

Centaurea alfonsoi (Asteraceae, Cardueae), a new species from Iran

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Centaurea alfonsoi Negaresh *sp. nova* (Asteraceae) is described and illustrated from Kermanshah Province, W Iran. It resembles *C. regia* subsp. *regia*, but differs from it by having densely tomentose phyllaries, with small appendages, triangular median appendages, shorter cilia and spine, and white flowers.

As several recent publications show (Mozafarian 2006, 2010, Ranjbar *et al.* 2011, 2012a, 2012b, 2012c, 2013a, 2013b, Ranjbar & Negaresh 2012, 2013a, 2013b, 2013c, 2013d, 2014a, 2014b, Negaresh & Rahiminejad 2014) there is a considerable amount of ongoing taxonomic research on the Iranian genera of the tribe Cardueae, Asteraceae. *Centaurea s. lato* is one of the largest genera of the tribe in Iran. Recent treatments of *Centaurea* based on morphological and geographical evidence (Wagenitz & Hellwig 2000, Greuter 2003, Hellwig 2004, Susanna & Garcia-Jacas 2007, 2009), and also *cpDNA* and *nrDNA* (Garcia-Jacas *et al.* 2001, 2006, Wagenitz *et al.* 2006) regarded *Rhaponticoides*, *Psephellus* and *Cyanus* as segregate genera. It has been reported that *Centaurea s. stricto* comprises nearly 200–250 species (Wagenitz 1975, Bremer 1994, Wagenitz & Hellwig 1996, Hellwig 2004, Garcia-Jacas *et al.* 2006, Susanna & Garcia-Jacas 2007, López *et al.* 2011).

During our field excursions in W Iran, some specimens belonging to *Centaurea* sect. *Cynar-*

oides were collected and identified according to *Flora Iranica* (Wagenitz 1980). In addition, several sheets were examined from the herbaria BASU, B, E, P and W. Our specimens resembled *C. regia* subsp. *regia*, but there were several differences that justify describing a new species.

Centaurea alfonsoi Negaresh, *sp. nova* (Fig. 1)

HOLOTYPE: Iran. Kermanshah: Kamyaran, 5 km to Ravan-sar, 1400–1420 m a.s.l., 31 June 2012 Ranjbar & Negaresh 28688 (holotype BASU!; isotype BASU!; photo HUI).

ETYMOLOGY: The specific epithet is given in honour of Dr. Alfonso Susanna, who has worked on various genera of the tribe Cardueae.

Biennial plants, 100–150 cm tall; collum neck with fibrous remnants of petioles from previous year. Stem erect, usually simple, ca. 13 mm in diam. at base, cylindrical, with thick white striations, densely leafy in median part, lower to median parts ± densely covered with



Fig. 1. *Centaurea alfonsoi* (holotype material). — **A:** Capitule. — **B:** Metaphase plate ($2n = 18$). — **C:** Habit. — **D:** Habitat. Scale bars: **A** = 2 cm, **B** = $2 \mu\text{m}$, **C** = 6 cm.

hirsute-articulate hairs and sessile glands, upper part sparsely arachnoid up to 1.5 mm long, and sessile glands hairs. Leaves rigid, papyraceous (sicco), loosely covered with hirsute-articulate hairs, densely on midrib and veins, up to 0.8 mm long, and glands hairs. Basal leaves unknown. Lower cauline leaves simple, almost withered at flowering, $22\text{--}34 \times \text{ca. } 16\text{--}17$ cm, subcordate to broadly ovate, with a 7–13 cm long petiole, sometimes with basal auricles, obtuse to subacute at apex, margin scabrous. Median cauline leaves sessile, simple, broadly oblanceolate or broadly lanceolate, $19\text{--}28 \times 10\text{--}17$ cm, winged or broadly decurrent, up to 6 cm long, acute

at apex, margin scabrid, sometimes denticulate. Upper cauline leaves sessile, simple, $3\text{--}14 \times 0.8\text{--}5$ cm, lanceolate or lanceolate-elliptic, loosely covered by arachnoid hairs, sometimes mixed with scattered hirsute-articulate hairs, acute or cuspidate at apex, margin subscabrous, narrowly decurrent. Capitula numerous, 10 to 15, arranged in racemes, upper capitula on peduncles 13–20 cm long, sometimes with bracts similar to phyllaries with small stramineous or chaffy appendages. Involucres ovoid to subglobose, $35\text{--}40 \times 35\text{--}40$ mm. Phyllaries multiseriate, yellow-greenish when dry, imbricate, coriaceous-scarious, densely tomentose, 0.2–0.3 mm

