Matthiola incana

Scientific Name

***Matthiola incana* (L.) R.Br.**

Synonyms

Cheiranthus albus Mill., *Cheiranthus annuus* L., *Cheiranthus coccineus* Mill., *Cheiranthus incanus* L., *Cheiranthus fenestralis* L., *Cheiranthus graecus* Pers., *Cheiranthus hortensis* Lam., *Cheiranthus viridis* Ehrh., *Hesperis fenestralis* (L.) Lam., *Hesperis incana* (L.) Kuntze, *Matthiola annua* (L.) Sweet, *Matthiola fenestralis* (L.) R.Br., *Mathiolaria annua* (L.) Chevall.

Family

Brassicaceae

Common/English Names

Brampton Stock, Common Stock, Gillyflower, Hoary Stock, Imperial Stock, Stock, 10-Week Stock

Vernacular Names

Czech: Fiala Šedivá
Eastonian: Aedlevkoi
Esperanto: Matiolo Nuda
Finnish: Tarhaleukoija
French: Giroflée, Mattiole Blanchâtre, Voilier Grisâtre
German: Garten-Levkoje, Weisslichgraue Levkoje
Hungarian: Kerti Viola, Nyári Viola, Szagos Viola
Peru: Alhelí (Spanish)
Polish: Lewkonia Letnia
Portuguese: Goiveiro-Encarnado, Goivo-Encarnado
Slovašcina: Fajgelj, Šeboj, Sorta'
Slovencina: Fiala Sivá
Swedish: Gillyflower, Lövkoja
Turkey: Yalancı Şebboy
Welsh: Murwyll Coesbren, Murwyll Lledlwyd

Origin/Distribution

It is native to the coastal areas of southern and western Europe and has naturalized elsewhere. It has been introduced into the New World and Australia.

Agroecology

Matthiola incana is a cool climate species, growing best in temperatures of 15–24 °C. It thrives in full sun to light shade and grows best in well-drained, moist, fertile, organic rich soil with a neutral or slightly alkaline pH range.

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Edible Plant Parts and Uses

Its flowers are eaten as a vegetable or used as a garnish, especially with sweet desserts (Tanaka 1976; Facciola 1990). Studies reported that *M. incana* seeds contained oil rich (55–65 %) in omega-3 linolenic acid and could replace marine oils and thereby contribute beneficially to the human diet (Yaniv et al. 1999).

Botany

A biennial or perennial tomentose herb, 15–75 cm high, unbranched or with sparingly basal branching. Basal leaves rosulate; cauline leaves shortly petiolate or sessile, oblanceolate, 3–16 cm long, (0.5-) 1–2 cm broad margin entire; base attenuate to cuneate, apex rounded (Plates 1 and 2). Racemes 10–30-flowered. Flower: sepals linear-lanceolate to narrowly oblong, 10–15 by 2–3 mm; petals purple, violet, pink, red or white (Plates 1, 2 and 3), obovate to ovate, 20–30 by 7–15 mm, long clawed, apex rounded or emarginate; stamens 7–9, filaments 5–8 mm, anthers 2–4 mm; style 1–5 mm, stigma bilobed, erect, sessile. Siliquae (7-) 10–15 cm long, 2.5–4 mm wide, pubescent-glandular. Seed sub-orbicular, 2 mm across, brown, winged.

