

Prickly Pear

Scientific Name(s): *Opuntia ficus-indica* (L.) Mill., *Opuntia fragilis* (Nutt.) Haw., *Opuntia streptacantha* Lem., *Opuntia tuna* (L.) Mill.

Common Name(s): Barbary fig, Brittle pricklypear, Elephantear pricklypear, Nopal, Prickly pear, Pricklypear cactus, Tuna

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Clinical Overview

Use

Prickly pear is widely cultivated and used commercially in juices, jellies, candies, teas, and alcoholic drinks. American Indians used prickly pear juice to treat burns, and prickly pear has been used in Mexican folk medicine to treat diabetes. Prickly pear has been investigated for antioxidant, hypocholesterolemic, and anti-inflammatory, as well as other pharmacologic, effects. However, clinical trial data are lacking to recommend use for any indication.

Dosing

Prickly pear is used commercially in foods and is available in various doseforms, including capsules, tablets, powders, and juices. When using commercial products, manufacturer guidelines should be followed. *O. ficus-indica* dosing, doseforms, and treatment durations used in clinical trials have varied. See specific indications in Uses and Pharmacology section.

Contraindications

Use is contraindicated in individuals with hypersensitivity to any components of prickly pear.

Pregnancy/Lactation

Avoid use. Information regarding safety and efficacy in pregnancy and lactation is lacking.

Interactions

None well documented.

Adverse Reactions

Dermatitis is the most common adverse reaction to prickly pear.

Toxicology

No data.

Scientific Family

- Cactaceae (cactus)

Botany

Prickly pears are members of the Cactaceae (cactus) family, which includes about 97 genera and 1,600 species. The species are found in Europe, Mediterranean countries, Africa, the southwestern United States, and northern Mexico. Plants of the genus *Opuntia* are perennial shrubs, trees, and creeping plants that prefer a dry, hot climate. Prickly pear can grow 5 to 8 m in height; its roots are shallow, but the plant can spread up to 40 m in diameter over the ground. The stems are branched, the leaves are cylindrical in shape, and the plant is covered with barb-tipped bristles (known as glochids) that are unique to *Opuntia*. The flowers, petals, and sepals are numerous in quantity and color. The oval, pear-shaped, purplish fruit is pulpy and sweet but may be covered with spines or bristles. The seeds within the pulp are disc-shaped and of various colors. (Chevalier 1996, DeFelice 2004, Hocking 1997, Houérou 1996, Saleem 2006, Synman 2006, van Sittert 2002)

Subspecies include *Opuntia fulginosa*, *Opuntia megacantha*, *Opuntia dillenii*, *Opuntia microdasys*, *Opuntia biegllovii*, and *Opuntia acanthocarpa*.

History

Prickly pear is widely cultivated and used in juices, jellies, candies, teas, and alcoholic drinks. The fruits and flowers of the plant are used as natural food colorants. Cactus gum is used to stiffen cloth. Essential oils from the flowers are used to make perfumes, and the seeds are a source of oil. Prickly pear has also been used as a source of animal feed and dye. (DeFelice 2004, Saleem 2006)

There are numerous traditional uses of prickly pear. American Indians used prickly pear juice to treat burns. The Lakota tribe used prickly pear in a tea to assist mothers during childbirth. In traditional Chinese medicine, a cone of plant material would be burned on the skin to treat irritation or infection, a process known as *moxibustion*. (DeFelice 2004)

Prickly pear has a long history of use in Mexican folk medicine, particularly as a treatment for diabetes. Prickly pear pads have been used as a poultice for rheumatism. The fruit has been used for treating diarrhea, asthma, and gonorrhea. The fleshy stems or cladodes have been used to treat high cholesterol, high blood pressure, gastric acidity, ulcers, fatigue, dyspnea, glaucoma, liver conditions, and wounds. (DeFelice 2004, Gurrieri 2000) In South Korea, the plant has been used to treat abdominal pain, bronchial asthma, burns, diabetes, and indigestion. (Kim 2006) In Sicily, a flower decoction of prickly pear

has been used as a diuretic, with the cladodes valued for anti-inflammatory activity in treating edema, arthrosis, and whooping cough, and for preventing wound infection.(DeFelice 2004)

Prickly pear has been planted on steep slopes to control erosion.(Synman 2006)

Chemistry

The medicinal components of prickly pear are found in the flowers, leaves or pads, and fruit.

