RIBWORT

Plantago lanceolata L.

Family

Plantaginaceae.

Plantago is a genus of approximately 275 species of small, inconspicuous plants commonly called plantains or fleaworts. It also includes greater plantain *(Plantago major)* and psyllium *(Plantago psyllium)*, whose seeds are used in the making of a well known laxative, Metamucil. These plantain species should not be confused with the starchy cooking banana called plantain, whose name is a corruption of the Spanish word platano, meaning plane tree or banana tree.

Parts Used

Leaf.

Description

Ribwort is a common perennial weed of arable fields and grassland abundant throughout Europe, central and northern Asia. It is naturalised in Australia and the United States. The herb is a common roadside plant and is found in lawns. It is relatively drought resistant and is able to grow on dry sites such as embankments and chalk grassland. A rosette forming herb with a persistent taproot, the leaves are narrowly oblong, sparsely hairy and distinctly parallel-veined. The markedly ridged flowering stalks have numerous inconspicuous white or pale pink flowers in a dense solitary cluster.[1,2]

Traditional Use

Plantago is from the Latin *planta*, the sole of the foot, because it grows on paths and *lanceolata* refers to the lance shaped leaves. In his 1965 tome, Herbal, Joseph Wood Krutch says "homely ribwort shares with handsome dandelion the bitterest fury of the suburbanite proud of their lawn." The *Plantago* species appears not only in Dioscorides (c. 40 to 90 AD) but in the very earliest records of Anglo-Saxon medicine, as well as in a small Herbal of 1525. They also figure in the folklore of various peoples and are said to be known by the aborigines of Australia and New Zealand, and the United States, by names translatable as 'white man's foot', in reference to introduction by Europeans. Another old popular name was 'kemps'. The Anglo-Saxon word for soldier was *cempa* so it is thought the name is derived from this because of an old game country children used to play. The stalks of ribwort are particularly tough and wiry and the game involved striking the heads one against the other until the stalk breaks. Plantain has long been considered by herbalists to be a useful remedy for coughs, wounds, inflamed skin or dermatitis, and insect bites. Bruised or crushed leaves have been applied topically to treat insect bites and stings, eczema and small wounds or cuts. It was considered by herbalists to be a gentle, soothing expectorant and additionally to have a mild astringent effect said to help remedy haemorrhoids or bladder infections with mild amounts of blood in the urine. Ribwort has traditionally been regarded as a mucilage drug. The mucilage polysaccharides, mainly arabinose and galactose, are not resorbed and cover the mucosa with a protective layer against local irritations.[3,4,5,6,7]

Constituents

Phenolic acids (gallic, chlorogenic, cinnamic, caffeic acids), mucilage polysaccharides (mainly arabinose and galactose), iridoid glycosides (including aucubin and catalpol), tannins, silica, acteoside, aglycone aucubigein, five phentylethanoids, cistanosid, coumarins, saponins, flavonoids (apigenin and luteolin) and minerals (zinc and potassium).[8,9]

Actions

Anti-inflammatory, antioxidant, expectorant, anticatarrhal, antibacterial, antimicrobial, astringent, demulcent, soothing diuretic.

Pharmacological Activity

Anti-inflammatory and Antioxidant Action

Ribwort is considered a significant anti-inflammatory agent following a 2010 *in vitro* study. To evaluate anti-inflammatory activity of selected Plantago species (*P. lanceolata* L. and *P. major* L.) an optimised *in vitro* test for determination of cyclooxygenase-1 (COX-1) and 12-lipoxygenase (12-LOX) inhibition potency was undertaken. The results validated the well-known COX-1 inhibitory activity of ribwort and *P. major* methanol extracts (concentration required for 50% inhibition (Inhibitory Concentration IC(50)) was 2.00 and 0.65mg/mL, respectively). Furthermore, 12-LOX inhibitory activity of examined extracts was reported for the first time (IC(50) = 0.75 and 1.73mg/mL for ribwort and *P. major*, respectively).[10]

