

Dandelion (*Taraxacum officinale* and *T mongolicum*)

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Abstract

Dandelion (*Taraxacum spp*) is used in many traditional and modern herbal medical systems, as particularly has been documented in Asia, Europe, and North America. The root is primarily considered a gastrointestinal remedy supporting digestion and liver function, while the leaf is used as a diuretic and bitter digestive stimulant.

Preclinical research on dandelion has revealed numerous properties, including its actions as an inflammation modulator, diuretic, digestive stimulant, insulin stimulant, demulcent, prebiotic, immunomodulator, antiangiogenic, and anti-

neoplastic, although not all studies agree.

There are very limited numbers of clinical trials involving dandelion, and almost all of these involve complex herbal formulas containing dandelion as only 1 part. These formulas have been shown to counter indigestion, mildly help metabolize androgenic hormones, counter hepatitis B infection, reverse *Helicobacter pylori*-related gastritis, and reverse intestinal metaplasia. Overall, dandelion is very safe, although it may aggravate acute gastrointestinal inflammation. Further research is warranted on this widely-used, intriguing herbal medicine.

Dandelion (*Taraxacum spp*) is used in many traditional and modern herbal medical systems, as has been documented particularly in Asia, Europe, and North America. The root is primarily considered a gastrointestinal remedy, supporting digestion and liver function, while the leaf is used as a diuretic and bitter digestive stimulant.

Common Names

The English name *dandelion* is a corruption of the French *dent de lion*, meaning “lion’s tooth.” The herb is similarly named in many Indo-European tongues, also being called “lion’s tooth” in German (*Löwenzahn*) and Spanish (*diente de leon*). The name refers to the toothed margins of the leaves.

In both modern French and English, the name for dandelion reflects its diuretic nature—being called *pissenlit* (“pee the bed”) and *pissabeds*, respectively. It has also been called *fairy clock* in English, though the reason for this name is unknown.

Dandelion is called *pu2 gong1 ying1* in Chinese (the numbers depict tone), *hokouei* in Japanese, and *p’ogongyong* in Korean. No translations other than *dandelion* are given for the names.

The Latin name *Taraxacum* is from the Greek and means “disease remedy.”

History and Folk Use

Dandelions are among the most recognizable weeds in the world. Traditional use goes so far back as to predate written records. The leaf of Chinese dandelion (*T mongolicum*) was first mentioned in writing in the *Tang Materia Medica* (659 AD) and is classically considered a valuable remedy in Chinese medicine, both topically and internally, for treating abscesses, reducing eye inflammation, and provoking diuresis.¹

Opposite: *Dandelion (Taraxacum spp) is used in many traditional and modern herbal medical systems. The root is primarily considered a gastrointestinal remedy supporting digestion and liver function, while the leaf is used as a diuretic and bitter digestive stimulant.*

Despite its probable botanical origins in Asia, there are myths and traditional medicinal uses for dandelion across Europe² and the herb is possibly mentioned in Dioscorides’ famous *De Materia Medica*—Dioscorides used ancient Greek names for the plants and gave a description that sounds very much like dandelion.³ These traditional sources consistently referred to the roots as helpful for the liver, while the leaves and flowers were regarded as useful diuretics and bitter digestive stimulants.⁴

Throughout its enormous growing range, all parts of the dandelion were eaten as food.

Chemical Composition

Among the most important compounds in dandelion are sesquiterpene lactones (believed to have antiinflammatory and anticancer effects), phenylpropanoids (believed to have inflammation-modulating effects), triterpenoid saponins (effects unknown for this herb; well known for many others; eg, the adaptogenic effects found in plants such as *Panax ginseng*), and polysaccharides (complex carbohydrates). Major sesquiterpene lactones, generally occurring as glycosides (sugars), include taraxacosides, taraxacolides, dihydrolactucin, ixerin, taraxinic acids, and ainslioside.⁵ Phenylpropanoids (cinnamic acid derivatives) are plentifully present and include cichoric acid, monocaffeoyltartaric acid, 4-caffoylquinic acid, chlorogenic acid, caffeic acid, and related compounds. Inulin (a class of fibers known as fructans) is also present in large amounts in dandelion root.⁶

Dandelion leaf is a good source of potassium; 1 analysis found that 100 g (just over 3 oz) of leaf contained 297 mg potassium, putting it in a league with other high potassium-source foods.⁷ This means that, by dry weight, up to 4% of dandelion leaf is potassium. However, it should be pointed out that food-level doses (not the smaller medicinal doses) of leaf must be ingested to obtain potassium. A 5 mL (1 tsp) dose of leaf tincture with a 1:2 (weight:volume) ratio containing 4% potassium would provide just 100 mg of potassium, approximately one-fifteenth the dose necessary to be clinically relevant.

Pharmacology

Dandelion leaf and root have both been studied for their effects on digestion, mostly as bitter digestive stimulants. Dandelion root has been investigated for demulcent, prebiotic, hypoglycemic, and immune-modulating effects. Dandelion leaf has also been investigated as a diuretic and inflammation modulator.