long; appendages small, concealing part of phyllaries only, chartaceous and rigid, straw-coloured or pale brown-reddish, sometimes brownish. Outer phyllaries broadly oblong, $5\text{--}9.5 \times 7.5\text{--}10$ mm; appendages triangular-ovate, $8\text{--}10 \times$ ca. $9\text{--}10$ mm (including cilia and spine), narrowly decurrent, with $8\text{--}12$ cilia, $0.3\text{--}1.5$ mm long on each side, sometimes denticulate, gradually narrowing into a spine $1\text{--}2$ mm long. Median phyllaries broadly ovate, ca. $12 \times 10\text{--}13$ mm; appendages triangular, $11\text{--}13 \times$ ca. $10\text{--}11$ mm (including cilia and spine), not decurrent, with $3\text{--}5(6)$ cilia, $1.5\text{--}3$ mm long on each side, gradually narrowing into a spine $5\text{--}7$ mm long. Inner phyllaries broadly ovate to lanceolate or broadly lanceolate, $17\text{--}28 \times 9\text{--}13$ mm; appendages lanceolate to narrowly lanceolate, $8\text{--}16 \times 4\text{--}10$ mm (including cilia and spine), not decurrent, with $2\text{--}4$ cilia, $1.5\text{--}3$ mm long on each side, gradually narrowing into a spine $5\text{--}9$ mm long. Flowers white, becoming pale yellow upon drying; central florets hermaphroditic, $46\text{--}48$ mm long, corolla ca. 18 mm long, 5-lobed, lobes ca. 10 mm long, with brownish nerves, anther tube pink; peripheral florets sterile, finely dissected, not radiant, 4–5-lobed, limb lobe filiform, lobes ca. 8 mm long. Achenes oblong, $9\text{--}10$ mm long, $3.2\text{--}3.8$ mm wide, smooth and shiny, whitish, rounded at apex, glabrescent, insertion areole ca. 1 mm long. Pappus double, persistent, multiseriate, scabrous, whitish; outer $12\text{--}13$ mm long; inner shorter, $4.5\text{--}5$ mm long. Flowering in May and June, fruit ripening in June and July.

DISTRIBUTION AND HABITAT. *Centaurea alfonsoi* is a rare endemic to W Iran and is known only along roadsides and fallow fields around Baveh Geh village between Kamyaran and Ravansar in Kermanshah Province. It is accompanied with plants such as *Avena barbata* subsp. *barbata*, *Centaurea behen*, *C. regia* subsp. *regia*, *Scabiosa rotata*, *Zoega lepturea*, and *Cephalaria* sp.

Centaurea alfonsoi belongs to section *Cynaroides*, which includes taxa that often have solitary capitula or racemose synflorescences, decurrent upper cauline leaves, subglobose involucre, triangular to ovate or orbicular appendages that are not decurrent, usually ciliate and ending in a firm spine or spinule, and with rose, purple or yellow flowers (Ranjbar *et al.* 2013b). *Centaurea alfonsoi* resembles *C. regia* subsp. *regia*

in having the upper cauline leaves narrowly decurrent; papyraceous texture leaf; stem diameters to 12 mm; and a racemose inflorescence. The latter taxon is native to W Iran, SE Turkey, Syria and Iraq (Wagenitz 1975, 1980, Ranjbar *et al.* 2012a, 2013b). However, *C. alfonsoi* differs from *C. regia* subsp. *regia* by several characters (*see* Appendix). The two species have a similar geographical range in western Iran and may be considered sympatric.

KARYOLOGY. Chromosome counts were made on somatic metaphases using the squash technique. Root meristems from germinating seeds were used. Samples were pretreated with 0.05 M colchicin at 4 °C for 4 h. The material was fixed in Carnoy's solution for 24 h at low temperatures. Before staining, the material was hydrolyzed with 5 M hydrochloric acid (HCl) for 15 minutes at room temperature (20 °C), stained with 1% acetic orcein, and mounted in 45% acetic acid. Photographs of chromosomes were taken with an Olympus BX-41 photomicroscope at initial $1000\times$ magnification. Chromosome count was made from well-spread metaphases in intact cells, by direct observation and from photomicrographs.

We found a constant chromosome number of $2n = 18$ in all metaphase plates (Fig. 1B). The same number has been found in *C. imperialis*, an Iranian native (Garcia-Jacas *et al.* 1998, Ghaffari & Shahraki 2001).

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Appendix. Morphological comparison of *Centaurea alfonsoi* and *C. regia* subsp. *regia*.

Species	<i>C. alfonsoi</i>	<i>C. regia</i> subsp. <i>regia</i>
Stem indumentum	lower to median parts ± densely hirsute-articulate and with sessile glands, upper part sparsely arachnoid and with sessile glands	arachnoid-tomentose, becoming glabrescent
Lower cauline leaf shape	subcordate to broadly ovate, entire	broadly lanceolate, entire or in lower part pinnatilobate
Lower cauline leaf size	22–34 × ca. 16–17 cm	ca. 20 × 10 cm
Median cauline leaf size	19–28 × 10–17 cm	up to 20 × 7(–10) cm
Upper cauline leaf indumentum	loosely arachnoid, sometimes with scattered hirsute-articulate hairs	loosely hirsute-articulate
Involucre size	35–40 × 35–40 mm	40–55 × 40–60 mm
Phyllary indumentum	densely tomentose	glabrescent
Appendages	small, concealing part of phyllaries only	large, totally concealing phyllaries
Appendage color	straw-coloured or pale brown-reddish	white
Median appendage shape	triangular	broadly ovate
Median appendage size	11–13 × ca. 10–11 mm	20–25 × 20–25 mm
Outer appendages	triangular-ovate, with 8–12 cilia on each side and 0.3–1.5 mm long, sometimes denticulate	ovate, with 10–17 cilia on each side and (3–)4–6 mm long
Cilia of median appendages	5(–6) on each side and 1.5–3 mm long	10–17 on each side and (3–)4–6 mm long
Spine length of median appendages	5–7 mm	(8–)9–14 mm
Flower color	white	rose
Achene length	9–10 mm	6–7.5 mm