



Sorrel (lat. Rúmex)

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Abstract. The article discusses the main properties of sorrel and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of sorrel in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of sorrel on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

Key words: sorrel, benefit, harm, beneficial properties, contraindications

Beneficial features

Table 1. Chemical composition of sorrel (according to [Food+](#)).

Main substances (g / 100 g):	Fresh sorrel ^[1]
Water	93
Carbohydrates	3.2
Alimentary fiber	2.9
Squirrels	2
Fats	0.7
Calories (kcal)	22
Minerals (mg/100 g):	
Potassium	390
Sodium	four
Phosphorus	63
Calcium	44
Magnesium	103
Iron	2.4
Manganese	0.349
Zinc	0.2
Copper	0.131

Vitamins (mg/100 g):	
Vitamin C	48
Vitamin PP	0.5
Vitamin B6	0.122
Vitamin B2	0.1
Vitamin B1	0.04
AT 9	13

The genus *Sorrel* (*Rumex L*) has more than 150 species, the chemical composition and consumer characteristics of which may differ from each other. But, in general, regardless of the species, the plant is rich in anthraquinones, naphthalenes, flavonoids, stilbenoids, triterpenes, carotenoids and phenolic acids. For the preparation of medicinal raw materials, all parts of the sorrel are used.

The leaves of the plant are a source of flavonoids, carotene, ascorbic acid (which is also present in the flowers of the plant). Sorrel roots contain emodin, chrysophanic acid and other anthraquinone derivatives (up to 4%), tannins (up to 15%), oxalic, coffee and other organic acids, flavonoids, vitamin K. Tannins and anthraquinone derivatives are also found in fruits. At the same time, all parts of sorrel are distinguished by a high content of calcium oxalate, which, first of all, is associated with a number of contraindications when eating the plant.

Medicinal properties

Aerial parts of sorrel and roots are used (or considered as a candidate for use) in the treatment of a number of diseases and pathological conditions, which include gastrointestinal problems (constipation, diarrhea, bloody diarrhea, helminthic infestations), diseases of the gallbladder and liver, including infectious nature (for example, jaundice), colitis and enterocolitis, edema, hemorrhoids, diabetes, as well as skin lesions (ulcers, wounds, burns).

A variety of medicinal properties of sorrel are used to treat and / or eliminate the symptoms of these diseases. When used in certain quantities and concentrations, sorrel is able to reduce blood pressure, anesthetize, activate the excretion of urine and the movement of bile, soothe and relieve inflammation, stop bleeding, exfoliate dead cells and regenerate skin tissues.

In restoring the functioning of the gastrointestinal tract, large doses of sorrel preparations (0.5-1 g three times a day and more often) are prescribed for a laxative effect, and small doses (up to 0.25 g three times a day) **for an astringent effect**. All parts of the plant, when taken orally, increase the peristalsis of the large intestine, soften the feces and reduce the absorption time of food.

Various sorrel extracts show antioxidant, antibacterial, antifungal, and anticancer effects: ^[2]

- **Ethanol and methanol** extracts of sorrel leaves have powerful antioxidant potential. Also, antioxidant properties were found in different extracts of sorrel roots: the most pronounced and multispectral ones are in butanol and methanol extracts, but the chloroform fraction shows itself better than others in removing free radicals of hydrogen peroxide. ^[3]
- **Ethanol and hexane** extracts are able to inhibit a wide range of bacteria, showing multidrug resistance. Water sorrel extracts by suppressing the activity of *H. Pylori* are able to prevent damage to the gastric mucosa. ^[four]
- **Methanol, chloroform and hexane** oxalic extracts can successfully inhibit the growth of pathogenic fungal strains.
- **The ethanol** extract shows the highest (compared to the rest of the concentrates) cytotoxicity against the cell lines MCF-7 (invasive breast ductal adenocarcinoma), DU-145 (prostate

cancer) when analyzed with the lowest IC50 - 47.3 µg / ml (indicator IC50 shows how much inhibitor is needed to suppress the bioprocess by 50%).

