Radix cum Herba Taraxaci

Definition

Radix cum Herba Taraxaci consists of the entire plant of *Taraxacum officinale* Weber ex Wiggers (Asteraceae) (*1–3*).[1]

Synonyms

For *Taraxacum officinale*: *Leontodon officinale* With., *L. taraxacum L. Taraxacum officinale* (With.) Wigg., *T. dens leonis* Desf., *T. vulgare* Schrank, (*6*).

Selected vernacular names

Ackerzichorie, amargon, blowball, Butterblume, cankerwort, capo di frate, chicoria amarga, cicoria sarvatica, cicouureya de la bonne, cicoureya deis prats, dandelion, dent-de-lion, dente di leone, dhudal, diente de leon, dhorsat al ajouz, dudhi, engraissa-porc, florion d'or, gol ghased, Gemeiner Löwenzahn, gobesag, Irish daisy, hindabaa beri, hokgei, kanphul, kanphuli, kasni sahraii, Kettenblume, khass berri, Kuhblume, lagagna, laiteron, lechuguilla, lion's tooth, Löwenzahn, maaritpauncin, marrara, milk gowan, min-deul-rre, monk's head, mourayr, mourre de por, mourre de pouerc, oduwantschiki, paardebloem, patalagagna, peirin, Pfaffendistel, Pfaffenröhrlein, Pferdeblume, pilli-pilli, piochoublit, piss-a-bed, pissa-chin, pissanliech, pissenlit, poirin, po-kong-young, porcin, pu gong ying, puffball, pugongying, Pusteblume, ringeblume, salatta merra, sanalotodo, saris berri, seiyo-tanpopo, sofione, srissi, tarakh-chaqoune, tarkhshaquin, tarassaco, taraxaco, telma retaga, Wiesenlattich, witch gowan, yellow gowan (*4–10*).

Geographical distribution

Taraxacum officinale is indigenous to the northern hemisphere (*11*). *T. mongolicum, T. sinicum* and related species are found in the Korean peninsula and China (*4, 5*).

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[1] *Taraxacum mongolicum* Hand.-Mazz. and *T. sinicum* Kitag. are also recognized in the *Pharmacopoeia of the People's Republic of China* (*4*) and the *Pharmacopoeia of the Republic of Korea* (*5*).

Description

A perennial herb consisting of an underground, long, straight, tapering, fleshy brown root, which is continued upward as a simple or branched rhizome. From the rhizome arises a rosette of bright-green runcinate leaves and later, from the centre of the rosette, a hollow scape, 6–30 cm high bearing on its summit a broad orange-yellow head of ligulate flowers. Fruits are fusiform, greenish-brown achenes, terminating in a slender stalk crowned by a silky, spreading pappus, and borne on a globular fruiting head (*12*).

Plant material of interest: dried whole plants

General appearance

A crumpled and rolled mass. Roots conical, frequently curved, tapering, often broken into irregular pieces, externally brown. Root stock with brown or yellowish-white hairs. Leaves basal, frequently crumpled and broken; when whole, oblanceolate, greenish-brown or dark green with a pronounced midrib; apex acute or obtuse; margins lobate or pinnatifid. Pedicels one or more, each with a capitulum; involucre several rows, the inner row relatively long; corolla yellowish-brown or pale yellowish-white (*1, 4, 5*).

Organoleptic properties

Odour, slight; taste, slightly bitter (*1, 11*).

Microscopic characteristics

Epidermal cells on both leaf surfaces have sinuous anticlinal walls, cuticle striations distinct or sparsely visible. Both leaf surfaces bear non-glandular hairs with three to nine cells, 17–34 µm in diameter. Stomata, occurring more frequently on the lower surface, anomocytic or anisocytic, with three to six subsidiary cells. Mesophyll contains fine crystals of calcium oxalate. Transverse section of root shows cork with several layers of brown cells. Phloem broad, groups of laticiferous tubes arranged in several interrupted rings. Xylem relatively small, with indistinct rays, vessels large, scattered. Parenchymatous cells contain inulin (*1*).

