

Crocus linguisticus n. sp. : a well known species

Autor(en): **Mariotti, Mauro Giorgio**

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Crocus ligusticus n. sp., a well known species

MAURO GIORGIO MARIOTTI

ABSTRACT

MARIOTTI, M. G. (1988). *Crocus ligusticus* n. sp., a well known species. *Candollea* 43: 667-680. In English, English and Italian abstracts.

The lectotype of *Crocus medius* Balbis (1801) is designated after the original material has been found in TO. The characteristics of this specimen do not correspond to the taxon that BERTOLONI (1826) indicated as *C. medius* and that all subsequent authors referred under this name. It has therefore been necessary to describe this well known taxonomic unit as a new species: *Crocus ligusticus* Mariotti (= *C. medius* auct. non Balbis). Some data on the distribution, ecology and individual macro- and micro-morphological variation of *C. ligusticus* are given. *Crocus medius* Balbis (1801) then becomes a synonym of *C. nudiflorus* Smith (1798).

RIASSUNTO

MARIOTTI, M. G. (1988). *Crocus ligusticus* n. sp., una specie ben conosciuta. *Candollea* 43: 667-680. In inglese, riassunti in inglese e in italiano.

In seguito al ritrovamento di materiale originale in TO, è stato designato il lectotipus di *Crocus medius* Balbis (1801). Le caratteristiche di questo campione non corrispondono a quelle dell'entità intesa come *C. medius* da BERTOLONI (1826) e che tutti gli autori da questa data finora hanno appellato con questo nome. Per questa entità, già ben conosciuta, si è perciò resa necessaria la descrizione come nuova specie: *Crocus ligusticus* Mariotti (= *C. medius* auct. non Balbis). Di *C. ligusticus* vengono fornite anche notizie sulla attuale distribuzione, sull'ecologia e su alcuni aspetti di variabilità individuale macro- e micro-morfologica. *Crocus medius* Balbis (1801) è da considerarsi sinonimo di *C. nudiflorus* Smith (1798).

Introduction

As part of a broader study into the endemic species of Liguria (Italy) I began a few years ago to study *Crocus medius* Balbis. I wished to confirm the alleged differentiation of this *Crocus* into two ecological races: the Alpic¹ calcicolous and the Apenninic serpentinicolous (MARIOTTI, 1985).

Before I undertook the necessary morphological and karyological work it was indispensable to resolve the problem of the typification of *C. medius* and consequently its distinction from *C. nudiflorus* Smith. This very old question had apparently been resolved by Bertoloni in 1826. At first, not having traced any original material, I arrived at the same conclusion as BERTOLONI (1826) and indicated Plate 3 of volume 36 of "Iconographia Taurinensis"² as possible type (MARIOTTI, 1985) (Fig. 1B). Subsequently Mrs. G. Forneris, the curator of Torino (TO), discovered a specimen personally identified by Balbis in the same year as the publication of his protologue (BALBIS, 1801). This reopened the question and produced further developments.

¹This term is intended in the geographical sense and in contrast with Alpine which has an ecological sense.

²"Iconographia Taurinensis" is a collection of 64 volumes where all the plants which were cultivated in the "Hortus Regius Botanicus Taurinensis" from 1752 to 1868 are drawn and painted in water-colours.

Historical data

In the 9th year of the French Republic (= 1801), G. B. Balbis (b. 1765-d. 1831), director of the Botanical Gardens of Torino from 1801 to 1814, published the "Elenco delle Piante crescenti ne' Contorni di Torino", part (pp. 83-102) of which was entitled "Additamentum ad Floram Pedemontanam". On page 83 he described a new species: "*Crocus medius* N. Locis saxosis Tendae reperitur. Observ. Medium inter *sativum* et *vernum*; differt a priori ob folia breviora, et latiora, et ab altero ob folia longiora, et angustiora. Stigmata insuper in nostra specie tota fimbriata; stylus longus colorem habet *sativo* aemulum, similiterque tingens. In hortum Taurinensem ab octo annis excultus numquam habitum suum mutavit."

The diagnosis is very vague and makes no mention of the corm. Nothing is said about flowering time, colour of the perigon and certain other features of the plant. On the page 6 of "Miscellanea Botanica" Balbis (1804) himself declared:

"*Crocus medius* Balb. addit. ad flor. pedem. p. 83 nunc est *Crocus (multifidus)* flore aphylo, stygmatis capillaceo multifidis. *Ram. bulletin des sciences. Paris tab. 8, fig 1, 2, 3, 4. Vitm. suppl. 1, pag. 58.*"

From 1804 to 1826 *Crocus medius* was considered to be a synonym of *Crocus nudiflorus* Smith in Sowerby & Smith, Engl. Bot. 7: 491 (1798) because *C. multifidus* Ramond (1800) was considered a synonym of this second taxon (GAY, 1827).

In 1826 Bertoloni wrote a little monograph of the genus *Crocus* in Italy, in epistolary form addressed to Gay. He completed the description of *Crocus medius* from material personally collected in eastern Liguria (Varese Ligure and Bracco) and established the differences between this species and *Crocus nudiflorus* by comparing it with the exsiccata of the latter, collected near Dax, and the original figure. He also claimed to have previously sent to some botanists the exsiccata of the species he later intended as *C. medius*, under the name of *Crocus penicillatus*. He finally established that his species (*C. penicillatus*) and Balbis' *C. medius* were identical on the sole basis of a copy of the above mentioned plate included in the "Iconographia Taurinensis". In fact he was unable to examine the original exsiccata or the living plant owing to the fact that these were not traced by the successor of Balbis, prof. Capello.

Typification of *Crocus medius* Balbis and its consequences

A search for the original material of *C. medius* Balbis was performed in the following 36 herbaria: B, BM, BOLO, BR, C, CHE, COI, E, FI, G, GDOR, GE, JE, K, L, LAU, LD, LE, LINN, LIU, LY, M, MA, MPU, NAP, P, PAV, PI, RO, S, SIENA, TL, TO, W, WAG, WU. Similar searches were made for *C. penicillatus* Bertol. Two interesting exsiccata of *C. medius* were found in Torino (TO), hereafter described as A and B, but no specimen of *C. penicillatus* Bertol.

- A) "Crocus medius N. Addit. / ex H. B. T. / *Crocus multifidus* Vitm. Suppl. / 1801". The handwriting is Balbis's and the reference to *C. multifidus* has been added after the remaining inscriptions. The exsiccatum (Fig. 1A) consists of two plants: one having a corm and a somewhat damaged flower, the other a nearly intact flower but without a corm.
- B) "Triandria monogynia / *Crocus multifidus* Ram. / *Crocus medius* Balb. add. ad fl. p. 83 / *Crocus* fl. aphylo, stigmatibus capillaceo-multifidis Bullet. / des science Paris. tab. 8 fig. 1.2.3.4 Vitm. Suppl. I p. 58 / *Crocus nudiflorus* Pers. Syn. // ex H. B. T. 1802". The exsiccatum is part of Herb. Allioni and consists of two flowers and a little sheaf of leaves but no corm.

