six longitudinal wings, irregularly foveolate, dentate-marginate at apex [Plate 5 (E)].

General distribution: Endemic to Iran.

Habitat: Semi-desert region.

Specimens seen: Fars: Abadeh to Shirin-Khosro, after Saghad, 2250 m, Ghahreman & Attar 22509 (TUH, holotype); Abadeh, 13 km from Soghad to Shirin-Khosro, near Soghan, 2200 m, Mozaffarian 71300 (TARI); 12 km Saghad to Shirin-Khosro, 2100 m, Djavadi 53186 (IRAN).

Taxonomic remarks: *C. perspolitana*, as a distinctive endemic species of semi-desert areas of Fars province, is distinguished from *C. kotschyi* by its hard spiny leaves and bracts, long median bracts appendage, ca. 35 × 6 mm (not 15-20 × 3-4 mm).

74. *C. sarzehensis* Attar, Ghahreman & Assadi, Nord. Journ. Bot. 20 (6): 697 (2000).

Stem ca. 45 cm high, divaricately branched in upper half, arachnoid. Leaves tomentose-arachnoid above, glabrescent, densely arachnoid below; basal leaves not seen; upper stem leaves oblong, interruptedly decurrent; upper leaves reduced, distant from the heads. Heads 6-9 cm in diam., ca. 100-flowered. Involucre 2-3.5 cm in diam.; bracts ca. 100 in number; appendage of median bracts 20-37 × 10-15 mm, rhombic, asymmetric, with 1-3 minute spines at margin, attenuate into a long sharp spine at apex, longer than inner bracts, spread; innermost bracts ca. 25 mm long, exappendiculate, attenuate toward apex, papillose and ciliate on dorsal surface. Receptacle bristles scabrous. Corolla pale pink, ca. 23 mm long; limb almost as long as tube. Anther tube pink. Achenes ca. 5 × 2 mm, inversely ovate-pyramidal, bright brown, dark maculate, longitudinally ribbed; ribs indistinct, dentate above, attenuate toward base [Plate 5 (F)].

General distribution: Endemic to Iran.

Specimen seen: Kerman, 40 km from Kerman toward Sarzeh mountain, 2100-2500 m, Assadi & Miller 25326 (TARI).

75. *C. lactiflora* Rech. f., Flora Iranica 139A: 143 (1979).

