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Research Note

Isatis L. (Brassicaceae) in Iran: A New Record and a New Synonym

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Abstract: *Isatis takhtajanii* Avestisian is reported as a new record from western Iran. It is close to *I. tinctoria* L.; a list of diagnostic differences is provided. A more complete description of *I. takhtajanii* and a distribution map are given. *Isatis koeiei* Rech.f. is reduced to a synonym of *I. raphanifolia* Boiss. Iranian records of *I. spectabilis* Davis and *I. tinctoria* subsp. *tomentella* (Boiss.) Davis are considered to be misidentifications of *I. kotschyana* Boiss. & Hohen.

Key Words: *Isatis*, Brassicaceae, new record, new synonym, Iran

Introduction

The genus *Isatis* L. (*Brassicaceae*/*Cruciferae*), with some 79 species (Al-Shehbaz et al., 2006), is, for taxonomists, one of the most intractable cruciferous genera in the Near East and is often represented in herbaria by inadequate material (Davis, 1964, 1965; Hedge, 1968; Appel & Alshehbaz, 2003; Al-Shehbaz et al., 2006). In addition, due to the extreme variability in all morphological characters, the limits of many species are uncertain. Most if not all diagnostic characters used in earlier classifications are very variable and because of the unreliability of vegetative and floral characters it is difficult or impossible to identify many specimens when mature fruits are absent (Davis, 1964). The patterns of variation suggest that hybridisation may be widespread (Davis, 1965). Some botanists (Davis, 1965; Hedge, 1968) have suggested that many of these problems can probably only be solved with the aid of more detailed field observations and comprehensive field notes. Moreover, intermediate specimens are rather frequent, even between some taxa that are morphologically easily recognisable (e.g., in the case of *I. buschiana* Schischk., which can be erroneously determined as *I. tinctoria* L. and *I. lusitanica* L.; Davis, 1965; Hedge, 1968),

Very closely related to *Isatis* are *Pachypterygium* Bunge, *Tauscheria* Fisch. ex DC., *Sameraria* Desv., and the Central Asian *Chartoloma* Bunge (not reported thus far from Iran). Most of these genera were placed in the tribe Isatideae by De Candolle (1821) and Al-Shehbaz et al. (2006), but in the Arabideae subtribe Isatidinae by Hayek (1911) and the Lepidieae subtribe Isatidinae by Schulz (1936). The differences among these genera are often based on single fruit characters. For example, *Sameraria* only differs from *Isatis* by its distinct (instead of obsolete) style. The thickened (vs. thin) fruit margin is the feature used to separate *Pachypterygium* from *Isatis* (Hedge, 1968). Some botanists (e.g., Rechinger, 1958; Jafri, 1973; Sajedi et al., 2005) have reduced *Pachypterygium* to a synonym of *Isatis*, considering the thickened fruit margin to be an unreliable character to separate them.

Results and Discussion

Taxonomic treatment

Based on the Flora Iranica account (Hedge, 1968) and subsequent additions (Sajedi et al., 2004, 2005; Moazzeni & Zarre, 2006), Iran, with ca. 18 species of

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Isatis sensu Schulz (1936), is, together with Turkey, one of the most important diversification centres of the genus. During the preparation of a taxonomic revision of *Isatis* and its allies by the first author, we identified *I. takhtajanii* among specimens in the Research Centre of Agricultural and Natural Resources of Sanandaj (Iran). This species had not previously been reported from Iran. We also had the opportunity to study some Turkish specimens of *I. takhtajanii* provided by Dr Ali Dönmez of Hacettepe University (HUB), Ankara. Moreover, some photos of type specimens were provided by Dr Ihsan A. Al-Shehbaz to confirm identification.

Isatis takhtajanii Avestisian, Izv. Akad. Nauk Arm. 14(3): 77, fig. 1. (1961).

Type: [Armenia] mons Kaputdschuch, macrodeclive orientale, in schistoso-lapidosis, 3400 m, 12. 7. 1950, A. Takhtajan (Holo. ERE. Photo!)