Both exsiccata show features corresponding to the brief original description, nevertheless the exsiccatum A is more complete and certainly earlier to judge by the collecting date and the incomplete citation of the protologue (as if the Additamentum were in press). Therefore I designate as Lectotype of *Crocus medius* Balbis Add. Fl. Ped. Elenco p. 83 (1801) the exsiccatum which I have described above and marked by the letter A (Fig. 1A). It is presently kept in the General Herbarium of Torino (TO).

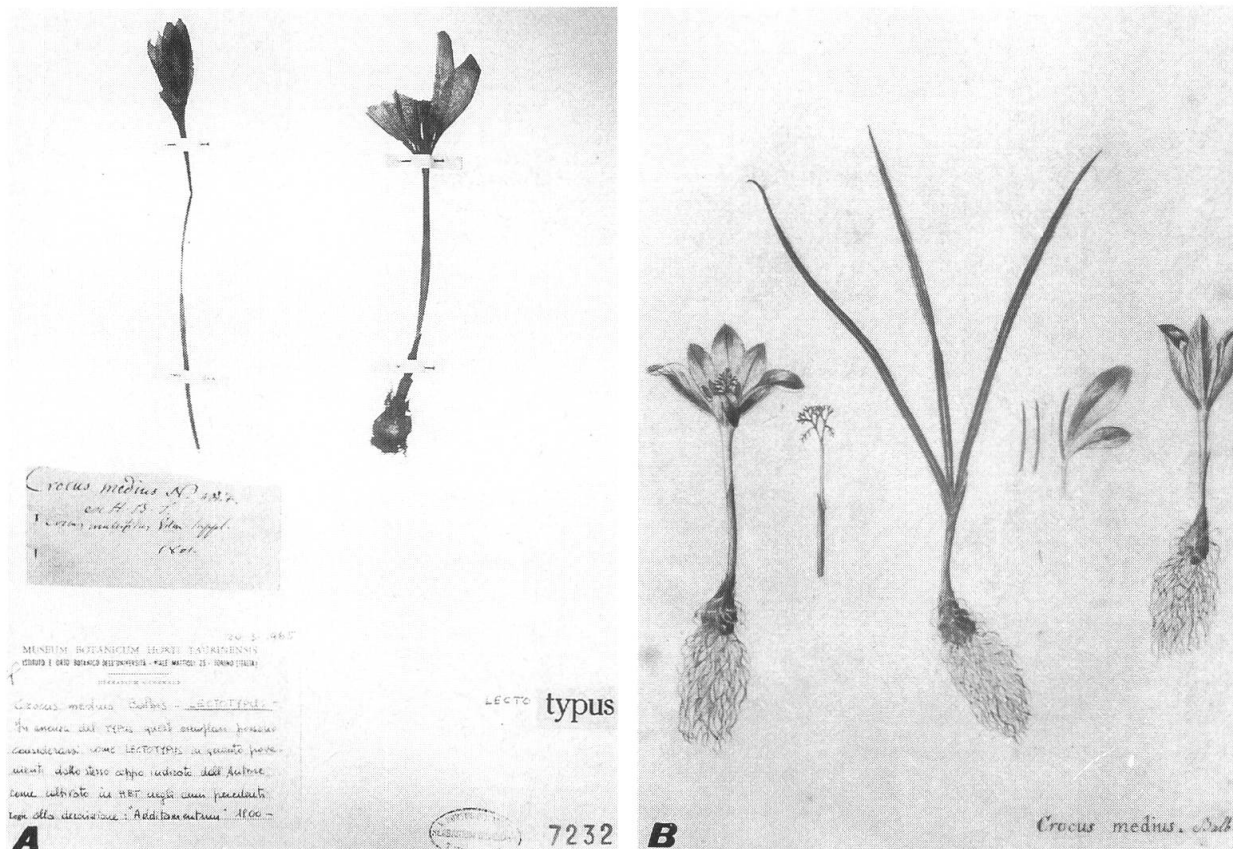


Fig. 1. — A, photograph of the lectotype of *Crocus medius* Balbis (TO); B, photograph of plate 3, volume 36 of "Iconographia Taurinensis".

According to BALBIS (1801) the original diagnosis was based on specimens cultivated in the Botanical Gardens of Torino over a period of 8 years. It is noteworthy that neither exsiccata, nor written records indicating the presence of *C. medius* exist from Tenda, except for the mention in the protologue. This absence is confirmed by a handwritten note of Burnat (G-BU) and by my personal investigations.

A careful analysis of the lectotype shows that the tunics are membranous with parallel, non reticulate fibres (Fig. 2C, 2D); the style (Fig. 3D) is much branched but not so deeply divided as in the individuals commonly known as *C. medius* by several authors and there is no sign of decaying cataphylls (Fig. 3C). These details, especially those of the tunics, are not evident from the above-cited plate of the "Iconographia Taurinensis".

The characters of the lectotype are clearly different from those of the plant which has been known as *C. medius* Balbis since 1826.

Comparing the features of the above-mentioned lectotype with those of the original material of *C. nudiflorus* Smith and of *C. multifidus* Ramond, it is reasonable to consider them to belong to the same taxonomic unit. By the priority principle the name of this unit is *Crocus nudiflorus* Smith. Balbis came to the same conclusions in 1804.

Crocus penicillatus Bertol. is solely cited in BERTOLONI (1826) — "Haec est species illa, quam sub nomine *Croci penicillati* jam miseram ad nonnullos Botanicos" — and is therefore *nomen nudum et invalidum* (ex art. 34.1/c, 34.1/d of ICBN).

Characters of *Crocus ligusticus*

In consequence it is clearly necessary to describe the unit mistakenly known as *C. medius* since 1826.