The ability of sorrel preparations to provoke the death of cancer cells has been confirmed in other studies. ^[5] Depending on the dosage, ethanol extracts of 6 species of sorrel demonstrated in vitro cytotoxic activity against leukemia cell lines.

Thus, sorrel potentially claims to be a medicine for both microbial infections and some oncological diseases.

Common sorrel extract has shown high antiplatelet activity (via modulation of the MAPK, PI3K/Akt signaling pathways) and therefore may be considered as a drug candidate in the therapy of platelet-related CVD. ^[6]

Also, modern studies indirectly confirm the tradition of using sorrel preparations for the treatment of liver diseases, restoration of liver functions and prevention of liver cirrhosis. The hepatoprotective properties of sorrel are clearly demonstrated in laboratory animals with impaired liver function caused by the intake of carbon tetrachloride ^[7], or, for example, in animals with type 2 diabetes. ^[eight]

At the same time, sorrel, due to the nepodin contained in it, has some independent antidiabetic properties, which appear both "in vitro" and in experiments on mice. ^[9] The same nepodin in sorrel exhibited antimalarial activity and prolonged survival time in the ethanol extract treatment group. ^[ten]

In medicine

Sorrel preparations in the supplement industry come in a variety of forms, from capsules to liquid extracts. When harvesting medicinal raw materials, all parts of the plant are used: leaves with petioles, root, fruits in panicles. Harvesting of roots is carried out in the fall after the death of the above-ground green mass.

Manufacturers in the list of indications for use indicate hepatitis, liver failure, cholecystitis, colitis, hemo- and enterocolitis, hemorrhoids, infection with worms, bleeding stomach ulcers, inflammation of the gums (gingivitis) and oral mucosa (stomatitis). According to the instructions, a liquid extract of horse sorrel roots should be used to reduce pressure in hypertension of the 1st and 2nd stages.

Also, small doses of drugs are recommended to activate the movement of bile and stop diarrhea. Large doses - to stimulate the contractile function of the muscles of the large intestine and enhance the excretion of feces. At the same time, it is stipulated that the laxative effect does not occur immediately, but after 8-12 hours after taking the drug, and with prolonged use, addiction may occur.

Sorrel is included in the mixture prescribed by Zdrenko, intended for the treatment of bladder papillomatosis and gastritis with low acidity, in which the cells that produce hydrochloric acid begin to atrophy (anacid type).

In folk medicine

Even during the formation of a systematic approach to herbal therapy, sorrel was used to relieve pain, normalize the functioning of the gastrointestinal tract, stop bleeding and get rid of skin pathologies.

- **Digestive organs.** A thousand years ago, Avicenna already knew that both sorrel leaves (to a lesser extent) and its seeds have a "fixing" effect. Moreover, preference in such therapy was given to the seeds of "large species".

The tradition of using weak non-concentrated decoctions to get rid of diarrhea has been preserved in folk medicine to this day. Similarly, not only seeds are used, but also plant roots containing 19-27% tannins (the indicators are given for common sorrel, but pronounced astringent properties are also characteristic of horse sorrel, water sorrel and a number of other species). To create an astringent effect in folk medicine, the flowers of the plant were also used in the form of a powder. As part of a complex remedy for stopping diarrhea, sorrel fried in olive oil was combined with pomegranate juice, zira (cumin, or Roman cumin) and dill. To get rid of constipation, large doses of decoctions of sorrel leaves are used, which increase intestinal motility and create a laxative effect. Raw leaves without processing are recommended by herbalists to improve digestion in general.