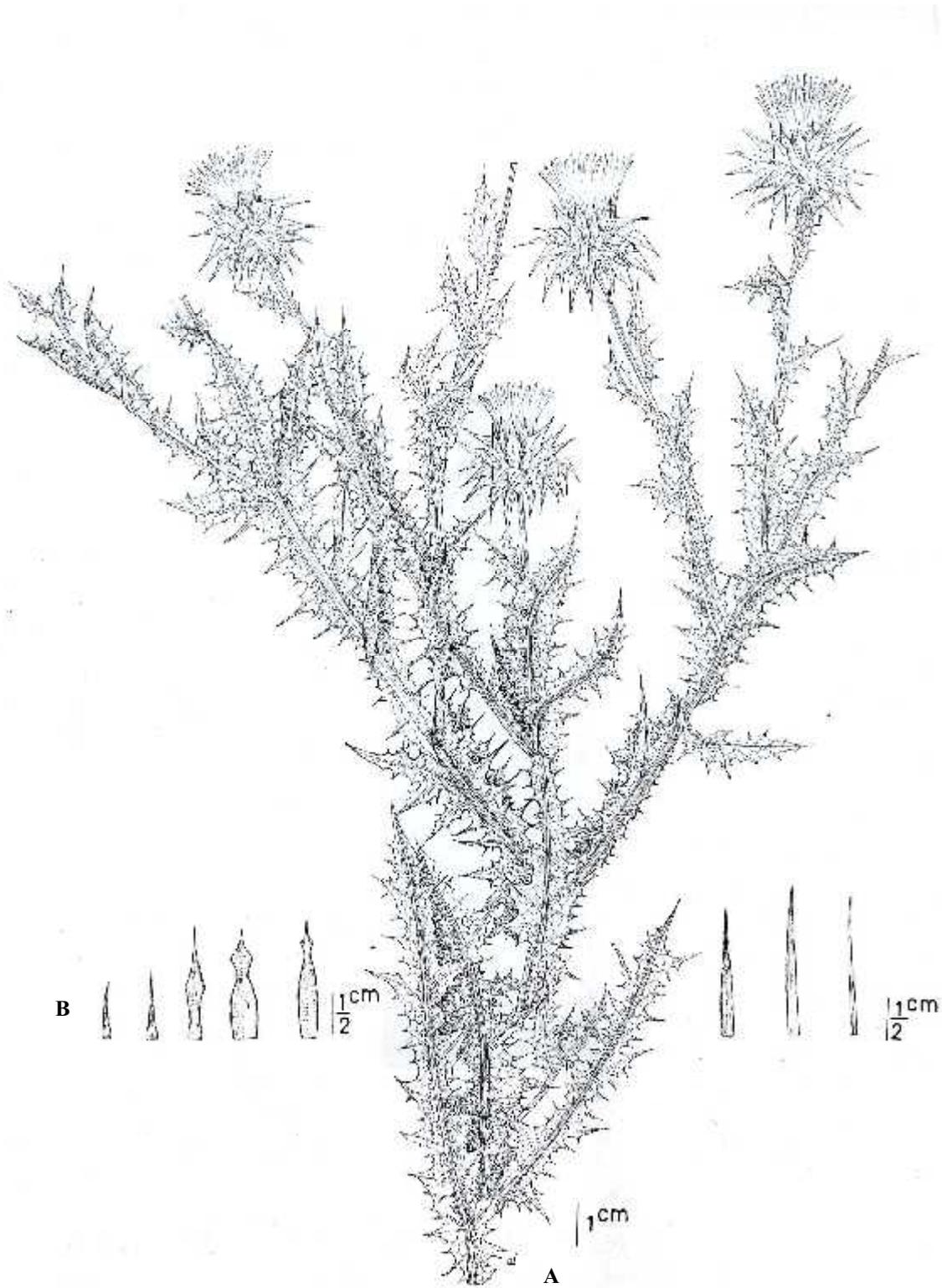


Fig. 10. *Cousinia kurdistanica*, A: habit, B: bracts.

Stem up to 40 cm high, branched from base. Leaves white arachnoid-tomentose on both sides, sometimes becoming glabrous; basal leaves lanceolate, pinnately lobed-pinnatisect; lobes triangular; stem leaves interruptedly decurrent, cuneate at base; upper leaves reduced, distant from the heads. Heads 4-8 cm in diam., ca. 115-flowered. Involucre ca. 3 cm in diam., loosely arachnoid; bracts 60-80 in number; appendage of median bracts 23-25 × 8 mm, lanceolate, rounded at base; innermost bracts up to 31 mm long, exceeded from involucre, attenuate into a sharp-pointed spine at apex. Receptacle bristles smooth. Corolla milky, 26-28 mm long; limb longer than tube. Anther tube milky. Achenes ca. 5 × 2.5 mm, brown-blackish, on surface rugose, with transversal wrinkles, longitudinally wing-shaped ribbed, minutely dentate above [Plates 5 (G), 8 (F), 9 (P)].

General distribution.: Endemic to Iran.

Specimens seen.: Esfahan: Khansar, 2240 m, Ghahreman & Attar 20037 (TUH); Shahreza to Semirom, Alijough mountain, 2600-3250 m, Delghandi & Tehrani 15182 & 15183 (IRAN); Golpayegan, Hendeh, 2100-2250 m, Norouzi & Ashtari 3055; Golpayegan, Golpayegan dam, Djavadi & Ghanbari 29544 (IRAN). Lurestan: 13 km Aligudarz from Khomain, Djavadi 53180 (IRAN); Aligudarz: 3 way intersection of Khomain, Djavadi 53181; between Aligudarz and Khomian, 1950 m, Djavadi & Ghanbari 29546 (IRAN); 10 km on road to Khomian from 3-way intersection at Aligudarz, 1500 m, Attar & Ghahreman 21876 (TUH). Markazi: Khomain to Arak, 2 km after Shahrak-e Sanati, Djavadi 53182 (IRAN).

76. *C. aligudarzensis* Attar & Ghahreman, Novon 17: 145 (2007).