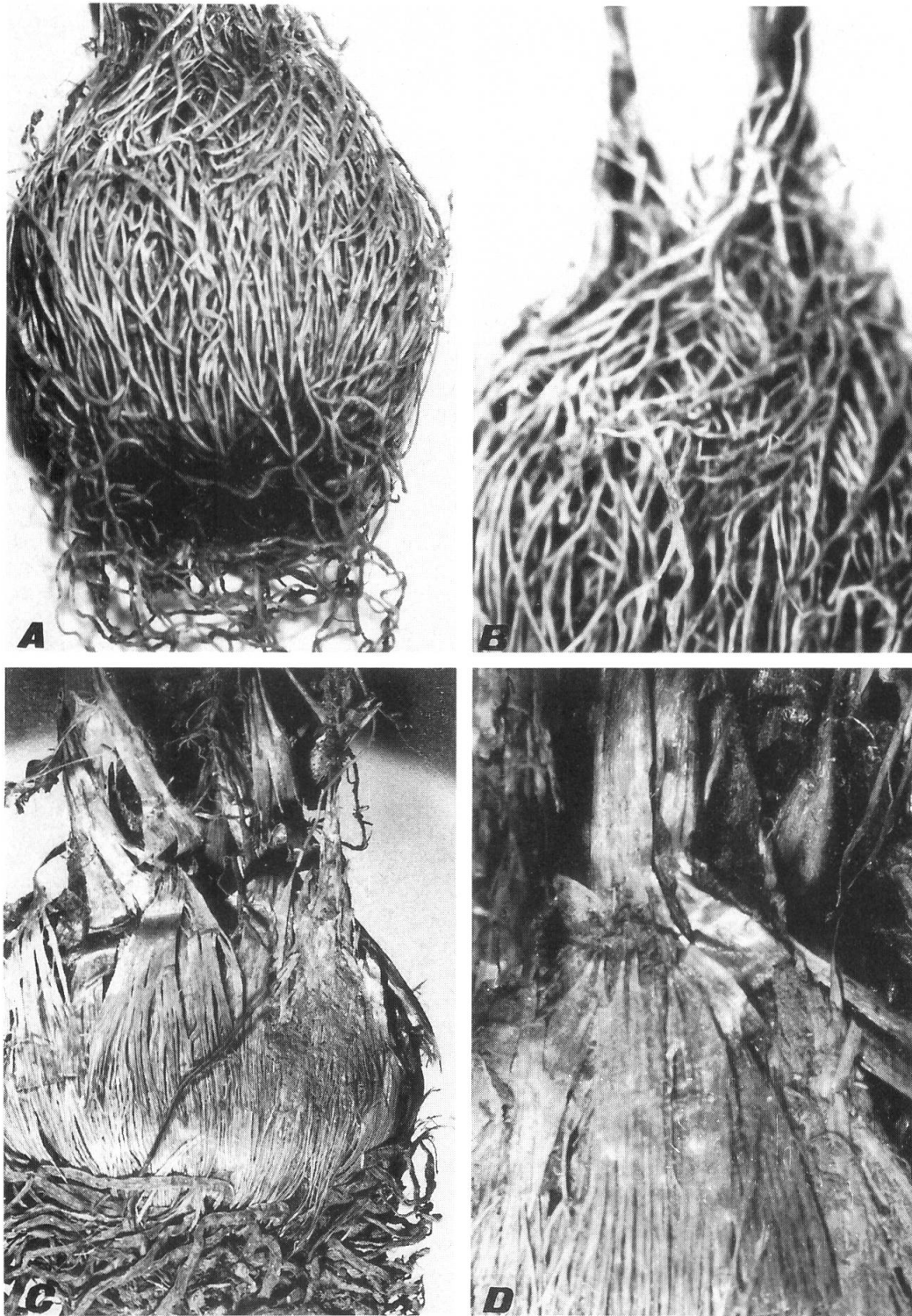


Fig. 2. — A, B, details of the corm (A 2.5 ×) and fibres of the tunics (B 5 ×) in *Crocus ligusticus*; C, D, the same in the lectotype of *Crocus medius* (C 3 ×; D 5 ×).

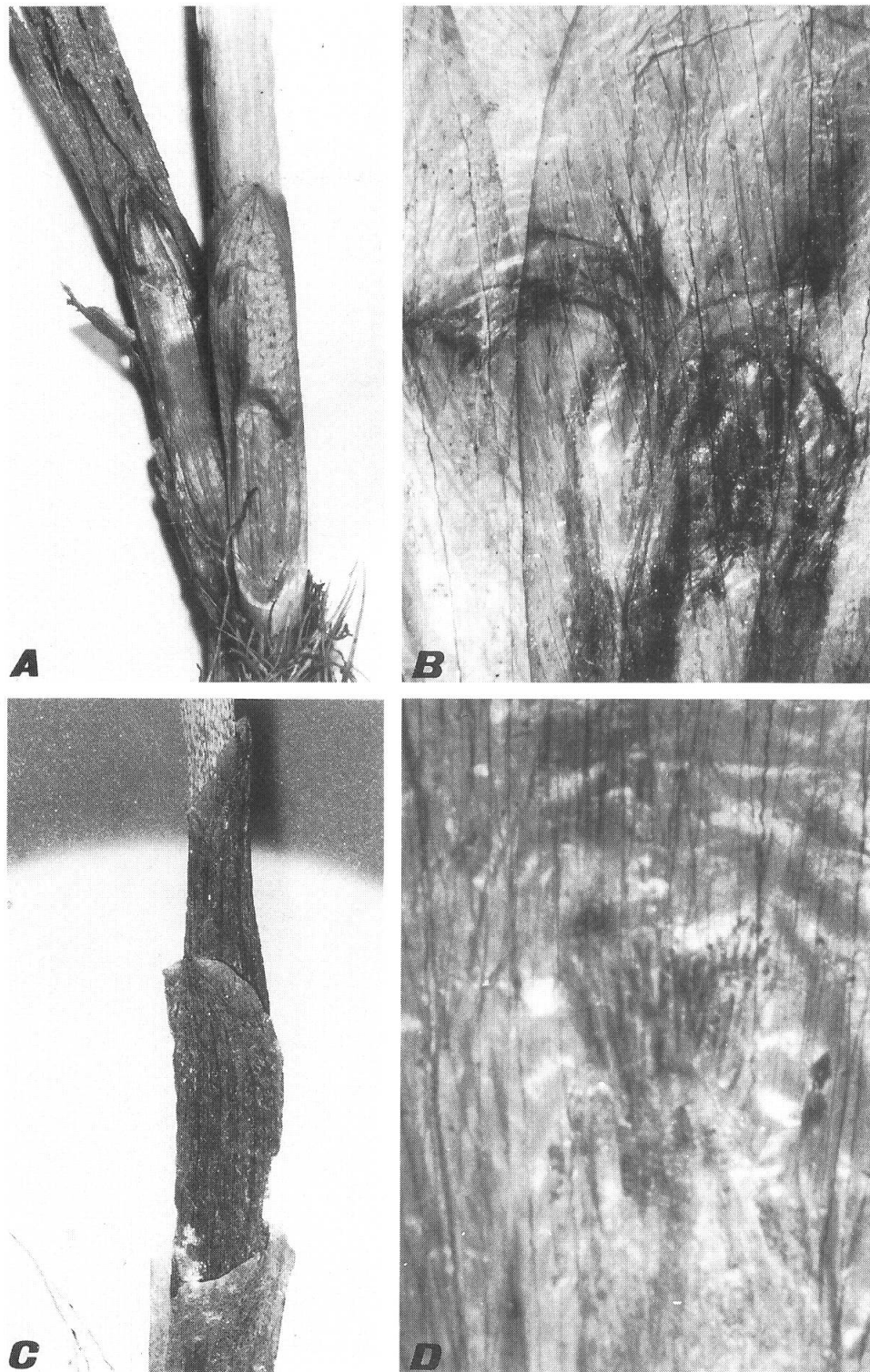


Fig. 3. — **A, B**, *Crocus ligusticus*: cataphylls and old persistent cataphylls (**A** 2.5 ×) and stigmas seen through the dried perigon (**B** 5 ×); **C, D**, the same in the lectotype of *C. medius* (**C** 2.2 ×; **D** 6.8 ×): the old cataphylls are absent, because they are not persistent.

