Do species of *Crataegus* sect. *Sanguineae* occur in Iran?

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Results of a revision of Iranian species of *Crataegus* section *Sanguineae* are presented here. Previously, two species of this section, *C. sanguinea* Pall. and *C. babakhanloui* Khat., were reported from Iran. However, detailed analyses of morphological and micro-morphological characteristics, as well as phytogeographical data, could not confirm this information; herbarium specimens recognised as *C. sanguinea* appeared to be *C. pentagyna* Waldst. & Kit. (*C. sect. Pentagynae*), while *C. babakhanloui* should be included in the *C. sect. Crataegus*. The section *Sanguineae* is represented in Iran only by *C. wattiana* Hemsl. & Lace, the presence of which is reported here for the first time.

Material and methods

Objective of the study

The objective of this study was to verify information concerning the Iranian species included in *Crataegus* sect. *Sanguineae*. The species concept and method of description of morphological characteristics proposed by Christensen (1992) were adopted with a few minor changes. Dry fragments of leaves and petals taken from herbarium specimens were mounted on SEM-stubs with double-sided cellotype coated with gold, and scanned by a SEM microscope (Hitachi, Japan, FESEM, 15 kV). The terminology used for describing the epidermis were adopted from Barthlott et al. (1998), Christensen and Hansen (1998) and Ganeva et al. (2009).

Results and discussion

*C. sanguinea* versus *C. pentagyna*

Species belonging to the *Crataegus* sect. *Sanguineae* are shrubs or small trees characterized by rather large, five- or more-lobed leaves with the veins usually extending to the apices of the serrate lobes only. Their flowers have 3 – 5 styles, the fruits are red, yellow or black, and the nutlets are furrowed or sulcate on the inner sides. *Crataegus sanguinea*, the type species of the section, is rather easily recognized by glabrous or sparsely hairy branchlets, broadly ovate or rhombic-ovate ± hairy leaves with 3–7 (or 3–9) acute or acuminate and densely serrate lobes, triangular and long-acuminate
calyx lobes up to 3 mm long, and red fruits. It occurs in eastern European Russia, in the southern regions of western, central and eastern Siberia, in Mongolia, and in northern China (Pojarkova 1939, Pakhomova 1976, Sokolov et al. 1980, Grubov 1982, Polozhiı́ 1988, Cuizhi and Spongberg 2003). In Iran, Khatamsaz (1988) reported *C. sanguinea* from Siah-Bisheh in the Mazandaran Province in a region being separated from its nearest stands in the upper reaches of the Ural River by a distance of about 1800 km. The information about the occurrence of *C. sanguinea* in Iran (Khatamsaz l.c.), was based on the herbarium specimen TARI 47609 (Fig. 1) collected during the flowering stage, so the colour of fruits of this plant was unknown to the author. Detailed examination of the above specimen demonstrated that, except for number of styles, it has little in common with 'true' *C. sanguinea*. Its branchlets are lanate, its leaves are smaller, up to 5 cm long, 3–5-lobed and narrowly or broadly obovate with coarsely serrate margins, and the calyx lobes are broadly triangular and acute, up to 2 mm long. The authors (BH and FA) visited the region in Siah-Bisheh during fruiting season, but no hawthorns with red fruits and other characteristics of *C. sanguinea* were found. Many specimens with...
Figure 2. Locality of *Crataegus pentagyna* subsp. *pentagyna* □ recorded as *C. sanguinea* by Khatamsaz (1988) on the background of this subspecies distribution in Iran ■. Distribution of *C. wattiana* in Iran ●.

Figure 3. SEM microphotographs of abaxial epidermis of leaves of *Crataegus*. (A)–(B) *C. pentagyna* subsp. *pentagyna* (Wendelbo and Cobham, TARI 14289), (C)–(D) *C. pentagyna* subsp. *pentagyna*, sub *C. sanguinea* in Khatamsaz 1988 (Assadi and Khatamsaz, TARI 47609).
black fruits have been collected there and were identified as *C. pentagyna* Waldst. & Kit., a species which is widespread in this area (Fig. 2). All specimens were very similar to the plant determined by Khatamsaz as *C. sanguinea* not only in the shape of leaves and number of styles but also in the micro-morphological features described below.

Micrographs of lower epidermis of leaves and upper epidermis of petals of *C. pentagyna* and those of the analyzed plant (TARI 47609) also support the above statement. In both cases, the cuticle of the abaxial leaf membrane is covered with irregular crystalloid waxes composed of platelets. Also very similar in shape and size are stomata, which are surrounded by the characteristic cuticular rim (Fig. 3A–D). Petals of *C. pentagyna* subsp. *pentagyna* and those of the specimen no. 47609 are also indistinguishable; their cells are elongated, papillose, knobby, and transversely striate (Fig. 4A–B).

