

The genus *Taraxacum* (Asteraceae) in Italy.

I. A systematic study of *Taraxacum* sect. *Palustria*

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Abstract: Four systematic units belonging to *Taraxacum* sect. *Palustria* are identified in Calabria and Basilicata (S Italy), none of them corresponding with *T. palustre* (Lyons) Symons, the only (collective) species of this section previously reported for that area. Two out of four species are here described as new to science: *T. carthusianorum* ($2n = 24$) and *T. lilianae* ($2n = 24$). Of the remaining two species, *T. multisinuatum* ($2n = 24$) results new for Italy and *T. siculum* new for peninsular Italy (known before only for Sicily). Morphological, cytotaxonomical and distributive data are illustrated and discussed.

Key words: Asteraceae, Italy, karyology, *Taraxacum*, taxonomy

Introduction

Due to a general scarce knowledge of the whole genus *Taraxacum* Wigg. in Italy, we start here a series of morphological and cytotaxonomical papers which will be devoted to the study of the Italian populations of this difficult genus. Aim of the present study is to clarify the taxonomy of *Taraxacum* sect. *Palustria* (H. Lindb.) Dahlst. in Calabria and Basilicata (S Italy).

According to a recent and exhaustive monograph (Kirschner & Štěpánek 1998), *Taraxacum* sect. *Palustria* (Asteraceae) comprises 127 species. Subsequently, two more species were described: *T. amplexum* Sonck from N Italy (Sonck 1998) and *T. flos-lacus* Kirschner & Štěpánek from W Alps (Štěpánek & Kirschner 2001). Only two out of the 129 known species exhibit obligate sexuality, both probably at the diploid level. The other species of the section are apomicts and polyploids. The ma-

ajority of species are confined to lower altitudes and foothills, and prefer wet or temporarily wet, mineral rich to subsaline sites with competition suppressed by flooding, grazing, mowing or other factors. The main diversity of the section is in C-S Europe, but its geographical range reaches also Anatolia and Transcaucasus in the east.

Presently, 13 species are known for Italy, mainly for its northern part (Kirschner & Štěpánek 1998; Sonck 1998; Conti & al. 2005), *T. amplexum* Sonck (Veneto), *T. arachnoideum* Kirschner & Štěpánek (Friuli-Venezia Giulia), *T. balticiforme* Dahlst. (Trentino-Alto Adige and Friuli-Venezia Giulia), *T. ciliare* Soest ("Larghe di Paderno", possibly Veneto), *T. dolomiticum* Soest, *T. huterianum* Soest, *T. lacustre* Soest and *T. madidum* Kirschner & Štěpánek (Trentino-Alto Adige), *T. olivaceum* Soest ("Dolardo", possibly Friuli-Venezia Giulia), *T. scaturiginosum* G.E. Haglund (Friuli-Venezia Giulia), *T. siculum* Soest (Sicily), *T.*

tenuifolium (Hoppe & Hornsch.) Koch (Emilia Romagna, Veneto, Trentino-Alto Adige and Friuli-Venezia Giulia) – one of the two sexually reproducing species – and finally *T. turfosum* (Sch. Bip.) Soest (Trentino-Alto Adige). For large areas of C-S Italy, only a vague "*T. palustre* (group)" is recorded (Contri & al. 2005).

Material and Methods

The study was based on *exsiccata* from CLU and FI and on live plants collected during the years 2004–2006. In order to establish the identity of S Italian plants we used the descriptions and analytical keys reported in Kirschner & Štěpánek (1998) and compared our data with those from Sonck (1998) and Štěpánek & Kirschner (2001).

Karyological studies were carried out, after cultivation in the Botanic Garden of Calabria University. Root tips were pretreated with a 0.3% Colchicine solution and fixed in Carnoy; afterwards they were hydrolyzed in 1N HCl solution and coloured with fuchsin; at the end, they were squashed in a 45% solution of acetic acid for counting and observation of chromosomes. Karyotype formula according to Levan & al. (1964) was drawn out from measurements made on five somatic metaphase plates. A_1 (Intrachromosomal asymmetry index) and A_2 (Interchromosomal asymmetry index) were calculated according to Romero Zarco (1986).

