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REVIEW ARTICLE

BOTANY, TAXONOMY AND CYTOLOGY OF *CROCUS ORIENTALES*-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. Asia and W. China. These species are highly valued as ornamental plants of their colourful flowers, horticultural varieties and industrial application, sub-genus *crocus* – *crocus orientales* –series are closely related species; and are difficult to be separated taxonomically and have a complex cytology. Botany, taxonomy and infra-specific of *crocus orientales* series are presented, and their distribution, ecology, phenology, description and chromosome counts are also provided with key of their identification

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INTRODUCTION

The genus *crocus* (Family – Iridaceae) comprises some 150 species (Horpke, 2012; Ruksans, 2013) having an old world distribution, primarily in the Mediterranean- Europe, W Asia and W China. The limits of the entire genus lie longitude 10^o W to 80^o E and latitude 30^o n to 50^o N. Phytogeographically, the majority of species occur within the Mediterranean region, extending east-ward into the Irano-Turanian region; both of these areas are characterized by cool to cold winters with autumn-winter-spring precipitation and warm summers with very little rain-fall; the genus *crocus* is welladapted to such conditions (Mathew, 1982). The species discovered since than have been integrated in to Mathew's classification, distributed sea (Portugal and W Morcco), Europe to W China and Mongolia. The centre diversity of the genus in Turkey with more than 70 taxa and Greece with 33 taxa (Petersan *et al.*, 2008; Mathew, 1984; Mathew, 2004; Davis *et al.*, 1988). The study shows` no support for the system of sections as currently defined`, although despite the many in consistancies between Mathew's classification and currently hypothesis (Petersan *et al.*, 2008). Two section sub-divided into 15 series. Later one more series was added (Mathew *et al.*, 2009) and one series was moved to another section (Horpke, 2012).

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The species evolution is generally accompanied or followed by partial changes in the chromosome complement and their can be few genera where such a wide range of variation occurs (Mather, 1932 and Ozhatay, 2002). 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 be 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 is less likely (Mathew *et al.*, 2009; Saxena, 2010; Brighton, 1977; Saxena, 2014; Saxena, 2014). Such chromosome barriers are of obvious importance and can lead on the further diverse which may eventually give rise to acceptable species. The closely related species have been difficult to separate taxonomically and have also found to be complex cytologically and have been treated as the series (Gawler, 1771; Brickell, 2008; Haywood, 1983). These physiological features have been discussed by the genus into a hierarchy of sub-genera, section and series of *crocus orientales*.

Botany

The taxonomic classification of *C. orientales* series is 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 or Ir
08. Genus	<i>Crocus</i>

Genus *crocus*: Herb: small, perennial, cormous.

Corm: oblate, covered with tunic.

Leaves: few, all basal green, adoxially with pale, median strips, base surrounded by membranous, sheath like leaves.

Aerial stem: not developed.

Flowers: emerging from ground, with peduncle and ovary sub-terrestrial.

Perianth: white, yellow or lilac to dark purple.

Tube: long, slender, segments similar, equal or sub-equal.

Stamens: inserted in the throat of the perianth tube.

Style: 1, slender, distally with 3 to many branches.

Capsule: small, ellipsoid or oblong-ellipsoid.

Seed: coats covered with dense mat of papillae (Zhao Yu-Tang, 1985).

Section: *Nudiscapus* – *species* without basal prophyll.

Series Orientales: Corm with parallel fibres or lightly reticulated, numerous leaves, spring flowering, style three forked. Crystal type typical styloids, calcium oxalate can be found in all major group of plants (Franceschi and Nataka, 2005). The following species of *crocus* are induced for description:

***Crocus alantavicus*:** Semenova and Reg (Semenov and Regel, 1868; Zhao *et al.*, 2000; Flora of China Editorial Committee, 2002; Samenov *et al.*, 1968; Zhang and Tan, 2009; Christopher, 2003; Walter *et al.*, 2008). *Crocus alantavicus* is described by Eduard August Von Regel and Peter Petrovich Von Semenov-Tjan _ Schansky in 1868. It belongs to the group of bulbous and tuberous plant. *C. alantavicus* was *C. michelsonii*. Jane McGrey mentions *C. alantavicus*: grew this for a while about 20 years ago, out of curiosity, Goodlad, see was out there, first image showed a flower with very narrow tepals with a light violet flush at the base, superficially, it looked nothing like the *C. alantavicus* I grew, that plant had white flower with very broad tepals which opened flat. The flowers were large than the of *C. korolkowii*.