Powdered plant material

Greenish yellow. Large root parenchymatous cells, brown reticulate vessels and tracheids and non-lignified fibres. Leaf fragments with sinuous, anticlinal-walled epidermal cells and a few anomocytic stomata. Numerous narrow annular thickened vessels and fragments of brown laticiferous tissues (*1*).

General identity tests

Macroscopic and microscopic examinations (*1*, *4*, *5*).

Purity tests

Microbiological

Tests for specific microorganisms and microbial contamination limits are as described in the WHO guidelines on quality control methods for medicinal plants (*13*).

Foreign organic matter

Not more than 2% (*3*).

Total ash

Not more than 17% (*3*).

Water-soluble extractive

Not less than 30% (*3*).

Loss on drying

Not more than 11% (*3*).

Pesticide residues

The recommended maximum limit of aldrin and dieldrin is not more than 0.05 mg/kg (*14*). For other pesticides, see the *European pharmacopoeia* (*14*) and the WHO guidelines on quality control methods for medicinal plants (*13*) and pesticide residues (*15*).

Heavy metals

For maximum limits and analysis of heavy metals, consult the WHO guidelines on quality control methods for medicinal plants (*13*).

Radioactive residues

Where applicable, consult the WHO guidelines on quality control methods for medicinal plants (*13*) for the analysis of radioactive isotopes.

Other purity tests

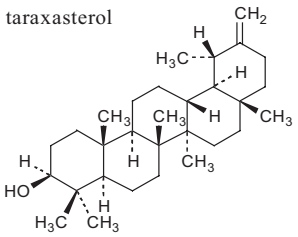
Chemical, acid-insoluble ash, sulfated ash and alcohol-soluble extractive tests to be established in accordance with national requirements.

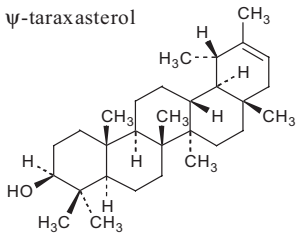
Chemical assays

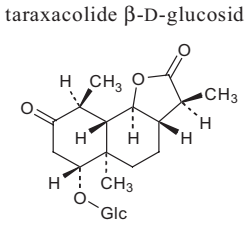
To be established in accordance with national requirements.

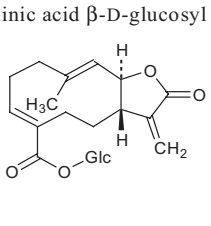
Major chemical constituents

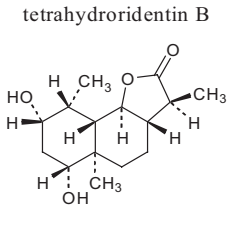
The characteristic constituents are sesquiterpenes, including the bitter eudesmanolides tetrahydroridentin B and taraxacolide β-D-glucopyranoside; and the germacranolides, taraxinic acid β-D-glucopyranoside and 11,13-dihydrotaraxic acid β-D-glucopyranoside. Also present are the *p*-hydroxyphenylacetic acid derivative, taraxacoside; the triterpenes, taraxasterol, ψ-taraxasterol and taraxerol; and inulin (2–40%) (*4, 10, 11*). Representative structures are presented below.

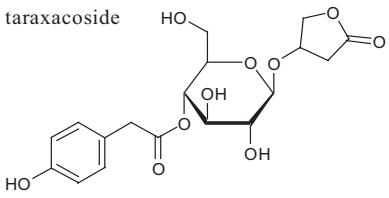


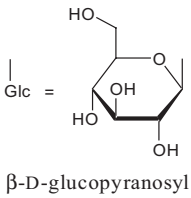












Medicinal uses

Uses supported by clinical data

No information available.