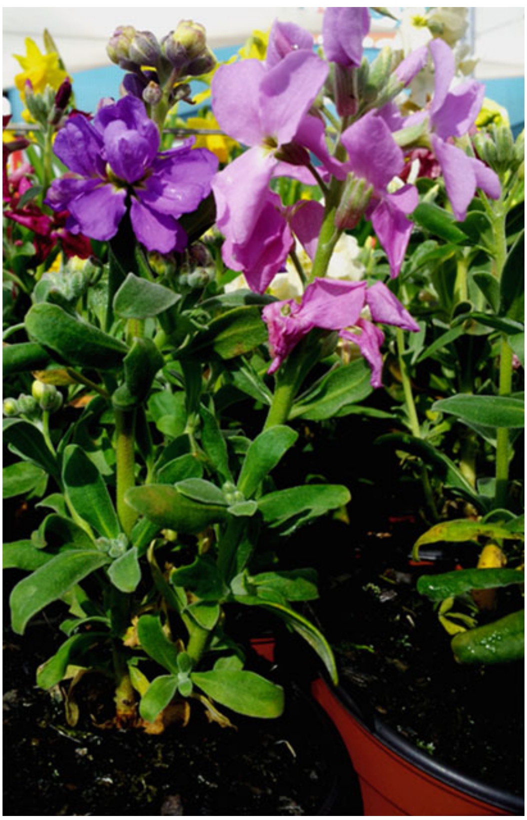

Plate 1 Purple flower stock and leaves

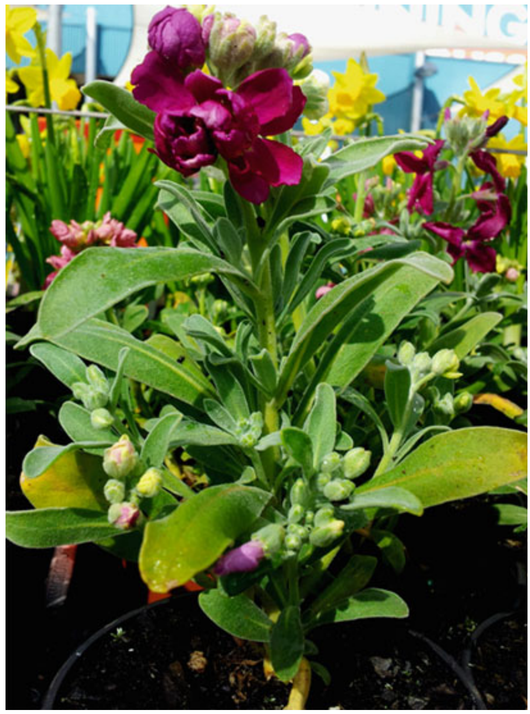

Plate 2 Maroon flower stock and leaves

Plate 3 Bunch of stock flowers

Nutritive/Medicinal Properties

Phytochemicals in Flowers

The flavonoid glycoside dactylin with the structure 5,7,3,4′- tetrahydroxy-3′-methoxyflavone-3-*O*-Β-D-glucopyranoside was isolated from *M. incana* (Rahman and Khan 1962). The following phenolic compounds *p*-coumaric, caffeic, ferulic and sinapic acids and kaempferol and anthocyanin pigments were found in the flowers of healthy and virus-infected plants of *Matthiola incana* (Feenstra et al. 1963). In healthy red flowers larger amounts of cinnamic acids were present, bound to the acylated anthocyanins and other compounds and possibly also as free acids. When anthocyanin synthesis was blocked, the formation of cinnamic acids was also inhibited, except for small amounts of sinapic and ferulic acids. In anthocyanin-producing flowers of *Matthiola incana*, the presence of naringenin, naringenin 7-glucoside, dihydrokaempferol and dihydrokaempferol 7-glucoside was detected (Forkmann 1979). The four isolated compounds initiated anthocyanin synthesis after administration to acyanic flowers of genetically defined lines of *Matthiola incana* and *Antirrhinum majus*.

Nine anthocyanin pigments were reported to be present in the flowers of *M. incana*: 3-glucoside, 3,5-diglucoside and 3-feruloyl-pcoumaroylsambubioside-5-glucoside of pelargonidin and 3-glucoside, 3-sambubioside-5-glucoside, 3-caffeoylglucoside, 3-*p*-coumaroylglucoside, 3-*p*-coumaroylsambubioside and 3-caffeoylsambubioside of cyanidin (Harborne 1964, 1967; Seyffert 1960; Teusch et al. 1994). Anthocyanidin 3-glucosides and 3-sambubiosides acylated with 4-coumarate or caffeate were identified in flower extracts of lines of *Matthiola incana* with wild-type alleles of the gene u (Teusch et al. 1994). Accumulation of acylated 3-glycosides during bud development was correlated with acyltransferase activity. Four acylated cyanidin 3-sambubioside-5-glucosides were isolated from purple-violet flowers of *Matthiola incana* (Saito et al. 1995). Three acylated anthocyanins were cyanidin 3-*O*-(6-*O*-acyl-2-*O*-(2-*O*-sinapyl-β-D-xylopyranosyl)-β-D-glucopyranosides)-5-*O*-(6-*O*-malonyl-β-D-glucopyranosides), in which the acyl group was p-coumaryl, caffeyl or ferulyl, respectively. The remaining pigment was free from malonic acid and was identified as cyanidin 3-*O*-(6-*O*-*trans*-ferulyl-2-*O*-(2-*O*-*trans*-sinapyl-β-D-xylopyranosyl)-β-D-glucopyranoside)-5-*O*- (β-D-glucopyranoside). Analysis of the anthocyanin constituents in 16 purple-violet cultivars revealed that they contained the above triacylated anthocyanins in variable amounts as main pigments. An aromatic pair of pigments containing sinapic and ferulic acids was considered to produce an important intramolecular effect, making bluish colours in these flowers. Ten acylated pelargonidin 3-sambubioside-5-glucosides were isolated from the red-purple flowers of *Matthiola incana*, and pelargonidin 3-glucoside was isolated from the brownish-red flowers of *Matthiola incana* (Saito et al. 1996). Seven of the ten pigments were determined to be pelargonidin 3-*O*-[2-*O*-(2-*O*-(acyl-I)-β-D-xylopyranosyl)- 6-*O*-(acyl-II)-β-D-glucopyranoside]-5-*O*-[6-*O*-(malonyl)-β-D-glucopyranoside], in which acyl moieties varied between sinapic, ferulic, caffeic and *p*-coumaric acids. The acylated pelargonidin 3-sambubioside-5-glucosides were present as the dominant pigments in the red-purple, salmon-pink and apricot colour cultivars. In contrast, pelargonidin 3-glucoside was present as a dominant anthocyanin in the copper colour cultivars, and also pelargonidin 3-sambubioside-5-glucoside was found as a minor pigment in the copper colour flowers.

