

**BOTANY, TAXONOMY AND CYTOLOGY OF *CROCUS KOTSCHYANI* SERIES****Dr. R.B. Saxena\***

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**ABSTRACT**

The genus *crocus* L. consists currently of about 160 recognized species, small, corm bearing, perennial species having an old world distribution, primarily in Mediterranean – West Europe and NW Africa to W China, with the center of species diversity on the Balkan Peninsula and in Turkey. Recent phylogenetic analysis proved several infrageneric units within the genus *crocus* to be para or poly-phyletic. In an attempt to arrive at a system of *crocus* that closely reflects species relationships, here phylogenetic, morphometric, geographic and nomenclatorial data for the species of narrower-defined, monophyletic *crocus* series *kotschyani*. *Crocus* series *kotschyani* are closely related, and are difficult to be separated taxonomically and have complex cytology. Botany of *crocus kotschyani* 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 to their identification.

**KEYWORDS:** *Crocus*, Geographic area, Botany, Chromosome, Cytology, Phenology, *Kotschyani* series.**INTRODUCTION<sup>[1-9]</sup>**

The genus *crocus* L. consists currently of about 160 recognized species occurring from W Europe and NW Africa to W China, with the center of species diversity on the Balkan Peninsula and in Turkey. Mathew divided into sub-genera (not supported recent phylogenetic research) and two-sections and sub-section divided into 15 series. Later, one more series was added and one series was moved to another section. The species discovered since then have been integrated into this classification, distributed sea (Portugal and W Morocco), Europe to W China and Mongolia. The center diversity of the genus in Turkey with more than 70 taxa and Greece with 33 taxa. The study shows no support for a system of section as currently defined, although despite the many inconsistencies between Mathew classification and current hypothesis.

The 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 information of breeding system, hybridization potential and the production of hybrids. So far, it is only 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 changes, it may generally be assumed that if the phenotypes are also

alike, there is a probability that there are no barriers to gene exchange. If karyotypes are observable different than inter-breeding as less likely. Such chromosome barriers are of obvious importance and can lead on the further divergence which may eventually give rise to acceptable species. The closely related species have been difficult to separate taxonomically and have also been found to be complex cytological and have been treated as the series.

**TAXONOMY<sup>[10,11]</sup>**

The taxonomic classification of the *crocus kotschyani* series as follows.

01. Division	Spermatophyta.
02. Sub-division	Angiospermae
03. Infra-division	Radiatopses
04. Class	Monocotyledonae
05. Sub-class	Liliidae
06. Order	Liliales
07. Family	Iridaceae
08. Sub-family	Crocoidae
09. Tribus	Croceae
10. Genus	<i>Crocus</i>

**Genus *crocus*:** Herb: small, perennial, cormous, deciduous. Corm: usually symmetrical, enclosed by several tunics of variable texture and colour. Cataphyll: up to 5, sheathy the aerial shoot. Leaves: appearing with or after the flowers, all basal, flat or channeled (canaliculated) on the upper surface, lower surface usually strongly keeled usually with two grooves,

deciduous, simple, alternate, linear and sessile with entire margins and parallel venation, 5-8 cm. high. Flowers: scape absent, one to several, each on a short, subterranean pedicel which is sometimes subtended by a membranous, sheathing prophyll. Bract: membranous. Bracteole: similar or reduced or absent. Perianth: regular, tube long and narrow, glabrous or with ring of hairs in the throat at the intertion of the filaments, segments usually sub-equal. Anthers: usually extrose. Style: 3 lobed to multifid. Ovary: sub-teranean. Fruits: capsule cylindrical or ellipsoid, maturing or above ground level by elongation of pedicel. Seeds: numerous, usually globose or ellipsoid, brownish or reddish, with a strophiole.

**Section *crocus*:** species with a basal prophyll.

**Series *kotschyani*:** Autumn-flowering, anthers white, style for the most part three-forked.

***Crocus autranii* Albov<sup>[12-17]</sup>**

**History:** *Crocus autranii*, is one the rarest and most sought autumn crocuses growing in very few collection. In nature it is only found in a gorgr of Abkhazia in the Caucasus, so no chance to collect additional material in the wild. It is ornamental plants from Russia. *C. autranii* was described by Nicholas Mikhailovic Albov in 1893. *Autranii*: epithet.