- **Liver, gallbladder, spleen.** From the early Middle Ages, sorrel leaves mixed with vinegar fought against diseases of the spleen, small doses of sorrel preparations and plant juice provoked a choleric effect, and long-term use of extracts treated jaundice.
- **Skin covers.** Sorrel leaves boiled in wine, applied as a compress, coped with lichen, and water decoctions were used for scabies. For the same purposes, a decoction of the roots or a powdered root mixed with fat (lard, badger fat, etc.) was also used externally. To accelerate the maturation of abscesses and the healing of wounds, fresh crushed plant roots were applied, which were ground into a gruel with sour milk or cream. For skin ulcers, a mixture of crushed sorrel, rose oil and saffron was used. In the simplest version, skin lesions were simply smeared with juice squeezed from sorrel.
- **Oral cavity and upper respiratory tract.** For toothache, folk medicine practiced rinsing the mouth with the juice of fresh leaves. To strengthen teeth and gums, sorrel leaves were simply chewed. A decoction of the roots healed the pharynx and larynx in case of irritation and coughing, and treated a runny nose.

In addition, in various folk traditions, decoctions of sorrel (leaves, roots, seeds) and / or its juice were used to treat scurvy, rheumatism, local tumors, inflammation of the large and small intestines, to stop bleeding (including hemorrhoidal, ulcerative, pulmonary and mother). With a headache, the juice of the plant was rubbed into the temples.

Decoctions and infusions

There are many similar folk recipes for decoctions and infusions of sorrel roots and leaves, examples of which are given below:

- **Decoction for rinsing with stomatitis and gingivitis.** Crushed fresh sorrel leaves (1 tablespoon) are first poured with boiling water (250 ml) and kept on low heat for a quarter of an hour, and then insisted for another hour. Strained broth should rinse the mouth 4-5 times a day until the inflammation of the gums is relieved and the oral mucosa heals.
- **A decoction of the roots for intestinal disorders.** Crushed roots (2 tbsp.) Pour a glass of water and boil for half an hour. Before use, the raw material is squeezed out, and the broth is cooled and filtered. You need to take such a drink in a third of a glass three times a day before meals.
- **Baths with decoction for cystitis.** With inflammation of the bladder mucosa, herbalists recommend taking baths with the addition of sorrel decoction. To do this, the leaves of the plant (500 g) are poured with a liter of boiling water and put in a water bath for 10-15 minutes. Strained broth is added to a daily relaxing bath.
- **Infusion to alleviate the symptoms of menopause.** Dried leaves of the plant (1 tablespoon) are poured with a glass of boiling water (200-250 ml) and kept for 3 hours until cool. Ready infusion is drunk per day, 70-80 ml in three doses half an hour before meals, and the whole course lasts a week.

in oriental medicine

Japanese sorrel (Rumex japonicus Houtt) is common in Korea, Japan and China. Its root is traditionally used in all these countries to treat constipation and more complex gastrointestinal disorders, jaundice, hematemesis, dysfunctional uterine bleeding.

In classical Tibetan medicine, with the help of sorrel, they relieve the “heat of wounds”, heal the liver, inhibit putrefactive fermentation in the intestines, expel helminths and stop ulcer bleeding. In particular, as an antihelminthic and hemostatic agent, decoctions of fresh leaves (1 tablespoon) are prepared, which are first boiled in 2 glasses of water, then insisted for two hours and drunk in strained form three times a day for half a glass.

In India, oxalic preparations purify the blood and lymph, in Mongolia they are used to relieve high fever and treat tuberculosis, and in China, decoctions of the root help get rid of skin pathologies.

In scientific research

Although there are about 150 species in the genus Sorrel, most phytochemical and pharmacological studies have been conducted on about 50 of them. The following are just some of the work of the last three years, which explores the potential of sorrel in the treatment of colitis, liver fibrosis, breast cancer, colon cancer, and human hepatocellular carcinoma.

- **Japanese sorrel has medicinal potential in the treatment of colitis .** ^[eleven]

In this study in laboratory mice, scientists evaluated the protective effect of methanolic sorrel extracts, which were used to treat dextran sulfate sodium (DSS) colitis.

8-week-old male mice were given methanolic sorrel extract for 14 days, followed by a week of 2.5% sodium dextran sulfate, which causes inflammatory bowel disease and reproduces the manifestations of ulcerative colitis, characterized by an abnormal immune response and dysfunction of the epithelial barrier. After dissecting laboratory mice and examining a number of factors, sorrel was found to be effective in suppressing DSS-induced colitis by protecting the tight junctions in the colon.

