ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Rediscovery of a rare North African endemic *Odontites* (*Orobanchaceae*): first record and variability from Tunisia

***Ridha El Mokni [1, 2, 3, 4], Houcine Sebei [2] and Mohamed Hédi El Aouni [1]**

1. University of Carthage, Laboratory of Botany and Plant Ecology (SNA-214), Department of Life Sciences, Faculty of Sciences of Bizerte, Jarzouna, 7021- Bizerta, Tunisia.
2. University of Carthage, Laboratory of Soil Sciences and Environment, Mograne Graduate School of Agriculture, 1121-Mograne, Zaghouan, Tunisia.
3. University of Jendouba, Silvo-pastoral resources Laboratory, Silvo-Pastoral Institute of Tabarka, BP n° 345, 8110-Tabarka, Tunisia.
4. IRESA, Laboratory of Forest Ecology, I.N.R.G.R.E.F, BP n°10, 2080-Ariana, Tunisia.

Manuscript Info

Manuscript History:

Received: 12 December 2014
Final Accepted: 19 January 2015
Published Online: February 2015

Key words:

Tunisia, Kroumiria, *Odontites*, New varieties, Endemism

Corresponding Author

Ridha El Mokni

Abstract

Odontites discolor subsp. *ciliatus* (syn. *O. purpurea* Don. subsp. *ciliata* (Pomel), an endemic Algerian taxon) is a member of *Orobanchaceae* family and the *Odontites purpureus* group has been recently first reported from North West of Tunisia, Kroumiria region. Morphological characteristics with illustrations are provided with notes on conspicuous differences in floral characters resulting in the distinction of two new different varieties.

Introduction

The genus *Odontites* Ludw. comprises, in a restricted sense, 26 species (Bolliger, 1996), as Rothmaler (1943), based on characters of the corolla, excluded some species that were separated and included in smaller genera (cf. Rico et al., 2008). Odontites species have a wide distribution, ranging from Madeira and the north of Africa to northern Europe and eastern Asia. However, most species are endemic to the Mediterranean region and, in addition; the genus shows the greatest diversity in the western part of this region (Bolliger, 1993). The western Mediterranean, particularly northern Morocco and Algeria, Tunisia and the south-eastern Iberian Peninsula, harbours the taxa that Bolliger (1996), mainly based on morphological data, included in the *O. purpureus* group. According to this author (cf. Le Floc'h et al., 2010; Dobignard et Chatelain, 2013), all the four species of this group (Rico and al., 2008) are present in North Africa, among them *Odontites discolor* Pomel with its two subspecies (subsp. *discolor* and subsp. *ciliatus* (Pomel) Bolliger) are endemic to Algeria and have a very restricted distribution (Quézel et Santa, 1963; Bolliger, 1996).

Material and Methods

During one of our regular floral surveys in Kroumiria forests (North western of Tunisia) on November 2013, we found many dried specimens of an unfamiliar *Odontites*. Difficult to identify with certainty at this state, we marked geographical coordinates in order to revisit the same site in an early time next year. Since september 2014, wider prospecting has been undertaken in the surroundings of the site till many beautiful flowering specimens were discovered for the first time in Tunisia (at least for me!). Many flowered specimens were photographed; some samples were taken to the laboratory for further analysis and comparisons.

1. Material Examined

The plant material collected in Kroumiria (Northern-West of Tunisia) (Fig.3), have been examined in comparison with Pomel herbarium specimens housed in Montpellier (Specimen: MPU005742) collected by Fardin and with the support of many relevant Floras and checklists (Quézel et Santa, 1963; Pottier-Alapetite, 1981; Greuter and al., 1989; Fennane et al., 2007; Greuter, 2008). All specimens collected are housed in the Herbarium of the Laboratory of Botany and Plant Ecology of Bizerta, University of Carthage (here indicated as BIZ), duplicates are deposited in the Herbarium of the Laboratory of Botany of Tabarka, University of Jendouba (here indicated as TAB). The descriptions here reported are based on the material studied. GPS coordinates and altitude for site is derived from Google Earth® (WGS84).

