

## A contribution to *Centaurea* sect. *Phaeopappa* (Asteraceae, Cardueae) in Iran

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### Abstract

*Centaurea ardabilica* and *C. tabriziana*, two new species endemic to NW Iran, are described and illustrated. Both new species belong to *C.* sect. *Phaeopappa*. *Centaurea ardabilica* is closely related to *C. daralagoezica* and is distinguished by having median and upper cauline leaves decurrent, peduncle up to 20 mm long and median and upper cauline leaves often lyrate, and involucres smaller; *C. tabriziana* is distinguished from *C. phaeopappa* by having median cauline leaves decurrent, segments of basal cauline leaves in 6–20 pairs, phyllaries with a median appendage 15–22 mm long and a spine up to 10 mm long. An updated key to the species of *C.* sect. *Phaeopappa* in Iran is provided.

**Key words:** Compositae, new species, taxonomy

### Introduction

*Centaurea* Linnaeus (1753: 909), a genus belonging to the tribe Cardueae of Asteraceae, is mainly distributed in Europe and Asia with some introductions in other more or less distant regions like North America, and has its centre of diversity in Central Asia (Davis *et al.* 1988, Bremer 1994, Susanna *et al.* 1995, Garcia-Jacas *et al.* 2000), with 189 taxa occurring mainly in the Mediterranean and Irano-Turanian regions (Wagenitz 1975, Davis *et al.* 1988, Wagenitz & Hellwig 1996, Wagenitz *et al.* 1998).

The paraphyletic nature of the classical delimitation of *Centaurea* is well known (Susanna *et al.* 1995, Garcia-Jacas *et al.* 2000), so that its revision is ongoing and depending on information derived from molecular characters in phylogenetic studies (Bremer 1994, Susanna *et al.* 1995, Wagenitz & Hellwig 1996, Garcia-Jacas *et al.* 2000). One result has been the segregation of certain groups traditionally included in *Centaurea* (e.g., *Rhaponticoides* Vaillant 1754: 165; or *Psephellus* Cassini 1826: 488), and re-incorporation of others that had been segregated into separate genera (see López & Devesa 2008).

The genus *Centaurea* in Iran has about 70 species. The high level of endemism (55%) supports the assertion that the country is one of the major centres of diversity for the genus (Wagenitz 1986, Wagenitz 1980, Ranjbar *et al.* 2012a, 2012b, 2013a, 2013b, Ranjbar & Negaresh 2012, 2013a, 2013b).

*Centaurea* sect. *Phaeopappus* (Candolle 1838: 560) Hoffmann (1895: 330) was treated in *Flora Iranica* by Wagenitz (1980) and later it was taxonomically revised by Ranjbar & Negaresh (2013c), and both revisions include descriptions of some new species from Iran. Herein we add two other new species, *Centaurea ardabilica* and *C. tabriziana*, which have been collected near Bogh Rodagh mountains in Ardabil province and in Kasabe mountains in East Azarbaijejan province (NW Iran). After examination of the literature as well as herbarium specimens and plants in the field, a preliminary list of the characters that had been or might be useful in delimiting *Centaurea* taxa was developed. The utility of these characters to distinguish species was assessed by examining specimens from across the range of the genus in NW Iran as well as from the plants collected in the field.

### Material and methods

Plants were collected from different regions within the distribution area of *Centaurea* sect. *Phaeopappa* during several

excursions in Iran, both in the flowering and fruiting phases, between 2012, 2013 and 2014. In addition, the collections of BASU, E, G, JE, LD, P, PR, W and WU herbaria were examined. Morphological characters such as shape of stem, shape, size and indumentum of leaves, shape and colour of appendages, colour and size of flowers, achene width and pappus length were studied in every species.