**Common name:** Species *crocus*, *Crocus*.

**Herb:** small, perennial, cormous. **Locality:** Transcaucasii: crete Bzybienne, paturayes alpine. **Country:** Georgia. **Found:** Asia-Temperate- Caucasus Transcaucasii. **Plant range:** Caucasus (W. Transcaucasus). **Native climate:** cold snowy winter, cool summer. **Wild habitat:** mountain meadows and limestone on slopes. **Plant:** 10 – 20 cm. **Distribution:** Caucasus/Abchasia (known only from this region). **Life form:** tuber geophytes. **Altitude:** 2300 m. asl. **Availability:** very rare in cultivation. **Corm:** globose, small, tunic membranous, thin. **Leaves:** very narrow, glabrous, un-developed flowering time. **Flowers:** dark lilac purple, very close to Scharojani are vallicol species, but flowers are large squat, darkened veined chisel. Flowers are white with large apparent throat. There is no obvious line very rarely it has a pale yellow spots. **Filaments:** white. **Anthers:** white. **Pollen:** white. **Styles:** yellow, divided into 3 arms, each fentre pasturages alpines. Plants D`abkhasie. **Fruit:** loculicidal. **Seeds:** many, different shaped, brown.  $2n = 32$ .

**Phenology:** September – October.

***Crocus gilanicus* Mathew B.<sup>[18-23]</sup>**

**History:** *Crocus gilanicus* is rare species from the Caspian forests of Guilan province in northern Iran (and adjacent Azerbaijan) whence it was introduced by discover, Professor Pav Wendelbo of Gothenburg in 1973. Most, if not all, of the plants in cultivation are

traceable of this introduction. B. Mathew discovered in 1973 and named after Gilan province in Iran where it was first found and described in 1975. Natively growing in Guilan province in the north part in Iran.

**Common name:** Species *crocus*, Autumn *crocus*, *Crocus*.

**Herb:** small, perennial, cormous. **Found:** Asia-Temperate: western Asia Iran. **Native climate:** continental montane, cold winter, cool summer. **Wild habitat:** forests and pastures. **Plant range:** NW Iran. **Distribution:** Iran/Gilan and Azerbaijan. Talish mountain. **Altitude:** 1500 – 2400 m asl. **Corm:** horizontal, tunic thin membranous. **Leaves:** short to grow in spring. **Flowers:** starry, medium sized, ghostly white flower, have subtlest hint of violet at the petal tips stained in a little deeper, petals lightly in hair-streaks of violet with age of the flowers often take on a faint hint, centre of the flower light sulphur-yellow. **Anthers:** white. **Filament:** white equal length. **Pollens:** white. **Styles:** yellow, on the anthers. **Fruit:** loculicidal. **Seeds:** brownish, different sizes.  $2n=24$ .

**Phenology:** August – September.

***Crocus karduchorum* Kotschy ex Maw<sup>[24-30]</sup>**

**History:** *C. karduchorum* was named in 1859 and gained an A.M. as long as 1928. The name has been misapplied since 1984 in bulb catalogus to *crocus kotschyanus* var. *leucopharynx*. The true plant available only years, is easy to grow in bulb frame through not exciting horticulturally. The true plant was only re-discovered and re-introduction to cultivation in 1974. Carl Georg Theodor Kotschy already described. *Crocus karduchorum* but the namewas validly published by George Maw.

**Common name:** Species *crocus*, *Crocus*.

**Herb:** small, perennial, cormous. **Found:** Asia-Temperate – Western Asia Turkey. **Origin:** near Lake van in NE Turkey. **Native climate:** cool, moist.montane. **Habitat:** stony, scattered Oak shrubby area. **Growth:** 10 cm. **Distribution:** endemic/Anatolia/Siirt, Bitlis. **Altitude:** 1800 – 2000 m asl. **Corm:** flat with parallel fibre membrane, corm are horizontal in nature. **Leaves:** 3-4, 1.5- 2 mm. broad, deciduous, green, simple, alternate, linear and sessile with entire margins and parallel venation, appearing long after the flowers. **Flowers:** 9 cm tall, mid lilac-blue, obvious core, born before leaves very early in the autumn, solitary, cup-shaped. **Anthers:** pale yellow. **Pollen:** white. **Filaments:** bright white, featherless. **Throat:** featherless bright white, no yellow marking. **Style:** white, flashy, very fragmented, on the anthers. Surrounded by pale yellow anther, which divided, autumn. **Fruit:** loculicidal capsule. **Seeds:** many, brownish, different shaped.  $2n=60$ .

