Definition: sorrel from Philip's Encyclopedia

(dock) Herbaceous perennial plant native to temperate regions. It has large leaves that can be cooked as a vegetable, and small green or brown flowers. Height: to 2m (6ft). Family Polygonaceae; genus Rumex, especially Rumex acetosa.

Summary Article: Sorrel: Rumex acetosa Red (Sheep's) Sorrel Rumex acetosella

From Encyclopedia of Herbs and Spices

Common Sorrel, Rumex acetosa L.

Image from: Buckler
Leaf sorrel in The Illustrated Cook’s Book of Ingredients

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**Taxonomy**

Name currently accepted: *Rumex acetosa*

Authority: Linn.

Taxonomic serial no.: 504901 (ITIS, 2016a)

Synonyms: The Plant List provides 21 synonyms (Anon., 2010a).


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Introduction

Sorrel or garden sorrel and red sorrel or sheep’s sorrel are the two important species of *Rumex*, used medicinally, as a spice and also as a vegetable. Sorrel (*Rumex acetosa*) is a perennial herb, which grows abundantly in most parts of Europe and North America, Greenland and temperate Asia. It grows commonly in meadows, at the edges of woodlands, by the side of roads and in back gardens; the plant prefers acidic moist soils. The plants can form large stands by vegetative growth, surviving for decades, shading out native vegetation.

It is also shade tolerant (Weber, 2003). It is also cultivated for its leaves that are used as a vegetable and as a spice. Sorrel leaves contain oxalic acid and hence can create health problems if consumed in excess. The lemony flavour and sour taste make the leaves a good ingredient in many dishes and salads to which sorrel adds a kiwi-fruit like flavour and acidic sourness. Sorrel’s acidity has caused chefs over the centuries to view it as a culinary note in a complex chord of flavours in soups and sauces. Domestic animals are fond of this herb. There is a belief that the cuckoo clears its voice by eating the leaves of this plant and hence the common name cuckoo’s meat (Grieve, 1971; Anon., 2014a,b).

The related species *Rumex acetosella*, known as sheep’s sorrel or red sorrel, is a medicinal herb used commonly in the past. It is found growing in abundance throughout Europe and the USA and also in the cooler areas of many other regions (see below).

Botanical Notes

The species description given here is adapted from the Flora of North America (Mosyakin, 2005), Plants of the Pacific Northwest coast (Pojar and MacKinnon, 1994), and the PROSEAbase (Do, 2001). Sorrel is a perennial herb, often cultivated in Europe and America as a garden herb or leaf vegetable (potherb). It is a slender plant that is deep rooted, grows to about 60–100 cm, has juicy stems and edible oblong leaves. Once established, the plant produces greens for 8–10 years or more. Sorrel is...
grown from seeds in early March and by July the plant is cut back. Sorrel needs soil that is rich in iron to flourish. Its leaves are held on an erect sturdy stem and are harvested by cutting with a sharp knife to avoid bruising. The smallest leaves are the most concentrated in flavour. It has a lemony flavour that is described as mildly sour and similar to that of kiwis or wild strawberries.

The stem is erect, rarely ascending and produces several branches from the base. Leaves are normally lacinate, oblong–ovate, ovate–lanceolate to lanceolate, variable in size but normally 2.5 times as long as wide, base sagitate, margins entire, normally flat, and the apex acute or sub-acute. The inflorescence is terminal, occupying the distal one-third of the stem, usually lax and interrupted especially in proximal part, narrowly paniculate and cylindrical. Flowers are small and perianth segments are six in two whorls of three, with the inner usually enlarged and mostly enclosing the fruit; stamens are six, in two whorls of three, inserted at the base and anthers basifixed. The ovary is superior, three-carpellate and unilocular with a single ovule; styles are three, outwardly deflexed or adnate to the marginal ribs, and the stigma is penicillate (having a tuft of hairs). Achenes are black to dark brown, shiny and smooth. The whole plant gives out a lemony smell.

*Rumex acetosa* is dioecious; pistillate (female) and staminate (male) plants are cytologically distinct having the X–Y mechanism of sex determination. The pistillate plant is 2n = 14 (12+XX); the staminate plant is 2n = 15 (12+XY1Y2) (Pojar and MacKinnon, 1994; Do, 2001; Mosyakin, 2005; CCDB, 2016).

