Definition: **chicory** from *Philip's Encyclopedia*

Perennial weedy plant whose leaves are cooked and eaten, or served raw in salads. The fleshy roots are dried and ground for mixing with (or a substitute for) coffee. Chicory has bright blue, daisy-like flowers. Height: 1.5m (5ft). Family Asteraceae/Compositae; species *Chichorium intybus*.

**Summary Article: Chicory: Cichorium intybus**
From *Encyclopedia of Herbs and Spices*

**Taxonomy**

Name currently accepted: *Cichorium intybus*

Authority: Linn.

Taxonomic serial no.: 36763 (ITIS, 2016)


Family: Asteraceae (Kingdom: Plantae; Subkingdom: Viridiplantae; Infrakingdom: Streptophyta; Superdivision: Embryophyta; Division: Tracheophyta; Subdivision: Spermatophytina; Class: Magnoliopsida; Superorder: Asteranae; Order: Asterales; Family: Asteraceae; Subfamily: /

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Cichorioideae; Tribe: Cichorieae; Subtribe: Cichoriinae; Genus: Cichorium; Species: intybus; Binomial: Cichorium intybus L.

Subspecific taxa and groups:

Cichorium intybus subsp. foliosum (Hegi) Janch., Cichorium intybus subsp. glabratum (C. Presl) Arcang., Cichorium intybus subsp. glaucum (Hoffmann & Link), Cichorium intybus subsp. sativum Janch., Cichorium intybus subsp. sylvestre; Cichorium intybus var. longipes Faure & Maire; Cichorium intybus var. radicosum Alef., Cichorium intybus var. rubicund Farw. etc. (Porcher, 2003).

Cultivar groups: The cultivated types of chicory fall under certain cultivar groups recognized by the horticulturists, based on morphology and agronomic characters. Major groups are: Rubifolium group, Variegatum group, Catalogna group, Rosularis group, Radicchio group, Grumolo group, Witloof group, Soncino group and Industrial chicory group.

Most of the varieties developed during the past six decades are meant mainly for vegetable purposes. Some of the varieties in the industrial group are used as a coffee substitute and also blended with coffee powder.

Common names: Chicory, common chicory, blue sailors, succory, coffeeweed.

Regional/vernacular names: Arabic: shikôryah, siris; Chinese: ji ju; Danish: cikorie; Dutch: wilde cichorei, brusselse kooltjes, chicorei, suikerij (Flemish), suikerije; Finnish: italiansikuri, salaattisikuri, juurisikuri; French: chicorée sauvage; German: bittere cichorie, cichorienkraut, gemeine cichorie,feldchicorie, wilde chicorie, wilde zichorie, hindläuf tenkraut, röhrkraut, röhrsalat, zichorienwegwarte, gemeine wegwarte, gewöhnliche wegwarte; Hungarian: cikória, mezei katáng; Italian: cicoria, cicoria amara; Japanese: kiku nigana; Norwegian: sikori; Polish: cykoria; Russian: cikorij; Spanish: achicoria, achicoria amarga, achicoria de raíz; Swedish: cikoria, vägvårda; Turkish: radikya, nardeng marulu; Vietnamese: rau di'êp dâng, diê'p xoân (Porcher, 2003).

Introduction

Chicory has been under cultivation from ancient times for its leaf, which is used for salads. Chicory for root production (root-chicory) has a history of only about 200 years. In Europe it was grown for its swollen roots that are dried, powdered and blended with coffee powder. Chicory-blended coffee gives an enhanced flavour and taste that is liked by many consumers. Chicory is cultivated mainly in Europe, although its cultivation has spread to many other regions. In places like South India, chicory is grown mainly for blending with coffee, whereas leafy chicory is seldom used. A number of cultivars of chicory are available. Some are grown for their roots, which are used for coffee flavouring. Others are selected for their leaves, which are used in salads. These can either be grown during the summer months or be ‘forced’ in darkness to produce blanched tips (chicons) from January to March. Chicory has an attractive blue flower head and is grown as an ornamental, but it seeds freely and is considered invasive in North America and Australia (Duke, 1996; Anon., 2015a).