- **Complex treatment with various fractions of sorrel leaves in the experiment regulates markers of oxidative dysfunctions and shows the ability to restore liver damage caused by carbon tetrachloride.** ^[12]

Carbon tetrachloride (CCl 4) is used in laboratory experiments as a substance that causes oxidative damage and fibrosis of liver cells. In this study, the scientists administered it to 48 male rats divided into 8 groups, each of which received different doses of CCl 4 and then different forms of medicinal sorrel extracts.

The scientists found that all extracts of oxalic leaves to some extent, but especially ethanol and methyl extracts, reduced DNA damage in rat liver tissues, and the complex administration of various plant fractions revealed a significant increase in the level of the antioxidant enzyme compared to the control group. Also, the complex use of sorrel preparations completely changed the level of enzymes and the lipid profile to a normal level. Thus, it was concluded that sorrel leaves are a strong antioxidant and are able to protect the liver from CCl 4-induced fibrosis.

- **Sorrel stem chloroform extract shows anti-cancer activity against cell lines of several types of cancer.** ^[13]

The crude extract of sorrel leaves, stems and flowers was evaluated for human breast cancer (MCF7), human colon cancer (Lovo and Caco-2), human hepatocellular carcinoma (HepG2) cell lines. Most of the crude extracts did not show significant levels of cytotoxicity in the cancer cell line tested. But the stem chloroform extract showed strong anti-cancer activity in all tested lines. And this gives grounds for conducting clinical trials to study the therapeutic potential of the stem extract as an effective and safe natural anti-cancer product.

Not all studies lead to evidence-based confirmation of the effect expected by scientists. A recent example of a “negative result” is the outcome of a paper published in April 2020. The authors tried to evaluate the effects of seed and leaf extracts of the common sorrel (*Rumex obtusifolius*) on the amoeba *Acanthamoeba*, which, penetrating into the cornea of the eye (usually while bathing a person), causes visual impairment, blindness, and can also lead to CNS disorders.^[fourteen]

Despite some encouraging intermediate results, the researchers were unable to identify sorrel extracts as promising candidates for the treatment of acanthamoebiasis. However, this does not mean that studies like this one should be considered ineffective, since in science a reliable negative result is no less useful.

Weight regulation

The calorie content of sorrel, like most other herbs, is low - about 22 kcal per 100 g of raw product. But sorrel is not used as the basis of a dietary program. Due to the abundance of oxalic acid (which can provoke an exacerbation of a number of diseases), it is not even safe to introduce it in large quantities into salads and / or fill the volume of the stomach with low-calorie leaves, as is sometimes practiced at the risk of health during unloading periods.

Since sorrel exhibits astringent properties in small safe amounts, and a laxative effect occurs with increasing doses, it is not entirely safe to use it for a long time in bowel cleansing programs. But if this product is not abused, then in the absence of contraindications, it is quite possible to diversify the main diet menu.

In cooking

In the cuisines of different nations of the world, sorrel is added to soups and borscht (shchi), flatbreads, casseroles, stews, salads and complex sauces, and is used as a filling for pies. But the specifics of the use of herbs in cooking may be due to the type of sorrel growing in the region:

- **Sparrow sorrel**, bitter in taste, has a pronounced lemon flavor, so in local cuisines it is often put in salads. As a curdling agent, it can be used in the preparation of cheeses.
- **Spinach sorrel**, as the name suggests, is eaten in a similar way to spinach, both raw and boiled. In recipes, it is sometimes referred to as "English spinach".
- **Horse sorrel** in Armenia and Azerbaijan is more often used in dried form, because during fermentation the bitterness disappears and a pleasant sour taste appears. In Uzbekistan, cuttings and leaves of a young plant of this species are eaten. During lean periods, its ground stems were added to flour when baking bread.

In combination with other products, sorrel goes well with potatoes, fish, and meat. For example, if you grind it and add it to mashed potatoes, the dish will not only acquire a slight sourness, but also change color to a delicate green. Sometimes this ability to "tint" the main product is used to make "sorrel" cocktails or ice cream.

