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BOTANY, TAXONOMY AND CYTOLOGY OF *CROCUS SPECIOSI* SERIES

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ABSTRACT

The genus *crocus* (Family- Iridaceae or Iris) contains Ca. 150 small, corm bearing, perennial species distributed, C.S. Europe, N. Africa, S. Asia and W. China. These species are highly valuated as ornamental plants of their colourful flowers, horticultural Varieties and industrial applications. Sub- genus *crocus* - *crocus speciosi* series are closely related species; and are difficult To be separated taxonomically and have a complex cytology. Botany of *crocus speciosi* series, taxonomy of their species and their infra-specific taxa are presented, and their distribution, ecology and phenology; description and chromosome counts are provided with key of their identification.

Key words: Crocus, Taxonomy, Geographic area, Cytology, Chromosome, *Crocus speciosi* series.

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INTRODUCTION

Crocus is a genus of flowering plants in its Iridaceae or Iris family comprising approximately 150 taxa, [1] divided into two Sub-genera [2], which is not supported by recent phylogenetic research [3]. Two sections sub-divided into 15 series. Later, one more series was added [4] and one series was moved to another section. A species evolution is generally accompanied or followed by partial changes in the chromosome complement and there can be few genera where such a wide range of variation occurs. The variation is, however, difficult to deal with or without informations of breeding systems, hybridization potential and the production of hybrids. So far, it has only been possible to make a comparative analysis of chromosome number and morphology, but these differences and similarities can be significant, and may well indicate barriers to successful inter-breeding. Although similar karyotypes do not reveal the presence of symmetrical structural changes, it may generally be assumed that if the phenotypes are also alike, thereis a probability that there are no barriers in gene exchange. If karyotypes are observably different than interbreeding isless likely [5,6]. Such chromosome barriers are of obvious importance and can lead on the further divergene which may eventually give rise to acceptable species. The closely related species have difficult to separate taxonomically and have also been found to be complex cytologically, and have been treated as series [7-9]. These physiological features have been discussed by the genus into a hierarchy of sub-genera, section and series of *crocus speciosi*.

BOTANY

Domain	Eukaryota
Kingdom	Plantae
Sub-kingdom	Viridaeplantae
Phylum	Tracheophyte
Sub-phylum	Euphyllophytina
Infra-phylum	Radiatopses
Class	Spermatopsida
Sub-class	Liliidae

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Super-order	Lilianae
Order	Asparagales
Family	Iridaceae or Iris
Sub-family	Crocoideae
Tribe	Lxieae
Genus	*Crocus*

Genus crocus: Herb: small, perennial, cormous. Corm: oblate, covered with tunic. Leaves: few, all basal, green, linear, adaxially with pale, median strips, base surrounded by membranous, sheathi like leaves. Aerial stems: not developed. Flowers: emerging from ground, with peduncle and ovary subterranean. Perianth: white, yellow or lilac to dark purple. Tube: long, slender, segments similar, equal or sub-equal. Stamens: inserted in the throat of perianth tube. Style: 1, slender, distally 3 to many branches. Capsule: small, ellipsoid or oblong-ellipsoid [10]. Section: Nudiscapus - species without a basal prophyll. Series speciosi: It belongs to those which look very natural and well supported as a monophyletic group. Corm tunic splits into at the base, leathery or membranous, foliage after flowers, autumn flowering. Style much divided.
The following species of crocus are induced for description:

Crocus pulchellus Herbert w. [2, 11 – 18]
Synonym (s): *Crocus constantinopolitanus*Hertoldt ex Maw.
Common name: Hairy crocus, Mount Athos crocus.
English name: Hairy crocus.