Botanical Notes

Chicyric plants are perennial herbs, with a fleshy taproot that grows deep, branched up to 75 cm long, with a milky sap. The stem is hollow, 30 cm to 2 m tall, often rough–hairy, becoming woody and reddish; branches are rigid and spreading. The basal leaves are sessile, lance-like to linear, with margins that either have dentations or more pinnate with sharply defined indentations. The stem leaves are
alternate, smaller, partly clasping the stem. They can be entire or toothed. The inflorescence is a cluster of one to three flower heads (synflorescence), from the upper leaf axils, widely spaced. The heads are either stalkless or on extremely short stalks. Flower heads are 2–3.5 cm wide with 8 to 25 mostly blue or rarely white ray flowers. The ray tips are five-toothed. There are no disc florets. Stamens are grouped around the style, which has a bifurcated stigma. In the blue type the stamens have blue anthers and stigma; in the white flower type, anthers are white, so also is the stigma. The flowers will open only in the sun and close by early afternoon, hence the common name, blue sailors. The outer side of the flower head has two series of phyllaries (leafy bracts). Fruits are achenes, 2–3 mm long, obovate, light brown and darker mottled, finely granular, obscurely 4- to 5-angled, the tip blunt and beakless; the pappus is a minute-fringed crown of tiny bristle-like scales. Flowering is from March to October, depending on climatic factors. The chromosome number is 2n = 18 (Duke, 1996; Shi and Kilian, 2011; Bebeau, 2014; IPCN, 2016).

**Chemical Notes**

There are many publications on the chemical composition of chicory (Leclercq, 1983; Bridle et al., 1984; Monde et al., 1990; Ernst et al., 1995; Krebsky et al., 1999; Roberfroid, 2000; Boeuf et al., 2001; De Kraker et al., 2003; Molan et al., 2003; Rossetto et al., 2005; Dauchot et al., 2009; Fathella et al., 2015). The information available as summarized in EMA (2010) is as follows.

**Flowers:** Cynadin 3-malonylglucoside (Bridle et al., 1984), delphinidin 3,5-di-O-(6-O-malonyl-β-D-glucoside) and delphinidin 3-O-(6-O-malonyl-β-D-glucoside)-5-O-β-D-glucoside, delphinidin 3,5-di-O-β-D-glucoside and 3-O-p-coumaroyl quinic acid has been identified (Nørbæk et al., 2002).

**Stem:** Coumarins such as umbelliferon, esculetin (6,7-dihydrocumarin) scopoletin, esculetin and cichorin (esculetin 7-O-β-D-glucoside).

**Leaves:** Caffeic acid, chichoric acid, many flavonoids and their glycosides (isorhamnetine, apigenin, apigenin-7-O-l-arabinoside, luteolin-7-O-glucuronide, quercetin-3-O-glucuronide, campheroil-3-O-glucoside, C-glycosilflavone) and selenium compounds.

**Roots:** Cichoriolide A, cichoriosides A, B and C from the root together with nine other sesquiterpene lactones (Seto et al., 1988) (see below).

**Root milk juice:** Sesquiterpene lactones of guajanolid type, lactucin and lactucopicrin (8-p-hydroxyphenylacetillactucin). A large number of sesquiterpenolactones have been isolated from chicory (Bais and Ravishankar, 2001). The main sesquiterpene lactones are lactucin, 8-deoxylactucin and lactucopicrin. These are found in the roots and the heads of the plant and are considered to be responsible for the bitter taste of chicory. The leaves and roots also contain traces amount of other bitter sesquiterpene lactones such as guianolides, lactupin, deoxylactupin, eudesmonolides and guanomanolides (Bais and Ravishankar, 2001).

**Volatile oils constituents:** Octane, octen-3-ol-1, 2-pentyl furan, (2E,4E)-heptadienal, 1,8-cineole, benzene acetaldehyde, n-nonan, camphor, (2E,6Z) nonadienal, (2E)-nonen-1-al, n-decanal, (2E,4E) nonadienal, n-tridecan, (2E,4E)-decadienal, β-elemene, (E)-caryophyllene, β-ylangene, geranyl acetate, (E)-β-farnasene, allo-aromadendrone, dehydro-aromadendrone, β-ionone, pentadecane, trans-β-guaiene, 2(E) –undecenol acetate, sesquicineole, (2E)-tridecanol, 2-pentadecanone, (E)-2-hexylcinnamaldehyde, octadecane, n-nonadecane, (5E,9E)-farnasyl acetone, n-eicosane, n-octadecanol and n-heicosane (Judžentiene· and Būdiene·, 2008).

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**Functional Properties**

A critical assessment of the functional properties is available in EMA (2010), which may be consulted for detailed information. A subsequent review is that of Street et al. (2013). Chandra and Jain (2016) reviewed the application of chicory in the treatment of lifestyle diseases. Major properties are mentioned below.

*Hepatoprotective effect:* Chicory root extract exhibited a hepatoprotective effect, as reported by Gadgoli and Mishra (1997) from their study on CCl4 and paracetamol-induced hepatotoxicity. Chicory extract administration resulted in a substantial reduction in the elevated hepatic functional parameters. The compound contributing to the effect was identified as cichotyboside. Similar results were also reported by others (Zafar and Mujahid Ali, 1998; Ahmed et al., 2003, 2008). Neha et al. (2014) briefly reviewed chicory’s role in hepatoprotection.