**TABAL 1.** Comparison of *Centaurea ardabilica* and *C. daralagoezica*.

<i>Centaurea daralagoezica</i>	<i>Centaurea ardabilica</i>	
Up to 15	Up to 18	Basal and lower leaves, length (cm)
10–15	12–18	Basal and lower leaves, segment pairs
Up to 11	Up to 6	Median cauline leaves, length (cm)
Not decurrent	Decurrent	Base of median cauline leaves
Not decurrent	Decurrent	Base of upper cauline leaves
Up to 10	Up to 20	Peduncle (mm)
27–32 × 30–31	20–30 × 15–20	Involucres, size (mm)
10–11.5 × ca. 5	5–7 × 7–9	Outer appendage (fimbriae and spine included), size (mm)
9–17 × 4.7–11	6–10 × 8–12	Median appendage (fimbriae and spine included), size (mm)
Ovate	Triangular	Appendage shape
Up to 5	Up to 3	Fimbriae, length (mm)

## Results and discussion

### *Centaurea ardabilica* Ranjbar & Heydari, **sp. nov.** Fig. 1

**Diagnosis:**—The new species is closest to *Centaurea daralagoezica* in habit, stem branching and colour of flowers, but it differs from the latter in the median cauline leaves decurrent (vs. not decurrent), pinnatisect to lyrate (vs. pinnatipartite, pinnatisect), peduncle up to 20 mm (vs. up to 10 mm) long, involucres 20–30 × 15–20 mm (vs. 27–32 × 30–31 mm), median appendages 6–10 × 8–12 mm (vs. 9–17 × 4.7–11 mm), appendages broadly triangular-ovate or triangular (vs. ovate), fimbriae up to 3 mm (vs. up to 5 mm) long.

**Type:**—IRAN. Prov. Ardabil: Khalkhal to Ardabil, around Kuh-e Bughru Dag, toward Neor Lake, 37°59'54.09", 48°32'5.1", 2000 m, 21 June 2013, *Ranjbar 34973* (holotype BASU!, photo W).

Perennial 40 cm tall, with woody rhizome, usually completely greenish, covered with abundant brown fibrous remains of petioles of previous year. Stem erect to ascending, often branched at the base or near base, branches unequal, rigid, densely leafy in median part. Leaves and stem ± densely floccose-tomentose. Basal and lower leaves distinctly large, 15–18 cm long, pinnatipartite to pinnatisect, sometimes interrupted, segments in 12–18 pairs, narrowly lanceolate-elliptic or linear or linear-lanceolate, rarely segments pinnatifid, acuminate at apex. Median cauline leaves sessile, or decurrent, pinnatisect or lyrate, segments in 4–5 pairs, linear or linear-lanceolate, acuminate at apex. Upper cauline leaves smaller, decurrent, lyrate or undivided, 2–7 cm long, linear or linear-lanceolate, sometimes falcate-curved, acuminate or mucronate at apex, almost shorter than capitula. Capitula 3 on peduncles 10–20 mm long, solitary at end of branches, involucres ovoid, 20–30 × 15–20 mm. Phyllaries multiseriate, imbricate, coriaceous, yellowish, glabrous and smooth. Outer phyllaries ovate or ovate-lanceolate, 3–7 × 4–7 mm, appendages 5–7 × 7–9 mm (fimbriae and spine included). Median phyllaries broadly lanceolate, 7–13 × 7–10 mm, appendages 6–10 × 8–12 (fimbriae and spine included). Inner phyllaries oblong or oblong-linear, median in upper parts reddish to black, 13–16 × 3–6 mm, appendages 3–5 × 3–5 mm (fimbriae and spine included). Appendages concealing a small part of phyllaries, broadly triangular-ovate, blackish in the central part, sometimes shortly decurrent on crenate margins, fimbriae whitish to creamy, distinct, subreflexed, numerous, 7–12 on each side, 1–3 mm long, spine blackish, 2–5 mm long, longer than the nearest fimbriae. Flowers purplish; central flowers hermaphrodite, 26–28 mm long, corolla 10–12 mm long, 5-lobed, lobes equal; peripheral flowers sterile, finely dissected, 5-lobed, limb lobes filiform. Mature achenes unknown, pappus multiseriate, scabrous, persistent, brownish, 16–20 mm long.

**Etymology:**—The specific epithet refers to Ardabil, where the new species was found.

**Distribution and habitat:**—*Centaurea ardabilica* occurs near Boghrodagh mountains in Ardabil Province, NW Iran (Fig. 1). This species is an Irano-Turanian element that occurs at elevations up to 2000 m.