Results and discussion

According to our morphological study, four apomict systematic units, belonging to *Taraxacum* sect. *Palustria* are identified in the studied area of S Italy. Two out of four units perfectly correspond to already described taxa, namely *T. multisinuatum* Kirschner, Sonck & Štěpánek – known before only for Greece (Kirschner & al. 1989) – and *T. siculum*, known before only for Sicily. As far the latter species is concerned, Kirschner & Štěpánek (1998), suggested taxonomic relationships with *T. scaturiginosum* group, even if they were able to study only few herbarium specimens from *locus classicus* of *T. siculum*. According to our observations on much more living and dried material from Calabria (Sila and Serre Ca-

labre), it is possible to fully confirm their hypothesis. Indeed, our plants have green lobed leaves, ovate outer bracts, green stigma, spinulose achenes with 0.8–1.2 mm long cone.

The remaining two units, as far as we are aware, are not identifiable with any previously known taxon. Some plant from Sila and Serre Calabre (here described as *T. carthusianorum*) are similar to *T. subpolonicum* Kirschner & Štěpánek (occurring in Polonia and Slovakia), but they are well differentiated from the latter species for involucre outer bracts features. *Taraxacum subpolonicum* has dark outer bracts 2.3–3.4 mm wide, with membranous margin (often reddish) of 0.2–0.4 mm, sparsely ciliate, while *T. carthusianorum* has light green outer bracts 1–2 mm wide, with membranous margin at most 0.2 mm wide, not ciliate.

A fourth group of plants from Pollino Massif (here described as *T. lilianae*) is somewhat intermediate among *T. subdolum* Kirschner & Štěpánek (occurring in C Europe) and *T. huterianum* (occurring in NE Italy, Austria, Czech Republic, and Slovakia). It is well differentiated from *T. subdolum* for involucre outer bracts features. The latter species has 15–21 ovate, not ciliate outer bracts, 8.5–10 mm long and 4–5.5 mm wide, while *T. lilianae* has (7)10–16 lanceolate outer bracts, with ciliate margins, 4.5–8 mm long and 1.5–3.5 mm wide. Moreover, the rostrum in *T. lilianae* is 3.5–4.8 mm, while in *T. subdolum* 8–9 mm long. Finally, it is well differentiated also from *T. huterianum* in having shorter cone (0.7 mm vs. 1.2–1.7 mm) and rostrum (3.5–4.8 mm vs. 8–9 mm).

All the four systematic units (both new or already known to science) are following, arranged in alphabetical order.

***Taraxacum carthusianorum* Aquaro, Caparelli & Peruzzi sp. nov. (Fig. 1)**

Diagnosis. Differt a *T. subpolonico* squamibus exterioribus viridibus minore amplitudine (1–2 mm), margine scarioso inconspicuo (ad 0.2 mm lato), sine cilia.

Planta 10–22 cm alta. Folia suberecta, subobovata – viridia, sparse araneosa, plerumque 5.9–18.5 cm longa et 1.4–4.8 cm lata, profunde divisa vel lobata; lobus terminalis obtuse triangularis vel triangularis, 1–1.5 cm longus, 1–1.5 cm latus; lobi laterales 3–4, anguste triangulares vel subdeltoidei, marginibus distalibus (raro denticulatis) convexis vel concavis; petiolus angustissimus, inaltus viridis, 2–3.8 cm longus.