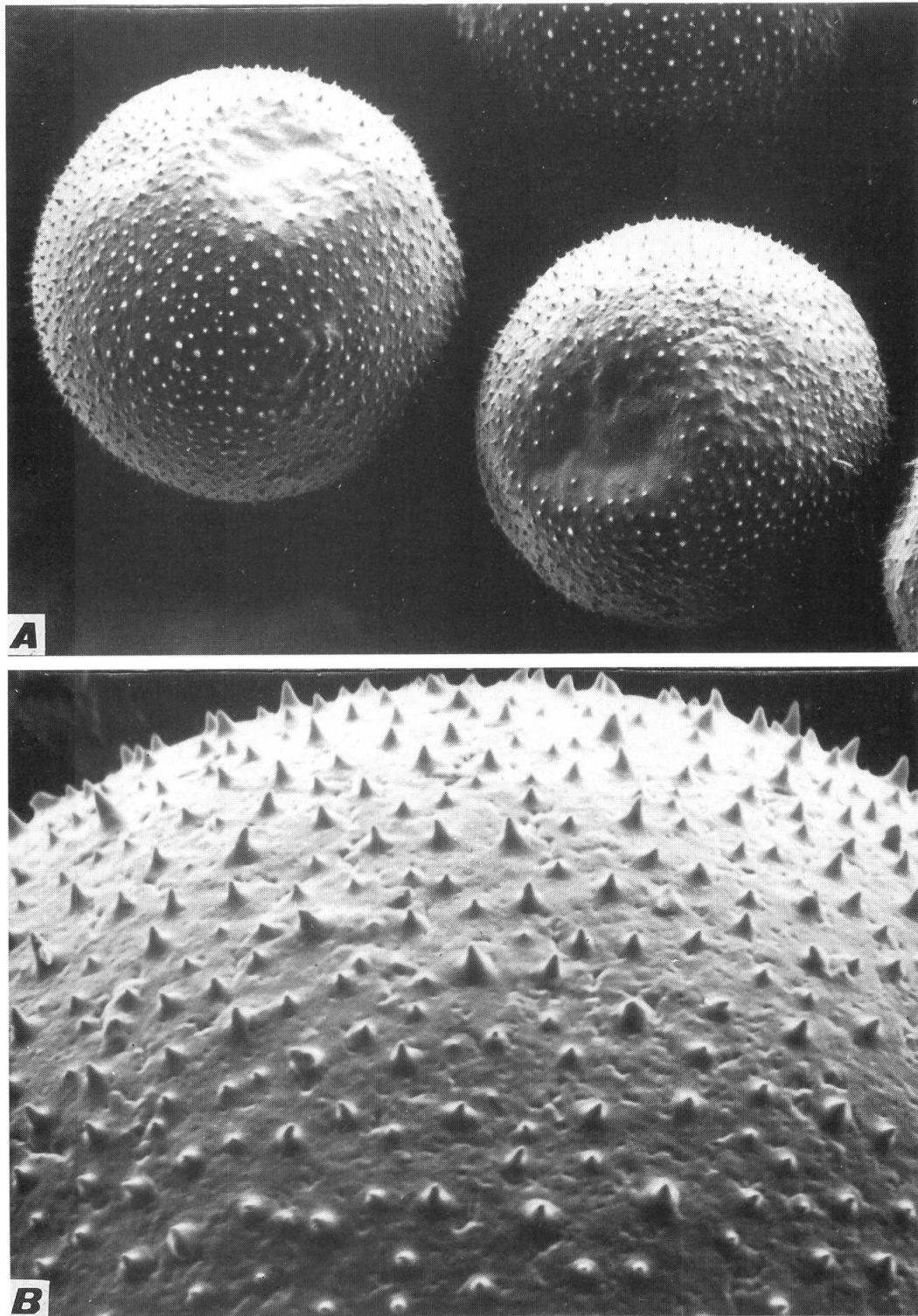


Fig. 4. — Pollen grains of *Crocus ligusticus*, SEM (A 550 ×; B 220 ×).

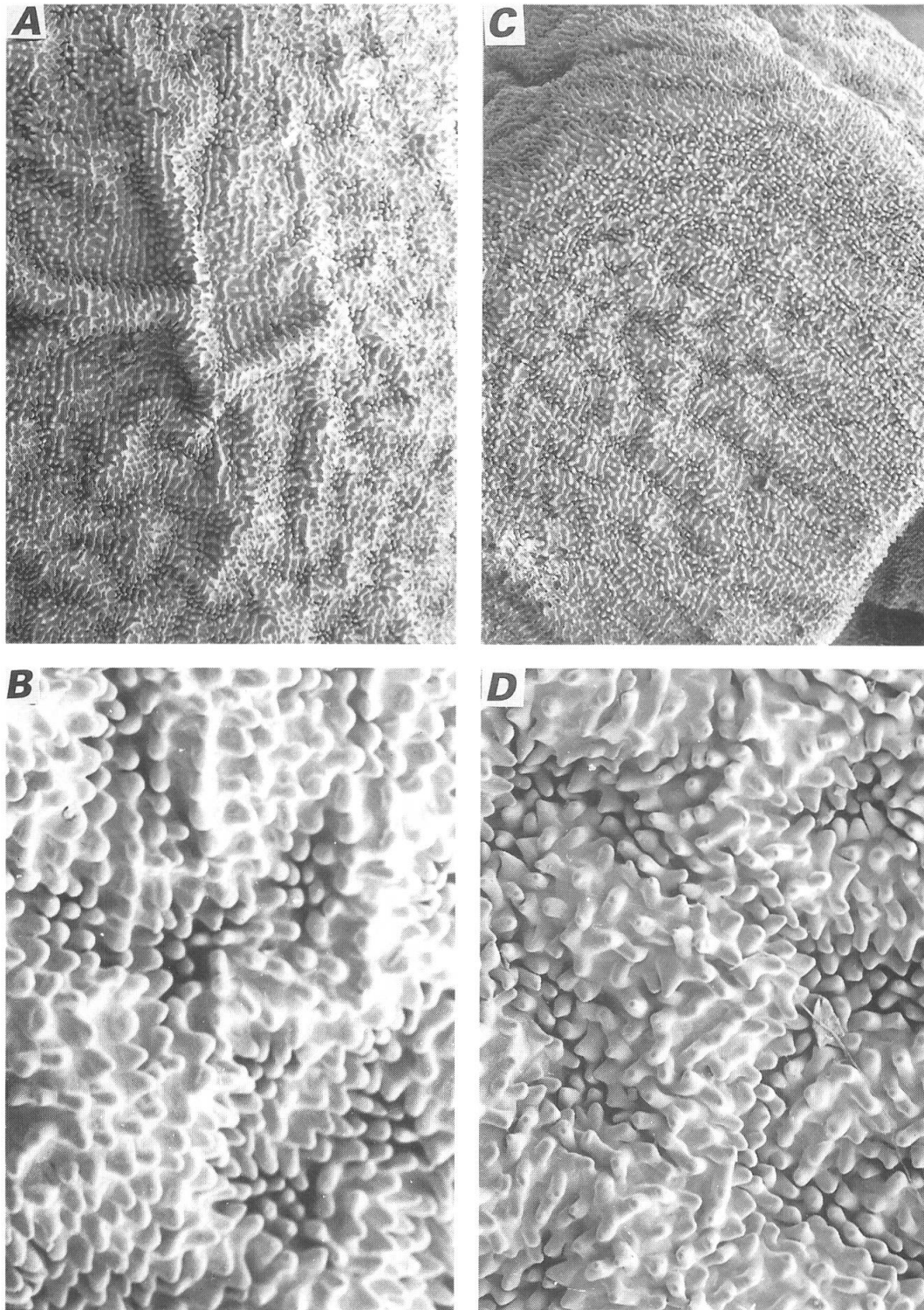


Fig. 5. — Seed-coat surfaces of *Crocus ligusticus*, SEM: populations from the Ligurian Apennines (A 224 \times ; B 896 \times) and from Ligurian Alps (C 224 \times ; D 896 \times).