HOLOTYPE

HERBARIUM OF BU-ALI UNIVERSITY  
No. 34973

Prov. Ardabil: Khalkhal to Ardabil, around  
Bughru Dag, toward Neor Lake

Alt. 2000 m  
Leg. Ranjbar

Date: 21.6.2013

**FIGURE 1.** *Centaurea ardabilica* Ranjbar & Heydari (Ranjbar34973, BASU). A. habit. B. close up of capitule. C. median cauline leaves.

**Relationships:**—*Centaurea ardabilica* is similar to *C. daralagoezica*, endemic to Armenia, in its stem branched, and colour of flower and pappus, but differs from the latter by its median cauline leaves decurrent (vs. not decurrent), median and upper cauline leaves pinnatisect to lyrate (vs. pinnatipartite, pinnatisect), peduncle up to 20 mm (vs. up to 10 mm) long, involucre ovoid, 20–30 × 15–20 mm (vs. 27–32 × 30–31), median appendages (fimbriae and spine

included) 6–10 × 8–12 mm (vs. 9–17 × 4.7–11 mm), appendage shape broadly triangular-ovate triangular (vs. ovate), fimbriae up to 3 mm (vs. up to 5 mm) long.

***Centaurea tabriziana*** Ranjbar & Heydari, **sp. nov.** Figs. 2, 3.

**Diagnosis:**—The new species is closest to *Centaurea phaeopappa* in habit, shape of achenes and pappus and colour of flower, but differing in the median cauline leaves decurrent (vs. not decurrent), median and upper cauline leaves pinnatisect to lyrate (vs. pinnatipartite to pinnatisect), upper cauline leaves 5–10 × 0.5–3 cm (vs. 4–6 × 0.2–0.4 cm), upper cauline leaves segments 3–5 pairs (vs. simple), peduncle up to 5 mm long (vs. sessile or 7–10 mm long), involucre 30–40 mm (vs. ca. 20 × 25 mm), median appendages (fimbriae and spine included), 15–22 mm (vs. 7–10 mm) long.

**Type:**—IRAN. Prov. East Azarbaijan: Tabriz to Varzaghan between Hiq and Zaqan Abad, 38°22'57.14", 46°43'0.94", 1810 m, 26 April 2013, *Ranjbar 35650* (holotype BASU!, photo W).

Perennial 50–55 cm tall, with woody rhizome, covered with abundant brown fibrous remains of petioles of the previous year. Stem erect, often branched above, sometimes branched in median to upper parts, cylindrical, rigid, 2–6 mm in diam. at the base, densely floccose-tomentose. Leaves almost pinnatipartite or lyrate. Basal and lower leaves distinctly large, 14–29 cm long, short-petiolate (sessile or on petioles up to 8 mm long), pinnatipartite to pinnatisect, segments in 6–20 pairs, narrowly lanceolate or lanceolate-linear or narrowly elliptic, 2–5 mm wide, sometimes falcate-curved, acuminate at apex. Median cauline leaves sessile or decurrent, 11–15 cm long, pinnatisect, segments in 6–15 pairs, lanceolate-linear or linear, 3–8 mm wide, acuminate at apex. Upper cauline leaves decurrent, smaller, 5–10 cm long, pinnatifid or lyrate, segments in 4–8 pairs, linear or linear-lanceolate, 5–15 mm wide, sometimes undivided, acuminate or elongated into a mucro, usually longer than capitula. Capitula 2–6 on peduncles 5 mm long or sessile, solitary at end of branches, involucre oblong, 1.5–2 × 3–4 mm. Phyllaries multiseriate, imbricate, coriaceous, greenish, smooth and glabrous. Outer phyllaries ovate-oblong, 4–10 × 3–8 mm, appendages 12–15 × 5–14 mm (fimbriae and spine included). Median phyllaries oblong, 12–15 × 7–10 mm, appendages 15–22 × 10–12 mm (fimbriae and spine included). Inner phyllaries oblong or oblong-lanceolate, 18–20 × 3–6 mm, sometimes striate, appendages 3–6 × 3–5 mm (fimbriae and spine included). Appendages concealing a major part of phyllaries, triangular or long-triangular, membranous-coriaceous, brownish black in central part or completely brown, sometimes shortly decurrent on crenate margins, innermost lacerate, fimbriae whitish, narrowly triangular, distinct, sometimes subreflexed, numerous, 10–16 on each side, 1–5 mm long, spine sometimes slender, brownish, 7–10 mm long, much longer than the nearest fimbriae. Flowers yellow; central flowers hermaphrodite, 28–33 mm long, corolla 13–15 mm long, 5-lobed, lobes acute and ± equal, ca. 6 mm long; peripheral flowers sterile, finely dissected, not radiant, 4–5-lobed, limb lobes linear, 4–5 mm long. Achenes oblong, 7–8 mm long, 2.5–3 mm wide, brown, glabrous, smooth or striate-costate, compressed, hilum lateral, 0.8–1 mm long, glabrous, whitish. Pappus multiseriate, persistent, scabrous, brownish, 15–16 mm long.