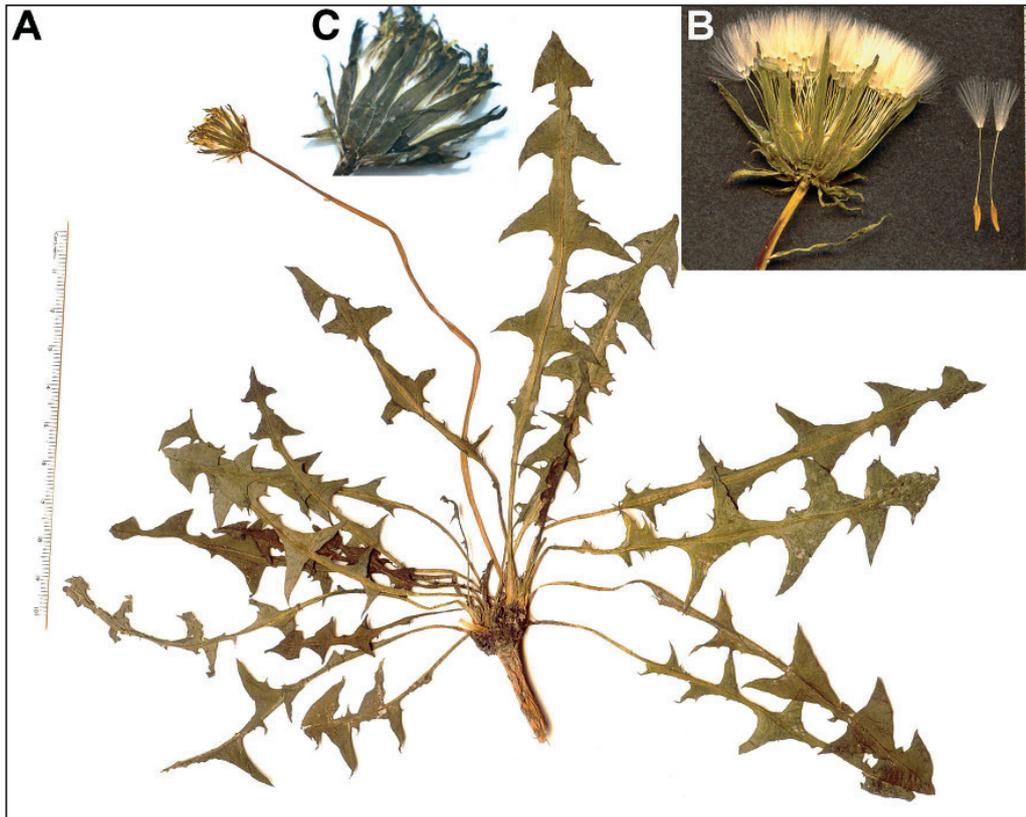


Fig. 1. *T. carthusianorum*:
A – general view;
B – particular of fruiting capitulum and achene;
C – particular of flowering capitulum. All plants scanned are parts of holotype collection.

Scapus viridis vel paulo brunnescens, superne sparse araneosus, 8–15 cm longus. Involucrum basi 1.1–2.7 cm diametro, squamae interiores ad 11–12 mm longae et 1–1.5 mm latae, squamae exteriores 16–21, non imbricatae, lanceolatae, 6–9 mm longae, 1–2 mm latae, virides, marginibus angustis, incospicuis ad 0.2 mm latis. Stigmata obscura vel pallide viridia, antherae polliniferae, grana pollinis diametro valde variantia. Achenium pallide griseo-brunneum, superne breviter subdense spinulosum, 3.5 mm longum (pyramide exclusa) et 1 mm latum, in pyramiden cylindricam 0.6 mm longam subabrupte abiens. Rostrum 9.5 mm, pappus albus *ca.* 6 mm longi.

Holotypus. Italy, Calabria, Serre Calabre: Piano della Lacina, Brognaturo (Vibo Valentia), 1023 m, prati umidi attorno al ponticello, 28.07.2005, coll. *Aquaro G., Peruzzi L. & Caparelli K. F.* (CLU, no. 18127; **Isotype:** FI).

Specimina visa altera. Italy, Calabria, La Sila (Calabria): La Scurca (S.S. 107 K. 91) pascolo umido a m 1300, 08.05.1950, coll. *Sarfatti & Corradi* (FI); La Sila (Calabria): Santa Barbara m 1300, 12.05.1950, *Sarfatti & Corradi* (FI).

Description. Perennial medium-sized herb, 10–22 cm tall, scarcely hairy, with scapes more or less

equalling the leaves in length. Leaves sub-erect, olive-green, 5.9–18.5 cm long, 1.4–4.8 cm wide, deeply lobed; terminal lobe obtuse-triangular to triangular, 1–1.5 cm long and 1–1.5 cm wide; lateral lobes 3–4, triangular to sub-deltoid; distal margin concave or convex, sometimes with little teeth; petiole green, not winged, 2–3.8 cm long. Scape green, with a reddish stripe, 8–15 cm long. Involucre 1.1–2.7 cm wide at the base; inner bracts 13–14, 11–12 mm long and 1–1.5 mm wide; outer bracts 16–21, not imbricate, lanceolate, adpressed to erect, 6–9 mm long and 1–2 mm wide, green, with membranous margin *ca.* 0.2 mm wide, not ciliate. Stigma light to dark green; anthers with pollen grains of variable size. Achenes grey-brown, with 13 ridges and short spines in the upper portion; body 3.5 mm long and 1 mm wide; cone 0.6 mm; rostrum 9.5 mm; pappus white, 6 mm long.

Etymology. The name of this species comes from "Certosa di Serra San Bruno", a well-known Carthusian monks' convent situated at the centre of the Serre Calabre Mts, near to the *locus classicus* of the new species.