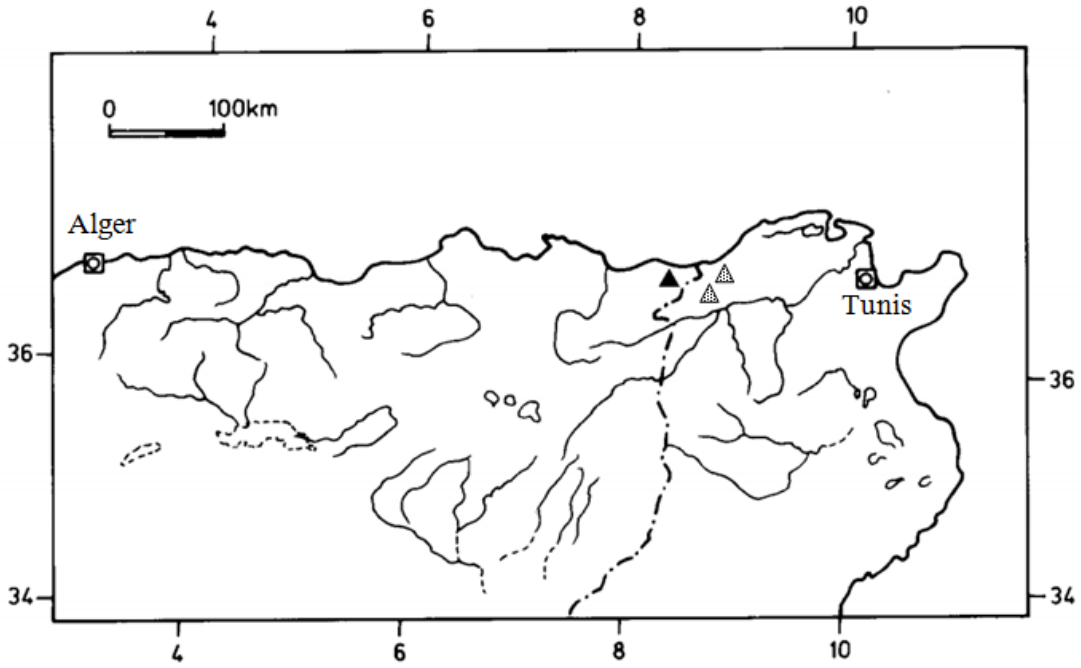

Figure 3. Map of the actual localization and distribution of the ***Odontites discolor*** Pomel subsp. ***ciliatus*** in North Africa (south of the Mediterranean region), ancient (▲) and native area in Algeria and (▲) recent record in Tunisia. Bolliger (1996), little modified.

2. Diagnosis

Specimen collected were identified as belonging to the *Odontites purpureus* group basing on morphological characteristics, such as a stem without long hairs, a basipetal inflorescence, a calyx with hairs ending in a thick pluricellular gland, a wholly or partially purple and glabrous or subglabrous corolla and the presence of more than four seeds per capsule (cf. Rico and al., 2008).

Results

Recently, the first author found a large population of ***Odontites discolor*** subsp. ***ciliatus*** from the Kroumiria region (North West of Tunisia). This record enlarged remarkably the distribution area of this species (Figure 3.), since it was previously known only from Northern-East of Algeria within the Bône (Annaba) region. The comparison between the Algerian type material and the Tunisian samples revealed constant and conspicuous morphological differences in some vegetative and floral characters (Figure 2.) together with constant habitat affinities. The morphological comparison resulted in the distinction of three different subpopulations into new, different varieties.
In fact, the abundant subpopulation from Kroumiria has not significant differences from the topotypical population in Algeria, therefore it belongs to ***O. discolor*** subsp. ***ciliatus*** var. ***ciliatus*** (syn. var. ***mediostylus***); samples collected from a second subpopulation belong to a different new variety here described as ***O. discolor*** subsp. ***ciliatus*** var. ***longistylus*** El Mokni, Sebei & El Aouni, then the third subpopulation shows different samples belonging to a new variety here described as ***O. discolor*** subsp. ***ciliatus*** var. ***brevistylus*** El Mokni, Sebei & El Aouni.