The effects of extracts from ribwort (leaves, flowers, roots) on mediators of inflammation have been investigated *in vitro* in rodent macrophages. They inhibited the production of nitric oxide in this cell line and significant scavenging of nitric oxide radicals. Pre-treatment with these extracts did not affect COX-1 mRNA production, COX-2 mRNA and PGE2 levels induced by lipopolysaccharide/interferon-γ challenge. The authors assume that the anti-inflammatory effects of ribwort extracts are based on the inhibition of nitric oxide and not a reduced prostaglandin production.[11]

Romanian researchers investigated *in vitro* if a standardised hydroalcoholic extract from ribwort leaves can suppress in cell-free systems the activities of 5-lipoxygenase and COX-2 which are key enzymes in the formation of pro-inflammatory eicosanoids from arachidonic acid. The ribwort extract displayed significant efficacy concerning a dose-dependent inhibition of COX-2 activity.[12]

The anti-inflammatory efficacy of extracts from ribwort has been investigated by means of the modified hen's egg chorioallantoic membrane test (HET-CAM). Four different freeze-dried liquid extracts (28% ethanol) were used.

At a 10-fold higher concentration (500µg/pellet vs. 50µg) the anti-inflammatory activity of the extracts was comparable to that of hydrocortisone, phenylbutazone and sodium diclofenac.[13]

The antioxidant activity of a methanol extract from the aerial parts of ribort was studied using the DPPH scavenging test (a common antioxidant assay) and lipid peroxidation inhibition assay, in which this extract was found to be the most active as compared to methanol extracts from other *Plantago* species.[14]

A recent study investigated the possible mode of action of the antioxidant potential of a hydroalcoholic extract from ribwort leaves standardised to mucilaginous substances. The antioxidant property was measured using a colorimetric assay and the free radical scavenging potential by means of activated human polymorphonuclear neutrophils (PMNs). For the extract, a minor antioxidant status and the capacity of scavenging free radicals released by activated PMNs were observed.[15]

Respiratory System Activity

The aim of a prospective, multicentre study was to obtain data on the administration of a cough syrup (100mL of the syrup contained 20g 1:1 ethanol fluid extract from ribwort) and to assess its efficacy and safety in patients with unspecific acute respiratory diseases. For the assessment of therapeutic course, subjective symptoms, efficacy and tolerability were rated by the patient and the doctor by means of scores from 0 to 5. A total of 593 patients (mean age 42 years, range 1 to 88 years) were included and 15% of the patient's were aged less than 18 years. The main diagnoses were acute respiratory infections (32% of the patients), acute bronchitis (28%) and irritative cough following acute respiratory infections (18%). The mean duration of administration of the cough syrup was 10 days with a mean daily dose of about 30mL of the syrup corresponding to about 6g of the herbal substance. After 3 to 14 days of treatment intensity and frequency of coughing was reduced by 67% and 66%, respectively. Thoracal pain decreased by 80%, irritative cough and dyspnea by 69%. Subjective findings and general condition as assessed by the doctor improved by 43% and 37%, respectively.

Global efficacy was assessed as good by the doctor in 62% of the patients, and as excellent by 26% of the patients. Moderate to insufficient efficacy was reported by about 13% of the patients, whereby the assessments by patients and doctors showed great similarity.[16]