Ecology. Humid grasslands of the mountain belt (900–1300 m), on siliceous substrates.

Chromosome number. $2n = 24$ (Fig. 2A). Karyotype formula: $2n = 3x = 24m$ (Fig. 2B); $A_1 = 0.28$, $A_2 = 0.23$.

Distribution. Presently known only for three Calabrian localities (Fig. 3, "+"), two of them on the Sila Massif and the other one on Serre Calabre.

Taxonomy. As discussed above, the species which is most closely related to *T. carthusianorum* is *T. subpolonicum* of the *T. paucilobum/T. vindobonense* group, to

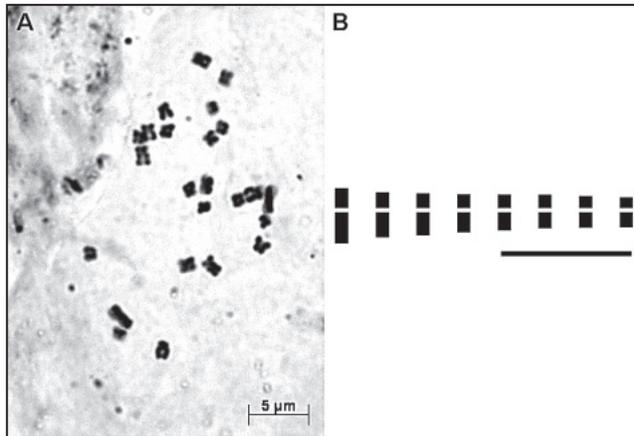


Fig. 2. Root tips metaphase plate of *T. carthusianorum*: A – $2n = 24$; B – haploid idiogram. Scale bar = 5 μ m.

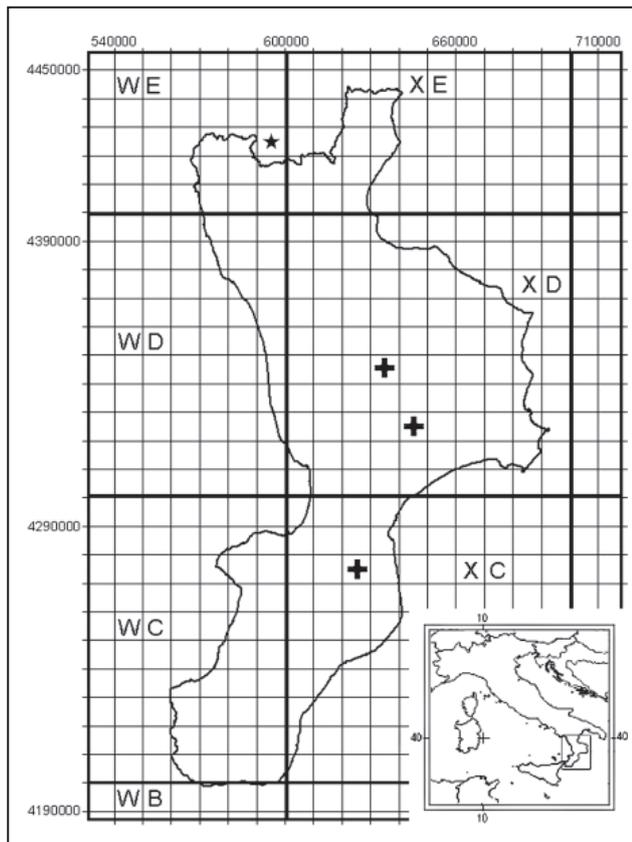


Fig. 3. Geographical distribution of *T. carthusianorum* (+) and *T. lilianae* (star).

which in our opinion also the new species belongs. However, other similar species having more than 15 lanceolate, erect to adpressed external bracts, leaves deeply lobed and pollen present are within the *T. subalpinum/T. noterophilum* group (*T. extimum* Kirschner, Sonck & Štěpánek from Greece, *T. strictum* Kirschner & Štěpánek and *T. melancholicum* Kirschner & Štěpánek from Bulgaria), the *T. scaturiginosum/T. sordidum* group (*T. scaturiginosum* G. Hagl., from E Mediterranean), and the *T. uliginosum/T. ranarium* group (*T. uliginosum* Kirschner & Štěpánek, from Central Europe). *Taraxacum carthusianorum* is easily distinguished from all the latter five species in having narrower capitula, narrower and glabrous external bracts, smaller achenes, (dark) green stigmas.