Odontites discolor subsp. ***ciliatus*** **(**Description and morphometric measurements are made on collected material!) Figure 1.

Annual, rarely perennial, roots (8 to 30 cm), short-lived suffruticosous plant, generally each individual plant with only one main stem, puberulent, non-viscid or only slightly viscid on the apical part. Stem up to 90-(120) cm. Leaves 10–14(30) in length with 2–3(5) mm in large, linear, linear-lanceolate or triangular lanceolate, entire, generally with glandular hairs. Inflorescence 3–4.5(5) cm in length (during flowering) with 10-15 slightly pedunculated flowers; bracts lanceolate with (6.5)7-8 mm in length. Calyx 4–5(5.5) mm in flowering, up to 6.6 mm during fruiting, oval lanceolate, hairiness similar to that of the leaves, usually less hairy, with acute teeth and hispid edges. Corolla 7–7.5(8.5) mm, with both lips purple sometimes slightly pinkish, glabrous on the external face; whitish tube 2.5–3.5(4) mm, shorter than lips, shorter or slightly exceeding the calyx. Stamens with smooth or finely papillosous filaments, twisted 90° under anther, so that the latter is arranged almost perpendicularly to the filament; anthers 1.1–1.5(1.8) mm, hidden or slightly protruding from corolla, dehiscent along almost the whole length, with an apical tuft of hairs ± twisted and glabrous on rest, exceptionally with some isolated hairs. Style 4.5-6(12) mm during fruiting, glabrous or with only a few hairs on basal half. Capsule subglobulate 3–4.8(5) mm long with 1.8–2.2(2.5) mm large, with rigid hairs inside, next to septum. Seeds 1.1–1.7 out of 0.5–0.7 mm, several (more than four) per capsule.
Up to this research, no infraspecific variation has been described in northern Africa (cf. Quézel et Santa, 1963; Pottier-Alapetite, 1981; Greuter and al., 1984-1989; Greuter, 1991) even in the recent floristic checklists (Le Floc'h et Boulos, 2008; Le Floc'h et al., 2010; Dobignard et Chatelain, 2013).

Odontites discolor Pomel subsp**.** ***ciliatus*** (Pomel) Bolliger var. ***ciliatus*** (syn. var. ***mediostylus***). Figure 1.
The styles length of flowers of the typical variety is about 8-10 mm, where each spikich inflorescence contains about 10-15 slightly pedunculated flowers.
The plants growing in Kroumiria (between Tabarka and Ras Rajel region) in Jendouba governorate, Lat. 36°57'04.69"N Long. 08°48'09.94"E, fitting almost to the description and ecology given by Pomel (1984-1875).
These grow generally in shady places of altitude forests of Kermes oak between 33 and 128 m, where soil is clayey sand with slightly acidic to alkaline pH.

Type: *Odontites ciliata* Pomel. / Bône / 1924, MPU005742 (Lectotype). One specimen belonging to the original material of this name was found in MPU.

Specimina visa:
Algeria: Région de Bône, Fradin, 1924 (MPU005742);

Tunisia: Tabarka, 07.11.2014, Kroumiria (Tabarka), thermopiles places of sandy forests of kermes oak beyond, 28 m, *R. El Mokni* (BIZ, PAL).

Flowering & Fruiting: —September–December.

Actual Distribution: —Endemic to Northern Western Tunisia (Tabarka-Ras Rajel Region).