Antibacterial and Antimicrobial Activity

A 2015 study investigating the *in vitro* and *in vivo* antimicrobial effects of ribwort tea (from flowers and leaves) on cariogenic (causing tooth decay) bacteria has returned positive results. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) against cariogenic bacteria were determined for ribwort tea. Subsequently, a controlled random clinical study was conducted. Group A was instructed to rinse with a ribwort mouth rinse, and Group B received a placebo mouth rinse for seven days. The salivary colonisation by *streptococci* and *lactobacilli* was investigated prior to treatment and on the fourth and seventh days. The *in vivo* test showed that Group A subjects presented a significant decrease in *streptococci* compared to Group B. The antistreptococcal activity of ribwort infusions could be related to the phenolic substances occurring in the infusion and is most likely the result of the synergistic activity of the many phenolics that were isolated. The authors concluded that ribwort extract could represent a natural anticariogenic agent via an antimicrobial effect and might be useful as an ancillary measure to control the proliferation of cariogenic flora however further studies are needed.[17]

Although the exact underlying mechanisms are still unknown, ribwort water extracts are frequently used to stimulate wound healing and to drain abscesses. A 2015 experimental study looked at the effect of ribwort water extract on skin wound healing in rats. Two excisional and one incisional skin wounds were performed on the back of each rat. Wounds were treated for three consecutive days with two different concentrations of the aqueous ribwort extract. Rats were sacrificed 7, 14, and 21 days after surgery. Samples of wounds were processed for macroscopic (excisions - wound contraction measurement), biomechanical (incisions - wound tensile strength (TS) measurement) and histological examination (excisions).

It was shown that open wounds treated with ribwort extract contained myofibroblasts and demonstrated significantly higher contraction rates. Furthermore, significantly increased wound TSs were recorded in treated rats as a consequence of increased organization of extracellular matrix proteins, such as the collagen type 1. The study demonstrated that ribwort aqueous extract improves skin wound

healing in rats. However, further research needs to be performed to find the optimal therapeutic concentration, and the exact underlying mechanism prior to being introduced into the clinical practice.[18]

Demulcent Activity

Moderate adhesive effects of polysaccarides from ribwort extracts on mucus membranes by means of an *ex vivo* system based on porcine buccal (mouth) membranes were shown in a German study. Aqueous extracts of polysaccharide-containing plants are widely used in therapy for irritated mucus membranes in the pharynx region. In order to prove the existence of mucilaginous effects of polysaccharide hydrocolloids on epithelia an *ex vivo* system based on porcine buccal membranes was established. The tissue culture was stable and there was no indication of cytolytic processes during the five hour incubation period. The test system was shown to discriminate the adhesive effects of different raw polysaccharides, obtained from a variety of medicinal plants. While polysaccharides from *Althaea officinalis*, *Plantago lanceolata*, *Malva moschata* (Musk mallow), or *Tilia cordata* (Lime flowers) showed only moderate bioadhesion to epithelial tissue, strong adhesive processes were observed with polysaccharides from *Fucus vesiculosus* (Bladderwrack) and *Calendula officinalis*. The adhesive effects were concentration-dependent. Histological studies of membranes, incubated with a fluorescence-labelled rhamnogalacturonan, indicated the presence of distinct polysaccharide layers on the apical membrane surface. With these results, adsorption effects of certain polysaccharides on mucus membranes were shown for the first time. Such effects suggest that this may account, at least in part, for the therapeutic effects of mucilage-containing plants in the treatment of irritated buccal membranes.[19]

Antiobesity Activity

A 2013 study investigated the antiobesity effects of ribwort leaf powder when fed to mice. The addition of ribwort to a high-fat diet did not affect food intake but significantly reduced food efficiency, suppressed body weight gain and visceral fat accumulation, and reduced serum free-fatty acid and glucose levels. These findings suggest that dietary ribwort exerts antiobesity effects by stimulating metabolism throughout visceral fat tissue by activating lipolysis, accelerating fatty acid β-oxidation and suppressing fatty acid synthase in white adipose tissue.[20]