C. *pulchellus* is an autumn - flowering species that is popular in garden. It was first recorded from wild in 1983. It is an extremely accommodating plant, growing well in both full sun or semi-shade and is a good species for naturalizing in grass.`Pulchellus` means beautiful and small - beautiful, certainly but nowhere near the smallest autumn crocus. Habitat: open Woods, S.E. part of Balkan Peninsula. Occurs: W. Turkey, S. Bulgaria, S. part of Yugoslavia, N. Greece (Macedonia) and someIslands in the northern part of the Aegean sea-Thasos, Samotraki and Chios. Alitude: 50 - 1800 m. Height: 10 - 13 cm. Native distribution: E. Aegeanls, Turkey, Bulgaria, Greece, Turkey - in - Europe, Yugoslavia. Ecology: a cormous perennial herb which is planted and naturalized in churchyards. Low land.Corm: tunic coriaceous splitting rings at the base. Leaves: 4 - 6 mm, green. Flowers: strong, delicate veining, never speekled or dotted on the outside. Throat: dark yellow, tube often tinged with yellow near the apex. Perianth tube: present. Segments: 2.3 - 4 x 1.3 - 2 cm. obovate filaments yellow densely pubescent. Anther: white. Stigma: few (6-9) in tight bunch, branches, hidden among anther. 2n = 12.
Phenology: Flowering: September - November.
Characteristics: C.*pulchellus* can be easily mistaken for *c. kotschyanus ssp. Kotschyanus* flowers: both have white pollen, yellow to orange branched filaments and similarly marked floral segments. One needs to get up fairly close to see the zonein the centre of the flower -in- *c. pulchellus*, the yellow is formed by solid bands of colour at the base of each right petals in *c.kotschyanus* by two yellow blotches, usually coalescing to form a `V` shaped marking, shown here on the left. Underground, things are a little easier - *c. pulchellus* has obvious rings around the base of the corm where *c. kotschyanus* does not. *C. pulchellus* smaller in size than its closest relative *c. specious*. The most important morphological differences are dark Yellow, even orange throat (somewhat similar are those of *c. specious* ssp. *xantholaimos*, ssp. *archibaldiorum*, ssp. *Ibrahimii* and *sakariensis*, but of a paler shade), hairy filaments (papillose or nude in most forms of *c. speciosus* except ssp. *Ibrahimii* and white anther (usually yellow in *c. speciosus*, white in ssp. *Ibrahimii* and can be either in ssp. *elegans)*. The flowers of *c.pulchallus* have strong, delicate veining but they are never speckled or dotted on the outside as in common in *c. speciosus*. *C. Speciosus* has distinct secondary veining on the perianth segments, not present in *c. pulchellus*. It blooms later than various *forms* of *c. speciosus*. It is plant from moist meadows but it grows in the quite dry spots as well. Although being quite similar and requiring similar conditions, they have never been recorded growing together in the wild.

Crocus pulchellus` zephyr` [11, 19 -21].
This has been taken from plant files.
Synonym : *Crocus pulchellus* Zephyr
Common name: Autumn crocus, Fall crocus - crocus pulchellus ` Zephyr`, Crocus zephyr.
Cultivar name: Zaphyr.
Category: Alpine and Rock Gardens bulbs. Origin: Balkans. Habit: tufted. Growing region: Garberville, California Olathe, Kansas Cayuga Heights New York. Wild habitat:dampturf and in thin woodland or scrub. Native climate: Mediterranean. Height: 13 cm, vigorous. Spread: 0 - 0.1 m. Time of ultimate height: 2 - 5 years. Distribution: Maeedionia, Serbia, S.Bulgaria, N. Greece, Turkey. Corm: tunic coriaceous, splitting rings at the base. Leaves: green, grassy-like with a longitudinal white strip along the midrib, 6 cm. long, 3 mm. wide, emerging after flowers. Flowers: 5 cm. deep, 4 cm wide, opaque white flushed violet-blue with darker vein, solitary, 4 cm. long, 9 - 12 cm. tall, fragrance. Anther: white. Filament: hairy. Throat: deep yellow. Style: orange, much branches. Foliage: green in autumn and winter, veined. Phenology: Flowering: September - October.
Characteristics: *C. pulchellus*, closely related to *c. specious* is also offered by some garden centries but the message here is` buyer beware` as some Dutch stocks are mixed hybrids with *c. specious*. These two species combine to produce a range of intermediate forms, some of which are very attractive; however few have the delicate forms of true *c. pulchellus*. In the wild the two species, *c. pulchellus*, the more western, being common. The

hybridizer year was 1940, but no-one seems sure of its origin. Due to very large flower form, possible of hybrid origin is called `Zaphyr`. The yellow throat flowers with white anthers (the two obvious differences with *c. speciosus*). They have a distinctive goblet shape and are carried on stronger tubes then *c. speciosus*.

Crocus speciosus Bieb M [22]

The specific epithet speciosus means ` Showy`.

Common name: Bieherstein`s crocus, Large autumn crocus, Fall blooming crocus. Habit: tufted. Habited: woods or alpine meadows, clearing in forest on limestone or non-calcareous formation. Native: N. Turkey, Greece, Iran. Height: 10 cm. Spread: 0 - 0.1 m. Time of ultimate height: 2 - 5 years. Flowers: silvery lilac - blue flowers in autumn, with darker vein. Throat: white. Leaves: developing after flower. Foliage: green.