**Etymology:** The specific epithet refers to Tabriz, the capital of East Azarbaijan province, near which the new species was found.

**Distribution and habitat:**—*Centaurea tabriziana* is distributed in Kasabe mountains in East Azarbaijan Province near Tabriz, NW Iran. This species is an Irano-Turanian element collected in the dry-steppe zone and on stony slopes of mountainous regions, growing in elevations higher than 1800 m.

**Relationships:**—*Centaurea tabriziana* is similar to *C. phaeopappa*, endemic to NW Iran, in flower colour, and length of achenes and pappus, but differ from this species in its median cauline leaves decurrent (vs. not decurrent), median and upper cauline leaves pinnatisect to lyrate (vs. pinnatipartite to pinnatisect), upper cauline leaves 5–10 × 0.5–3 cm (vs. 4–6 × 0.2–0.4 cm), upper cauline leaves segments 3–5 pairs (vs. simple), peduncle up to 5 mm long (vs. sessile or 7–10 mm long), involucre 30–40 mm (vs. ca. 20 × 25 mm), median appendages (fimbriae and spine included) 15–22 mm (vs. 7–10 mm) long.

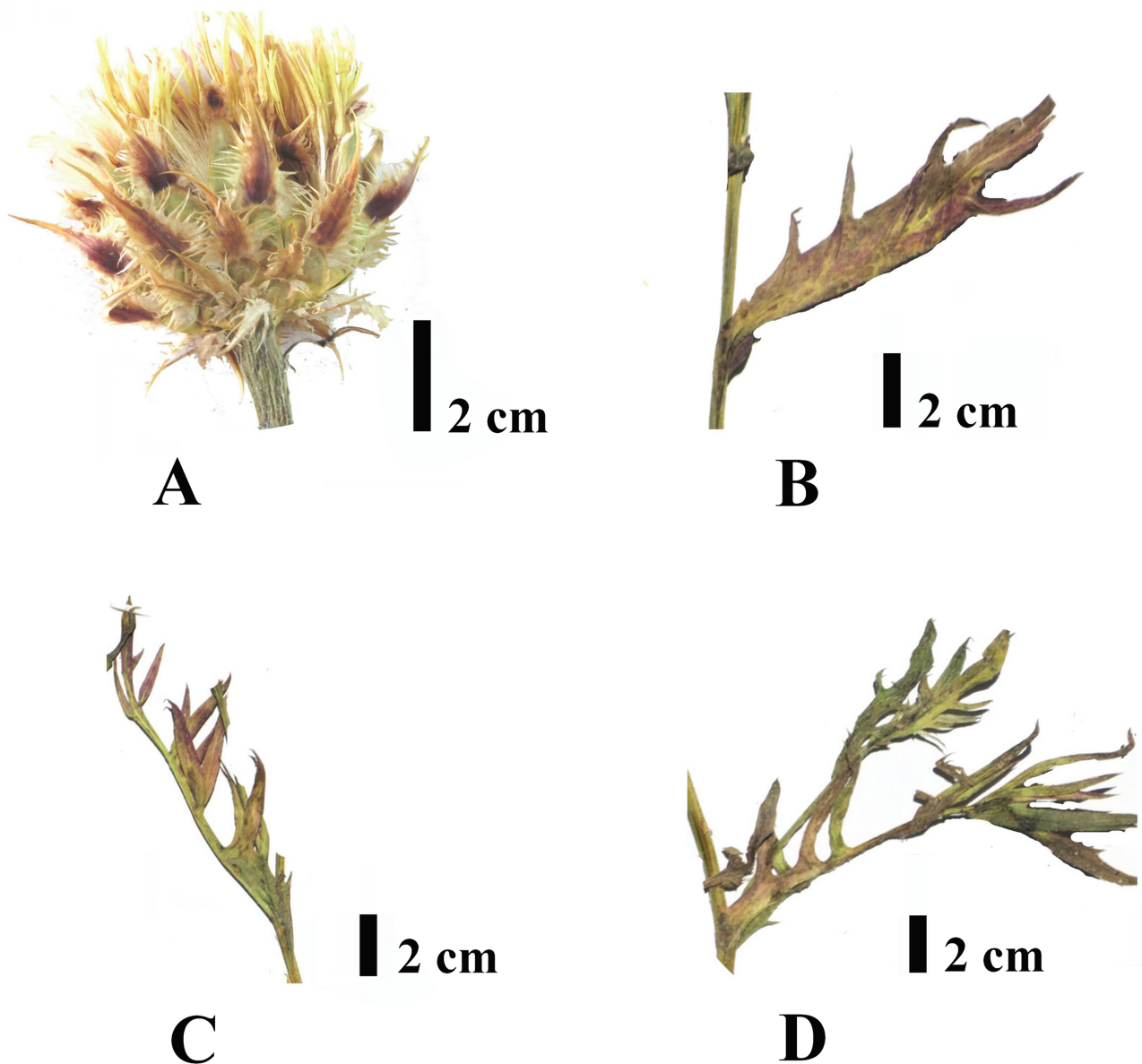
### Key to the species of *Centaurea* sect. *Phaeopappus* in Iran