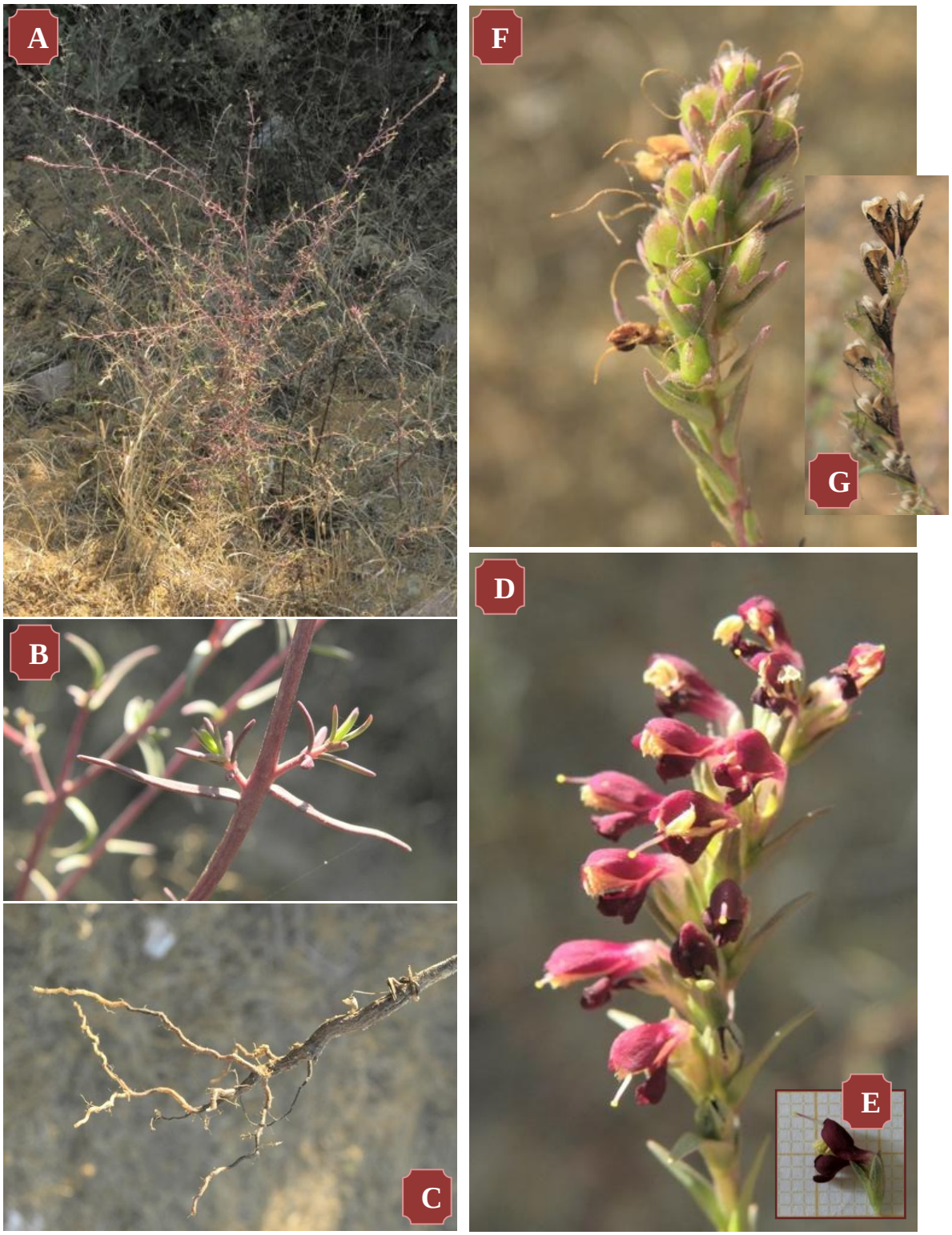

Figure 1. ***Odontites discolor*** Pomel subsp**.** ***ciliatus*** (Pomel) Bolliger; **A.** Plant in its natural habitat, **B.** Linear- lanceolate to triangular lanceolate, entire leaves, **C.** Annual roots, **D.** Inflorescence with 13 slightly pedunculated flowers with lanceolate bracts; Corolla with both lips purple glabrous on the external face and a whitish tube; anthers slightly protruding from corolla, with an apical tuft of hairs**, E.** Single flower with some morphometric measurements, **F.** Capsules subglobulate with rigid hairs in their slightly indented apex, next to septum, **G.** Dehiscent capsules after seed release. (Photos all taken from Tunisian field, Ridha El Mokni).

Odontites discolor Pomel subsp**.** ***ciliatus*** (Pomel) Bolliger var. ***longistylus*** El Mokni, Sebei & El Aouni **var. nova.** – Figure 2. A

The styles length of flowers of this new variety is about 10-12 mm, where each spikich inflorescence contains about 14-18 slightly pedunculated flowers.

This taxon is known, since 2014, from Kroumiria (Tabarka) in Jendouba governorate Lat. 36°57'01.62"N, Long. 08°48'07.36" E., with annual flowering stems up to 80 cm tall. It differs mainly from ***Odontites discolor*** Pomel subsp**.** ***ciliatus*** (Pomel) Bolliger var. ***mediostylus*** by its bit dense inflorescence (14-18 vs. 10-15 flowers per spikish) and its high length of the styles of its flowers (10-12 mm vs. 8-10 mm). This new variety grows generally in thermophilous open lands between 33-36 m above sea level (a.s.l.), where soil is sandy with almost slightly acidic to alkaline pH.

Type: Tunisia-Jendouba: Tabarka, thermophilous opened lands, 33-36 m a.s.l., 07/11/ 2014, *R. El Mokni* (**Holo:** BIZ; **Iso:** TAB).