***Taraxacum lilianae* Aquaro, Caparelli & Peruzzi sp. nov. (Fig. 4)**

Diagnosis. Differt a *T. subdolo* squamibus exterioribus minore numero, longitudine et amplitudine vel rostro minore; a *T. huteriano* pyramide rostroque minoribus.

Planta 6–10 cm alta. Folia suberecta, sublivaceo – viridia, sparse araneosa, plerumque 4.5–10 cm longa et 0.4–1.7 cm lata, sinuato-dentata vel profunde divisa; lobus terminalis obtuse triangularis vel hastatus, (1.3)2–2.8 cm longus, 0.4–1.7 cm latus; lobi laterales 2–4, anguste triangulares vel subdeltoidei, marginibus distalibus integris. interlobia saepe conspicua, 3–9 mm, marginibus interdum dentatis; petiolus subalatus, viridis vel purpureo, 1.1–4 cm longus. Scapus paulo brunnescens, araneosus, 2–5.5 cm longus. Involucrum basi (0.7)1–2 cm diametro, squamae interiores ad 10–15 mm longae et 1.3 mm latae; squamae exteriores (7)10–16, non imbricatae, ovatae vel lanceolatae, 4.5–8 mm longae, 1.5–3.5 mm latae, obscure viridia, stria mediana oscura 0.5–0.6 mm lata, marginibus angustis, inconspicuis ad 0–1 mm latis, ciliolatae. Stigmata obscura, antherae polliniferae, grana pollinis diametro valde variantia. Achenium olivaceo-stramineum, superne sparse spinulosum, 2.7–3 mm longum (pyramide exclusa) et 0.7–0.9 mm latum, in pyramiden cylindricam 0.7 mm longam subabrupte abiens. Rostrum 3.5–4.8 mm, pappus albus ca. 5 mm longi.

Holotypus. Italy, Basilicata, Massiccio del Pollino: il Visitone (Pz), versante Nord del Pollino in corrispondenza di una depressione umida a margine della strada, 26.04.2006, coll. Aquaro G., Caparelli K.F.

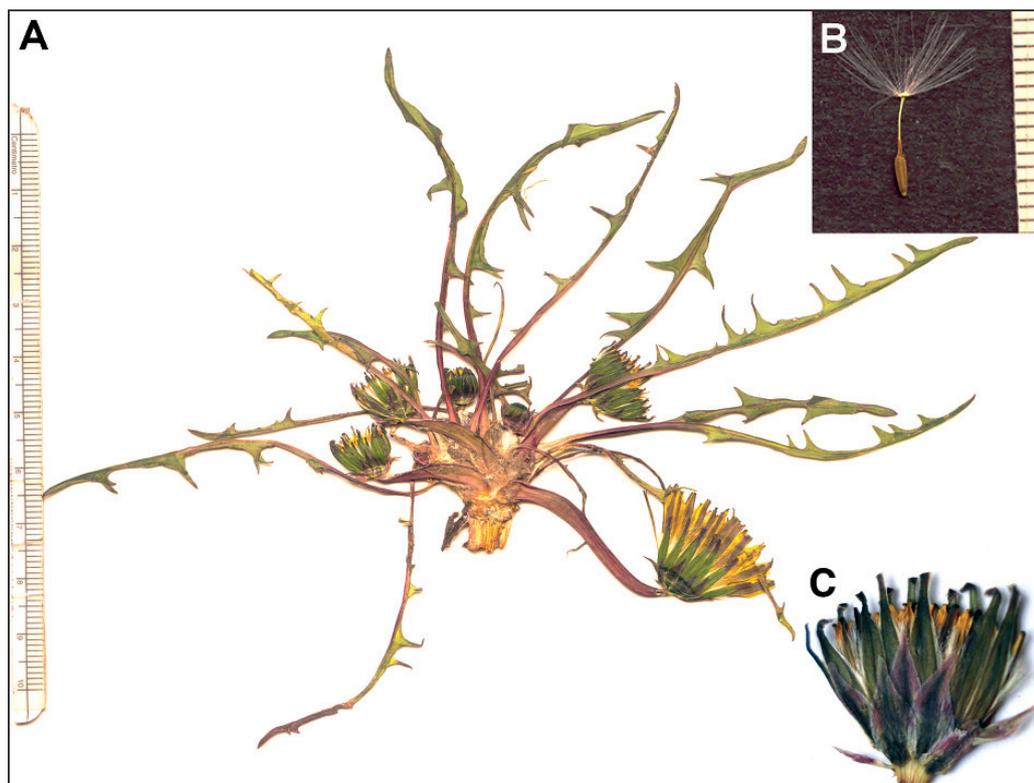


Fig. 4. *T. lilianae*:
 A – general view;
 B – particular of achene;
 C – particular of external bracts.
 All plants scanned are parts of holotype collection.