- |    |   |                      |
|----|---|----------------------|
| 1. | Flowers purple or dark wine reddish .....               | 2                    |
| –  | Flowers yellow .....                                    | 4                    |
| 2. | Median and upper cauline leaves broadly decurrent ..... | <i>C. ardabilica</i> |
| –  | Median and upper cauline leaves not decurrent .....     | 3                    |





FIGURE 2. *Centaurea tabriziana* Ranjbar & Heydari (Ranjbar35650, BASU).



**FIGURE 3.** *Centaurea tabriziana* Ranjbar & Heydari (Ranjbar35650, BASU). A. close up of capitule. B. upper leaves. C & D. median leaves. Scale A–C = 2 cm.

3. Basal and lower leaves 13–17 cm long, capitula 4–5 on peduncles 5–20 mm long ..... *C. assadii*
- Basal and lower leaves 20–30 cm long, capitula 2–3 on sessile peduncles ..... *C. handelii*
4. Plant glabrous; basal and lower leaves undivided; involucre ovoid to subglobose or ovoid-globose, 30–40 mm long ..... *C. albonitens*
- Plant floccose-tomentose, basal and lower leaves pinnatifid to pinnatisect, involucre subglobose, 25–35 mm long ..... 5
5. Involucres subglobose, 25–35 mm wide ..... 6
- Involucres oblong, 20–25 mm wide ..... 7
6. Plant up to 20 cm tall; median and upper cauline leaves not decurrent; spine of phyllaries 3–4 mm long; capitula 1 on sessile peduncle ..... *C. farsistanica*
- Plant up to 55 cm tall; median and upper cauline leaves decurrent; spine of phyllaries 7–10 mm long; capitula 1–3 on peduncles 5 mm long ..... *C. tabriziana*
7. Terminal spine 4–11 mm long; appendages concealing a major part of phyllaries; leaves almost pinnatisect or pinnatifid ..... *C. phaeopappa*
- Terminal spine 2–5 mm long; appendages only partly concealing the basal part of phyllaries; leaves often simple or with few divisions ..... 8
8. Plant 24–32 cm tall; stem erect; basal leaves shorter than stem, upper cauline leaves shorter than capitula; pappus 13–16 mm long ..... *C. indistincta*
- Plant 7–22 cm tall; stem arcuate-ascending or suberect, sometimes strongly abbreviated; basal leaves almost longer than stem, upper cauline leaves longer than capitula; pappus 22–24 mm long ..... *C. aucheri*

