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# *Centaurea cyanus*

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## Scientific Name

*Centaurea cyanus* L.

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## Synonyms

*Centaurea concinna* (Boiss. & A. Huet.) Trautv., *Centaurea concinna* Willd. ex Steud., *Centaurea cyaneum* St.-Lag., *Centaurea cyanus* var. *denu-data* Suksd., *Centaurea hoffmanniana* Asch., *Centaurea lanata* Roxb., *Centaurea pulcherrima* Wight ex DC., *Centaurea pulchra* DC., *Centaurea rhizocephala* Trautv., *Centaurea segetalis* Salisb., *Centaurea umbrosa* Reut., *Cyanus arvensis* Moench, *Cyanus cyanus* Hill, *Cyanus dentato-folius* Gilib., *Cyanus vulgaris* Delarbre, *Jacea segetum* (Hill) Lam., *Leucacantha cyanus* (L.) Nieuwl. & Lunell.

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## Family

Asteraceae

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## Common/English Names

Bachelors Button, Blue Bottle, Blue Cap, Blue poppy, Blueblow, Bluebonnets, Bluebottle, Boutonniere Flower, Cornflower, Cyani Flower, Garden Cornflower, Hurtsickle

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## Vernacular Names

**Brazil:** Escovinha, Fidalguinhos

**Czech:** Chrpa Modrá, Chrpa Modrák, Chrpa Polní

**Danish:** Kornblomst

**Dutch:** Korenbloem

**Eastonian:** Rukkilill

**Esperanto:** Cejano, Centaŭreo Grenkampa, Grenfloro

**Finnish:** Ruiskaunokki, Ruiskukka

**French:** Barbeau, Barbeau Bleu, Bleuet, Bleuet Des Champs, Casse Lunette, Centaurée Bleue, Centaurée Bleuet, Centaurée Bluet

**Gaelic:** Gormán

**German:** Blauchrut, Blaue Kornblume, Blaumütze, Cyane, Hunger, Hungerblume, Kaiserblume, Kornbeisser, Kornblume, Kornfresser, Kornmutter, Kornnelke, Kornnägeli, Kreuzblume, Rockenblume, Roggenblume, Schanelke, Sichel-blume, Sträpsen, Tremisse, Trämpsen, Zachariasblume, Ziegenbein

**Hungarian:** Búzavirág, Kék Búzavirág, Vetési Búzavirág

**Icelandic:** Akurprýði, Garðakornblóm, Kornblóm

**Italian:** Fiordaliso, Fiordaliso Vero

**Japanese:** Yaguruma-Giku

**Norwegian:** Åkernellik, Knoppurt, Kornblom, Kornblomst

**Polish:** Bławatek, Chaber Bławatek, Kolendra Siewna

**Portuguese:** Ambreta, Centáurea, Ciano, Fidalguinhos, Lóios, Lóios-Dos-Jardins, Loucos-Dos-Jardins, Saudades

**Romanian:** Albastrele

**Slovaščina:** Escovinha, Fidalguinhos

**Slovenčina:** Nevädza Poľná

**Spanish:** Aciano, Azulejo, Centaura Azul, Pincel

**Swedish:** Blågubbar, Blåklint, Blåklätt, Klint

**Turkish:** Maviçiçek, Peygamber Çiçeği

**Welsh:** Glas Yr Ŷd, Penlas Yr Ŷd

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## Origin/Distribution

Cornflower is indigenous to Europe, where it occurs as a weed in fields.

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## Agroecology

It is found especially on porous, nutrient-rich soils with pH 6.6–7.6 in grain fields, rye fields, fallow land, wasteland and roadsides in its native range. It thrives in full sun but has high average daily water requirement.

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## Edible Plant Parts and Uses

The flowers are eaten cooked or raw as vegetables in salads or as garnish (Facciola 1990; Bown 1995; Rop et al. 2012). An edible blue dye is obtained from the flowers, used for coloring sugar and confections. The young shoots are also eaten (Chiej 1984).

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## Botany

A robust, herbaceous annual, 20–85 cm with grey-green, distally branched, weakly tomentose, slender stem. Leaves gray-tomentose, alternate, basal leaves linear-lanceolate, 3–10 cm, with entire margins sparsely toothed and acute apices, petiolated, cauline leaves linear, sessile with entire margins. Flower heads (capitula) rounded or flat-topped cymbiform arrays, 2.5–3.5 cm diameter, on long peduncles surrounded by campanulate involucre bracts. Phyllaries green, ovate to oblong, tomentose to subglabrous, margins and erect appendages white to dark brown or black fringed



**Plate 1** Opened and unopened cornflowers

with slender teeth (Plate 1). Capitula's ray florets 25–35, violet blue–blue (Plate 1) (sometimes pinkish or white), obliquely funnel-shaped, tip lobed, those of sterile florets raylike and enlarged, 20–25 mm those of fertile florets 10–15 mm; disc florets violet blue, tubular, in the centre of capitula. Stamens 5. Pistil of 2 fused carpels. Fruit elliptic, flattish, yellowish, fine-haired, 3.5–4 mm (0.14–0.16 in.) long cypsela, tip with short, stiff unequal bristles.