Demulcent and Prebiotic Activity: Dandelion roots have a distinct demulcent action and prebiotic properties due to their content of inulin⁸; fall-harvested roots have the highest inulin content.⁸

Digestion, Inflammation, and Angiogenesis: Sesquiterpene lactones impart a bitter taste to the plant, which is especially notable in the leaf but also in the root (particularly when spring-harvested).⁹ These compounds also likely explain the increase in bile production seen in animal studies with dandelion,¹⁰ with the studies themselves lending support to the traditional use of dandelion as a bitter digestive stimulant. One study showed that sesquiterpene lactones contributed to the inflammation-modulating properties of dandelion root.¹¹

Other studies showed that crude extracts of both root and flower modulated inflammation, and some evidence suggests that phenylpropanoids might be key to this activity.^{12,13} Ethanol extracts of the dried aerial parts have been shown in rodent studies to reduce inflammation and inhibit angiogenesis, though which constituents were responsible for these effects were not investigated.¹⁴

Hypoglycemic Effects: Dandelion root and leaf repeatedly have been shown to have hypoglycemic properties, though the exact mechanisms of action are poorly understood.^{15,16} Of concern, at least 1 report attributes this property to an insulin secretagogue effect (ie, stimulating pancreatic beta-cell release of insulin).¹⁷ This mechanism could lead to further insulin resistance and contribute to beta-cell burnout in patients with diabetes. This said, however, at least 1 mouse study has failed to confirm any hypoglycemic effects of dandelion.¹⁸ Human trials are necessary to clarify dandelion's effects on blood sugar and determine if the herb may be helpful or harmful for people with diabetes.

Immunity: Studies on the effects of various dandelion extracts and compounds on the immune system are contradictory, some showing inhibition and some stimulation of tumor necrosis factor, for example.^{19,20} This may suggest that dandelion extract has various effects on different lymphocyte populations or body tissues, or it may indicate that dandelion can modulate immune reactions. The polysaccharides in dandelion, of which there are many, are often credited with being key intermediaries in immune interactions.²¹ More in-depth research is needed on dandelion's immune-system effects.

Miscellaneous Preclinical Studies: In vitro and rodent studies consistently show that various parts of dandelion have antineoplastic activity.^{22,23} The leaf was more antioxidant than the root in vitro.²⁴ Dandelion leaf has proven diuretic in rats, though at fairly high doses in 1 study and only to a modest degree in another.^{25,26} Another study failed to find a diuretic action of oral or intraperitoneal dandelion extracts.²⁷ Recently, an animal study showed that a dandelion extract upregulated estrogen, progesterone, and follicle-stimulating hormone receptors in mice.²⁸ Other effects of dandelion appear to be the result

of multiple constituents acting in concert, although lack of research makes it difficult to draw conclusions.

Clinical Applications, Western Studies

Bitter and Diuretic Principles: For most clinical uses, dandelion has not been scrutinized rigorously according to modern scientific methods. Traditionally, the leaf is regarded as a useful bitter and moderately potent diuretic. Though no study has yet been published to support these uses, a preliminary trial documenting dandelion leaf's diuretic activity was in press at the time of writing this article (Spelman K, et al. *J Altern Complement Med.* 2008). The German Commission E approves the use of dandelion as a diuretic and also for use in anorexia, dyspepsia, and biliary abnormalities.²⁹

Detoxification: Dandelion root has a long history of use for supporting liver function and treating various dermatologic and systemic disorders, based on the theory that the herb improves the liver's ability to detoxify. These ideas have received little research attention.

In regard to hormone detoxification, a recent study compared the effects of an herbal formula containing dandelion (specifically, *T officinalis*), turmeric (*Curcuma longa*), artichoke (*Cynara scolymus*), rosemary (*Rosmarinus officinalis*), schisandra (*Schisandra chinensis*), and milk thistle (*Silybum marianum*), a healthy diet, and placebo on hormone levels in 40 premenopausal women.³⁰ The study ran for 4 menstrual cycles. Compared with the other 2 treatments, the herbal formula caused significant declines in early follicular-phase androgens with no effect on levels of any other sex steroid hormone. The implications of this study are hard to determine, but it does suggest that dandelion and other herbs may have some role in enhancing detoxification of androgens.

Gastrointestinal Complaints: The use of dandelion leaf for indigestion or other atonic gastrointestinal complaints is also largely unverified by modern studies. However, a case series of 24 patients with nonspecific, chronic colitis treated with a formula consisting of dandelion (specifically, *T officinalis*), St John's wort (*Hypericum perforatum*), lemon balm (*Melissa officinalis*), calendula (*Calendula officinalis*), and fennel (*Foeniculum vulgare*) demonstrated remarkable symptomatic improvement in terms of stool normalization and pain reduction.³¹

Warts: The traditional use of fresh dandelion stem latex to treat warts has not been evaluated.

Clinical Applications, Chinese Studies

Several Chinese-language studies have reported on the effects of various formulas containing *T mongolicum*. Unfortunately, full text translations of these studies are not available, and the information provided here is based solely on English-language abstracts. Therefore interpretation of these studies must be undertaken cautiously.