**TABLE 2.** Comparison of *Centaurea tabriziana* and *C. phaeopappa*.

<i>Centaurea tabriziana</i>	<i>Centaurea phaeopappa</i>	
Up to 55	25–45	Plant height (cm)
Predominantly lyrate	Pinnatisect or pinnatipartite	Leaves, dissection
Longer than capitula	Shorter than capitula	Upper cauline leaves
5–10 × 0.5–3	4–6 × 0.2–0.4	Upper cauline leaves, length (cm)
4–8	Simple	Upper cauline leaves, segment pairs
Decurrent	Not decurrent	Base of upper cauline leaves
15–20	0	Upper cauline leaves, decurrent length (mm)
11–15 × 2–5	7.5–12 × 2–3	Median cauline leaves, decurrent length (mm)
Decurrent	Petiolate	Base of median cauline leaves
0	30	Median cauline leaves, petiole length (mm)
10–25	0	Median cauline leaves, decurrent length (mm)
14–29	20–25	Basal and lower cauline leaves, length (cm)
6–20	25–30	Basal cauline leaves, segment pairs
Decurrent	Not decurrent	Base of basal cauline leaves
Dense	Loose	Density of leaves
5	7–10 or sessile	Peduncle (mm)
30–40	ca. 20 × 25	Capitula (mm)
12–15 × 7–10	7–10 × 6–8	Median phyllaries, size (mm)
Brownish black	Brown or dark brown	Appendage colour
15–22	7–10	Median appendage (fimbriae and spine included), size (mm)
Whitish straw	Whitish brown	Fimbriae, colour
Up to 10	Up to 6	Spine, length (mm)

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## References

- Bremer, K. (1994) *Asteraceae: Cladistic and classification*. Timber Press, Portland, Oregon, 752 pp.
- Candolle, A.P. de (1838) *Prodromus systematis naturalis regni vegetabilis*, vol. 6. Treuttel & Würtz, Paris, pp. 1–687.
- Cassini, H. (1826) Pséphelle, *Psephellus*. In: Cuvier, G. (Ed.) *Dictionnaire des sciences naturelles*, vol. 43. Le Normant, Paris, pp. 488–490.
- Davis, P.H., Mill, R. & Tan, K. (Eds.) (1988) *Flora of Turkey and the East Aegean Islands*, vol. 10. Edinburgh, Edinburgh University Press, pp. 489–501.
- Garcia-Jacas, N., Susanna, A., Mozaffarian, V. & Ilarslan, R. (2000) The natural delimitation of *Centaurea* (Asteraceae: Cardueae): ITS sequence analysis of the *Centaurea jacea* group. *Plant Systematics and Evolution* 223: 185–199.  
<http://dx.doi.org/10.1007/BF00985278>
- Hoffmann, O. (1895) Compositae. In: Engler, A. & Prantl, K. (Eds.) *Die natürlichen Pflanzenfamilien*, vol. 4(5). W. Engelmann, Leipzig, pp. 1–342.
- Linnaeus, C. (1753) *Species plantarum*. Salvius, Holmia [Stockholm], 1200 pp.