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

Native: Central Asia and West China.

Native climate: Central Asia mountains, cold winter, dryish summer.

Wild habitat: mountain meadow, river side (The Kora river middle flow, Kopal district, Taldy-kurgan region and SE Kazakhstan).

Distribution: NW Xinjiang (Kazakhstan, Uzbekistan and Kyrgyzstan).

Height: 7 – 10 cm.

Altitude: 1200 – 1300 m.

Corm: 1.2 -2 cm. in diameter, tunic yellowish brown, membranous.

Leaf: 6 – 15, 8-10 cm. X 2 mm. at anthesis, Ca 20 cm X 5 mm. fruit, deciduous simple, alternate, linear and sessile with entire margins and parallel venation.

Flower: fragrant, shaded externally with silvery speckles open in February – April to reveal a pure white interior with a yellow heart, solitary, cup-shaped.

Perianth: white with yellow center, striped or spotted grey or blue abaxially.

Tube: 2.5 – 6 cm., segments narrowly oblanceolate, outer ones ca. 2.5 cm. X 6 – 8 mm. inner ones narrower than outer.

Stamens: ca. 2,5 cm. Anthers: orange yellow.

Style: filiform, orange, 3 lobed at apex. Lobes white to deep yellow, hort.

Capsule: ellipsoid, ca 1.2 cm. X 8 mm.

Seed: light to reddish brown, ovoid, small, white appendage. $2n = 20$.

Phenology: Flowering: May to August.

Characteristics: *c. alantavicus* needs a dry summer. *Crocus* descend from a collection made by Jains Ruksans in the Chingan Range of Uzbekistan in 1977 at about 2000 m. The main results are as follows: (i) sexual reproduction is the main reproduction mode, each plant can produce 1 – 4 new corm, but most of them are one. (ii) the interior ovary is below ground at anthesis, while the other parts of the flower are above ground and (iii) flowers open in day and close in night.

***Crocus caspius*:** Fisch and Mey ex Hohen (Fisch *et al.*, 1938; Fisch *et al.*, 1983; Mathew and Brighton, 1977; Idem and Athew, 1975; Wendelbo, 1977) *C. caspius* is a species of flowering plant in them mad. This species is Fisch and Camey ex Hohen found from sea-level to altitude of 1300 m. in the southern Caspian region and described in 1834. A gorgeous species from the Caspian woodlands, introduced by Paul Furse and later by Per wendelba. It is a robust species, flowering in very late autumn or very early spring, according to temperature regime. Culture is easy in well-drained loam-base compartment.

It can be grown in an alpine house or out-side in the well drained site with a warmish, dryish, summer rest, but nothing too serve. *C. caspius* belongs to the group of bulbous and tuberous.

Synonym: *Crocus boryanus* var. *caspius* (Fisch and May C.A. ex Hohen) Herb.

Native: N Iran and U.S.S.R..

Distribution: Iran.

Native climate: cold moist winter, drier but not arid in summer.

Wild habitat: scrub and woodland, mountain Toothills around Caspian sea.

Altitude: 1300 m.

Corm: tunic membranous, splits at the base.

Leaves: narrow, green, alternate, sessile, proded with the flowers.

Flowers: up to 9 cm. height, very soft pinkish-violet to white with a well marked and defined, often stippled lilac on outer petals.

Throat: yellow often a pinkish or orange suffusion outside autumn.

Anthers: yellow.

Stigma: yellow. **Capsule:** ellipsoid. $2n = 24$.

Phenology: Flowering: November – February.

Characteristics: When plant seen almost in bud, later on the flowers expanded and flatten, the petals become paler and more showing to stigma expanded and elongated. Quite distinct amongst the autumn flowering *crocuses* and one of the most beautiful. Not difficult in cultivation in the UK and regulary sets seed. Curiously the capsules ripen at or just below ground level, in most other species the stem elongates to lift the capsule well above ground.

Note: often available, this is still rare in cultivation in Australia.

Crocus korolkawii Regel and Maw (Maw and Regel, 1879; Regel ex Maw, 1880; Boissier, 1884; Fedtsch, 1968; Stewart, 1972; Wendelbo and Mathew, 1975). This species is named for General N.J. Korolkev, a Russian botanist who collected plants in Central Asia in early 1870, for whom a garden honey suckle, a species Iris and other plants are named. In general impression, the coloration of `Kiss of spring is a pure yellow, and additional shading on the outer petals being invisible whenever called ` *Crocus korolkowii* kiss spring`.