Stem up to 30 cm high, few branched, cuneate-attenuate, densely arachnoid-tomentose, canescent, rarely glabrescent and green, densely leafy. Leaves ca. 15 × 4 cm, coriaceous, sessile, pinnatifid or lobed; lobes triangular, terminating into a spine ca. 3 mm long; basal leaves 10-30 cm long, lanceolate, pinnatifid; stem leaves cuneate at base, gradually reduced upward. Heads single, terminal, ca. 5.5 cm diam., 120-150-flowered. Involucre ca. 2.5 cm in diam.; bracts 70-75 in number; median bracts appendage 7-17 × 5-9 mm, triangular, with 2 small spines on each side, spreading-erect; inner bracts appendage 4-6 × 2.5-4.5 mm, rhomboid, terminating to a straight spine; innermost bracts straw yellow, acute, prominent, lanceolate, gradually attenuate. Receptacle bristles smooth. Corolla pink, brown when dry, ca. 22 mm long; tube almost as long as limb. Anther tube purple. Achenes ca. 5 × 2 mm, inversely pyramid, attenuate toward base, blackish brown, longitudinally

striate, pale maculate, rugose, denticulate above; outer achenes curved; inner achenes straight [Plate 5 (H)].

General distribution.: Endemic to Iran.

Specimens seen.: Lurestan: 10 km on road to Khomian from 3-way intersection at Aligudarz, 1500 m, Attar & Ghahreman 27613 (TUH, holotype).

Taxonomic remarks.: *C. aligudarzensis* was considered as a synonymy of *C. kotschy* (syn.: *C. silyboides*) by Mehregan & Kadereit (2008). Whereas it differs from *C. kotschy* by the following characters: appendage of median bracts widely triangular (not long lanceolate), 5-9 mm at base (not 3-4 mm), bracts with distinct spines at margin (not indistinctly spinulose at margin), heads excluding spines 2.5 cm in diam. (not 1-1.5 cm), flower number per head 120-150 (not 65-100). It is noticeable that *C. kotschy* has wider distribution, whereas *C. aligudarzensis* is distributed in a limited area in Lurestan province. *C. aligudarzensis* is closely related to *C. lactiflora*, but distinguished from it by having pink corolla and anther tube (not milky).

77. *C. qaradaghensis* Rech. f., Flora Iranica 90: 258 (1972).

Stem thick, furrowed, leafy, simple or branched; branches long, numerous, erect or recurved. Leaves herbaceous; basal and lower stem leaves not seen; upper leaves decurrent, oblong or ovate-triangular; uppermost leaves reduced, ovate-lanceolate, distant from the heads, but transformed into an involucre bracts. Heads 6-7 cm in diam., many-flowered. Bracts 50-60 in number; median bracts imbricate, spread, gradually attenuate, terminated to a 5 mm long rigid spine at apex, smooth at margin, white arachnoid at base; midrib thick, keeled; venation indistinct; innermost bracts lanceolate, brown, membranous, gradually attenuate toward apex, not exceeded from involucre. Receptacle bristles scabrous. Corolla pale purple, ca. 25 mm long; tube longer than limb. Anther tube fleshy-colored. Mature achenes unknown [Plate 5 (I)].

General distribution.: Endemic to Iran.

Specimen seen.: Azerbaijan: Qara Dag on Kiamaki Dag (Kamcheh), near Daran, SE Jolfa, 1400-2400 m, Termeh 5062 (IRAN & 43662 K, isotype).

Doubtful and invalid records

Cousinia canescens DC., Prodr. 6: 556 (1838).

This species was described based on a specimen from unknown locality in Iran. Rechinger (1972) recorded it from Iran while regarded *C. wettsteiniana* Bornm. as a synonymy of it. Based on the examination of the specimens from the type locality of the latter species with its description and the description of *C. canescens*, it is quite clear that these two species may not be regarded as synonyms. However, in this paper *C.*

wettsteiniana is mentioned as a synonym of *C. grandis*. No material was found in Iran to be named *C. canescens*, therefore it seems further studies are needed to understand the identity of *C. canescens* and if it occurs in Iran. It may be that the type specimen has erroneously been recorded from Iran.

Cousinia purpurea C. A. Mey. in DC., Prodr. 6: 555 (1837).

Syn.: *Arctium purpureum* (C. A. Mey.) O. Kuntze, Revis. Gen. 1: 308 (1891).

This species was recorded from Iran by Rechinger (1972) from an area between Nakhchivan and Khoy (correctly Kok) based on the type specimen, but as both Nakhchivan and Kok are outside Iran, the record of this species from Iran is not confirmed.

General distribution: S Transcaucasus.