In cosmetology

Sorrel extracts are used in both medical and skin care cosmetics. Therapeutic is intended mainly for the elimination of age spots (lightening serums and creams), the treatment of acne and fungal infections (including dandruff). In cosmetics, sorrel can be found in cleansing gels, lotions and tonics, as well as in bath products. So, Oriflame has a whole group of creams with sorrel extracts (*Rumex Occidentalis* Extract), which even out skin tone with varying degrees of protective effect, an anti-wrinkle cream, a multifunctional CC cream, etc.

As part of brightening agents to combat pigmentation, freckles, sunburn, age spots, as a rule, complex formulas are used that enhance the moderate effectiveness of pure sorrel preparations. At the same time, a randomized, double-blind, placebo-controlled study testing a 3% ointment based on *Rumex Occidentalis* showed that in the treatment of melasma, oxalic preparation is no less effective than a 4% hydroquinone cream traditionally used to get rid of acquired melasma spots on the skin. face, neck and hands. ^[fifteen]

The lightening mild effect is better manifested with prolonged use of sorrel preparations, which, by blocking the activity of the tyrosinase enzyme, inhibit the synthesis of the melanin pigment. But the peculiarity of the oxalic component is that anti-melasma activity is manifested even on the skin of Asians (45 Filipinos took part in the study described above). In addition, the alignment of skin tone also occurs due to a decrease in redness caused by a rush of blood to the capillaries (that is, by reducing the severity of erythema).

As part of medical cosmetics, sorrel extracts are also used to treat fungal diseases. At home, to create an antifungal effect, a slurry of ground roots is usually prepared, which, when applied as a compress, reduces itching and pain. The same sorrel gruel is also used to combat dandruff (the product is rubbed into the scalp for several minutes, and then washed off with water). During the preparation of the gruel, the sorrel is thoroughly washed, crushed and poured over with boiling water. But before the first application of such a remedy, you should always conduct a half-hour test on a small sensitive area of the skin (for example, on the wrist) to see if the sorrel gruel will cause an allergic reaction.

Less commonly, sorrel is now used in products intended for oral care, although more recently, a root-based powder intended for polishing tooth enamel has been common.

Dangerous properties of sorrel and contraindications

The dangerous properties of sorrel are associated primarily with the abundance of oxalic acid in most species of this plant. Both the acid itself and its salts, oxalates that are poorly soluble in water, are not mutagenic or carcinogenic, but toxic. So, magnesium oxalate and especially calcium linger in the renal pelvis, bladder, urinary tract, eventually acquiring the form of sand or stones of complex crystalline shape. The isolated concentrated oxalic acid is dangerous both by external contact and if swallowed, as it causes chemical burns, burning, spasms, swelling of the larynx, bronchi or lungs. A large amount of this substance can even lead to the death of a person.

However, the danger of death occurs after swallowing 15 grams or more of oxalic acid, and this amount does not come with food. 100 g of green leaves contains 600-800 mg. In a normal diet, a person eats up to 1200 mg (and vegetarians up to 2000 mg) of oxalate every day. But, given that the safe level of oxalic acid for a healthy person is about 50 mg per 100 g of food, it is better not to abuse sorrel. Moreover, there are a lot of oxalates not only in sorrel, but also in other products - in cocoa beans, chocolate, spinach, rhubarb, etc.

An excess of oxalates in a person most often manifests itself in the form of pain (cutting) in the stomach, in the side, in the lower abdomen, an increase in the volume of urine and / or pain when

urinating, and rapid fatigue. But the main health risks are still associated not with a one-time overeating of sorrel, but with the systematic use of extracts from different parts of the plant.

A recent study evaluated the chronic effects of aqueous and ethanolic extracts of spinach sorrel seeds on male and female laboratory rats. Scientists have observed adverse changes occurring in the kidneys, liver and lungs after a 14-week administration of oxalic preparations. Moreover, males were more susceptible than females to the same doses of extracts. However, after a 15-day rehabilitation period without oxal supplementation, most of the animals returned to normal.