Perennial with well-developed caudex; stems 25-100 cm tall, branched at the base, glabrous. Basal leaves petiolate, 2.5-15 cm; thin to ± thick, glabrous to hirsute-pubescent, obovate-oblong, obtuse at tip, entire to dentate, 2-15 × 1-3 cm. Cauline leaves narrowly oblong, 5-3 × 1-1.5(-2.5) cm, acute to obtuse at apex, shortly

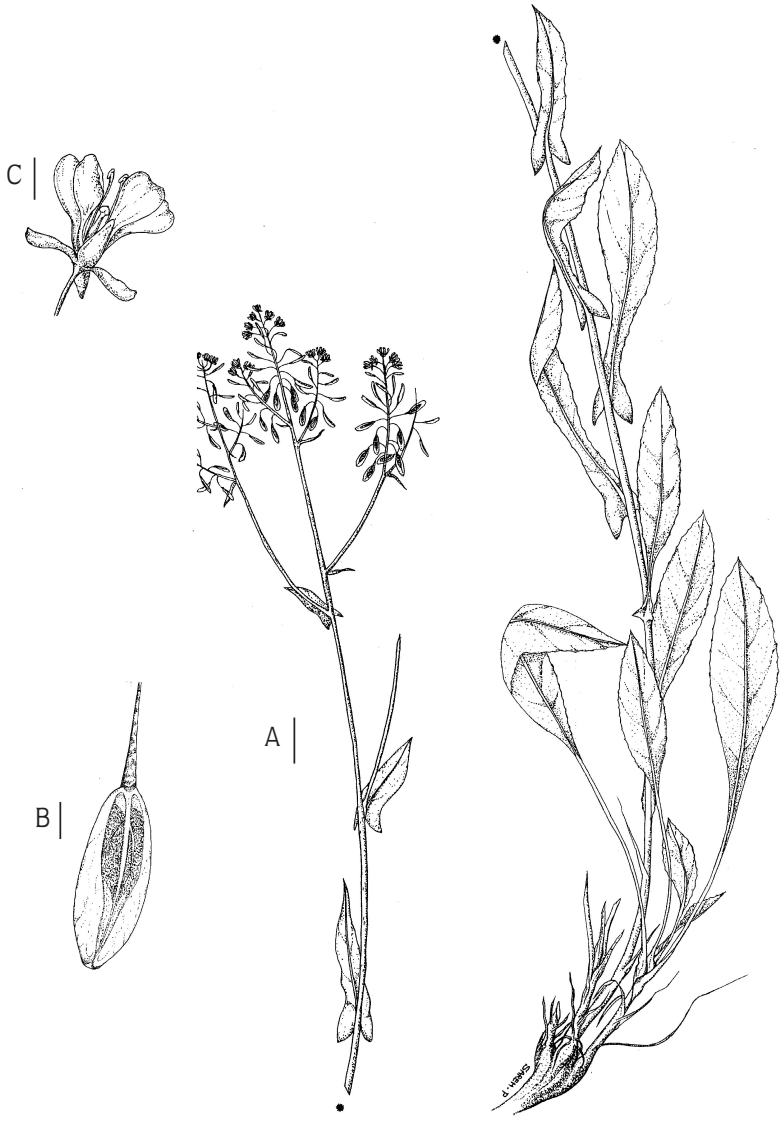

Figure 1. *Isatis takhtajanii*, A: habit, B: fruit, C: flower. Scale bar in A = 1 cm, B = 1.5 mm, C = 2 mm.

and obtusely auricled at base, 6-10 × 3-5 mm. Pedicels slender to ± thickened at apex, 5-10 mm at fruiting time, glabrous. Sepals ca. 3 × 1-1.5 mm, oblong, sparsely pilose. Petals yellow, 3-4.5 × 1.5-2 mm, obovate, rounded at apex. Fruit elliptic-oblong, (7-)9-15 × 3-4.5 mm, winged all around, shortly attenuate below, acute to rounded at apex, glabrous or shortly velutinous at locules; wing thick or ± thin, 0.5-1 mm wide; locule ± median, wider than the wing, (2-)2.5-3 mm wide. Seeds 3-3.5 × 1-1.5 mm.