Specimens seen: Armenia: Erivan, Persia border (Azerbaijan), Grossheim 632 (K); Ararat: 7 km NNE Ararat, 2 km SE Vedi, 0.5 km SE of village Gorovan, Sandy area with Calligonum polygonoides shrubland, 985 m, Oberprieler 10096 (B).

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REFERENCES

Afzal-Rafii, Z.. 1980: Contribution à l'étude cytotaxonomique de quelques Cousinia d'Iran. - Biol. Ecol. Medit. 7: 6-14.

Aryavand, A. 1975: Contribution à l'étude cytotaxonomique de quelques angiospermes de l'Iran. - Botaniska Notiser 128: 299-311.

Assadi, M. 1987: Plan of the Flora of Iran (in Farsi). - Research Institute of Forests and Rangelands, Tehran.

Attar, F. 2000: The systematic studies of Cousinia (Asteraceae) sect. Cynaroideae in Iran (Ph.D. thesis). - Tehran University.

Attar, F. & Ghahreman, A. 2000: Two new species and a new record of the genus Cousinia Cass. Sect. Cynaroideae (Asteraceae) from west of Iran. -Iran Journ. Bot. 8 (2): 259-269.

Attar, F. & Ghahreman, A. 2005: Two new species of the genus Cousinia (Asteraceae) from Iran. -Nord. Journ. Bot. 23 (4): 589-592.

Attar, F. & Ghahreman, A. 2006: A synopsis of sect. Cynaroides (Cousinia, Compositae), distribution patterns and diversity centers. -Rostaniha 7 (Supplement 2): 315-342.

Attar, F. & Ghahreman, A. 2007: Cousinia aligudarzensis (Asteraceae), a new species of section Cynaroides Bunge from Iran. -Novon 17: 145-147.

Attar, F., Ghahreman, A. & Assadi, M. 2000: Three new species of the genus Cousinia (Asteraceae, Sect. Cynaroideae) from Iran. -Nord. Journ. Bot. 20 (6): 697-700.

Attar, F., Ghahreman, A. & Assadi, M. 2001: Studies on the genus Cousinia Cass. (Compositae) in Iran. -Iran Journ. Bot. 9 (1): 55-62.

Attar, F., Ghahreman, A. & Assadi, M. 2002: Cousinia zagrica (Asteraceae), a new species from West of Iran. -Sendtnera 8: 5-7.

Boissier, E., 1875: Cousinia in Flora Orientalis 3: 458-513. -Genevae and Basileae.

Bremer, K. 1994: Asteraceae: Cladistics and classification. -Timber press, Portland, Oregon.

Koch, C. 1851: Beiträge zu einer Flora des Orientes. -Linnaea 24:305-624.

Cassini, A. H. G. 1827: Cousinia Cass. in Dict. Sci. Nat. 47: 503. -Strasbourg.

DE Candolle, A. P. 1837: Cousinia in Prodrum Systematicis Naturalis Regni Vegetabilis 6: 552-557. -Parisiis.

Fedorov, AA. (ed.). 1969: Chromosome Numbers of Flowering Plants. -Leningrad: Nauka (in Russian).

Ghaffari, S. M. 1984: IOPB Chromosome number reports LXXXIII. -Taxon 33: 351-354.

Ghaffari, S. M. 1986: Chromosome number reports XCIII. -Taxon 35: 897-903.

Ghaffari, S. M. 1987: Chromosome studies in some flowering plants of Iran. -Rev. Cytol. Biol. Veg. Bot. 10: 3-8.

Ghaffari, S. M., Attar, F. & Ghahreman 2000: Distribution and chromosome studies on some species of Cousinia Cass., (section Cynaroideae) from Iran. -Pak. Journ. Bot. 32 (2): 311-316.

Ghaffari, S. M., Garcia-Jacas, N. & Susanna, A. 2006: New chromosome counts in the genus Cousinia (Asteraceae) from Iran. -The Linnean Society of London, Botanical Journal of the Linnean Society 151: 411-419.

Ghahreman, A., Iranshahr, M. & Attar, F. 1999: Introduction two new and a rare species of the genus Cousinia Cass., sect. Cynaroideae (Asteraceae). -Iran Journ. Bot. 8 (1): 15-22.