An ***Odontites discolor*** Pomel subsp**.** ***ciliatus*** (Pomel) Bolliger differs per sua parte densa infiorescenza e lungo stiles.

Eponymy: the name refers to the distinctly high length of styles of the flowers.

Flowering & Fruiting: —September–December.

Actual Distribution: —Endemic to Northern Western Tunisia (Tabarka-Ras Rajel Region).

Odontites discolor Pomel subsp. ***ciliatus*** (Pomel) Bolliger var. ***brevistylus*** El Mokni, Sebei & El Aouni **var. nova.** – Figure 2. B

The styles length of flowers of the new variety is about 6-8 mm, where each spikich inflorescence contains about 8-10 slightly pedunculated flowers.

This taxon is known, since 2014, from Kroumiria (Tabarka) in Jendouba governorate Lat. 36°56'45.71"N, Long. 08°48'15.88" E., with annual flowering stems up to 90(-120) cm tall. It differs mainly from ***Odontites discolor*** Pomel subsp**.** ***ciliatus*** (Pomel) Bolliger var. ***mediostylus*** by its low dense inflorescence (8-10 vs. 10-15 flowers per spikish) and the length of styles of its flowers (6-8 mm vs. 8-10 mm). This new variety grows generally in thermophilous open lands between 43-86 (-108) m a.s.l., where soil is usually sandy with almost alkaline pH.

Type: Tunisia-Jendouba: Tabarka, thermophilous opened lands, 43-108 m a.s.l., 07/11/ 2014, *R. El Mokni* (**Holo:** BIZ; **Iso:** TAB).

An ***Odontites discolor*** Pomel subsp. ***ciliatus*** (Pomel) Bolliger differs per sparse inflorescentis e brevi stiles.

Eponymy: the name refers to the distinctly short length of styles of the flowers.

Flowering & Fruiting: —September–December.

Actual Distribution: —Endemic to Northern Western Tunisia (Tabarka-Ras Rajel Region).