- López, E. & Devesa, J.A. (2008) Notas taxonómicas sobre el género *Centaurea* L. (Asteraceae) en la Península Ibérica. I. *C. cordubensis* Font Quer, *C. bethurica* E. López & Devesa, sp. nov., *C. schousboei* Lange. *Anales del Jardín Botánico de Madrid* 65: 331–341.  
<http://dx.doi.org/10.3989/ajbm.2008.v65.i2.296>
- Ranjbar, M., Negaresh, K. & Karamian, R. (2012a) *Centaurea regia* subsp. *javanroudense*, a new subspecies of *Centaurea* sect. *Cynaroides* (Asteraceae) from the flora of Iran. *Biological Diversity and Conservation* 5(1): 5–10.
- Ranjbar, M., Negaresh, K., Karamian, R. & Joharchi, M.R. (2012b) *Klasea nana* (Asteraceae), a new species from NE Iran. *Annales Botanici Fennici* 49: 402–406. <http://dx.doi.org/10.5735/085.049.0615>
- Ranjbar, M. & Negaresh, K. (2012) A note on the genus *Cyanus* (Asteraceae, Cardueae) from Iran. *Biological Diversity and Conservation* 5(3): 18–23.
- Ranjbar, M. & Negaresh, K. (2013a) Taxonomic notes on *Centaurea* sect. *Acrocentron* (Asteraceae) in Iran, with the description of a new species. *Annales Botanici Fennici* 50: 239–248.  
<http://dx.doi.org/10.5735/086.050.0406>
- Ranjbar, M. & Negaresh, K. (2013b) Taxonomic notes on the *Psephellus zuvandicus* Sosn. group (Asteraceae) from Iran. *Phytotaxa* 170(3): 199–206.  
<http://dx.doi.org/10.11646/phytotaxa.170.3.5>
- Ranjbar, M. & Negaresh, K. (2013c) A revision of *Centaurea* sect. *Phaeopappus* (Asteraceae, Cardueae). *Phytotaxa* 123(1): 1–40.  
<http://dx.doi.org/10.11646/phytotaxa.123.1.1>
- Ranjbar, M., Negaresh, K. & Karamian, R. (2013a) *Cyanus ouramanicus* (Asteraceae), a new species from Iran. *Annales Botanici Fennici* 50: 160–164.  
<http://dx.doi.org/10.5735/085.050.0306>
- Ranjbar, M., Negaresh, K. & Karamian, R. (2013b) *Centaurea shahuensis* and *C. ravansarensis* spp. nov. (Asteraceae, Cardueae) from west Iran. *Nordic Journal of Botany* 31: 430–436.  
<http://dx.doi.org/10.1111/j.1756-1051.2012.00014.x>
- Susanna, A. & Garcia-Jacas, N. (2006) Tribe Cardueae. In: Kadereit, J.W. & Jeffrey, C. (Eds.) *Kubitzki's The Families and Genera of Vascular Plants*, vol. 8. Springer Verlag, Berlin & Heidelberg, pp. 123–146.
- Susanna, A., Garcia-Jacas, N., Soltis, D.E. & Soltis, P.S. (1995) Phylogenetic relationships in tribe Cardueae (Asteraceae) base on ITS sequences. *American Journal of Botany*. 82: 1056–1068.  
<http://dx.doi.org/10.2307/2446236>
- Vaillant, S. (1754) Neue Kennzeichen dreier Classen von Pflanzen mit zusammengesetzten Blumen, nämlich: der *Cynarocephalarum*, derer mit Artischockenhäuptern; *Corymbiferarum*, die zusammengesetzte, scheibenförmige Blumen tragen; *Cichoracearum*, wegwartartiger. *Der Königl. Akademie der Wissenschaften in Paris. Anatomische, Chymische und Botanische Abhandlungen* 5: 143–194, 333–377.
- Wagenitz, G. (1975) *Centaurea* L. In: Davis, P.H. (Ed.) *Flora of Turkey and the East Aegean Islands*, vol. 5. Edinburgh University Press, Edinburgh, pp. 524–528.
- Wagenitz, G. (1980) *Centaurea* L. In: Rechinger, K.H. (Ed.) *Flora Iranica*, vol. 139b. Akademische Druck- und Verlagsanstalt, Graz, pp. 356–362.
- Wagenitz, G. (1986) *Centaurea* in South-West Asia: patterns of distribution and diversity. *Proceedings of the Royal Society of Edinburgh* 89B: 11–21.
- Wagenitz, G. & Hellwig, F.H. (1996) Evolution of characters and phylogeny of the Centaureinae. In: Hind, D.J.N. & Beentje, H.J. (Eds.) *Compositae: Systematics. Proceedings of the International Compositae Conference, Kew, 1994*. Royal Botanic Gardens, Kew, pp. 491–510.
- Wagenitz, G., Ertuğrul, K. & Dural, H. (1998) A new species of *Centaurea* sect. *Psephelloideae* (Compositae) from SW Turkey. *Willdenowia* 28: 157–161.  
<http://dx.doi.org/10.3372/wi.28.2815>