- Haffner, E. 2000: On the phylogeny of the subtribe Carduinae (tribe Cardueae, Compositae). -Englera 21.
- Holmgren, P. K. & Holmgren, N. H. 1998+ (continuously updated): Index herbariorum: a global directory of public herbaria and associated staff. - Published on the Internet at <http://sweetgum.nybg.org/ih/>
- Huber-Morath, A. 1975: Cousinia in P. H. Davis (ed.), Flora of Turkey and the East Aegean Islands vol. 5: 329-353. -Edinburgh University Press.
- Knapp, H. D. 1987: On the distribution of the genus Cousinia (Compositae). -Pl. Syst. Evol. 155: 15-25.
- Koch, C. 1851: Beiträge zu einer Flora des Orientes. - Linnæa 24: 305-624.
- Lopez-Vinyallonga, S., Mehregan, I., Garcia-Jacas, N., Tscherneva, O. Susanna, A. and Kadereit, J. W. 2009: Phylogeny and evolution of the Arctium-Cousinia complex (Compositae, Cardueae-Carduinae). - Taxon 58: 153-171.
- Mabberley, D. J. 1990: The plant book. -Cambridge, UK: Cambridge University Press.
- Mehregan, I. 2008: Systematics, phylogeny and biogeography of Cousinia-Asteraceae (Ph.D. thesis).?
- Mehregan, I & Kadereit, J. W. 2008: Taxonomic revision of Cousinia sect. Cynaroideae (Asteraceae, Cardueae). Wildenowia 38: 293-362.
- Rechinger, K. H. 1972: Compositae-Cynareae I. Cousini in K. H. Rechinger (ed.). Flora Iranica, no. 90. -Graz, Austria.
- Rechinger, K. H. 1979: Compositae III-Cynareae. Cousinia in K. H. Rechinger (ed.). Flora Iranica, no. 139A: 108-153. -Graz, Austria.
- Rechinger, K. H. 1986: Cousinia: morphology, taxonomy, distribution and phytogeographical implication. -Proceedings of the Royal Society of Edinburgh 89 B: 45-58.
- Susanna, A., Garcia-Jacas, N., Vilatersana, R. & Garnatje, T. 2003a: Generic boundaries and evolution of characters in the Arctium group: a nuclear and chloroplast DNA analysis. -Collectanea Botanica, Barcelona 26: 101-118.
- Susanna, A., Garcia-Jacas, N., Vilatersana, R. Garnatje, T., Valles, J. & Ghaffari, S. M. 2003b: New chromosome counts in the genus Cousinia and the related genus Schmalhausenia (Asteraceae, Cardueae). -Bot. J. Linn. Soc. 43: 411-418.
- Susanna, A. & Garcia-Jacas, N. 2006 ["2007"]: Tribe Cardueae Cass. (1819). - Pp. 123-147 in Kadereit J. W. & Jeffrey C. (volume ed.), the families and genera of vascular plants 8. - Berlin, etc.
- Tscherneva, O. V. [Cherneva O. V.] 1962: Compositae-Cousinia in Shishkin B. K. & Bobrov E. G. (ed.), Flora SSSR 27: 108-357. - Moscow and Leningrad [English translation: Enfield. 1993].
- Tscherneva, O. V. 1985: Chromosome number in the species of the genus Cousinia (Asteraceae) in the flora of the USSR. -Botaniceskij Zurnal 70: 856-857 (in Russian).
- Winkler, C. 1892: Synopsis specierum generic Cousinia Cass. -Acta Horti Peteropolitani 12 (2): 181-286.
- Winkler, C. 1897: Mantissa synopsis specierum generic Cousinia Cass. -Acta Horti Peteroplitanis 14 (2): 187-243.