Crocus ligusticus Mariotti spec. nov.

= *Crocus medius* auct. non Balbis (1801); BERTOLONI (1826), GAY (1827), HERBERT (1847), KLATT (1866), BAKER (1876; 1892), MAW (1882; 1886), BOWLES (1924; 1952), MATHEW (1982) etc.

Diagnosis. — Tunicae reticulatae; scapus prophylo subtentus; flos autumnalis violaceus; antherae luteae; stylus multifidus; folia hysternanthia.

Descriptio. — Cormus subglobosus vel pyriformis, raro depressus, 10-35 mm diametro. Tunicae fibrae validae, reticulatae, infra radiatae et parum ramificatae, supra fasciculo coadunatae et simplices. Cataphylla superioris anni praesentia. Vaginae 3-5, raro 2, glabrae, apice rotundatae-obtusae, quam spatha breviores, inferiores 10-35 mm, superiores 15-115 mm longae.

Folia (1)2-3(5), hysternanthia, 100-400 mm longa, 2-8 mm lata, linea albida centrali superne ornata, linearia, base longe attenuata et callosa callo obtusiusculo. Lamina generatim glabra. Margines foliorum revolutae, integrae, vel diffuse denticulatae denticulis ad basim versis.

Flos 1(2), autumnalis, 85-380 mm longus. Prophyllum praesens. Spatha unica, 40-240 mm longa, 1.5-5 mm lata, glabra, albida, teretiuscula vel vix infundibuliformis, apice generatim acuta, raro obtusa vel bifida. Tubus floris 50-330 mm longus, 0.5-3 mm latus, glabrus, albidus. Faux 4-20 mm longa, 5-15 mm lata, nuda violacea-pallida vel albida, intus venosa venis ferme visibilibus. Segmenta glabra, violacea, ferme venosa, concava, ab obovato-oblanceolata ad ovato-lanceolata, apice obtusa, rotundata-apiculata vel acuta; externa 20-55 mm longa et 7-22 mm lata, interna 16-50 mm longa et 7-18 mm lata. Stamina quam stigmata breviora. Filamenta 2-15 mm longa, glabra, albida vel luteo-alba. Antherae 10-30 mm longae, luteae, infra leviter dilatatae vel sagittatae, generatim filamentis aequantes. Granum pollinis 80-110 μ m diametro, inaperturatum, echinulatum. Stylus in perigonio inclusus, 5-28 mm longus, miniatum vel aurantiacum, stamina circiter 6-18 mm excedens, rarissime aequans, profunde multifidum laciniis capillaribus apice crassiusculis.

Scapus circiter 20 mm longus florationis et 50-100 mm fructificationis temporibus.

Capsula 16-24 mm longa, 6-10 mm lata, ellipsoidalis, chlorochroa pallida subinde alutacea. Cuspis superposita circiter 4-6 mm longa, reliquis partibus spathae tecta.

Semina circiter 2-3 mm longa, 1.5-2.2 mm lata, ovoidea-ellipsoidea, rufidula, raphe indistincta et caruncula parvula munita, maxime exigue papillosa.

Ab affine *C. nudifloro* fibris tunicarum reticulatis non parallelo-membranosis et stigmatibus magis ramosis differt.

Etymologia. — Ex Liguria, ubi disperse occurrit, species nominatur.

Typus: Holotypus in GDOR: Liguria orientale, Passo del Bocco di Bargone, m 900 circa, 2.10.1983, M. G. Mariotti, G. Barberis & G. Rametta. Isotypus in GE et in Herb. personale. Topotypus: Passo del Bocco di Bargone, 12.10.1984, M. G. Mariotti (FI).

Iconographia. — Chazal 1832 in MATHEW (1982) pl. 17; MOGGRIDGE (1874) pl. XX; MAW (1886) pl. XXVII; COSTE (1905) III p. 360; FIORI & PAOLETTI (1921) Fig. 758; nostra (Fig. 6).

Description

Corm subglobose or pyriform, rarely depressed, about 10-35 mm in diameter. Tunic fibres strong, markedly reticulate, basal fibres radiating and slightly branched, upper fibres bristly, unbranched and united into a bunch (Fig. 2A, 2B). Corm capped with a persistent neck of old cataphylls. Cataphylls (sheathing leaves) 3-5, sometimes 2, glabrous, rounded to obtuse at the apex, shorter than the spathe, the lower 10-35 mm, the upper 15-115 mm in length (Fig. 3A).

Leaves (1)2-3(5), hysternanthous, 10-400 mm long, 2-8 mm wide, green with a distinct whitish median stripe, long attenuate towards the base, attenuate and with a small obtuse callosity at the apex. Blade generally glabrous; margins revolute, slightly denticulate with small teeth turned towards the base.

Flower 1(2), autumnal, 85-380 mm long. Prophyll present. Proper spathe single, 40-240 mm long, 1.5-5 mm wide, glabrous, whitish, terete or nearly funnel-shaped, generally acute or sometimes obtuse or bifid at the apex. Flower tube 50-330 mm long, 0.5-3 mm wide, glabrous, usually