Seeds are dispersed by wind, water and attaching to animals. Fragments of roots easily grow to new plants.

**Chemical Notes**

Duke (2016) provides a list of chemical components present in sorrel. The constituents include α-linoleic acid, chrysophanic acid, chrysophanin, chrysophanol, emodin, hyperin, hyperoside, oxalic acid, oxymethylanthraquinone, physcion, potassium binoxylate, quercetin, rutin, tannins and vitexin.

The important biologically active compounds present in sorrel are the proanthocyanidins, of which four classes occur in sorrel (Anke et al., 2006, 2007; Bicker et al., 2009):

- *Proanthocyanidin dimers*: Epicatechin-(4-8)-catechin (procyanidin B1), epicatechin-(4-8)-epicatechin (procyanidin B2), catechin-(4-8)-catechin (procyanidin B3), catechin-(4-8)-epicatechin (procyanidin B4), epiafzelechin-(4-8)-epicatechin, epicatechin-(4-8)-epicatechin-3-O-gallate, epiafzelechin-3-O-gallate-(4-8)-epicatechin-3-O-gallate, epicatechin-3-O-gallate-(4-8)-epicatechin-3-O-gallate, epicatechin-(4-6)-epicatechin (procyanidin B5), epicatechin-(4-6)-catechin (procyanidin B7), epiafzelechin-(4-6)-epicatechin-3-O-gallate, epicatechin-(4-6)-epicatechin-3-O-gallate and epicatechin-(2-7, 4-8)-epicatechin (procyanidin A2).
- *Proanthocyanidin trimers*: Epicatechin-(4-8)-epicatechin-(4-8)-epicatechin (procyanidin C1), epicatechin-(4-8)-catechin-(4-6)-catechin, epicatechin-(2-7,4-8)-epicatechin-(4-8)-epicatechin and epicatechin-3-O-gallate-(2-7,4-8)-epicatechin-(4-8)-epicatechin.
- *Proanthocyanidin tetramers*: Epicatechin-(4-8)-epicatechin-(4-8)-epicatechin-(4-8)-epicatechin (procyanidin D1) and epicatechin-(2-7, 4-8)-epicatechin-(4-8)-epicatechin-(4-8)-epicatechin.

Many anthraquinone compounds have been reported, some of which are known to possess biologically

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important activities. They include: oxymethyl anthraquinone, emodin, aloe-emodin, ruminic, phylsin, chrysophanol and pulmatin derivatives (Lee et al., 2005; Lim et al., 2011; Bae et al., 2012).

Stokes et al. (2003) reported gibberellic acid derivatives (GA-18, GA-23 and GA-38) from the plant. Sorrel leaf is a rich source of potassium, magnesium, copper, iron, manganese and zinc, as well as high energy values essential in human and animal nutrition. Leaves contain (mg/100g): carbohydrate: 63.81, energy: 228 (kcal/100 g), potassium: 2132, Na: 28.61, Ca: 53, P: 7.73, Mg: 73, Fe: 10.8, Mn: 13.6, Zn: 2.66 and Cu: 0.85. Sorrel contains about 7–11% oxalic acid; both soluble and insoluble oxalates are present in the tissue (Idris et al., 2011).

**Functional Properties**

Sorrel acts as a diuretic. It stimulates secretion and improves resistance to infections (acting as an antibacterial agent), although some of these effects are questionable. Sorrel contains several anthraquinone derivatives such as chrysophanol, emodin and aloe-emodin. Anthraquinones are well known as laxatives; their metabolism in the human gut liberates anthrones, which stimulate the peristaltic movements. Sorrel extract was reported to inhibit the tumour activity of sarcoma-180-tumour cells implanted in mice. Sorrel extract inhibited the enzymes aniline hydroxylase and aminopyrine demethylase and prolonged the duration of pentobarbital-induced narcosis and significantly enhanced the phagocytic and complement activities. An ethanol extract showed anti-histaminic, anti-cholinergic and anti-bradykinin activities in rabbits *in vivo*. An aqueous extract exhibited an anti-inflammatory action, as assessed from various standard tests. Oxalic acid is toxic; in a high dose it can cause serious health problems including mortality. Sorrel leaves are reported to be fatal to sheep. Oxalic acid and oxalates (soluble and insoluble) cause toxic symptoms such as salivation, tremors, ataxia, hypocalcaemia, azotaemia, perirenal oedema and tubular degeneration (Aggarwal et al., 1986; Panciera et al., 1990; Suleyman et al., 1999; Do, 2001).