*Cholesterol reduction and anti-diabetic effect:* Pushparaj et al. (2007) reported that chicory extract at 125 mg/kg body weight for 14 days reduced serum glucose by 20%, triglycerides by 91% and cholesterol by 16%. Kim (2000) reported a very significant reduction in cholesterol, absorption into the blood stream, 30% in the jejunum and 41% in the perfused ileum.

*Anti-inflammatory activity:* Aqueous root extract of chicory when administered inhibited the anaphylactic reaction induced by the compound 48/80 (a synthetic compound that inhibits histamine release and promotes mast cell degranulation) dose dependently. Ethyl acetate extract of chicory root produced a marked inhibition of prostaglandin E(2) in human colon carcinoma HT29 cells treated with the pro-inflammatory agent tumour necrosis factor-alpha (TNF-α). This is due to the inhibition of expression of cyclooxygenase-2 (COX-2) and direct inhibition of COX enzyme activity (Cavin et al., 2005). Root extract in a dose-dependent manner decreases significantly carrageenan-induced paw oedema. The extract led to a decrease in serum TNF-α, interleukin-6 and interleukin-1 levels and simultaneously an increase in the activities of catalase and glutathione peroxidase in paw oedema tissue. Chicory extract also exhibited a significant reduction in granuloma formation in cotton-pellet-induced granuloma in mice (Rizvi et al., 2014). Chicory extract administration ameliorated the after-effects induced by cisplatin administration. The extract also reduces the nephrotoxicity (Shafaq and Tabassum, 2009).

*Other effects:* Anti-tumour activity, an analgesic action, sedative action and anti-malarial activity, anti-allergic activity, antimicrobial activity are among the other effects reported (Nandagopal and Ranjitha Kumari, 2007; EMA, 2010; Street et al., 2013).

**Uses**

**Medicinal uses**

Chicory is credited with many medicinal properties, which include diuretic, laxative, chologogue, mild hepatotonic, digestive and hypoglycaemic properties. Chicory has been used in the treatment of liver congestion, jaundice, rheumatic and gouty joints (Khare, 2007; Anon., 2012). It was an important herbal medicine in the past, although it is little used now. The roots are the most medicinally active part. A decoction of the root has proved to be of benefit in the treatment of jaundice, liver enlargement, gout and rheumatism. A decoction of the freshly harvested plant is used for treating gravel (Grieve, 1971; Chiej, 1984; Chevallier, 1996; Foster and Duke, 2000). The latex in the stems is applied to warts in order to destroy them (Chancellor, 1980). EMA (2010) lists the uses of chicory in various European
countries. The German Commission E Monographs approve chicory for loss of appetite and dyspepsia. In France, herbal tea from the root is traditionally used for conditions such as digestive disorders and for aiding in elimination functions by promoting renal activity and digestion. It is also indicated as an adjuvant in slimming diets. A mixture of the leaves and roots is described in French Pharmacopoeia and The Italian Pharmacopoeia (Scholz, 2006). On the basis of the available information one may conclude that chicory is useful in traditional herbal medicinal products for the relief of symptoms related to mild digestive disorders (such as a feeling of abdominal fullness, flatulence and slow digestion) and temporary loss of appetite (EMA, 2010).

Culinary uses
Chicory leaves are bitter but the bitterness gets substantially reduced after boiling or after stir-frying. Growers use techniques of blanching the leaves and emerging buds so that the bitterness can be kept to a minimum. The blanched leaves and buds (known by the name chicons) are used in Europe, especially in France, as a vegetable and as a salad component. Flowers are an attractive addition to salads. Boiled tubers are palatable owing to the inulin content and are employed in cooking in many ways. Chicory root contains three sugars, namely pentose, levulose and dextrose. Roots are used in seasoning soups, sauces and gravies and to impart a rich deep colour to the dishes. The roasted root is used as a caffeine-free coffee adulterant or substitute; its powder is often blended with coffee powder for the production of a chicory–coffee blend. This is the most important use of chicory and such blends are liked by many coffee drinkers (Tennison, 1987). Young roots have a slightly bitter caramel flavour when roasted. Older roots are much bitterer and usually not used. Roasted roots are also used in many recipes and a good selection of recipes using chicory can be found online (e.g. Anon., 2015b–d).

Safety Issues
Handling the chicory plant might cause skin irritation. Commission E reports hypersensitivity to chicory and other Asteraceae and adverse effects of rare allergic skin reactions. Patients with bile stones or gallstones should first consult a physician before using chicory. Symptoms of the toxic effect may occur after oral, cutaneous or inhalatory exposure. Carcinogens, namely, 1,2-benzoperylene, 3,4-benzopyrone and floranthene, occur in chicory, increasing on roasting, especially above 175 °C. Ingestion of 100 g may cause slight bradycardia. Special precautions and warnings include avoiding the use during pregnancy and breast-feeding. Chicory may stimulate menstruation and cause a miscarriage (Duke, 2002).

References


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