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## Nutritive/Medicinal Properties

Rop et al. (2012) reported that edible flowers of *Centaurea cyanus* had a dry matter content (%w/w) of 9.75 %, crude protein of 6.73 g/kg and the following elements (mg/kg fresh mass (FM)): P 534.48 mg, K 3568.77 mg, Ca 246.18 mg, Mg 138.49 mg, Na 74.28 mg, Fe 6.89 mg, Mn 2.29 mg, Cu 0.89 mg, Zn 7.59 mg and Mo 0.49 mg.

From the aerial plant parts, six flavonoid aglycons (quercetin, kaempferol, isorhamnetin, apigenin, luteolin, hispidulin), 8 flavonoid glucosides (quercetin 7-*O*-β-*D*-glucoside (quercimeritrin), isorhamnetin-7-*O*-β-*D*-glucoside, kaempferol 7-*O*-β-*D*-glucoside, apigenin 4'-*O*-β-*D*-glucoside, apigenin 7-*O*-β-*D*-glucoside (cosmosiin), luteolin 7-*O*-β-*D*-glucoside (cynaroside), apigenin 7-apioglucoside (apiin), luteolin 7-apioglucoside (graveobioside)) and four hydroxycinnamic acids (caffeic, chlorogenic, neochlorogenic and

isochlorogenic acids) were isolated (Litvinenko and Bubenchikova 1988). Also, amino acids arginine, serine, methionine, proline, glutamic acid, tryptophan, alanine, phenylalanine and threonine were detected. Apigenin-4'-*O*-(6-*O*-malonylglucoside)-7-*O*-glucuronide, methyl-apigenin and methyl-vitexin, cyanidin-3-*O*-succinylglucoside-5-*O*-glucoside/centaurocyanin (the marker compound), cyanidin-3,5-diglucoside/cyanidin, quercetin-3-*O*-gluco-rhamnoside/rutoside, isorhamnetin-7-*O*-glucoside, naringenin and naringenin-7-*O*-gluco-rhamnoside were also reported from cornflower (Pirvu et al. 2012).

The following phenolic compounds were found in the flowers: *cis* and *trans*-caffeic acids, protocatechuic and chlorogenic acids, *p*-hydroxybenzoic, *p*-coumaric, vanillic, syringic, ferulic, salicylic and benzoic acids, as well as *cis*-sinapic acid, *trans*-sinapic acids or *o*-hydroxyphenylacetic acid and *p*-hydroxyphenylacetic acids (Murav'eva and Bubenchikova 2007; Pirvu et al. 2012) and coumarins: 7-hydroxy-6-methoxycoumarin (scopoletin) and 7-hydroxycoumarin umbelliferone (Bubenchikova 1990).

Blue cornflower pigment protocyanin was found to have a complex of six molecules each of anthocyanin (centaurocyanin, cyanidin 3-*O*-(6-*O*-succinylglucoside)-5-*O*-glucoside) and flavones glycoside (apigenin 7-*O*-glucuronide-4'-*O*-(6-*O*-malonylglucoside), with metals one ferric iron, one magnesium and two calcium ions (Shiono et al. 2005; Takeda et al. 2005). *Centaurea cyanus* flowers were found to contain phenylpropanic compounds, flavonoids and anthocyanins and tannins (Chiru 2009). Anthocyanins were found to confer diuretic, antiinflammatory and healing properties. Red flowers were found to have four to five times more anthocyanins and also phenolic compounds than blue flowers.

The methanol extract of the seeds of *Centaurea cyanus* afforded four indole alkaloids: moschamine, *cis*-moschamine, centcyamine and *cis*-centcyamine (Sarker et al. 2001). Epoxy lignans, berchemol and larciresinol 4-*O*- $\beta$ -D-glucopyranoside were found in the seeds of *C. cyanus* (Shoeb et al. 2004).

Volatiles emitted from mechanically damaged *C. cyanus* leaves included predominantly (100–1,000  $\mu$ g) *cis*-3-hexenyl acetate; *cis*-3-hexenol,

$\beta$ -caryophyllene and germacrene D; *trans*- $\beta$ -farnesene (38–100  $\mu$ g) and 1–37  $\mu$ g of *trans*-2-hexenal, hexyl acetate, hexanol, *trans*-2-hexenol,  $\alpha$ -copaene,  $\beta$ -cubebene,  $\gamma$ -amorphene/ $\gamma$ -muurolene,  $\alpha$ -muurolene, unknown sesquiterpene, bicyclogermacrene,  $\delta$ -cadinene and geranylacetone (Beck et al. 2008). *C. cyanus* had been reported to attract the weevil, *Ceratapion basicorne*, a candidate for biological control.