An acetone–water extract of sorrel has a strong antiviral activity against herpes simplex virus type 1 (HSV-1), which is mainly due to the flavan-3-ols and oligomeric proanthocyanidins (Gescher et al., 2011). Flavan-3-ols and epicatechin-3-O-gallate-(4β-8)-epicatechin-3-O-gallate abolished virus entry into the host cell by blocking attachment to the cell surface. Lee et al. (2005) reported that sorrel extract has anti-mutagenic and cytotoxic properties, owing to the presence of the anthraquinone compound emodin. Emodin strongly inhibited many tumour cell lines and also showed an anti-mutagenic activity against N-methyl-N¢-nitro-N-nitrosoguanidine and 4-nitroquinoline-1-oxide. Sorrel extract offers protection against induced gastric ulcers in mice. Pretreatment with ethanolic sorrel extract reversed negative effects such as inflammation, oedema, haemorrhage and loss of epithelial cells. In an antioxidant assay, sorrel extract showed potent 2,2-diphenyl-1-picrylhydrazyl radical scavenging activity, and it also decreased NO-production in murine macrophage cell line RAW 264.7 in a dose-dependent manner. Emodin is mainly involved in this protective effect (Bae et al., 2012).

**Uses**

**Medicinal uses**

Sorrel is a medicinal herb once used to cure many ailments. Duke (2002) has provided an extensive list including: acne, anaemia, loss of appetite, asthma, bleeding, boils, constipation, diarrhoea, diuresis, fever, gonorrhoea, HIV infection, inflammation, itching, jaundice, kidney stones, nasal inflammation, respiratory disease, respiratory inflammation, skin cancer, sore throat, stomach problems, ulcerated

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bowl, ulcers (gastrointestinal) and vitamin C deficiency (scurvy). Sorrel is most often used medicinally as part of combination formulae; some patented formulations too are available in the market such as Essiac and Sinupret. Many ethnombotanists and medicinal plant experts have also recorded the use of sorrel in various ailments (Lust, 1979; Chiej, 1984; Bown, 1995; Khare, 2007).

The leaf juice, mixed with fumitory (Fumaria officinalis L.), was in use as a cure for itchy skin and ringworm. A root infusion was used as a diuretic and in the treatment of jaundice, gravel and kidney stones. Both the roots and the seeds have been used to stop haemorrhages. A homeopathic remedy is made from sorrel and it is used in the treatment of spasms and skin ailments. In earlier times in European countries, sorrel was used as a refrigerant and diuretic and it was employed as a cooling drink in febrile disorders. Sorrel was said to be quite effective for curing scurvy (Grieve, 1971; Chiej, 1984; Bown, 1995).

In South-east and Far East Asian countries sorrel was an important medicinal plant for treating diseases such as jaundice, intermittent fever, chronic bronchitis (Indonesia); tuberculosis, hepatitis, arthritis, diabetes, scabies, haemorrhoids, constipation, ringworm, acne, scabies, anaemia and leucorrhoea (Vietnam); the sorrel rhizome was also used for chronic bronchitis, ringworm and haemorrhoids (Philippines). In Brazil and Cuba, a decoction of the rhizome was taken in the past as an astringent tonic, depurative and laxative; in Cuba it was used for skin eruptions and ulcers. A related species (Rumex crispus L.) is an important plant used in traditional medicine (Nadkarni, 1976; Do, 2001; Anon., 2014a).