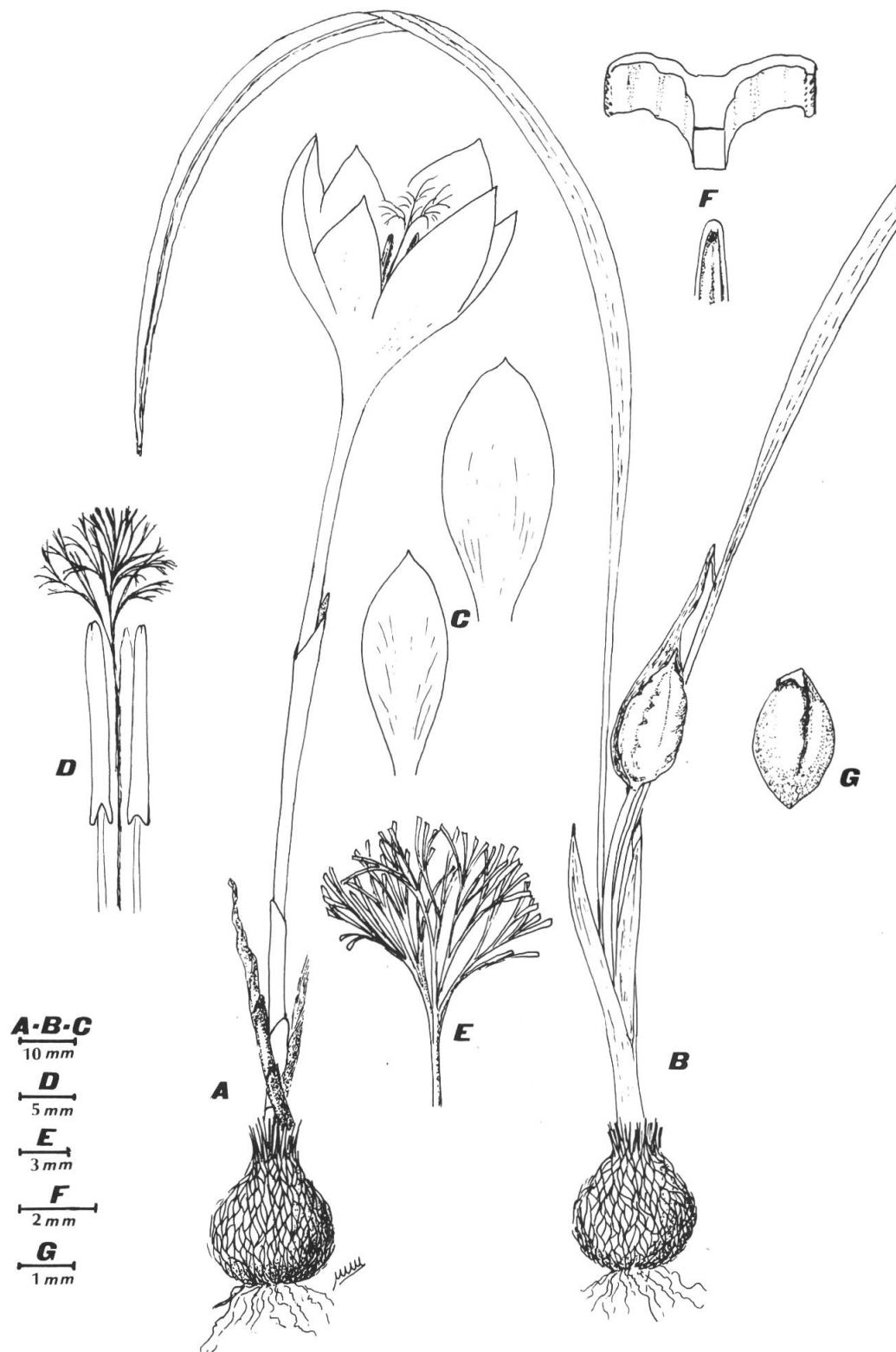


Fig. 6. — *Crocus ligusticus*: **A**, autumnal specimen with flower; **B**, spring specimen with leaves and fruit; **C**, outer and inner perigonal segments; **D**, anthers, styles and stigmas; **E**, stigmatic bundle; **F**, two details of a leaf (cross section in the middle and apex); **G**, seed.

whitish. Throath 4-20 × 5-15 mm, unbearded, pale violet or whitish, internally faintly veined. Perigonial segments glabrous, violet, marked with indistinct darker veins towards the base, concave, obovate-oblongate to ovate-lanceolate, obtuse or rounded to apiculate or acute at the apex, the outer segments 20-55 mm long and 7-22 mm wide, the inner 16-50 mm long and 7-18 mm wide. Stamens generally shorter than the style and stigmas. Filaments 2-15 mm long, yellow, slightly widened or sagittate at the base, generally about twice as long as the filaments. Pollen grains 80-110 µm in diameter, non-aperturate and echinulate. Style divided into a spreading mass of slender bright scarlet to orange branches, 5-28 mm long, included in the perigon, almost always longer than the anthers, very rarely of the same length (Fig. 3B).

Scape about 20 mm long at flowering time and 50-100 mm at the maturity of the fruit.

Capsule 16-24 mm long, 6-10 mm wide, ellipsoid, first greenish, then pale brown, bearing at its apex an awn-like prolongation, 4-6 mm long, covered by the remains of the proper spathe and tube.

Seeds about 2-3 mm long and 1.5-2.2 mm wide, ovoid to ellipsoid, reddish-brown, minutely papillose, with an indistinct raphe and a small caruncle.

It differs from the similar *Crocus nudiflorus* Smith notably in the tunic fibres being reticulate, not parallel, and the more deeply branched style.

Chromosome number

$2n = 24$; the counting was made from root tips taken from cultivated plants collected in the type locality (Roti Michelozzi & Allione, in press); the following numbers were counted in populations from other localities: $2n = 24 + 5B$ (BRIGHTON, 1976), $2n = 24 + 0.5B$ (MATHEW, 1980), $2n = 24$ (MATHEW, 1982).

Life form and phenology

Bulbous geophyte. The species flowers from mid September to mid November and has leaves and fruit from April to June.

Geographical distribution

This species has a narrow distribution area limited to the Maritime and Ligurian Alps and the Ligurian Apennines: it extends westwards to Mt. Mulacier, Gorbio and Roquebrune, eastwards to Pignone (Province of La Spezia), northwards to the "Langhe" of Belbo Valley, to the Gorzente and Lemme Valleys (on the northern side of the Ligurian-Piedmontese Apennines) and Varese Ligure (in eastern Liguria). There is a relative disjunction of the eastern populations which occur on ophiolitic soils; this disjunction is shared by other plants and seems to be due to the presence of the marly-calcareous outcrop of Mt. Antola east of Genova.

The record of this species (sub: *C. medius* auct.) from Oldenico near Vercelli (PARLATORE, 1860), handed down sometimes doubtfully to the present day (PIGNATTI, 1982), is wrong and has resulted in a confusion of names, owned by Parlatores himself (handwritten note in FI). The specimens collected in this locality (FI and RO), correspond to *C. vernus* Hill.

The distribution range based on reliable bibliographical data as well as exsiccata and personal observations is shown on a UTM grid map divided into 25 km² squares (Fig. 7).