### Antioxidant Activity

Cornflowers were found to have a total antioxidant capacity of 6.81 g ascorbic acid equivalent/kg fresh mass (FM), a total phenolic content of 4.76 g gallic acid/kg/FM and total flavonoid content of 1.81 g rutin/kg FM (Rop et al. 2012).

### Antiinflammatory Activity

Different pharmacological experiments (inhibition of carrageenan, zymosan and croton oil-induced oedemas, inhibition of plasma haemolytic activity, induction of anaphylatoxin activity) showed that polysaccharides extracted from *C. cyanus* flower heads had antiinflammatory properties and interfered with complement (Garbacki et al. 1999). Additionally, these polysaccharides were found to be mainly composed of galacturonic acid, arabinose, glucose, rhamnose and galactose. The findings rationalized the use of cornflower flowers in European phytotherapy for the treatment of minor ocular inflammations.

### Cytotoxicity Activity

Four indole alkaloids, moschamine, *cis*-moschamine, centcyamine and *cis*-centcyamine, isolated from the seeds exhibited cytotoxicity as determined by brine shrimp lethality bioassay (Sarker et al. 2001). Crude extracts of *Centaurea cyanus* exhibited cytotoxicity in *Artemia salina* and human fibrosarcoma cells, and were found to contain guaianolides (Bruno et al. 2005). The inflorescence and root ethanol extracts of *C. cyanus*

elicited antileukemic properties and induced cell death via apoptosis (Wegiera et al. 2012).

### **Serotonergic and COX Inhibitory Activities**

Moschamine, a safflomid-type phenylpropenoic acid amide found in *C. cyanus*, was found to exhibit serotonergic and COX inhibitory activities (Park 2012). At the concentration of 10  $\mu\text{mol/l}$ , moschamine was able to inhibit forskolin-stimulated cAMP formation by 25 %, via inhibiting serotonin receptors in the OK cells. The inhibition was repressed by two 5-HT1 antagonists (Nan-190 and spiperone), suggesting that moschamine may suppress cAMP formation via binding to 5-HT1 receptors in the cells. Also, moschamine being a very potent compound inhibited COX-I by 58 % and COX-II by 54 %, at the concentration of 0.1  $\mu\text{mol/l}$ .

### **Antiulcerogenic Activity**

The crude aqueous, ethanol and acetone extracts of *C. cyanus* flower head and aerial parts were found to have potent gastroprotective effect using the stress-induced ulcer model in rats (Pirvu et al. 2012). The polyphenol fraction of the acetone extract contained high levels of polysaccharides and minerals (over 60 %) and modest level of quercetin, apigenin and caffeic acid derivatives (<1 %).

### **Traditional Medicinal Uses**

Cornflower has been used in herbal medicine for a long time (Grieve 1971; Lauenert 1981; Chiej 1984; Chopra et al. 1986; Bown 1995; Chevallier 1996) but is seldom used nowadays (Chiru 2009). The dried flowers are antipruritic, antitussive, astringent, mildly diuretic, emmenagogue, ophthalmic, very weakly purgative and tonic. An infusion can be used in the treatment of dropsy, constipation, kidney ailments, or as a mouthwash for ulcers and bleeding gums. The infusion is also taken as a bitter tonic and stimulant for the liver, improving

digestion as well as improving resistance to infections. An eye wash prepared with cornflower blossoms is employed as an antiinflammatory for eye ailments, conjunctivitis, as well as to relieve strained, tired, or puffy eyes. Blue blossoms infused in water are held to have both curative and calming action for nervous disorders. Eye wash is reputed to strengthen weak eyes. Traditionally it is said to work best on blue eyes while *Plantago major* (great plantain) was used for brown eyes. The seeds are employed as a mild laxative for children. Cornflower leaves are used to create a cleansing facial steam for dry sensitive skin. A decoction of the leaves is antirheumatic.

### **Other Uses**

The cornflower is considered to be a good companion, in small quantities, for cereal crops and a good plant for bees, butterflies and moths. Flowers are popularly used in fresh and dried floral arrangements. A blue dye is obtained from the petals when mixed with alum; the dull impart a lovely color to linen but the dye is not permanent. Extracts of the plant are used in hair shampoos and rinses.

In folklore, cornflowers were worn by young men in love; if the flower faded too quickly, it was taken as a sign that the man's love was not returned.

### **Comments**

The blue cornflower is the national flower of Estonia and also one of the national flowers of Germany.

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