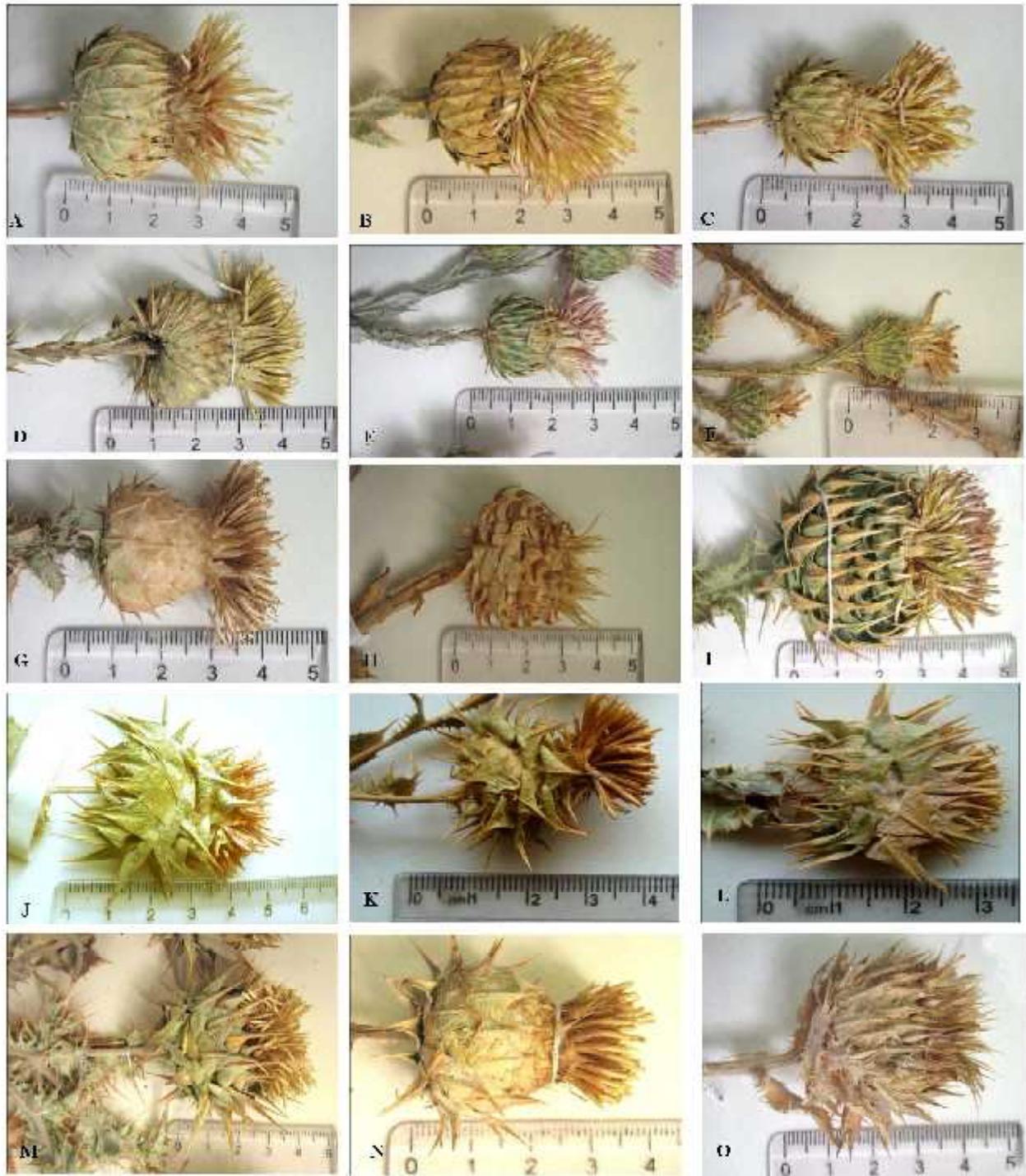


Plate 1. Capitulum: A. *Cousinia pergamacea*, 2257 (TUH); B. *C. fursei*, 12214 (IRAN); C. *C. millefontana*, 19672 (TUH); D. *C. caroli-henrici*, 22455 (TUH); E. *C. concinna*, 20562 (TUH); F. *C. subinflata*, 9243 (IRAN); G. *C. hamadanensis*, 20551 (TUH); H. *C. anoplophylla*, 5048 (IRAN, 34012-E); I. *C. inflata*, 22479 (TUH); J. *C. barbeyi*, 8783 (TUH); K. *C. schiraziana*, 22519 (TUH); L. *C. pasargadensis*, 36294 (TUH); M. *C. denaensis*, 22495 (TUH); N. *C. khansarica*, 20037 (TUH); O. *C. qandilica*, 22009 (TUH).



Plate 2. Capitulum: A. *Cousinia dalauensis*, 19918 (TUH); B. *C. grandis*, 15188 (IRAN); C. *C. grantii*, 11748 (IRAN); D. *C. eriocephala*, 22442 (TUH); E. *C. zagrica*, 74871 (TARI); F. *C. chlorosphaera*, 26244 (TUH); G. *C. ardalisensis*, 53210 (IRAN); H. *C. gaharensis*, 38259 (TUH); I. *C. keredjensis*, 21807 (TUH); J. *C. zardkuhensis*, 21887 (TUH); K. *C. lordeganensis*, 20567 (TUH); L. *C. elwendensis*, 20566 (TUH); M. *C. khorramabadensis*, 21651 (TUH); N. *C. phyllocephala*, 21838 (TUH); O. *C. macrocephala*, 55338 (TUH).