**Phenology:** September – November.

*Crocus kotschyanus* subsp. *cappadocicus* B. Mathew.<sup>[31-39]</sup>

**Scientific name:** *Crocus kotschyanus* subsp. *cappadocicus*.

**Common name:** Species crocus, Autumn crocus, Crocus, Kotschyanus crocus.

**Canonical name:** *Crocus kotschyanus cappadocicus*

**Herb:** small, perennial, cormous. **Native:** Turkey.

**Native climate:** alpine/sub-alpine. **Wild habitat:** scattered between meadows and shrubbery with rocks.

**Height:** 8 cm. **Spread:** 0.0-0.1 m. **Time of ultimate height:** 2-5 years. **Distribution:** endemic/central & eastern Anatolia/ Kayseri, Kahramanmaras, Sivas, Erzincan, Tunnel. **Altitude:** 2000 – 2700 m. asl. **Corm:** thin membranous axous corm tunic, oriented on its side in soil. **Leaves:** deciduous, simple, arranged opposite one another, linear with entire margins, green, silvery green central stripe, sessile, parallel venation, develop in late winter. **Flowers:** cup-shaped, solitary, yellow, pale purple or dark purple or purple dark veins are very prominent, the bull ring subsp. *kotschyanus* than is dimmed and is as big a spot on each petal. Flower center around the faint lemony spotted. **Anthers:** white. **Pollen:** white. Filament: creamy, shiny and hairless. **Style:** up – right, after the level of anther vague divided into parts. Stylus bottom of the hill is lemony white and yellow. **Fruit:** loculicidal capsule. **Seeds:** many, different sizes, brownish.  $2n = 10$ .

**Phenology:** September – November.

**Characteristics:** A very distinctive flower and almost unique in the corms Being oriented on their side with a fine violet thread-like tracery. Throat being a misasic ring of yellow blotches.

*Crocus kotschyanus* subsp. *hakkariensis* B. Mathew.<sup>[37, 40-43]</sup> **Synonym:** *Crocus kotschyanus* subsp. *hakkariensis* B. Mathew. **Scientific name:** *Crocus kotschyanus* subsp. *hakkariensis*.

**Other name:** *Crocus kotschyanus* subsp. *hakkariensis*

**Herb:** small, perennial, cormous. **Native:** Turkey.

**Native climate:** cold winter, cool summer. **Wild habitat:** rocky, stony fields and scattered bushes.

**Height:** up to 10 cm. **Spread:** 0.0 – 0.1 m. **Time of ultimate height:** 2-5 years. **Distribution:** endemic/southern part of Eastern Anatolia/ Hakkari. **Altitude:** 1100 – 3250 m. asl. **Corm:** tunic membranous, corms are horizontal in nature. **Leaves:** 3-4, up to approximately 3 to 4 mm. wide, arranged opposite one another, green, start to grow in spring. **Flowers:** cup-shaped, approximately 10 cm. high, arranged solitary, hermaphrodite, hues of the pale lilac colour, veins obscure and unclear, lemony of the throat white, yellow spots in the petals turn into very small faint points. **Anthers:** white. **Pollen:** white. **Filaments:** white, hairy. **Throat:** white hairy. **Style:** bottom of the hill is white and light yellow. **Stigma:** elongant orange-yellow. **Fruit:**

loculicidal capsule. **Seeds:** many, different sizes, brownish.  $2n = 10$ .