Figure 4. SEM microphotographs of adaxial epidermis of petals of *Crataegus*. (A) *C. pentagyna* subsp. *pentagyna* (Foroughi, TARI 8069), (B) *C. pentagyna* subsp. *pentagyna*, sub *C. sanguinea* in Khatamsaz 1988 (Assadi and Khatamsaz, TARI 47609).

Figure 5. *Crataegus wattiana*. (E) leaf from central portion of long shoot, (F1)–(F2) upper leaves of flowering shoot, (f) stipule of leaf of flowering shoot, (P) pome, (PD) ventral surface of pyrene. E, F1, F2, P, PV from Mozaffarian, TARI 77601.
Crataegus babakhanloui

Crataegus babakhanloui was described by Khatamsaz (1991) from a specimen collected in northern Iran (TARI 47505), having medium-sized leaves and fruits with (2–)3–4 pyrenes, which are free at the apex and 'minutely pitted ventrally'. The latter feature was most important for referring the new species to C. section Sanguineae (Khatamsaz 1991, 1992). However, examination of the specimens and other samples from the region in the authors' own collections (TUH and TARI) showed that pyrenes of C. babakhanloui are not free at the apex and can be both shallowly sulcate and smooth on the same plant. In contrast to species of the section Sanguineae, its stems are densely lanate, and its leaves are small, 3–5-lobed, and densely villous-lanate. The above characteristics, as well as leaf and seed epidermis (Hamzeh‘ee et al. 2015), show that C. babakhanloui does not belong to the section Sanguineae but should be placed among the species C. sect. Crataegus, aside the closely related species C. kurdistanica Hadač & Chrték.

Crataegus wattiana

During revision of herbarium material of Crataegus in the Iranian herbaria (Hamzeh‘ee 2013), some interesting specimens were found from the Isfahan (IRAN) and Yazd (TARI) provinces (Fig. 5–6). These specimens with rather large (3)57-lobed leaves, flowers with white anthers, and greenish-yellow
Crataegus sect. Sanguineae (Zabel ex Rehder) C. K. Schneid. (1906, p. 768) in Iran

**Crataegus wattiana** Hemsl. & Lace (1891, p. 323) (Fig. 5–6).


**Type:** Pakistan, Quetta, Urak, J. H. Lace (K), Riedl (1969).

**Description**

Tree up to ca 10 m high. Stems unarmed or with stout aphyllous thorns up to ca 2.3 cm long. Twigs glabrous, green, becoming brownish green with age. Leaf blades more or less herbaceous, bright green, glabrous on both surfaces. Leaf blades of flowering shoots 3.0–8.5 cm long, 3.0–7.5 cm wide, broadly oblong to broadly ovate, broadly cuneate or subtruncate at base; lobes 2–4 pairs, basal pairs 0.2–0.9 times as long as the width of lamina to midrib, each lobe acute or apiculate, their margin irregularly coarsely serrate with few or numerous teeth or fine teeth, lobes of elongate shoots often entire. Inflorescence corymbose, lax, glabrous, with few or numerous teeth or fine teeth, lobes of elongate shoots often entire. Inflorescence corymbose, lax, glabrous, 3–6 cm long, up to 12-flowered. Pedicel 5–9 mm long, glabrous; bracts serrate, 2–4 mm long, 0.2–4.0 mm wide, caducous. Hypanthium 3–4 mm long, glabrous. Sepals 2.0–2.5 mm long. 1.2–1.5 mm long, long-triangular, acute at apex entire. Petals white, 5–6 mm long, 4.5–7.0 mm wide, more or less obovate. Stamens 15–19; anthers white. Styles 4–5. Fruits 8 mm long, 7.0–7.5 mm in diameter, subglobose or ellipsoid, yellow, glabrous, crowned by the persistent, reflexed to suberect sepals; yellowish when fresh; pyrenes 4–5, dorsally and ventro-laterally sulcate-foveate or sulcate, free in the apex, glabrous; hypostyle glabrous.

**Phenology**

Flowering in May to April and fruiting in September to October.

**Similar species**

*Crataegus wattiana* is a very characteristic species easy to recognize by its glabrous stems and leaves, unevenly coarsely serrate to entire leaf lobes, and yellow fruits.

**Additional specimens examined**

Yazd: Shir Kuh, Mehriz, Darr-e Damghahan, 2100–2500 m a.s.l., Mozaffarian 77601 (in fruits) and 79252 (in flowers), TARI, idem, Hamzeh’ee and Arabzadeh 95448, TARI and TUH, Isfahan: Chaleh Akhore, 1940 m a.s.l., Musavi and Sabeti S.n., IRAN (sub *C. aminii* Kharamsaz).

**Acknowledgments** – We thank Rafat Habibi, the artist of the Research Institute of Forests and Rangelands, for preparing the drawing of *Crataegus wattiana*.

**References**


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