& Gargano D. (CLU, no. 19799, two sheets; **Isotypes**: CLU, no. 19800, 19801, 19802; FI, PI)

Paratypes. Italy, Basilicata, Massiccio del Pollino: il Visitone, versante Nord del Pollino in corrispondenza di una depressione umida a margine della strada, prov. Potenza, Basilicata, 24.04.2004, coll. *Bernardo L.* (CLU, no. 18251); Massiccio del Pollino: il Visitone, versante Nord del Pollino in corrispondenza di una depressione umida a margine della strada, prov. Potenza, Basilicata, 24.04.2004, coll. *Bernardo L.* (CLU, no. 13193).

Description. Perennial medium-sized herb, 6–10 cm tall, densely hairy on the adaxial surface of the leaves and on rachis; scapes short, more or less equalling the leaves in length. Leaves sub-erect, olive green, 4.5–10 cm long, 0.4–1.7 cm wide, dentate to deeply lobed; terminal lobe obtuse-triangular to sagittate, (1.3)2–2.8 cm long and 0.4–1.7 cm wide; lateral lobes 2–4, triangular to sub-deltoid; distal margin entire; interlobes 3–9 mm long, often with dentate margin; petiole green to reddish, narrowly winged, 1.1–4 cm long. Scape reddish-brown, 2–5.5 cm long. Involucre (0.7)1–2 cm wide at the base; inner bracts 10–18, 10–15 mm long and 1.3 mm wide; outer bracts (7)10–18, not imbricate, ovate to lanceolate, adpressed, 4.5–8 mm long and 1.5–3.5 mm wide, dark

green, with a dark median stripe 0.5–0.6 mm wide and with a membranous margin ca. 0.1 mm wide, ciliolate. Stigma dark green; anthers with pollen grains of variable size. Achenes greenish-grey, with few short spines in the upper portion; body 2.7–3 mm long and 0.7–0.9 mm wide; cone 0.7(1) mm; rostrum 3.5–4.8 mm; pappus white, ca. 5 mm long.

Etymology. This species is dedicated to Dr. Liliana Bernardo (University of Calabria), field botanist specialist in the flora of Calabria and Pollino Massif, who first collected it.

Ecology. Humid grasslands of the mountain belt, on calcareous substrates.

Chromosome number. $2n = 24$ (Fig. 5A). Karyotype formula: $2n = 3x = 3m + 3sm + 18m$ (Fig. 5B); $A_1 = 0.25$, $A_2 = 0.34$.

Distribution. Presently known only for one locality in Pollino Massif (Fig. 3, star).

Taxonomy. As discussed above, the most similar species are *T. subdolum* of the *T. subdolum/T. memorabile* group and, above all, *T. huterianum* of the *T. tenuifolium/T. subolivaceum/T. mendax* group, to which in our opinion also the new species belongs. Other similar species sharing less than 18, ovate to lanceolate external bracts, less than 8 mm long and less

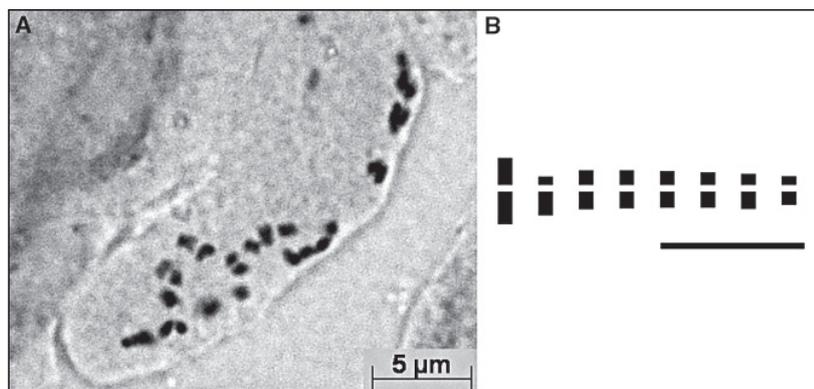


Fig. 5. Root tips metaphase plate of *T. lilianae*: A – $2n = 24$; B – haploid idiogram. Scale bar = $5\mu\text{m}$.