**Phenology:** September – November.

**Characteristics:** distinctive wedge shaped petals.

*Crocus kotschyanus* subsp. *kotschyanus* Koch<sup>[37, 44-50]</sup>

**History:** Although still sometimes packaged as *crocus zonatus*, the currently recognized name for this species is *kotschyanus*.

**Synonym (s):** *Crocus kotschyanus* Koch

*Crocus zonatus* J. Gay ex Klatt.

**Common name:** Fall crocus (Misc), Autumn crocus zonatus,

**Botanical name:** *Crocus kotschyanus* subsp. *kotschyanus* Koch.

**Herb:** small, perennial, cormous. **Native:** Cilia, Labanon, Turkey, Asia, China. **Original:** horticultural.

**Habit:** erect, clump-forming. **Growing reason:**

Garberville, California, Colorado spring, Colorado

corpus Christi, Texas. **Native climate:** cold winter, cool

montane summer. **Wild habitat:** stony, scattered bushes

and grasslands. **Height:** 3-15 cm. **Spread:** 0.04 – 0.8 m.

**Maturity:** 2-5 years. **Growth habit:** stalked clump.

**Distribution :** south Anatolia, CE Taurus/Konya,

Karaman, Mersin, Adana, Osmaniye, Kahramanmaras,

Gaziantep, Hatay, Turkey/Syria, Labanon. **Altitude:** 550

– 2600 m asl. **Corm:** up-right and flatted at the top and

bottom nature, as a tan tunic thin and membranous,

growing 0.3 m by 0.1 m its hardy zone and not frost, low

stalked perennial clump. **Leaves:** come up in spring and

fade summer, grass like, generally with large stripe

running up to the middle, green fall beauties favorite for

many years. **Flowers:** very large, fragrant, lilac, light

blue or white, light weight core, goblet shaped, yellow,

dark yellow or orangein centres, appearing in autumn

before their leaves, hermaphrodite. Flower tube is white

or off-white and does not include any line or mark.

**Throat:** dark rings- bright yellow and dark yellow or

orange colour. **Filament:** creamy, shiny and hairless.

**Anthers:** white. **Pollen:** white. **Style:** bottom of the hill

is lemony white and yellow. **Fruit:** loculicidal capsule.

**Seeds:** brownish, different sizes and shapes, many.  $2n =$

08, 10.

**Phenology:** September – November.

**Characteristics:** (1) bright yellow and dark yellow or

orange ring is the main features that distinguishes this

group from other groups. (ii) It is not grow in shade. (iii)

Plant tends to tree seeds, which can make it a bit weedy.

*Crocus kotschyanus* subsp. *Suworowianus* K. Koch<sup>[37,51-61]</sup>

**Synonym (s):** *Crocus karsianus* Fomin.

*Crocus kotschyanus* subsp. *suworowianus* (K. Koch) B. Mathew.<sup>[37,40-43]</sup>

*Crocus vallicola* var. *lilacinus* Maw.

*Crocus vallicola* var. *suworowianus* (K. Koch) Maw.

*Crocus vallicola* var. *zoharbii* Maw

*Crocus zoharbii* Maw.

**Botanical name:** *Crocus suworowianus* K. Koch.

**Herb:** Small, perennial, cormous. **Native:** Turkey. **Found:** Asia-temperate- Caucasus north Caucasus, transcaucasus, western Asia Turkey. **Plant range:** Turkey, Caucasus. **Native climate:** cold winter, cool dryish summer. **Wild habitat:** rocky, stony fields, scattered bushes. **Distribution:** NE Anatolia/kars, Artvin, Erzinean. Erzurum, Giresun, Gumushane, Rize, Trabzone/Caucasus. **Altitude:** 2000 – 3100 m. asl. **Corm:** tunic membrane, corms are horizontal in nature. **Leaves:** 4-6, up to 4 mm. wide, arranged opposite one another, green, start to grow in spring. **Flowers:** cup-shaped, 10 cm. height, arranged solitary, early season will ghostly white (a rare violet form is also known) or lilac veining, veins and yellow spots in the throat is to faint. The ends of the petals is generally pointed, finely lived with palest lavender hairs-treaks. Throat bears a bright chrome yellow ring formed from two golden yellow marks present at the base of each petals, hermaphrodite. **Anthers:** off –white or white. **Pollen:** white. **Filament:** bright white hairless. **Throat:** bright white hairless. **Stigma:** elongant orange –yellow. **Fruit:** loculicidal capsule. **Seeds:** brownish, many different sizes.  $2n = 20$ .