In general, the application of the aqueous extract did not lead to irreversible effects, and sorrel extracts caused pathological changes only at very high doses (4000 mg/kg). Lower doses and aqueous extracts produced either minor or reversible changes.^[16]

However, there are often recommendations for the period of treatment with sorrel preparations to eliminate the "oxalate effect" in parallel to use lemon juice or add apple cider vinegar to dishes. These products help to lower the pH of urine to 3.5-4.5, which speeds up the dissolution of oxalates and their elimination from the urinary tract. Also, to bind oxalic acid, it is recommended to combine sorrel with fermented milk products (sour cream, kefir).

Due to the fact that sorrel root extract can have a stimulating effect on the smooth muscles of the uterus, taking these drugs is contraindicated during pregnancy. The aerial part of the plant, rich in anthraquinones, is also not recommended during pregnancy, and the introduction of sorrel into the diet in this case requires consultation with a doctor.

Selection and storage

When choosing sorrel, you should focus on the same signs as when choosing other greens: buy leaves with a uniform color, rejecting yellow, darkened, drying out and with spots. Sluggish leaves are also rejected - fresh stems will crunch when pressed. But in general, it is difficult to keep sorrel fresh for a long time, so sellers often cut it off immediately before selling it, and buyers take a bunch in a volume that can be eaten at a time.

If it became necessary to "hold" the sorrel for 2-3 days, then it is better to wrap it in plastic wrap, cut the ends of the stems, dip them in water and put them in the refrigerator.

To preserve sorrel for a longer period, the herb is dried, frozen, salted or preserved in its own acid.

- **Drying.** The washed sorrel is first dried as a whole on a towel in the sun, and then cut and dried in a ventilated room on a windowsill between two paper towels, which should absorb excess moisture. In inclement weather, sorrel is harvested using dryers at a temperature of 50-60°C.
- **Freeze.** The washed greens are cut across the leaf and dipped for 0.5-1 minute in boiling water until its color changes to olive. After that, the sorrel is well dried for several hours and packed in plastic containers, which are then sent to the freezer.
- **Salting.** The washed leaves are stacked in a glass jar in layers, and the space between them is abundantly covered with salt. Such a container is tightly closed with a lid and sent to a refrigerator or basement with a low temperature.
- **Canning "in its own juice".** Washed leaves in a chopped state are laid out in a frying pan without oil and heated until they darken and let the juice flow. Immediately after this, the sorrel with juice is transferred to pre-sterilized jars, after which the cycle is repeated until the entire jar is filled with leaves. Banks are closed, and the grass in them "reaches" under the covers for several more hours.

The latter method allows you to store sorrel for about 3 months. In other cases, this period is extended to 1-2 years.

Sorrel has not received wider use in the economy. But, on the other hand, judging by the active and productive study of plant extracts by scientists, all the medicinal possibilities of the herb have not yet been revealed. And the beneficial properties already known today allow people to maintain their health using traditional medicine. It should only be remembered that the use of sorrel as a medicine in home therapy is associated with certain risks, therefore, plant preparations should be used with extreme caution for a long time.