Uses described in pharmacopoeias and well established documents

To stimulate diuresis (*2, 5*), increase bile flow and stimulate appetite, and for treatment of dyspepsia (*2*).

Uses described in traditional medicine

As a galactagogue, laxative and tonic. Treatment of boils and sores, diabetes, fever, inflammation of the eye, insomnia, sore throat, lung abscess, jaundice, rheumatism and urinary tract infections (*10*).

Pharmacology

Experimental pharmacology

Anti-inflammatory and analgesic activity

External applications of 2.0 mg/ear of a methanol extract of the dried leaves to mice reduced ear inflammation induced by 12-*O*-tetradecanoylphorbol-13-acetate (*16*). Intragastric administration of 1.0 g/kg body weight (bw) of a 95% ethanol extract of the whole plant to mice inhibited benzoquinone-induced writhing (*17*). Intraperitoneal administration of 100.0 mg/kg bw of a 95% ethanol extract of the whole plant to mice inhibited carrageenan-induced footpad oedema by 42%, and reduced pain as measured by the hot-plate test and benzoquinone-induced writhing (*17*). Intragastric administration of 100.0 mg/kg bw of an 80% ethanol extract of the dried roots to rats inhibited carrageenan-induced footpad oedema by 25%, compared with 45% inhibition resulting from administration of 5.0 mg/kg bw of indometacin (*18*).

Antimicrobial activity

A 95% ethanol extract of the dried aerial parts, 1.0 mg/ml, did not inhibit the growth of *Bacillus globifer*, *B. mycoides, B. subtilis, Escherichia coli, Fusarium solani, Klebsiella pneumoniae, Penicillium notatum, Proteus morganii, Pseudomonas aeruginosa, Salmonella gallinarum, Serratia marcescens, Staphylococcus aureus, Mycobacterium smegmatis* or *Candida albicans* in vitro (*19, 20*). No antibacterial effects were observed using a 50% ethanol extract of the whole plant, 50 µl/plate, against *Escherichia coli, Salmonella enteritidis, Salmonella typhosa, Shigella dysenteriae* or *Shigella flexneri* (*21*).

Antiulcer activity

Intragastric administration of 2.0 g/kg bw of an aqueous extract of the whole plant to rats protected the animals against ethanol-induced gastric ulceration. A methanol extract, however, was not active (*22*).

Choleretic activity

Intragastric administration of an aqueous or 95% ethanol extract of the whole plant (dose not specified) to rats increased bile secretion by 40% (*23*).

Diuretic activity

Intragastric administration of 8.0–50.0 ml/kg bw of a 95% ethanol extract of the whole plant to rats induced diuresis and reduced body weight (*24*). Intragastric administration of 0.1 ml/kg bw of a 30% ethanol extract of the whole plant to mice induced diuresis (*25*). However, intragastric

administration of 50.0 mg/kg bw of a chloroform, methanol or petroleum ether extract of the roots to mice did not consistently increase urine output (*26*).

Hypoglycaemic activity

Intragastric administration of a 50% ethanol extract of the whole plant to rats, 250.0 mg/kg bw, or rabbits, 1.0 g/kg bw, reduced blood glucose concentrations (*27*). However, intragastric administration of 2.0 g/kg bw of the powdered whole plant to rabbits did not reduce blood sugar concentrations in alloxan-induced hyperglycaemia (*28*). Intragastric administration of 25.0 mg/kg bw of an aqueous extract of the dried root to mice reduced glucose-induced hyperglycaemia (*29, 30*). However, a decoction or 80% ethanol extract of the dried roots had no effect (*30*).