than 3.5 mm wide, with a median dark green stripe, scarcely lobed leaves and pollen present are within the *T. bavaricum*/*T. paukertianum* group (*T. balticiforme* Dahlst. from Central Europe), the *T. paucilobum*/*T. vindobonense* group (*T. paucilobum* Hudziok from SE Europe), the *T. trilobifolium*/*T. madidum* group (*T. madidum* Kirschner & Štěpánek from Central Europe), the *T. apiculatoides*/*T. sophiae* group (*T. apiculatoides* Melecka from Balkans). *Taraxacum lilianae* is easily distinguished from all the other three species in having narrower capitula, shorter achene body and rostrum. Indeed, it is noteworthy to say that, as far as we are aware, both achene and rostrum in *T. lilianae* are the shortest within the whole sect. *Palustria*.

***Taraxacum multisinuatum* Kirschner, Sonck & Štěpánek, Ann. Bot. Fenn. 26(3): 345 (1989)**

Specimina visa. Italy, Calabria – Complesso montuoso di Verbicaro Orsomarso: Piano di Mezzo, 1270 m, ai margini del laghetto, 11.05.2005, Aquaro G., Gargano D. & Uzunov D. (CLU, no. 18128; PI).

Ecology. Humid grasslands of the mountain belt, on calcareous substrates.

Chromosome number. $2n = 24$ (Fig. 6A). Karyotype formula: $2n = 3x = 24m$ (Fig. 6B); $A_1 = 0.18$, $A_2 = 0.16$. Our counting confirms a previous one effected on Greek plants (Kirschner & Štěpánek 1998).

Distribution. Greece and S Italy (Pollino Massif; Fig. 7, star).

Taxonomy. According to Kirschner & Štěpánek (1998), this taxon belongs to the *T. subalpinum*/*T. noterophilum* group, a marginal species complex in the section *Palustria* – mostly occurring in the Balkans – with leaf shapes somewhat similar to sect. *Erythrocarpa* or sect. *Ruderalia* and densely spinulose achenes.

***Taraxacum siculum* Soest, Proc. Kon. Ned. Akad. Wetensch., Ser. C, Biol. Med. Sci. 69: 450 (1966)**

Specimina visa. Italy, Calabria – Piano della Lacina, Brognaturo (Vv) lungo il corso d'acqua, a valle del ponticello. UTM 33S XC 23 71, 1023 m, ontaneta, suolo arido in estate, 25.04.1998, Gargano D. (CLU, no. 18130); Sila, pendici meridionali del M.te Volpintesta, nei pressi della S.S. 107, ca. 1300 m, prati umidi, 24.04.2006, Peruzzi L., Caparelli K. F. (CLU, no. 19803).

Ecology. Humid grasslands of the mountain belt; in Calabria on siliceous substrates.

Chromosome number. Unknown.

Distribution. Sicily (Ficuzza) and S Italy (Sila Massif, Serre Calabre; Fig. 7, circle).

Taxonomy. Kirschner & Štěpánek (1998), tentatively suggested taxonomic relationships with *T. scaturiginosum* group, as discussed above. Our results support the affinity with *T. scaturiginosum* G. Hagl. (from E Mediterranean) in particular. On the other hand, other features of the leaves and achenes remind the *T. subalpinum*/*T. noterophilum* group, especially *T. declivicola* Kirschner, Sonck & Štěpánek and *T. extimum* Kirschner, Sonck & Štěpánek (both from Greece), which share number and shape of external bracts and cone length with *T. siculum*.

Conclusions

It was possible to identify four distinct agamospecies of *Taraxacum* sect. *Palustria* in the studied area of S Italy. Two of them, *T. multisinuatum* ($2n = 24$) and *T. siculum* are phylogeographically very interesting species and are new records for Italy and peninsular Italy, respectively. Moreover, two species were here described as new to science: *T. carthusianorum* ($2n = 24$) and *T. lilianae* ($2n = 24$). Both species, at the present state of knowledge, appear endemic to S Italy.