Flowering: July-August

Specimen seen

Iran, Prov. Sanandaj: Saqez to Baneh, Piromaran village, Nacarous mountain, 2420 m, 3.7.2001, *H. Maroofi & H. Naseri* 1284 (KOH: Herbarium of the Research Centre of Agricultural and Natural Resources of Sanandaj); SW Sanadaj, Korymaryam mountain, 2700 m, *H. Maroofi* 7939 (KOH!). Turkey, A8/9, Artvin: around Pirnal village pasture, 2600-3100 m, N. Demirkuş 2618 (HUB!).

This species is close to *I. tinctoria,* from which it is separated by the strongly perennial habit with a well-developed caudex instead of the usually annual or biennial habit and by having subobtuse not acute leaf auricles and the fruits widest at the middle instead of near the apex; also, the locule is wider than the wing, not the reverse (for more details see Table).

General distribution and habitat

Isatis takhtajanii is an Irano-Turanian element (Figure 2). It grows in open steppe vegetation at 2400-3600 m and is widely distributed in C and SE Turkey, where it is known from many gatherings, especially in C9 (an area adjacent to Iran). It is also found in Armenia (Takhtajan, 1966); its presence at the western borders of Iran is, therefore, not surprising. To date, it has not been recorded from adjacent N Iraq (Hedge & Lamond, 1980).

A new synonym in *Isatis*

Isatis koeiei Rech.f. and *I. raphanifolia* Boiss. are both endemic to Iran. *Isatis koeiei* was described by Rechinger (1955) on a specimen collected by Koeie 393 W (photo!) from a single gathering in Shahbazan (Prov. Lorestan). It is closely related to *I. raphanifolia* (photo of isotype!) and differs from it by having longer fruit (22 mm in *I. koeiei* vs. 15 mm in *I. raphanifolia*) and entire leaves (in *I. koeiei*) vs. pinnate-lyrate (in *I. raphanifolia*). However, through our detailed field studies and measurements of

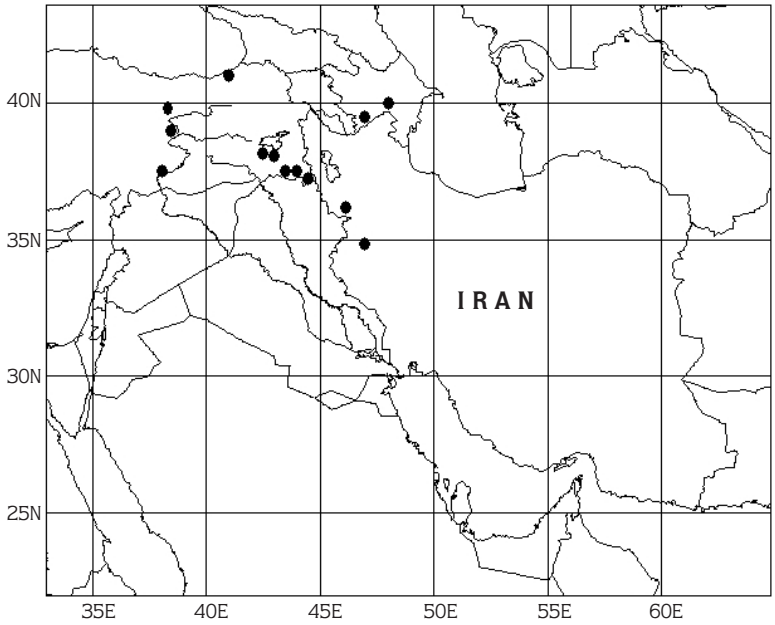

Figure 2. Distribution of *Isatis takhtajanii* in Iran and neighbouring countries.
Distribution of *Isatis takhtajanii* in neighboring countries adopted from Yildirimli (1988)

Table. Comparison between *Isatis takhtajanii* and *I. tinctoria*.