**Phenology:** September – November.

**Characteristics:** A robust species. Good out in the radw where its flowering follows on from the superficially similar (but distinct) *c. callicola*, the pair being the harbingers of autumn. Flowers lined with palest lavender hair streaks. Throat bears a bright chrome yellow ring formed from two golden yellow marks, which are present at the base of each petals.

*Crocus ochroleucus* Boiss and Gaill<sup>[37, 62-65]</sup>

**Scientific name:** *Crocus ochroleucus* Boiss & Gaill

**Botanical name:** *Crocus ochroleucus*

**Common name:** Fall crocus.

**Other name:** straw colored crocus.

**Herb:** small, perennial, cormous. **Native:** Syria, Israel, Labanon, Asia Minol. **Range:** SW Asia. **Habit:** tufted. Life form: geophytes corm. **Found:** space between the bushes between. **Native climate:** worm dryish summer, cool moist winter. **Habitat:** stony place, occasionally in scrub. **Distribution:** SW Syria, N Israel, Labanon, Horticultaural origin. **Growth:** 10 cm. **Spread:** 0.1 – 0.1 m. **Time of ultimate Height:** 2-5 years. **Altitude:** 300 – 1500 m. asl. **Corm:** tunic has a thin membrane and vertical very thin fibries. Corm occurs around plenty cormlet. **Stem:** absent. **Leaves:** all basal, deciduous, simple, arranged opposite one another, linear with entire margins, 3-6, deep green, narrow, ensiform leaf with white central stripe along the leaf axis, produced with or shortly after the flowers. **Inflorescence:** solitary. **Flowers:** 10-19 cm. tall, cup-shaped, arrange solitary, white or cream with yellow, rarely white with ring spots in the throat, hermaphrodite, 3 stamens and pollen, fragrant, oranamental feature. **Anthers:** yellow. **Pollen:**

yellow. **Filaments:** yellow. **Throat:** yellow. **Style:** 3 frilled branches, apart from yellow-coloured muzzle, antherlevel. **Fruit:** loculicidal capsule. **Seeds:** numbers, different sizes, brownish.  $2n = 10$ .

**Phenology:** October – December.

**Characteristics:** *Crocus ochroleucus* - wide spread in the Leavant/Holy land where it frequents base after over-grazed or arid scrubby areas usually on lime – stone.

*Crocus scharojanii* subsp. *scharojanii* Rupr.<sup>[66-69]</sup>

**Synonym:** *Crocus scharojanii* subsp. *scharojanii*.

**Binomical name:** *Crocus scharojanii*.

**Common name:** Species crocus, Crocus.

**Herb:** small, perennial, cormous. **Found:** Asia – Temperate – Caucasus north caucasua. Transcasus, western Asia Turkey. **Locality:** region alpine du Lazistan dessus de Djimil, prairies humcdeau. **Native:** Turkey. **Native climate:** cold winter with snow, cool moist summer. **Wild habitat:** damp turf near mountain streams and spring over granitic lacks. **Distribution:** Cauceasus region of former USSR, NE Turkey. **Altitude:** 2300 – 3500 m. asl. **Life form:** tuber geophytes, **Plant range:** SW Asia. **Corm:** membrane corm in nature tunic and vertical form. **Leaves:** deciduous, simple, arranged opposite one another, linear with entire margins, green, silvery green central stripe, sessile, parallel venation, bloom with leaves in the natural environment. **Flowers:** narrow goblet, deep yellow, only species blooming in the fall, buds are shaped like the tip of always closed, pointed ends of the petals. **Anthers:** yellow. **Pollen:** yellow. **Filaments:** yellow, lint. **Styles:** yellow anthers pass the level or amount, significantly integral parts. **Fruit:** loculicidal capsule. **Seeds:** many, different sizes, brownish.  $2n = 8$ . **Phenology:** August – September.