Conclusion

Protection of the distribution area of these endemic taxa from unguided ecotourism as well as none well studied managements that do not take into account such herbaceous vegetation is needed to conserve them *in-situ*. *Ex-situ* conservation could not be possible and efficient given that such plants are hemiparasites.

Acknowledgements

Authors are especially grateful to Doctor Errol Vela (Maitre de Conférences at the University of Montpellier-2; expert consultant on Environmental and Mediterranean Botany, France) and to Professor Enrique Rico (Professor of Botany at the Department of Botany, Faculty of biology, University of Salamanca, Spain) for providing the necessary facilities in obtaining plant identification.

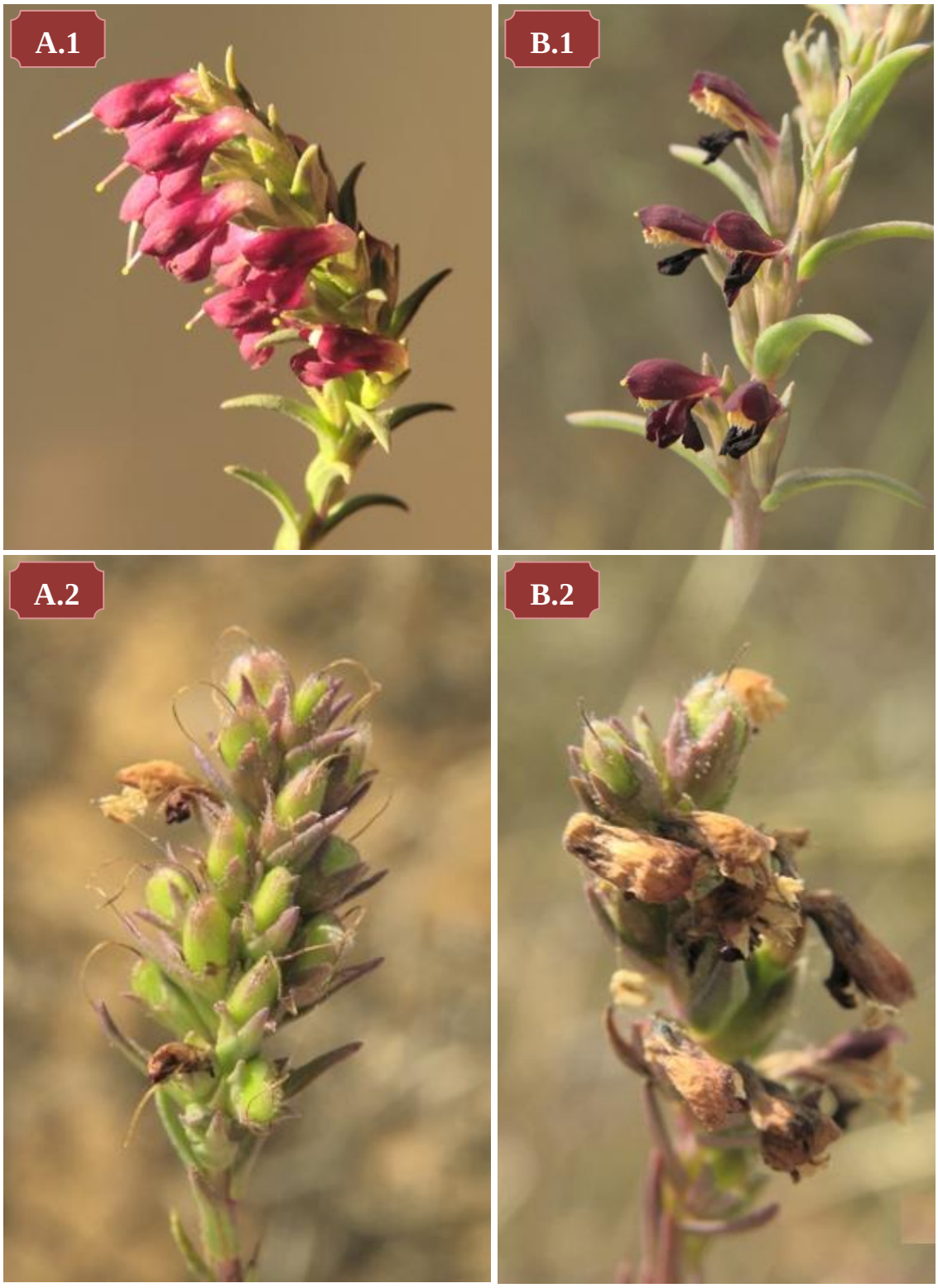

Figure 2. ***Odontites discolor*** Pomel subsp**.** ***ciliatus*** (Pomel) Bolliger ; **A**. the var. ***longistylus*** El Mokni, Sebei & El Aouni **var. nova.** With its dense inflorescence (A.1.) and its long style (A.2.). **B**. the var. ***brevistylus*** El Mokni, Sebei & El Aouni **var. nova.** With its sparse inflorescence (B.1.) and its typical short style (B.2.). (Photos all taken from Tunisian field, Ridha El Mokni).

References

Bolliger, M. (1993). Systematik und Chorologie der Gattung *Odontites* Ludwig s.l. (*Scrophulariaceae*). *Flora*, 188: 345–365.

Bolliger, M. (1996). Monographie der Gattung *Odontites* (*Scrophulariaceae*) sowie der verwandten Gattungen *Macrosyringion*, *Odontitella*, *Bornmuellerantha* und *Bartsiella*. Willdenowia, 26: 37–168.

Dobignard, A. et Chatelain, C. (2013). *Index synonymique de la flore d'Afrique du Nord : Dicotyledoneae : Oleaceae* à *Zygophyllaceae.*, vol. 5, Éditions des conservatoire et jardin botaniques, Genève. p. 15-18.