Immunological effects

Intragastric administration of 3.3 g/kg bw of an aqueous extract of the whole plant to mice daily for 20 days significantly ($P < 0.01$) decreased cyclophosphamide-induced immune damage (*31*). Treatment of scalded mice with suppressed immune functions with an aqueous extract of the whole plant (dose and route not specified) stimulated the immune response (*32*). Nitric oxide synthesis inhibition induced by cadmium in mouse peritoneal macrophages stimulated with recombinant interferon-γ and lipopolysaccharide was counteracted by treatment of the cells with an aqueous extract of the whole plant, 100 µg/ml. The results were mainly dependent on the induction of tumour necrosis factor-α (TNF-α) secretion stimulated by the aqueous extract (*33*). Treatment of primary cultures of rat astrocytes with an aqueous extract of the whole plant, 100.0 µg/ml, inhibited TNF-α production induced by lipopolysaccharide and substance P. The treatment also decreased the production of interleukin-1 in astrocytes stimulated with lipopolysaccharide and substance P. The study indicated that Radix cum Herba Taraxaci may inhibit TNF-α production by inhibiting interleukin-1 production, thereby producing anti-inflammatory effects (*34*). Treatment of mouse peritoneal macrophages with an aqueous extract of the whole plant, 100 µg/ml, after treatment of the cells with recombinant interferon-γ, resulted in increased nitric oxide synthesis owing to an increase in the concentration of inducible nitric oxide synthase. The results were dependent on the induction of TNF-α secretion by Radix cum Herba Taraxaci (*35*).

Toxicology

The intraperitoneal median lethal dose (LD_{50}) of a 95% ethanol extract of the whole plant in rats was 28.8 mg/kg bw (*24*). In rats, the maximum

tolerated dose of a 50% ethanol extract of the whole plant administered by the intraperitoneal route was 500.0 mg/kg bw (*27*). No visible signs of toxicity were observed in rabbits after intragastric administration of the powdered whole plant at doses of 3–6 g/kg bw per day for up to 7 days (*36*).

Clinical pharmacology
No information available.

Adverse reactions
Allergic reactions including anaphylaxis and pseudoallergic contact dermatitis have been reported (*37–40*). Cross-reactivity has been reported in individuals with an allergy to the pollen of other members of the Asteraceae (*41*).

Contraindications
Radix cum Herba Taraxaci is contraindicated in obstruction of the biliary or intestinal tract, and acute gallbladder inflammation. In case of gallbladder disease, Radix cum Herba Taraxacum should only be used under the supervision of a health-care professional (*2*).

Warnings
May cause stomach hyperacidity, as with all drugs containing amaroids (*2*).

Precautions
Drug interactions
A decrease in the maximum plasma concentration of ciprofloxacin was observed in rats treated with concomitant oral administration of 2.0 g/kg bw of an aqueous extract of the whole plant and 20.0 mg/kg bw of ciprofloxacin (*42*).

Carcinogenesis, mutagenesis, impairment of fertility
No effects on fertility were observed in female rabbits or rats after intragastric administration of 1.6 ml/kg bw of a 40% ethanol extract of the whole plant during pregnancy (*43*).

Pregnancy: teratogenic effects
No teratogenic or embryotoxic effects were observed in the offspring of rabbits or rats after intragastric administration of 1.6 ml/kg bw of a 40% ethanol extract of the whole plant during pregnancy (*43*).

Other precautions

No information available on general precautions or on precautions concerning drug and laboratory test interactions; non-teratogenic effects in pregnancy; nursing mothers; or paediatric use.

Dosage forms

Dried whole plant, native dry extract, fluidextract and tincture (*1, 2*). Store in a tightly sealed container away from heat and light.

Posology

(Unless otherwise indicated)

Average daily dose: 3–4 g of cut or powdered whole plant three times; decoction, boil 3–4 g of whole plant in 150 ml of water; infusion, steep 1 tablespoonful of whole plant in 150 ml of water; 0.75–1.0 g of native dry extract 4:1 (w/w); 3–4 ml fluidextract 1:1 (g/ml) (*2*); 5–10 ml of tincture (1:5 in 45% alcohol) three times (*1*).

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