**Characteristics:** *Crocus scharojanii* is one of there plants: just see the new, white, roots emerging from the new corm and the shoots already extending on the two in the centre.

*Crocus scharojani* subsp. *lazicus* (Boiss) B. Mathew.<sup>[70-74]</sup>

**Synonym:** *Crocus lazicus* Boiss

**Basionym:** *Crocus lazicus* Boiss.

**Common name:** species crocus, Crocus.

**Herb:** small, perennial, cormous., endemic. **Found:** Asia-Temperate: western Asia Turkey. **Locality:** Lazistan, au dessus de Dijimil. **Native climate:** cold winter with snow, cool moist summer **Wild habitat:** humid area in always wet and humid alpine meadow and creeks. Height: approximate 10 cm. **Spread:** 0.0 – 0.1 m. **Distribution:** endemic/NE Anatola/ Artvin, Rize, Trabzon. **Native:** endemic Turkey. **Life form:** tuber geophytes. **Altitude:** 2300 – 3500 m. asl. **Corm:** nature corm vertical state, is thin membrane-like tunics. **Leaves:** deciduous, simple, arranged opposite one another, linear with entire margins, green, silvery green in central stripe, sessile, parallel venation, bloom with leaves in the



natural environment. **Flowers:** yellow, such as tips and buds off completely dilemmas. The ends of the petals, hermaphrodite, cup-shaped, solitary. **Anthers:** yellow. **Pollen:** yellow. **Filament:** yellow. **Styles:** yellow anther or the level of interest of the amount specially indivisible parts and other stops. **Fruit:** loculicidal capsule. **Seeds:** many, different sizes, brownish.  $2n = 8$ .

**Phenology:** August – September.

**Characteristics:** (i) *cormi* subsp. *scharojani* bases on smaller and located around the stalo (not available in other species) (ii) flower tips and buds off completely dilemmas. The ends of the petals, the other subsp. according to *scharojani* it is more rounded.

#### *Crocus vallicola* Herb<sup>[75 – 85]</sup>

**History:** One of the very first of the autumnal species to appear, in August, rarely even in July though it also carries on later than this, especially if planted later and had flowers into October – November under these conditions. The *Crocus vallicola* was described by William Herbert in 1845. The name is considered as validly published. The description of *crocus vallicola* was taken from herbarium specimen of unspecified type.

**Synonym (s):** *Crocus vallicola* var. *lilacinus* Maw.  
*Crocus vallicola* var. *suwarowianus* (K.Koch) Maw.  
*Crocus vallicola* var. *zoharbii* Maw.

**Common name:** Species crocus, Autumn crocus, Crocus.

**Herb:** endemic, small, perennial, cormous. **Found:** Asia-Temperate – Caucusus north caucasur, Transcaucasus, western Asia Turkey. **Native climate:** cold winter with snow, cool moist summer. **Wild habitat:** damp turf and sub-alpine pastures over granitic rocks. **Structure:** weed. **Easy:** naturalises. **Plant height:** less than 20 cm. **Distribution:** NE Anatolia/ Artvin, Rize, Trabzon, Erzurum, Gumushane/ Georgia.. **Altitude:** 900 – 2000 m. asl. **Corn:** the membrane corm in nature tunic and vertical form. **Leaves:** deciduous, simple, alternate, linear and sessile with entire margins and parallel venation, start to grow in spring. **Flowers:** cup-shaped, arranged solitary, tips appears to be completely closed buds and dilemmas, white petals terminate in a thread like wisp ( acuminate) which is often inter-wine stopping the flower from expanding fully, miasmic violet veins to-wards the tube. **Anthers:** very light yellow or being. **Pollen:** white. **Filament:** white, hairless. **Throat:** white and hairless. **Stylus:** after the level of anther is divided into very short pieces of beige and cream. **Fruit:** loculicidal capsule. **Seeds:** many, different size and shapes, brownish.  $2n = 08$ .

**Phenology:** August – September.

**Characteristics:** difference from *suworowianus* – pointed petals, flowers are more open topside like a funnel, Kormi still is horizontal in nature. *Lazicus* –

yellow flowers. Parts of *crocus vallicola* are considered toxic.

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