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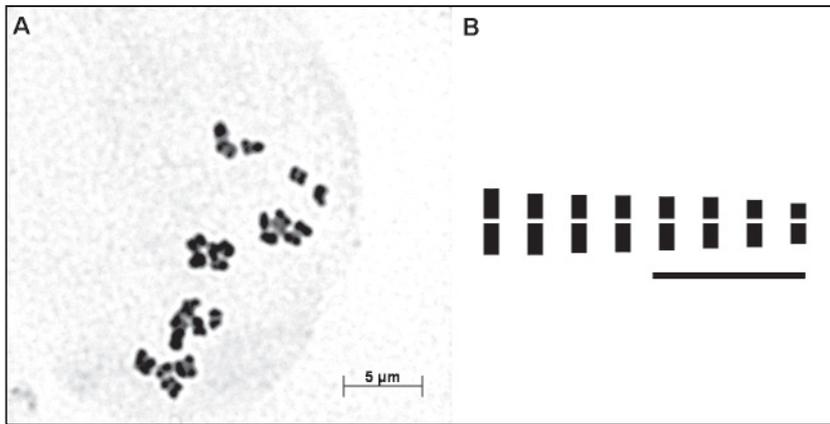


Fig. 6. Root tips metaphase plate of *T. multisinuatum*:
A – $2n = 24$; **B** – haploid idiogram.
 Scale bar = 5 µm.

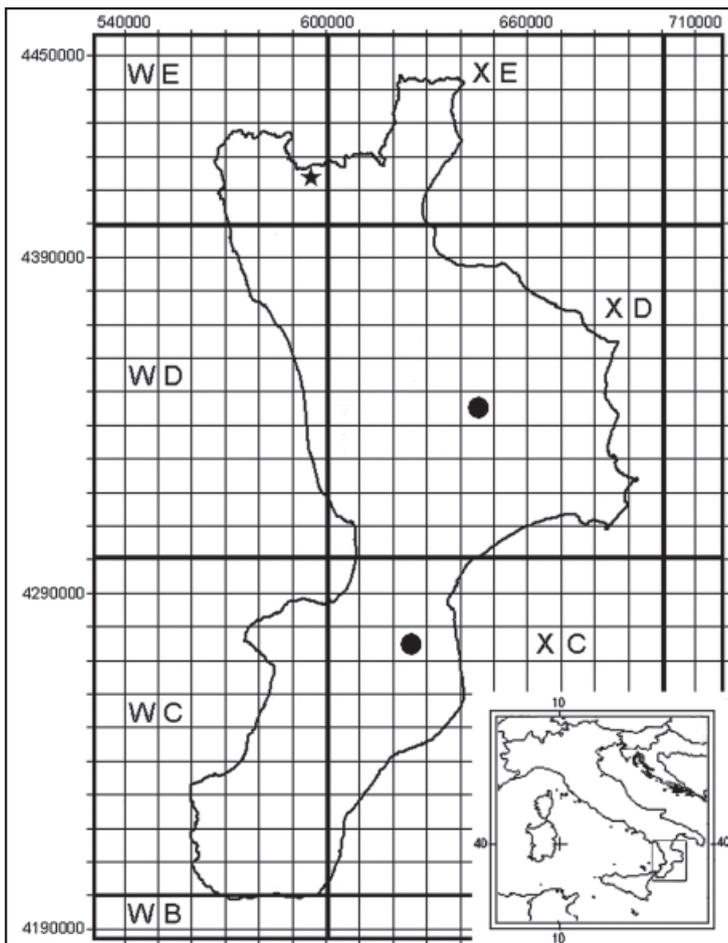


Fig. 7. Local geographical distribution of *T. multisinuatum* (star) and *T. siculum* (circles).

References

- Conti, F., Abbate, G., Alessandrini, A. & Blasi, C. 2005. An annotated checklist of the Italian Vascular Flora. Palombi Ed., Rome.
- Kirschner, J., Sonck, C. & Štěpánek, J. 1989. Four new *Taraxacum* species of sect. *Palustria* from Greece. – *Ann. Bot. Fenn.*, **26**(3): 343–348.
- Kirschner, J. & Štěpánek, J. 1998. A monograph of *Taraxacum* sect. *Palustria*. Inst. Bot., Acad. Sci. Czech Republic, Průhonice.
- Levan, A., Fredga, K. & Sandberg, A.A. 1964. Nomenclature for centromeric position on chromosomes. – *Hereditas*, **52**: 201–220.
- Romero Zarco, C. 1986. A new method for estimating karyotype asymmetry. – *Taxon*, **35**(3): 526–530.
- Sonck, C.E. 1998. Three new species of *Taraxacum* from northern Italy. – *Ann. Bot. Fenn.*, **35**: 119–122.
- Štěpánek, J. & Kirschner, J. 2001. A new hexaploid species of *Taraxacum* sect. *Palustria* from Savoie, the W Alps. – *Preslia*, **73**: 277–279.