Fennane, M., Ibn Tattou, M., Ouyahya, A. et El Oualidi, J. (2007). Flore Pratique du Maroc, vol.2. Travaux de l'Institut Scientifique, Série Botanique, n°38, Rabat. p. 549-552.

Greuter, W., Burdet, H. M. and Long, G. (1984-1989). Med-Checklist. A critical inventory of vascular plants of the circum-Mediterranean countries, 1, 3-4. – Genève.

Greuter, W. (1991). Botanical diversity, endemism, rarity, and extinction in the Mediterranean area: an analysis based on the published volumes of Med-Checklist. Bot. Chron., 10: 63–79.

Greuter, W. (2008). Med-Checklist. A critical inventory of vascular plants of the circum-Mediterranean countries, **2**. – Palermo, Genève & Berlin.

Le Floc'h, E. et Boulos, L. (2008). Flore de Tunisie. Catalogue synonymique commenté. Montpellier. 461pp.

Le Floc'h, E., Boulos, L. et Vela E. (2010). Catalogue synonymique commenté de la flore de Tunisie. Tunis. éd.2. 500 pp. Tunisie. p. 315-316.

Pottier-Alapetite, G. (1981). Flore de la Tunisie Angiospermes-Dicotylédones, Gamopétales. Publications Scientifiques tunisiennes, Tunis. p. 863-864.

Quézel, P. et Santa, S. (1962). Nouvelle flore de l'Algérie et des régions désertiques méridionales. vol.2. CNRS, Paris. p. 850-851.

Rico, E., Delgado, L. and Herrero, A. (2008). Reassessing the *Odontites purpureus* group (*Orobanchaceae*) from south-east Spain and north-west Africa. Botanical Journal of the Linnean Society, 158: 701–708. With 7 figures.

Rothmaler, W. (1943). Die Aufspaltung von *Odontites* Hall. ex Zinn. *Mittheilungen des Thüringischen Botanischen Vereins*, 50: 224–230.