Culinary uses

The edible parts of sorrel are the flowers, leaves, root and seed. In former times, leaf juice was used as a milk-curdling agent. The leaf was eaten raw and cooked; it has a thirst-quenching property. The young leaf is used as salad green, as a potherb and also puréed and used in soups. Sorrel has a lemony flavour, which can be very strong depending on the quantity used. Mostly it forms part of a mixed salad. Leaves can be stored after drying for later use. Flowers are cooked as a vegetable or used as a garnish. Roots are cooked and made into noodles. Seeds, both raw and dried, are also used. Sorrel is the main ingredient in the French recipe for soupe aux herbes and is used for flavouring the famed salmon with sorrel fry. There are many variants for the soupe aux herbes but in all sorrel is an ingredient. Sorrel can be profitably used in a variety of dishes including those containing fish, shellfish, butter, bacon, potatoes, rice, lentils, celeriac, leafy green vegetables, eggs, chicken, mustard and cheese (Lust, 1979; Chiej, 1984; Facciola, 1998; Fern, 2011; Cardinas, 2012). Sorrel is used in many dishes in Europe and the USA, the details of which are available from several sources (Dusoulier, 2014; Anon., 2015a,b).

Safety Issues

The Natural Standard has brought out on sorrel an assessment report that is adopted widely by user agencies (Anon., 2017a,b). Sorrel has toxic properties and when consumed in excess can be highly toxic. It can cause allergic reactions in sensitive people. The pollen is a potential source of allergy. Signs of allergy include rash, itching and shortness of breath (Kemper, 1999; Anon., 2014a,d). Sorrel poisoning may cause symptoms like stomach pain or cramping, vomiting, nausea and diarrhoea. Other side effects may include difficulty in breathing or skin irritation caused by sorrel allergies. Rarely, kidney stones or kidney damage might occur. Large doses of sorrel should be avoided and this herb is not safe for children (Kemper, 1999; Anon., 2014a,c).
Sheep's Sorrel, *Rumex acetosella* L.

Name currently accepted: *Rumex acetosella* L.

Taxonomic serial no.: 20934 (ITIS, 2016b).


Common names: Sheep's sorrel, red sorrel.

Regional/vernacular names: **Chinese**: xiao suan mo; **Finnish**: ahosuolaheinä; **French**: petite oseille, oreille de brebis, rumex fausse-oseille, surelle, surette, vinette; **German**: kleine sauerampfer; **Italian**: acetosa minore, romice acetosella; **Japanese**: hime suiba; **Portuguese**: azeda-de-ovelha (Brazil),

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Introduction
Sheep’s sorrel occurs mainly in grassland, mixed-grass prairie and montane meadow communities throughout temperate North America and Europe. Sheep’s sorrel is common in floodplains and riparian habitats.

Botanical Notes
Sheep’s sorrel is similar to common sorrel in most characteristics. It is a dioecious rhizomatous perennial herb that sometimes forms dense colonies by adventitious shoots from widely spreading roots and creeping rhizomes. Its stems are numerous, erect and highly branched, growing 10–50 cm in height. The lower leaves are petiolate, 1–5 cm in length, 1.5–2 mm in width and lanceolate–linear. A membranous sheath surrounds the stem at each node.

The plant is dioecious. The inflorescence is a terminal panicle, 3–40 cm long, with male and female flowers borne on separate plants. Male flowers are orange–yellow; female flowers are red–orange. Flowers consist of three scale-like sepals and three petals. Sepals of the male flowers are reddish yellow, red or purplish or rarely pale green; sepals of the female flowers are pure red to dark red or purplish. Female flowers have a superior ovary with a single basal ovule; male flowers have six stamens. Fruits (achenes) are small, pale yellow–brown to slightly reddish brown, smooth, shiny and enclosed in three persistent flower scales. Chromosome numbers are 2n = 14, 21, 28, 35, 42. Sex chromosomes are present: staminate plant: XY; pistillate plant: XX. This species represents a polyploidy series and hence exhibits a wide range of variability (Esser, 1995; GISD, 2010; IPCN, 2015; CABI, 2016).

Sheep’s sorrel reproduces primarily by vegetative means by its roots and rhizomes, which produce shoots. Germinating seeds will quickly develop spreading rhizomes. This results in dense clonal colonies that can persist for as many as 15 to 20 years. Sheep’s sorrel has attained the status of a noxious weed in many localities in the USA. It is a highly competitive species and effectively outcompetes native species for light and eventually replaces them (Esser, 1995; CABI, 2016).

Chemical Notes
The chemical composition is similar to common sorrel, described above.

Functional Properties
Functional properties are similar to common sorrel, described above.

Uses
Medicinal uses
Medicinal uses are also similar to common sorrel.

Culinary uses
Culinary uses are similar to common sorrel; see above.
Safety Issues
Any safety issues are similar to those of common sorrel.

References


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