Isorhamnetin-glucoside, kaempferol, luteolin, penduletin, piscidic acids, quercetin, rutin, and beta-sitosterol have been found in the flowers of prickly pear.(D'Amelio 1999) The fruits yield a mucilage that is a complex mixture of polysaccharides, with the presence of galactose, arabinose, xylose, and rhamnose.(Matsuhira 2006)

Prickly pear fruit has high nutritional value.(El Kossori 1998) Ethanol-soluble carbohydrates are the most abundant components of prickly pear fruit pulp and skin, making up 50% of the pulp and 30% of the skin. Betalain compounds are responsible for the various colors of the fruit.(Butera 2002) The skin contains calcium, iron, potassium, magnesium, manganese, sodium, and selenium.(El Kossori 1998, Galati 2003) The edible pulp contains biothiols, taurine, flavonols, tocopherols, and carotenoids.(Dok-Go 2003, Tesoriere 2005) However, industrial processing of juice components results in some loss of vitamins A, E, and C.(Gurrieri 2000, Tesoriere 2005) The seeds are rich in phosphorus and zinc. The oils from the seeds and peel are a good source of polyunsaturated fatty acids.(Ennouri 2005, Ramadan 2003a, Ramadan 2003b)

Several older chemical analyses of enzymes from *Opuntia* species are available.(Bhatia 1977, Mukerji 1968, Mukerji 1969, Sisini 1969) One study documents the volatile constituents of *O. ficus-indica*,(Flath 1978) while another identifies the constituents of *O. fragilis*.(Abramovitch 1968) Other studies discuss the chemistry of prickly pear, including isolation of albumin,(Uchoa 1998) amino acid composition in the fruits,(Stintzing 1999) and fatty acids of the seeds.(Barbagallo 1999)

Uses and Pharmacology

Anti-inflammatory activity

An active anti-inflammatory principle has been isolated and identified as beta-sitosterol.(Park 2001b)

In vitro data

The polysaccharides from prickly pear cladodes have been studied in vitro for anti-inflammatory/chondroprotective effects in treatment of joint diseases.(Panico 2007)

Clinical data

Prickly pear may inhibit the production of inflammatory mediators associated with the symptoms of alcohol hangover. In a double-blind, placebo-controlled, crossover trial, 55 healthy volunteers received placebo or 1,600 units of *O. ficus-indica* extract 5 hours before consuming alcohol. Patients consumed 1.75 g of alcohol per kilogram of body weight over 4 hours. In patients treated with *O. ficus-indica*, C-reactive protein and symptoms such as nausea, dry mouth, and anorexia were reduced.(Wiese 2004)

Antioxidant effects

Opuntia species have antioxidant activity that may be associated with their phenolic content.(Lee 2002)

Clinical data

In a comparative study in healthy volunteers (N=18)(Tesoriere 2004) and a study of patients with familial isolated hypercholesterolemia (N=15),(Budinsky 2001) short-term supplementation with 250 g of fresh fruit pulp once or twice daily reduced oxidative damage to lipids and improved oxidative stress status.

Cardiovascular risk factors/Weight loss

Clinical data

A meta-analysis of 5 blinded randomized controlled trials evaluated the effect of cactus pear (various doseforms of *O. ficus-indica* at daily dosages ranging from 400 mg to 15 g for durations of 6 weeks to 2 years) on body weight and cardiovascular risk factors. Analysis of data from studies identified through April 2014 revealed a nonsignificant difference in body weight and waist circumference between cactus pear and controls, with statistically significant reductions in body mass index (BMI), percent body fat, blood pressure, and total cholesterol. However, heterogeneity was high, and risk of bias was highly variable. Effect sizes for BMI and percent body fat reductions were small and not clinically important. (Onakpoya 2015)

Diabetes

Animal data

A study conducted in a murine model suggested *O. ficus-indica* treatment inhibits glucose absorption from the intestine and enhances glucose uptake from insulin-sensitive muscle cells through the AMPK/p38 MAPK signaling pathway.(Ota 2017)

Clinical data

A systematic review showed a lack of evidence to support use of *Opuntia* spp. fruit products as alternative or complementary therapy to manage or reduce the risk of type 2 diabetes mellitus.(Gouws 2019)

Diuretic effects

Animal data

Prickly pear cladode, fruit, and flower infusions increased diuresis in a rat model.(Galati 2002)

Hyperlipidemia

Animal data

Two animal studies examined the effect of prickly pear seeds or seed oil on serum and lipid parameters in rats, with reductions in serum cholesterol and low-density lipoprotein (LDL) observed in rats treated with seed oil.(Ennouri 2006, Ennouri 2007) In another study, raw *O. ficus-indica* had beneficial effects on hypercholesterolemia in rats.(Cardenas Medellín 1998) A pectin isolate from prickly pear decreased LDL metabolism in guinea pigs.(Fernandez 1990, Fernandez 1992, Fernandez 1994)

Clinical data

In one small study (N=29), prickly pear significantly reduced cholesterol levels.(Fрати-Munari 1983) In another study, 8 healthy volunteers and 8 patients with familial heterozygous hypercholesterolemia were treated with prickly pear edible pulp 250 g/day for 4 weeks. Significant ($P>0.01$) decreases in total and LDL cholesterol and reduced platelet proteins were observed in both subject groups.(Wolfram 2003)