Specimina visa selecta

Entre Roquebrune et Gorbio, 15.11.1876, *W. Barbey* (G, G-BU); entre Gorbio et Roquebrune, 12.1876, id. coll. (G); *ibid.*, 6.9.1871, *Burnat & Moggridge* (G-BU); near Roccabruna, west of Mentone, 14.6.1871, *Moggridge* (FI); *ibid.*, 25.10.1871, id. coll. (FI, G-BU); *ibid.*, 25.10.1872, id. coll. (G-BU); près Roccabruna à l'ouest de Menton, 10.4.1871, id. coll. (G-BU) pro parte; a Roquebrune près Menton, 23.10.1873, id. coll. (G-BU); Roccabruna borgata Comba, 800 m, 10.10.1986, *A. Belliardo* (TO); Bois de Ferguet, 9.9.1885, *Barla* (G-BU); *ibid.*, 2.9.1891, id. coll. (G-BU); supra

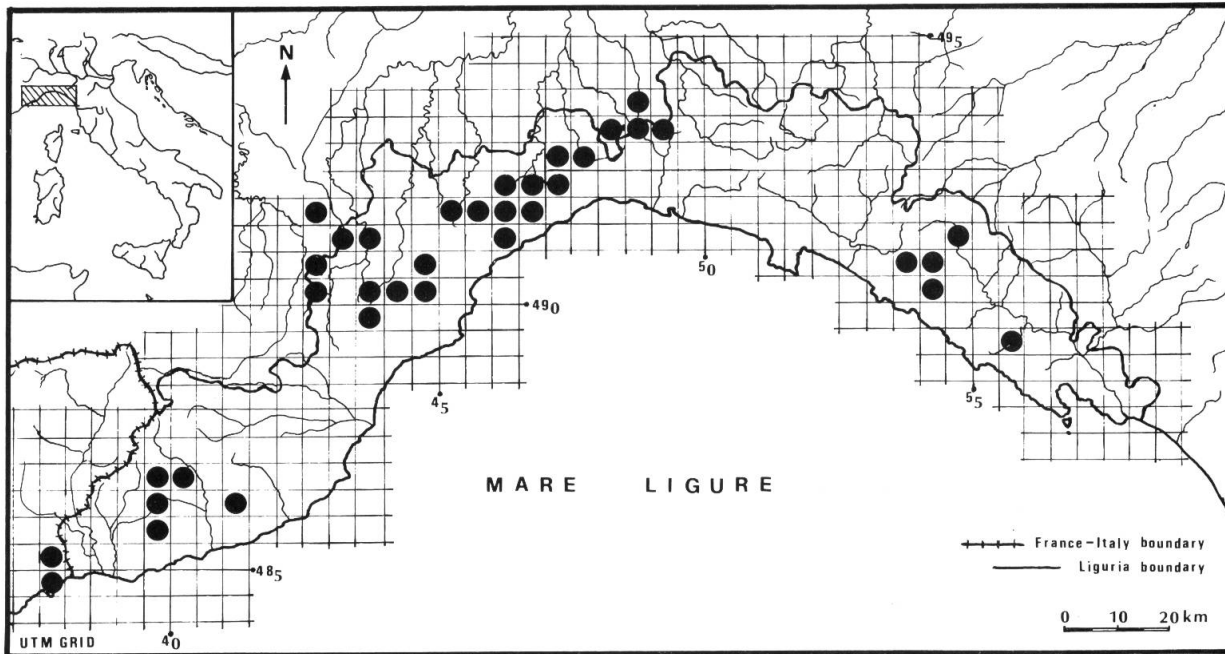


Fig. 7. — Actual known distribution of *Crocus ligusticus*.

Mentone, 10., Ardoino (RO-Ces); Colli della Liguria, 1824, *Badarò* (TO); Colli della Liguria occid., 1825, id. coll. (BOLO-Bertol); Case Langan au-dessus de Val Nervia, 1100-1200 m, *Bicknell* (G-BU); S. Romolo presso Sanremo, 11., da Panizzi 1847 (FI); M. Bignone St. Remo, 5.1876 et 23.10.1877, *Maw* (FI); M. Bignone supra Sanremo, 1200 m, 25.10.1903, *Bicknell & Pollini* (FI, GDOR, S, TO); ibid., 1290 m, 5.10.1909, id. coll. (G); M. Bignone sopra Sanremo, 11.10.1886, *Bicknell* (FI, GE); ibid., 14.10.1891, id. coll. (FI, G-BU, TO); ibid., 1200 m, 14.10.1891 et 11.6.1892, id. coll. (TO, RO); ibid., 11.6.1892, id. coll. (TO); ibid., 24.10.1892, id. coll. (TO); ibid., 7.10.1897, id. coll. (S); ibid., 4.1898 et 9.1898, id. coll. (G-BU); ibid., 24.10.1900, id. coll. (G); Sanremo M. Bignone, 10.1903, id. coll. (S); M. Bignone supra Sanremo, 1200 m, 12.10., id. coll. (FI); ibid., 7.10.1897, *Pollini* (FI, G); M. Ceppo supra Bajardo, 1500 m, 13.10.1899, *Bicknell* (FI); in montibus Dolcedo, s.d., *Berti* (FI); Massimino, salendo al Colle dei Giovetti, 550 m, 10.10.1935, *Vignolo-Lutati* (TO); Ceva in Valle Belbo, 2.4.1863 et 25.4.1864, *Romano* (G-BU, TO); in sylvis della Sparpagliata, Ceva, 11.5.1865, id. coll. (TO); Sale, 11.1863, *Figone* (TO); ibid., 25.4.1864, *Romano* (TO); Sale prope puteum ferrovia, 2.4.1863, *Romano & Figone* (TO); Sale prope Cebam, 25.4.1864, id. coll. (TO); Sale Langhe, 600 m, 13.10.1937 et 7.5.1938, *Vignolo-Lutati* (FI); Millesimo a N del Castello di Cosserria, 600 m, 25.10.1936, *Vignolo-Lutati & Fontana* (TO); Millesimo a sinistra della strada per Roccavignale al km 0.5, 540 m, 25.10.1936, id. coll. (G, TO); Millesimo verso Roccavignale, 430 m, 26.4.1937, id. coll. (TO); Millesimo, 16.4.1937 et 19.10.1937, id. coll. (FI); Colle S. Giacomo, pendici M. Alto, 17.10.1984, *Mariotti* (GE, Herb. pers.); Altare, 460 m, 18.10.1896, *Mezzana* (FI); ibid., 17.10.1984, *Mariotti* (Herb. pers.); Costa del Prato a Cà di Barletto pr. P. so di Cadibona, 460 m, 18.9.1896, *Mezzana* (RO); ibid., 25.10.1904, id. coll. (FI, RO); ibid., 25.10.1904 et 28.5.1905, id. coll. (FI, RO); presso le Ferriere di Montenotte, 17.10.1984, *Mariotti* (Herb. pers.); M. Ermetta presso Savona, da Moretti, 5.1850 (FI); supra Varazze, M. Beigua, 700-1000 m, 28.9.1890, *Chioventa* (RO); M. Begora supra Varazze, 15.4.1909 et 14.10.1909, *Gresino* (FI); M. Ermetta, Appennino Ligure, 10.1903, id. coll. (FI); M. Beigua, s.d., *Sbarbaro* (FI); M. Beigua, dint. di Bric Resonau, 30.8.1962, *E. Martini* (GE); pr. Bric Ciasso nella Valle del Rostiolo, 17.10.1984, *Mariotti* (Herb. pers.); presso il Dan nella Valle del Rostiolo tra Vara e Piampaludo, 17.10.1984, id. coll. (Herb. pers.); M. Reixa ad Arenzano, 8.10.1905, *Bevilacqua* (GDOR); in montibus supra Voltri, aut. 1856, *Baglietto* (CHE, S); Appennino di Voltri, 9.1856, id. coll. (RO); ibid., 10., id. coll. (RO-Ces, TO); Voltri, 10.1856, *Caldesi* (RO-Ces); M. Dente, 3.10.1878, *Canepa* (RO); M. Dente sull'Appennino di Voltri, 3.10.1878, s. coll. (RO); prope Masone, 28.10.1846, *Delponte* (TO); alta Valle del Gorzente

Table 1. — Phytosociological data of ten stands where *Crocus ligusticus* is common.