Antibiotic Actions: An herbal formula known as *fu zheng qu xie** was just as effective as the antibiotic gentamycin in 75 cases

*Listed ingredients of *fu zheng qu xie*: *Astragalus membranaceus*, *Atractylodes macrocephala*, *Paeonia lactiflora*, *Taraxacum mongolicum*, *Oldenlandia diffusa*

of gastric disease caused by *Helicobacter pylori* (formerly known as *Campylobacter pyloridis* or CP).³² This study found that in the Chinese herbal medicine group, clinical symptoms obviously improved—with the curative effective rate for CP at 80% (24 of 30 patients), the death rate for CP at 30% (9/30), and the effective rate for pathohistological changes at 50% (15/30). Differences of curative effective rate between the two groups were statistically insignificant ($P>.05$).

Hepatitis B: A formula called *jie du yang gan gao** (JY) was significantly more effective than another botanical formulation (the main ingredients of which were charred hawthorn [*Fructus Crataegi*], charred germinated barley [*Fructus Hordei Germinatus*], and wheat bran) in lowering elevated liver enzymes and curing patients with hepatitis B in a 96-person, double-blind trial.³³ Cure meant that serum hepatitis B virus (HBV)-DNA become negative. According to the abstract, 27% of JY-group patients had normalization of serum alanine aminotransferase levels (ALT, chemicals that liver cells release when they are damaged or sick) and 32% became HBV-DNA negative compared to just 9% and 18% (respectively) of the other group.

Intestinal Metaplasia: The herbal formula *xiao wei yan powder†* was quite effective at reversing intestinal metaplasia in 120 patients (91%-92% of patients normalized), compared with 120 untreated controls (only 14%-21% normalized).³⁴

Dosage and Sustainability

Recommended doses of the crude dried root or leaf *Taraxacum spp* range from 4 to 10 g daily in divided doses. Fresh root or leaf can be consumed as food at levels of 50 g or greater per day according to traditional knowledge. Based on our experience, typical doses of root or leaf tinctures in the United States are 3 to 5 mL 3 times/day.

The *British Herbal Pharmacopoeia (BPH)* recommends 0.5 to 2 g of root or 4 to 8 mL of root tincture, both 3 times/day.³⁵ The *German Commission E Monographs* recommend doses of 3 to 4 g of root twice daily or 10 to 15 drops of tincture 3 times/day.³⁶

BPH recommends 3 to 5 g of leaf or 5 to 10 mL of leaf tincture, both 2 times/day.³⁵ Commission E recommends 4 to 10 g of leaf or 2 to 5 mL of tincture, both 3 times/day.²⁹

Dandelion is a prolific weed that has naturalized in temperate regions around the globe. As a result, it is not environmentally threatened in any way. The widespread use of herbicides to kill dandelions suggests that they should not be harvested from urban settings without first determining if they have been sprayed.

Safety and Drug Interactions

Dandelion is a commonly available food with a long history of human use and as such poses little risk of harm. Dandelion extracts are listed on the US Food and Drug Administration's "generally recognized as safe" (GRAS) list for foods and supplements. Allergy to dandelion can occur but is rare. Patients sensi-

tized to other members of the *Asteraceae* plant family are sometimes cross-sensitized to dandelion.³⁷

Dandelion doses up to 6 g/kg in rabbits have shown no toxicity.¹⁵ Consumption of diets containing 33% dandelion for months produced no toxic effects in rats.³⁸ No negative effects in humans have been reported during pregnancy or lactation, in children, or in combination with pharmaceutical drugs. One study in rats found that 2 g/kg body weight taken with the drug ciprofloxacin greatly impaired absorption of this antibiotic, presumably due to the mineral content of dandelion leaf,³⁹ as minerals are known to chelate ciprofloxacin and block its absorption and activity.

Because it is a bitter, dandelion should be used with caution in patients with acute gastrointestinal inflammation or obstruction or in those with nonatonic reflux esophagitis. Bitters can potentially stimulate or aggravate these conditions.

Conclusion

Dandelion is widely used in traditional and natural medicine systems around the world yet has received surprisingly little research attention. Given that some preclinical and clinical research has suggested this gentle, safe remedy may have significant activity, further research is clearly essential.

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*Listed ingredients of *jie du yang gan gao*: *Artemisia capillaris*, *Taraxacum mongolicum*, *Plantago seed*, *Cephalanoplos segetum*, *Hedyotis diffusa*, *Chrysanthemi indicum*, *Smilax glabra*, *Astragalus membranaceus*, *Salvia miltiorrhiza*, *Polygonum orientale*, *Paeonia alba*, *Polygonatum sibiricum*
†Listed ingredients of *xiao wei yan powder*: *Smilax glabra*, *Hedyotis diffusa*, *Taraxacum mongolicum*, *Caesalpinia sappan*, *Paeonia alba*, *Cyperus rotundus*, *Bletilla striata*, *Glycyrrhiza uralensis*

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