In a study of women with metabolic syndrome (N=68), consumption of dried leaves from *O. ficus-indica* as a dietary supplement (NeOpuntia 1.6 g per meal for 6 weeks) was associated with a rapid increase in circulating HDL cholesterol level, a decrease in LDL cholesterol, and a (slight) decrease in triglycerides. These results suggest that prickly pear may exert a hypocholesterolemic effect.(Del Socorro Santos Díaz 2017, Linarés 2007)

A systematic review examined various dosages of prickly pear fruit and cladode consumption in healthy and obese patients, as well as in patients with metabolic illnesses (ie, type 2 diabetes and metabolic syndrome). Prickly pear fruit consumption was associated with significant reductions in total cholesterol versus placebo ($P<0.05$) in all but one included study. In the remaining studies (n=6), LDL cholesterol levels decreased ($P<0.05$). (Gouws 2020)

Neuroprotective effects

Animal and in vitro data

Flavonoids isolated from *O. ficus-indica* var. *saboten* species had neuroprotective activity against oxidative neuronal injury induced in rat cortical cells.(Dok-Go 2003) In in vitro and in vivo models of cerebral ischemia, *O. ficus-indica* had a protective effect against neuronal damage induced by global ischemia.(Kim 2006)

Nutrition

Prickly pear fruit liquid has been studied as a natural sweetener.(Sáenz 1998) Opuntia spp. have also been studied as a source of dietary fiber.(Rosado 1995)

Platelet function

Clinical data

In a study evaluating effects of prickly pear on platelet function in healthy volunteers (n=8) and patients with mild familial heterozygous hypercholesterolemia (n=8), prickly pear pulp 250 g/day significantly reduced platelet proteins. The study noted that at least part of prickly pear's beneficial action on the cardiovascular system might be due to decreasing platelet activity, thereby improving hemostatic balance. Prickly pear may have antiplatelet activity, which may be useful in patients with prothrombotic conditions.(Wolfram 2003)

Ulcers

A cytoprotective mechanism is associated with an interaction between the mucilage monosaccharides from prickly pear and membrane phospholipids.(Galati 2007, Vázquez-Ramírez 2006)

Animal data

Histological evidence supports the efficacy of prickly pear cladodes against the formation of ethanol-induced ulcers.(Galati 2001)

Wound healing

Animal data

Histological evidence documents that topical application of polysaccharide extracts from prickly pear cladodes enhanced cutaneous repair and healing of large, full-thickness wounds in a rat model.(Park 2001a, Trombetta 2006)

Dosing

Prickly pear is used commercially in foods and is available in various doseforms, including capsules, tablets, powders, and juices. When using commercial products, manufacturer guidelines should be followed. *O. ficus-indica* dosing, doseforms, and treatment durations used in clinical trials have varied.

Pregnancy / Lactation

Avoid use. Information regarding safety and efficacy in pregnancy and lactation is lacking.

Interactions

Prickly pear may theoretically exacerbate hypoglycemia in patients being treated with hypoglycemic agents (eg, metformin, glyburide, rosiglitazone, acarbose).(Bush 2007) Prickly pear may also exacerbate

diuresis in patients being treated with diuretic agents (eg, furosemide, hydrochlorothiazide). However, these interactions are not well documented.

Adverse Reactions

Dermatitis is the most common adverse reaction to prickly pear. Treatment with topical corticosteroids has been recommended.

Prickly pear ingestion, especially of the seeds, can cause large bowel obstruction requiring medical intervention.(Zahra 2018)

Toxicology

Patients hypersensitive to any components of prickly pear should avoid use.

Index Terms

- *Opuntia acanthocarpa*
- *Opuntia bieglonii*
- *Opuntia dillenii*
- *Opuntia fulginosa*
- *Opuntia megacantha*
- *Opuntia microdasys*

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This information relates to an herbal, vitamin, mineral or other dietary supplement. This product has not been reviewed by the FDA to determine whether it is safe or effective and is not subject to the quality standards and safety information collection standards that are applicable to most prescription drugs. This information should not be used to decide whether or not to take this product. This information does not endorse this product as safe, effective, or approved for treating any patient or health condition. This is only a brief summary of general information about this product. It does NOT include all information about the possible uses, directions, warnings, precautions, interactions, adverse effects, or risks that may apply to this product. This information is not specific medical advice and does not replace information you receive from your health care provider. You should talk with your health care provider for complete information about the risks and benefits of using this product.

This product may adversely interact with certain health and medical conditions, other prescription and over-the-counter drugs, foods, or other dietary supplements. This product may be unsafe when used before surgery or other medical procedures. It is important to fully inform your doctor about the herbal, vitamins, mineral or any other supplements you are taking before any kind of surgery or medical procedure. With the exception of certain products that are generally recognized as safe in normal quantities, including use of folic acid and prenatal vitamins during pregnancy, this product has not been sufficiently studied to determine whether it is safe to use during pregnancy or nursing or by persons younger than 2 years of age.

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