Taxon×→ Character↓	*I. takhtajanii*	*I. tinctoria*
Habit	perennial	annual to biennial or short-lived perennial
Leaf auricle	subobtuse	acute
Fruit shape	elliptic-oblong	obovate rarely oblong
Size of fruit	10-25 × 3-7 mm	10-15 × 3-5
Width of locule	2.5-3 mm	1.5-2 mm
Width of wing	0.5-1 mm	2-3 mm
Position of locule	middle to base	middle

several additional herbarium specimens of *I. raphanifolia* it was shown that these differences break down. The size of fruit overlaps and in *I. raphanifolia* it is up to 30 mm (especially in the type location, around Shiraz province) and also the shape of the leaves overlap. In the same population of *I. raphanifolia*, lyrate to entire leaves can be found; the 2 species also have the same geographical distribution in W Iran (Figure 3). For these reasons, *I. koeiei* is reduced to a synonym of *I. raphanifolia*.

Excluded species

Isatis spectabilis P.H. Davis in Notes R.B.G. Edinb. 26: 22(1964).

Sajedi et al. (2005) reported the central Turkish *I. spectabilis* from SE Turkey, based on the incomplete specimen *Iranshahr & Dezfolian* 15646 (IRAN!). This specimen has been studied at the IRAN herbarium. It consists only of an inflorescence with ripe fruit; basal parts are lacking. Field studies in Sanandaj and examination of all specimens in KOH showed that the specimen is only a form of *I. kotschyana* Boiss & Hohen.

Isatis tinctoria subsp. *tomentella* (Boiss) P.H. Davis in Notes R.B.G. Edinb. 26:22(1964).

The citation of *I. tinctoria* subsp. *tomentella* in Iran (Sajedi et al. 2005) refers to a specimen from Kermanshah, Piri mountain, 1320-1520 m, *Hamzee*, 71083 (TARI!). According to our concept (Moazzeni & Zarre, 2006), *I. tinctoria* is an annual, biennial or short-lived herb and has cauline leaves with long acute auricules, whereas the Sajedi specimen is distinctly perennial and, more importantly, the cauline leaves are exauriculate. Therefore, we think that this specimen does not belong to *I. tinctoria,* but is a form of *I. kotschyana.*

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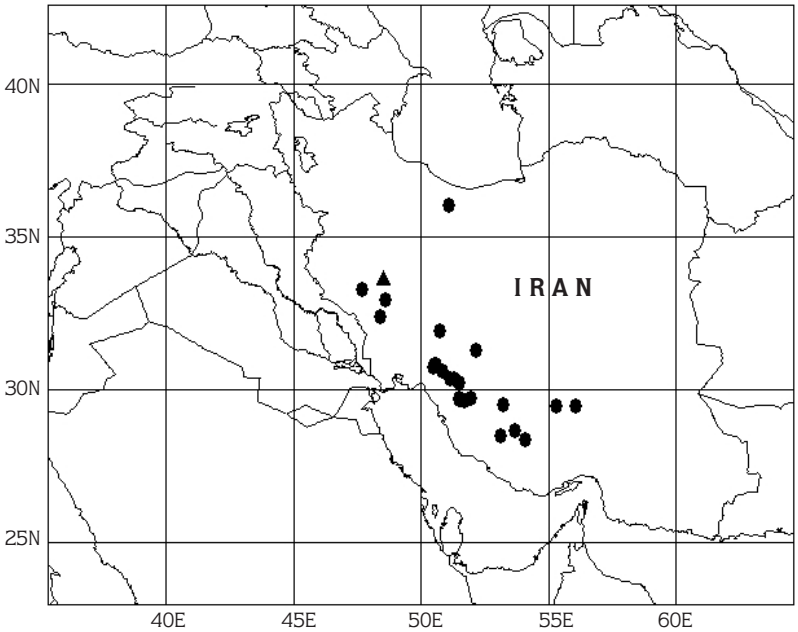

Figure 3. Distribution of *Isatis raphanifolia* (●) and *I. koeiei* [1] (▲) in Iran.

[1]As a distinct species

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