Antipeptic Ulcer Activity

The effect of the leaf extract of ribwort on gastric secretion and cytoprotection was evaluated using different models of gastroduodenal ulcer, including acetic acid induced chronic gastric ulcer, indomethacin induced gastric ulcer, cysteamine induced duodenal ulcer and pylorus ligation induced gastric ulcer. The aqueous extract was administered at 200mg/kg and 400mg/kg and 140mg/kg and 280mg/kg for mice and rats, respectively, and compared with vehicle or the standard, ranitidine (50 or 70mg/kg) or misopristol (280µg/kg). In addition, activity of the mucilage (172mg/kg) was also evaluated in acetic acid induced chronic gastric ulcer. In all cases, higher doses of the extract provided better protection than lower doses and the mucilage, hinting at a dose-dependent effect. Whilst higher doses of the extract showed a better healing of the ulcer as well as protection in indomethacin and pylorus ligation models, activities of lesser magnitude than ranitidine were noted in the cysteamine model. Together these findings indicate that higher doses used in the present study provided an overall better protection against gastroduodenal ulcers than the standard drugs employed through antisecretory and cytoprotective mechanisms.[21]

Antiviral Activity

Recent research proposes a possible herbal treatment using ribwort for AIDS-related symptoms. The author cites studies which suggest that plant lectins inhibit HIV infection and cell fusion, and her experience of witnessing the improved condition of a man diagnosed with AIDS-Related Complex after regular ingestion of tea made from the ribwort. She adds, however, that further studies are needed.[22]

Antispasmodic Activity

An ethanolic (20%) soft extract of ribwort inhibited the ileum contractions caused by acetylcholine, histamine, potassium and barium ions and barium induced tracheal contractions in guinea-pigs. These effects were comparable to those of atropine and papaverine.[23]

Anthelmintic Activity

A recent *in vivo* study has shown that ethanolic and aqueous extracts from ribwort leaves displayed significant anthelmintic activity against pinworms in mice.[24]

Antitoxic Activity

In vitro antimitotic (inhibits cell division) and antigenotoxic (doesn't damage DNA which causes a cancer mutation) effects with aqueous extracts from ribwort leaves were observed in a recent study.[25]

Indications

- Upper respiratory catarrh, particularly in children, including chronic mucous membrane discharge, asthma, acute and chronic bronchitis, coughs of all sorts, pertussis (whooping cough), rhinitis, sinusitis, nasal and middle ear catarrhal conditions
- Inflammation of the mouth and throat
- Dysentery and diarrhoea, gastric and peptic ulcer, colitis, haemorrhoids
- Incontinence in children, painful urination, cystitis
- Externally for wounds and inflammation of the skin, as a form of first aid for insect bites and bruises

Energetics

Cooling, moistening.

Use in Pregnancy

Not advised as there is insufficient evidence for safe administration.

Contraindications

None known.

Drug Interactions

None known.

Administration and Dosage

Liquid Extract:	1:1
Alcohol:	25%
Weekly Dosage:[26]	20 to 80mL

Formulas Lyndsay Shume has used successfully in clinical practice.

Sinusitis/Rhinitis (200mL)

Recommended dose: *1 to 4mL TDS*

Ribwort *(Plantago lanceolata)* 1:1	40mL
Eyebright *(Euphrasia officinalis)* 1:1	60mL
Echinacea *(Echinacea purpurea)* 1:1	40mL
Elder Flowers *(Sambucus nigra)* 1:1	40mL
Golden Seal *(Hydrastis canadensis)* 1:3	20mL
Total:	200mL

Post Nasal Catarrh (200mL)

Recommended dose: *1 to 4mL TDS*

Ribwort *(Plantago lanceolata)* 1:1	40mL
Ground Ivy *(Glechoma hederacea)* 1:1	60mL
Eyebright *(Euphrasia officinalis)* 1:1	60mL
Echinacea *(Echinacea purpurea)* 1:1	20mL
Golden Seal *(Hydrastis canadensis)* 1:3	20mL
Total:	200mL

Ribwort Succus

Juice fresh ribwort leaves and mix the juice with an equal amount of honey. Pour into sterilised bottles and store in a cool place. Dose: One teaspoonful as needed for coughs.

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