Botanical name: *Crocus korolkowii* kiss of spring.

Cultiver name: Kiss of spring.

Habit: Herb/Forb.

Native: dry mountains central Asia in the `Stan` countries: sub-alpine areas of Kosovo, Afghanistan, N Pakistan, Tadjikistan, Uzbekistan. `Stan` means `The country or place where one dwells`. Thus Afganistan is O the place where the Afghans dwell.

Life cycle: perennial.

Native climate: cold winter with snow, dry summer.

Wild habitat: open rocky and grassy places.

Altitude: 1200 – 1300 m.

Distribution: Pakistan (Chitral), NE Afghanistan, Uzbekistan, Tadjikistan, Russia (north wands to kara taumountains).

Height: 10 – 20 cm. Spread: 0.5 cm.

Growth habit: rosette.

Origin: Pakistan.

Corm: 1-2 cm. in diameter, sub-globose, inner-tunics splitting into many parts, each with separate parallel fibres, inner tunics membranous.

Cataphylls: 3-5, white, sometimes with brownish, greenish or purples veins at the tip.

Leaves: synanthous (-7) 10-12, 0.1 – 0.25 cm., mid green glabrous or subscabrid at the margins.

Inflorescence: 1-3-5 flowered cyme.

Bract and bracteoles: exerted from the cataphylls, c. 4-10cm. long.

Flowers: fragrant, bright yellow, large, 5 – 7 cm. long, vernal.

Perianth tube: (-3) 5 – 10 (-13) cm., yellow, purplish or bronze.

Segments: 6, in 2 whorls sub-equal or inner slightly shorter and less acute, 2 – 3.5, 0.6 – 1.2 cm., elliptic to oblanceolate, subacute to obtuse.

Stamens: 3, filaments 4-6 mm. long, glabrous or somewhat pubescent at the base.

Another: 8 – 13 mm. long, yellow.

Style: as long as or longer than the upper tip of the anthers, divided into 3 elongated stigmatic arms, terminating into expanded pipillose stigmas.

Capsule: 1.2 – 2.1 cm. long cylindrical, carried at ir just below the ground level of maturity.

Seeds: 0.3 mm. long, sub-globose or ellipsoid or trigonous, reddish brown. $2n = 20$.

Phenology: Flowering: February – March

Characteristic: An important ornamental plant in cold regions, grown in sunny rock gardens. The flower colour variation with the external colour varying from nearly yellow to biscuits-coloured through all degrees of grayish, blackish-brown, bronze or purplish to entirely deep bronze is probably the main virtue. This plant is toxic. This early flower (from February) is 10 – 20 cm. high.

Crocus michelsonii Fedtsch (Mathew B. and Brighton, 1977, Fedtsch, 1932; Ali, 1978; Schmid, 2002; flora, ?; Shulkina, 2008). This is one of the most beautiful of all *crocus*. In Russia, it comes in ornamental plants.

Scientific name: *Crocus michelsonii*.

Common name: Crocus michelsonii spring flg, Crocus Michelson, Crocus Michelsonii B. Fedtsch, Spring fig crocus michelsonii.

Habit: Herb/Forb.

Life cycle: perennial.

Native: Kopete Dag range of Turkmenistan and Iran.

Native climate: cold winter, cool drier summer.

Wild habitat: open stony slopes and in thin scrub.

Distribution: Spans Iran and Russia.

Height: 10 – 12 cm.

Mainly found: rocky soil in alpine zone.

Corm: pear-shaped, tunic membranous with parallel fibres.

Leaves: short to grow during flowering period, reaching 30 cm. X 2 mm, green alternate, sessile, deciduous, entire margins and parallel venation.

Flowers: whitish or violet, heavily marked with lilac blue on the out-side of the petals, large, about 7.5 cm. long.

Throat: not yellow. **Styles:** white. $2n = 20$.

Phenology: Flowering: Late winter and early spring.

Characteristics: Parts of *C. michelsonii* spring fig are considered toxic. Naturally marks quite big corms (for a species crocus that is) with characteristic shape and silkey woven tunic. Exclusively early flowering in Lithuanic. Probably it's a winter crocus in west Europe. Different shades of blue in colour of the flower. Flowering late January after a prolonged period below freezing, when were they covered.

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