Phenology : Flowering : September - October.

Crocus speciosus* ssp. *Speciosus Bieb M. [2, 23- 26].

Habitat: woods or alpine meadows, clearing in forest on limestone or non- calcareous formation. Distribution: Crimea (Ukraine) and Caucasus (Russia, Armenia, Georgia, Azerbaijan, Turkey). Altitude: 800 - 2500 m. Locality: Caucasus mountain. Corm depressed: globase, 8 - 25 mm. diameter, sometimes with cormlets at its base, tunic coriaceous with distinct basal rings at the base and a long brown neck of old cataphyllus at the apex. Cataphylls: 3 - 4. Leaves : 3 - 5, deep green, hysteranthous, emerging long after flowering, glabrous or with ciliate or scabrid margin or pubescent on the upper lamina, 4 - 10 mm. wide and up to 37 cm. long, without ridges in lateral channels. Flowers: 1-2, 13-25 cm. tall, lilac blue usually conspicuously vained darker, usually with distinct secondary veining, sometimes silvery or whitish on the cutside or with a darker speckling. Throat: glabrous, whitish or faintly yellow, rarely yellow (Armenia). Prophyll: absent. Bract and bracteole: subequal, membranous. Perianth tube: 5 - 20 cm. long, white or purplish toned in upper part. Segments: 3 -7 cm. long, inner distinctly broader than outer up to 2.2 cm. wide. Filaments: white or light yellow, glabrous or minutely papillose, 4 - 11 mm. long. Anthers: yellow, 2.5 - 3 times longer than filaments. Style: divided at the top of anthers into many yellow to deep orange slender branches well overtopping anthers. Capsule: carried just above ground level at maturity. Seed: reddish - brown, nearly globase, up to 3 mm. in diameter. 2n =14 (Caucasua), 18 (Crimea).
Phenology: Flowering: September to November.

Crocus speciou*s ssp. *xantholaimos Mathew [2, 24- 26]

The new ssp. from Northern Turkey first found many years ago by Dr. Tom Norman.
Common name: Autumn crocus, Crocus.
Habitat: clearings in Abies and Rhododendron forest, alpine turf (Yaila) and stony hill-side on limestone formations. Distribution: N. Turkey (Sinop). Altitude: 1150 - 1300 m. Locality: Turkey, Sinop Prov., passes between Kabali and Boyabat. Corm: tunics membranous and splitting into horizontal rings at base. Leaves : narrow, deciduous, simple, alternate, linear and sessile with entire margins and parallel venation, 3 - 5 number hysteranthous, 4- 20 x 0.1 - 0.25 cm., dark green colour with distinct median with stripe.Flowers : solitary, lilac or dark lilac. Segments: 1.5 - 8.0 cm. length, oblong in shape. Perianth tube: 5- 13 cm. length, yellow, sparsely pubescent. Throat : deep yellow. Style: many branched but shorter than anthers. Capsule: 0.6 - 1.0 cm. length, loculicidal. Seeds: 0.5 - 1.5 mm. diameter, dark reddish brown. 2n = 10.
Phenology: flowering : September.

Crocus speciosus* ssp. *Ilgazensis Mathew [2,13,14,19,26]

Habitat: clearings in Abies forest, turf on stony hillside on limestone formation. Distribution: N. Turkey (Cankiri and Amasya). Altitude: 1600 - 1850 m. Types locality: Turkey, Cankiri Prov., Ilgaz Dag pass, 1700 m. Corm: tunic membranous, splitting into vertical fibres without distinct horizontal rings at the base. Leaves: 5 - 6 in number, hysteranthous and about 8 - 11 cm. length, 0.1 - 0.2 cm. in width, dark green with a distinct median white strips. Flowers: 1 - 2 in number, lilac - blue with 2 - 4.5 cm. long, generally smaller. Perianthtube: 2 - 11 cm. length. Segments: 3 -5 cm. long, lanceolate. Throat: white. A small part of the tube remains under - ground. Style: divided in 6 - 8 branches, hidden among anthers, coloure. Capsule: 0.8 - 1.0 cm. length. Seeds: 1 - 1.5 mm. diameter, dark reddish - brown in color. 2n = 6, 8. Phenology: Flowering: September - October.