<i>Crocus ligusticus</i>	V		
<i>Festuco-Brometea</i>			
<i>Brachypodium pinnatum</i> *	V	<i>Helianthemum nummularium</i>	
<i>Festuca ovina</i> s.l.	III	subsp. <i>obscurum</i>	II
<i>Anthyllis vulneraria</i>	II	<i>Hippocrepis comosa</i>	II
<i>Asperula aristata</i>	II	<i>Hypericum perforatum</i>	II
<i>Carlina acaulis</i>	II	<i>Leontodon hispidus</i>	II
<i>Centaurea lunensis</i>	II	<i>Potentilla hirta</i>	II
<i>Galium corrudifolium</i>	II	<i>Silene vulgaris</i>	II
<i>Galium verum</i>	II	<i>Trifolium ochroleucon</i>	II
<i>Molinio-Arrhenatheretea</i>			
<i>Achillea millefolium</i>	III	<i>Prunella vulgaris</i>	II
<i>Centaurea jacea</i> s.l.	III	<i>Stachys officinalis</i>	II
<i>Taraxacum officinale</i>	III	<i>Trifolium pratense</i>	II
<i>Dactylis glomerata</i>	II	<i>Trisetum flavescens</i>	II
<i>Daucus carota</i>	II	<i>Anthoxanthum odoratum</i>	I
<i>Euphrasia rostkoviana</i>	II	<i>Knautia arvensis</i>	I
<i>Leucanthemum vulgare</i>	II	<i>Sanguisorba officinalis</i>	I
<i>Plantago lanceolata</i>	II	<i>Succisa pratensis</i>	I
<i>Nardo-Callunetea</i> Preisg. 1949 and forest reconstitution phases			
<i>Genista pilosa</i>	IV	<i>Fraxinus ornus</i>	I
<i>Calluna vulgaris</i>	III	<i>Genista januensis</i>	I
<i>Erica herbacea</i>	III	<i>Juniperus communis</i>	I
<i>Sesleria autumnalis</i>	III	<i>Pinus nigra</i> (introduced)	I
<i>Cruciata glabra</i>	II	<i>Pinus pinaster</i>	I
<i>Erica arborea</i>	II	<i>Pinus sylvestris</i>	I
<i>Fragaria vesca</i>	II	<i>Plantago serpentina</i>	I
<i>Hepatica nobilis</i>	II	<i>Potentilla erecta</i>	I
<i>Peucedanum cervaria</i>	II	<i>Quercus ilex</i>	I
<i>Ranunculus lanuginosus</i>	II	<i>Quercus pubescens</i>	I
<i>Viola riviniana</i>	II	<i>Sorbus aria</i>	I
<i>Castanea sativa</i>	I	<i>Vaccinium myrtillus</i>	I
<i>Fagus sylvatica</i>	I		
Other serpenticolous species			
<i>Genista salzmanni</i>	I	<i>Euphorbia spinosa</i>	
<i>Allium cirrhosum</i>	I	subsp. <i>ligustica</i>	I

*Except for *C. ligusticus*, the nomenclature is according to PIGNATTI (1982).

Vallino (TO); Valle media del Gorzente sotto il serb. Acque Ferrari, 5.10.1905, id. coll. (TO); M. Pasucco, valico dei Serbatoi Acq. De Ferrari Galliera, 16.10.1942, *Cucini* (SIENA); Molini di Voltaggio, 24.10.1900, *Gestro* (FI, G, GDOR); alle falde del M. Lecco sopra Molini di Voltaggio, 4.10.1908, *Ferrari, Vallino & Gola* (TO); M. Lecco alla Bocchetta di Voltaggio, 1908, *Vallino* (TO); in montibus Liguriaie orientalis, s.d., *Viviani* (RO-Ces); in Liguria orientali a Varese in herbis l.d. il Rosario, 18.9.1813, *Bertoloni* (BOLO-Bertol); e Varese, a J. B. Rossi 1829 (BOLO-Bertol); P.so del Bracco, 12.10.1984, *Mariotti* (Herb. pers.); P.so del Bocco di Bargone, 900 m, 2.10.1983, *Mariotti, Barberis & Rametta* (GDOR, GE, Herb. pers.); ibid., 12.10.1984, *Mariotti* (FI); presso Pignone, 20.10.1980, id. coll. (Herb. pers.); ibid. 12.10.1984, id. coll. (Herb. pers.).

Ecology

This species occurs at altitudes ranging from 200 m to 1200-1300 m, in the westernmost part of the distribution area even to 1600-1880 m. *C. ligusticus* generally avoids hot sunny exposures at lower altitudes and cold shady places at higher altitudes. It therefore occurs in different climatic belts, in grassy formations, which are transitorily or permanently kept by man. These formations arose after the ancient destruction of forests of *Quercion ilicis* Br.-Bl. (1931) 1936, *Quercion pubescentis* Br.-Bl. 1931 and *Fagion sylvaticae* s.l., but now fall into the category of *Festuco-Brometea* Br.-Bl. & Tx. 1943 and *Molinio-Arrhenatheretea* Tx. 1937.

Table 1 gives the phytosociological data of ten localities between Mt. Bignone and Pignone; both grassy formations (*Festuco-Brometea* and *Molinio-Arrhenatheretea*) and forest reconstitution phases are displayed.

Variation

Macro-morphological observations

The main qualitative and quantitative characters of 600 specimens, including 150 which were collected at fruiting time were analyzed for the description. A biometric analysis revealed wide individual variation. It was not possible to compare correctly the Alpic and the Apenninic populations because of the preponderance of Alpic specimens.

Micro-morphological observations

Seed teguments and pollen grains of specimens collected at Colla S. Giacomo (province of Savona), Passo del Faiallo (provinces of Savona and Genova), Passo del Bocco di Bargone (province of Genova and La Spezia), were observed by SEM. The material was coated with gold using Edward S150A Sputtering apparatus, observed under the Philips 501B Scanning Electron Microscope at different voltages (7.2-154 kV) and photographed at different magnifications with a Nikon FM camera.

The pollen grains are always non-aperturate, with an echinulate surface; the echinula were conic-pointed, about 1.2-1.9 μm long, homogeneously disposed except in a little hollow where the pollen is thought to develop (Fig. 4A, 4B).

The seed-coat surface is covered with papillae, finger-like projections, rounded at the apex, 2.8-4.5 μm long, occurring in short, more or less parallel rows (Fig. 5). The arrangement of the papillae of the seeds collected in the Ligurian Alps (Colla S. Giacomo) seems to be more regular than that of seeds collected in the Ligurian Apennines (Passo Bocco di Bargone). However, this difference seems to be taxonomically insignificant.

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