Plate 3. Capitulum: A. *Cousinia silvanica*, 24064 (TUH); B. *C. sagittata*, 29560 (IRAN); C. *C. lurestanica*, 21824 (TUH); D. *C. straussii*, 29558 (TUH); E. *C. parsana*, 20553 (TUH); F. *C. kornhuberi*, 20550 (TUH); G. *C. ecbatanensis*, 22371 (TUH); H. *C. onopordioides*, 9163 (IRAN); I. *C. verbascifolia*, 21907 (TUH); J. *C. monocephala*, 21931 (TUH); K. *C. disfulensis*, 22600 (TUH); L. *C. kermanshahensis*, 19810 (TUH); M. *C. jaccobsii*, 22370 (TUH); N. *C. shulabadensis*, 27593 (TUH); O. *C. bobekii*, 8797 (TUH).



Plate 4. Capitulum: A. *Cousinia sahandica*, 15185 (IRAN); B. *C. gilliatti*, 9014 (IRAN); C. *C. cynaroides*, 22584 (TUH); D. *C. kotschyi*, 20552 (TUH); E. *C. sabalanica*, 22572 (TUH); F. *C. nana*, 64185 (TARI); G. *C. shebliensis*, 20580 (TUH); H. *C. calocephala*, 20556 (TUH); I. *C. kopi-karadaghensis*, 70067 (TARI); J. *C. arakensis*, 21811 (TUH); K. *C. behboudiana*, 5049 (IRAN); L. *C. stroterolepis*, 21148 (TARI); M. *C. kirrindica*, 19962 (TIH); N. *C. mobayenii*, 20569 (TUH); O. *C. sanandajensis*, 20559 (TUH).



Plate 5. Capitulum: A. *Cousinia lurorum*, 20568 (TUH); B. *C. kurdistanica*, 3232 (Sanandaj Herbarium); C. *C. bornmulleri*, 22532 (TUH); D. *C. farsistanica*, 8782 (IRAN); E. *C. perspolitana* 22509 (TUH); F. *C. sarzehensis*, 25326 (TARI) ; G. *C. lactiflora*, 21876 (TUH); H. *C. aligudarzensis* , 27613 (TUH); I. *C. qaradaghensis*, 5062 (TARI).



Plate 6. Bracts: A. *Cousinia pergamacea*, B. *C. millefontana*, C. *C. fursei*, D. *C. concinna*, E. *C. inflata*, F. *C. grandis*, G. *C. grantii*, H. *C. keredjensis*; I. *C. sardashtensis*; J. *C. lordeganensis*, K. *C. khorrabadensis*; L. *C. sagittata*; M. *C. parsana*, N. *C. kornhuberi*.



Plate 7. Bracts: A. *Cousinia onopordioides*, B. *C. verbascifolia*, C. *C. disfulensis*; D. *C. kermanshahensis*; E. *C. gilliattii*, F. *C. cynaroides*, G. *C. kotschyi*, H. *C. nana*, I. *C. shenbliensis*, J. *C. calocephala*, K. *C. kopikaradaghensis*; L. *C. behboudiana*.



Plate 8. Bracts and achenes: A. *Cousinia mobayenii*, B. *C. sanandajensis*, C. *C. kirrindica*, D. *C. lurorum*, E. *C. farsistanica*, F. *C. lactiflora*; G. *C. pergamacea*, H. *C. millefontana*, I. *C. concinna*, J. *C. subinflata*, K. *C. inflata*, L. *C. grandis*; M. *C. grantii*; N. *C. khorramabadensis*.



Plate 9. Achenes: A. *Cousinia phyllocephala*, B. *C. parsana*, C. *C. ecbatanensis*, D. *C. verbascifolia*, E. *C. monocephala*, F. *C. kotschyi*, G. *C. nana*, H. *C. shebliensis*, I. *C. calocephala*, J. *C. behboudiana*, K. *C. sefidiana*, L. *C. kirrindica*, M. *C. sanandajensis*, N. *C. lurorum*; O. *C. farsistanica*, P. *C. lactiflora*.