***Crocus speciosus*s ssp. *archibaldiorum*.** Ruksans [13]

The general description is same as ssp. *speciosus* except the following characteristics: Habitat: steep mountain slopes in turf or at Fagus forest sides and among shrubs, on limestone formations. Distribution: N.E. Iran (Mazandaran, Gilan), S. Azerbaijan (as C. *polyanthus* Grossheim, nom. Illeg). Altitude: 650 - 1200 m. Type locality: Iran, Kuhho-ye-Tales, between Nov and Khalkhal, steep mountain slopes just before pass 2080 m. Corm: coriaceous, tunic without a prolonged neck. Basal rings: present. Leaves: develop soon after flowering, 4 - 6 mm. width. Flowers: whitish from the outside with minutely branched, comparatively wide lilac strips from the bottom of the segments up to the tip. Throat: yellow. Anther: yellow. Stigma: many short branches, ending at the level of or overtopping the anther. 2n = 12. Phenology: Flowering: October.

Crocus speciosus* ssp. *Ibrahimii Ruksans [27]

The general description is the same as mentioned in ssp. *specious* except the following characteristics: Habitat: clearing in Quercus forests and heath on the limestone or non-calcareous formations. Distribution:

Turkey, perhaps also found in adjacent S.E. Bulgaria. Alitude: 100 - 400 m. Time locality: Turkey in Europe, near Canakca. Corm: tunic, coraceous. Tunic neck: short or without. Basal rings: present. Leaves: 1.5 4 (5) mm. Throat: yellow. Filaments: hairy. Anther: white. Stigma: many branched, overtopping to anthers.
Phenology: Flowering: October - November.

Crocus speciosus ssp. ***sakariensis*** Ruksans [17]

The general description is the same as mentioned in ssp. *specious* except the following characteristic: Habitat: in shade under Corylus and among young plantings in full sun, on humus -rich gravelly clay. Distribution: known only from the type locality. Altitude: 50 150 m. Type locality: Sakarya. Corm: tunic, membranous, without basal rings. Leaves: 3 - 6 mm. wide. Perianthtube: 10 cm. long. Segments: 30 - 35 mm. long. Throat: deep yellow. Anthers: yellow. Stigma: many branched, well overtopping anther.
Phenology: Flowering: October - November.

Crocus speciosus ssp. ***bolensis*** Ruksans [17]

The general description is the same as mentioned in ssp.*speciosus* but the following characteristics: Habitat: on open alpine truf (Yaila) and in clearing of Pinus and Abies forests. Distribution: Turkey - Abant, Bolu and Gokceler Dag. Altitude: 850 - 1700 m. Type locality: Turkey - height above Lake Abant. Corm: coriaceous, long, with basal rings. Leaves: 3 - 4 (5) mm. Throat: white. Anther: yellow. Stigma: many well branched, but ends below the tips on anthers. 2n = 8.
Phenology: Flowering: October - November.
Characteristics: Flowers are smaller than in the type subspecies, generally nicely striped. From ssp. *ilgazenis* well separable by the distinctly - branched stigma, from ssp. *kantholaimes* by the white thread.

Crocus speciosus **ssp.** ***Hellenicus*** Ruksans [17]

The general description is the same as mentioned in ssp. *speciosus* but with the following characteristics: Habitat: on Yailas at forests edges and on mossy slopes, on limestone. Distribution: Greece, Three disjunction localities in Loannina, Etoloakirnania and Fokida. Altitude: 500 - 1350 m. Type locality: Greece, Loannina, Vikos Canyon, nr. Monodenri. Crom: tunics membranous, with weakly developed basal rings, without prolong neck. Leaves: narrow, 1 - 3 (4) mm. wide. Throat: white. Anthers: yellow. Stigma: many branched, overtopping on anthers.
Phenology: Flowering: October - November.

Crocus speciosus **ssp.** ***elegans*** Ruksans. [17].

The general description is the same as mentioned in ssp. *speciosus* but with the following characteristics: Habitat: on clearing and edges of Abies forests and rocky out crops. Distribution: Turkey – Geyik Daglari (known from two localities) and Gorece Dagi and possibly western most and of Akcali Daglari. Altitude: 1400 - 1700 m. Type locality: Turkey - Konya province, south of Sugla Golu. Corm: tunics membranous, splitting longitudinally into strips, basal rings indistinct. Long neck formed by old cataphylls present, but thin and very brittle. Leaves: 4 mm. wide. Throat: white. Anthers: white (Yellow. Stigma: many branched, overtopping anthers. 2n = 18. Phenology: Flowering: October – Noverber [27].

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