Literature

1. US National Nutrient Database, [source](#)
2. Riffat B, Ejaz A, Hina S, Javed I, Saira T, Tariq M. Rumex dentatus could be a potent alternative to treatment of microbial infections and of breast cancer. J Tradit Chin Med. 2019 Dec;39(6):772-779.
3. Sumaira Sahreen, Muhammad Rashid Khan, Rahmat Ali Khan. Comprehensive assessment of phenolics and antiradical potential of Rumex hastatus D. Don. Roots - BMC Complement. Altern. Med. 2014, Feb 8, 14, 47. DOI: 10.1186/1472-6882-14-47
4. Han JH, Khin PP, Sohn UD Effect of Rumex Aquaticus Herba Extract Against Helicobacter pylori -Induced Inflammation in Gastric Epithelial Cells - J. Med. food. 2016, Jan., 19(1), 31-37.
5. Wegiera M., Smolarz HD, Bogucka-Kocka A. Rumex L. species induce apoptosis in 1301, EOL-1 and H-9 cell lines - Acta Pol. Pharm. 2012, May-Jun., 69(3), 487-499.
6. Jeong D, Irfan M, Lee DH, Hong SB, Oh JW, Rhee MH. Rumex acetosa modulates platelet function and inhibits thrombus formation in rats. BMC Complement Med Ther. 2020 Mar 23;20(1):98. doi: 10.1186/s12906-020-02889-5.
7. Sahreen S., Khan MR, Khan RA Evaluation of Rumex hastatus leaves against hepatic fibrosis: a rat model - BMC Complement. Altern. Med. 2017, Aug 30, 17(1), 435. doi: 10.1186/s12906-017-1943-5.
8. Degirmenci I., Kalender S., Ustuner MC, Kalender Y., Gunes HV, Unal N., Basaran A. The effects of acarbose and Rumex patientia on liver ultrastructure in streptozotocin-induced diabetic (type II) rats - Drugs Exp. Clin. Res. 2002, 28(6), 229-234.
9. Ha BG, Yonezawa T., Son MJ, Woo JT, Ohba S., Chung UI, Yagasaki K. Antidiabetic effect of nepodin, a component of Rumex roots, and its modes of action in vitro and in vivo - Biofactors. 2014, Jul-Aug., 40(4), 436-447. doi: 10.1002/biof.1165.
10. Lee KH, Rhee KH Antimalarial activity of nepodin isolated from Rumex crispus - Arch. Pharm. Res. 2013, Apr., 36(4), 430-435. doi: 10.1007/s12272-013-0055-0.
11. Kim HY, Jeon H, Bae CH, Lee Y, Kim H, Kim S. Rumex japonicus Houtt. alleviates dextran sulfate sodium-induced colitis by protecting tight junctions in mice. Integr Med Res. 2020 Jun;9(2):100398. doi: 10.1016/j.imr.2020.02.006.
12. Sumaira Sahreen, Muhammad Rashid Khan, and Rahmat Ali Khan. Evaluation of Rumex hastatus leaves against hepatic fibrosis: a rat model. BMC Complement Altern Med. 2017; 17:435. doi:10.1186/s12906-017-1943-5.
13. Muhammad Farooq, Nael Abutaha, Shahid Mahboob, Almohannad Baabbad, Nawaf D Almoutiri, Mohammad Ahmed A M Wadaan. Investigating the Antiangiogenic Potential of Rumex vesicarius (Humeidh), Anticancer Activity in Cancer Cell Lines and Assessment of Developmental Toxicity in Zebrafish Embryos. Saudi J Biol Sci. 2020 Feb;27(2):611-622. doi: 10.1016/j.sjbs.2019.11.042.

14. Nayeri T, Bineshian F, Khoshzaban F, Asl AD, Ghaffarifar F. Evaluation of the effects of Rumex obtusifolius seed and leaf extracts against Acanthamoeba: An in vitro study. Infect Disord Drug Targets. 2020 Apr 22. doi: 10.2174/1871526520666200422111044.
15. Mendoza CG, Singzon IA, Handog EB A randomized, double-blind, placebo-controlled clinical trial on the efficacy and safety of 3% Rumex occidentalis cream versus 4% hydroquinone cream in the treatment of melasma among Filipinos - Int. J. Dermatol. 2014, Nov., 53(11), 1412-1416. DOI: 10.1111 / ijd.12690
16. Islam R, Mamat Y, Ismayil I, Yan M, Kadir M, Abdugheny A, Rapkat H, Niyaz M, Ali Y, Abay S. Toxicity of anthraquinones: differential effects of rumex seed extracts on rat organ weights and biochemical and haematological parameters. Phytother Res. 2015 May;29(5):777-84. doi: 10.1002/ptr.5317.

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Sorrel - useful properties, composition and contraindications

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