Tatsuzawa et al. (2012) classified *M. incana* flower colours into eight groups, A–H, based on the hue values of their flowers and the major anthocyanin pigment found as follows: in violet flowers (hue values b*/a* = −0.66 and −0.69, V 84A) of group A, cyanidin 3-dihydroxycinnamoyl-sambubioside-5-malonyl-glucosides; in purple flowers (−0.43 and −0.45, P 75A) and red-purple flowers (−0.14 and −0.16, RP 74A) of groups B and D, pelargonidin 3-dihydroxycinnamoyl-sambubioside-5-malonyl-glucosides; in red-purple flowers (−0.21 and −0.24, RP 72A) of group C, cyanidin 3-monohydroxycinnamoyl-sambubioside-5-malonyl-glucosides; in red flowers

(0.05 and 0.06, RP 66A) of group E, pelargonidin 3-monohydroxycinnamoyl-sambubioside-5-malonyl-glucosides; in copper (0.23 and 0.16, R 54A) and peach (2.37 and 2.09, R38C) flowers of groups F and G, pelargonidin 3-glucoside; and a small amount of pelargonidin 3-glucoside was present in yellow flowers of group H.

Phytochemicals in Seeds

The fatty acid composition of *M. incana* seed oil was found to be myristic (2.60 %), palmitic (4.73 %), stearic (4.37 %), arachidic (2.50 %), lignoceric (0.73 %), oleic (32.17 %), linoleic (21.70 %), linolenic (10.70 %), erucic (13.10 %) and resin acids (7.40 %) (Rahman and Khan 1961). Sitosterol was found in the unsaponifiable matter.

Studies reported that *M. incana* seeds contained oil rich (55–65 %) in omega-3 ($n-3$) linolenic acid and elicited a beneficial effect when fed to animals by reducing cholesterol levels and increasing ($n-3$) fatty acid levels in the plasma (Yaniv et al. 1999). Cholesterol levels were significantly lowest in rats fed with diets rich in *M. incana* oil (27 % reduction) for 6 weeks, and triglycerides were significantly lower in rats receiving either *M. incana* or sunflower oil (36 % reduction). The contents of arachidonic acid and other ($n-6$) fatty acids were significantly the lowest in the liver and plasma of rats that had received *M. incana* oil. The levels of ($n-3$) fatty acids were significantly greater in both the liver and plasma of rats fed with *M. incana* oil. The ratio of ($n-3$)/($n-6$) long-chain fatty acids in the plasma was seven times higher in rats fed with *M. incana* oil than in those fed with sunflower oil and 6 times higher than in those fed with coconut oil. *M. incana*, being a rich source of ($n-3$) fatty acids, could replace marine oils and thereby contribute beneficially to the human diet. Earlier, Ecker et al. (1991) found the breeding lines of *Matthiola incana* tested differed significantly with respect to the levels of palmitic, oleic, linoleic and linolenic acids in the seed oils. Embryonic-stage heterosis in linolenic acid concentration was demonstrated by F1 hybrid seeds, derived from mating horticulturally different lines. Linolenic acid content was negatively correlated with both oleic acid content ($R^2=-0.85$) and linoleic acid content ($R^2=-0.66$). A moderate negative correlation was found between the level of palmitic acid and that of oleic acid ($R^2=-0.40$). None of the breeding lines or the F1 hybrids significantly passed the limit of 67 % linolenic acid. Studies by Heuer et al. (2005) found that total yield, seed number and oil content of *M. incana* seeds were not affected by salinity, whereas the content of omega-3 was significantly increased.

Traditional Medicinal Uses

The seeds are reported to be aphrodisiac, bitter, diuretic, expectorant, stimulant, stomachic and tonic (Chopra et al. 1986). An infusion has been employed to treat cancer, and when mixed with wine it has been used as an antidote to poisonous bites.

Other Uses

Matthiola incana is a popular ornamental plant. The flowers are often harvested for use in floral arrangements and decorative displays.

Comments

The plant is readily propagated from seeds.

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