

Opuntia ficus indica, vulgaris, dillenii

Prickly Pear Cactus Fruits

Indications

Diabetes, obesity, hyperlipidemia, atherosclerosis, diabetes-related heart disease, and metabolic syndrome.

Mechanism of Action

The bright magenta-to-orange colors of various species of *Opuntia* fruits is partly because of the presence of betalains,¹ so named because they also occur in beets (*Beta vulgaris*). The betalains include betacyanins and betaxanthins, such as betanin, isobetanin, and betamic acid, shown to be best absorbed in a whole food matrix rather than in isolated or in purified form.² Betalains are water soluble and have excellent bioavailability. The betalains are credited with anti-inflammatory mechanisms and antioxidant effects³ greater than those of vitamin C,⁴ and they also help protect the vasculature in states of hyperglycemia and hyperlipidemia. Betalains protect against cytokine induced inflammation⁵ and may also reduce elevated inflammatory cytokines themselves.⁶ *Opuntia ficus indica* may help protect the vascular system when nitric oxide is excessively induced.⁷ The pyrone glycoside opuntioside has been shown to have hypotensive effects.⁸ One mechanism of improved lipid profiles is via the ability of *Opuntia* glycoproteins to inhibit lipid oxidation.⁹ Improved glucose uptake and glycogen use by the liver and skeletal muscle contributes to the hypoglycemic effects.¹⁰

Opuntia ficus indica has been shown to protect the liver and other tissues from environmental toxins. Toxins are implicated in diabetes and dysglycemia via impairment of the ability of the liver to process carbohydrates. Environmental toxins are also implicated in metabolic deficiency via damage to the thyroid, impairment of the insulin response, and disruption of endocrine function. *Opuntia ficus indica* medications protect animals from nickel chloride, carbon tetrachloride, ethanol, and organophosphate pesticide toxicity and against glutathione depletion and superoxide dismutase activation.^{11,12,13,14} *Opuntia* protects cells and nuclei from the cytotoxic and genotoxic effects of the potent estrogenic zearalenone, a research molecule used to investigate exogenous estrogens.^{12,15} Zearalenone is a mycotoxin and endocrine disruptor that is naturally occurring in some foods and is noted to cause reproductive disorders in animals as well as having hepatotoxic and hematotoxic effects; thus, it is used in research to search for compounds that are able to protect against its damage.¹⁶ All such toxins and xenoestrogens are implicated in vascular damage, organ inflammation, heart disease, and polycystic ovary syndrome etiology, a condition linked to diabetes and metabolic syndrome

Evidence-Based Research

Opuntia fruit preparations are shown to have hypoglycemic¹⁶ and hypolipidemic^{10,17} actions, and diabetic animals are reported to improve with *Opuntia* fruit consumption.¹⁸ *Opuntia* juice may optimize

basic metabolism^{8,19} and lower elevated blood sugar.¹⁶ Both the seed oil, which is rich in polyunsaturated fatty acids,^{10,20} and the cactus pads¹⁷ are shown to improve blood lipids. *Opuntia ficus indica* seeds promote weight loss in rat models of diabetes and metabolic syndrome, an outcome associated with a reduction in serum thyroxine and glucose, and an increase in high-density lipoprotein (HDL), and liver and muscle glycogen content.^{8,10}

Opuntia ficus indica has been investigated in human subjects. Leaf preparations improved lipid parameters in metabolic syndrome patients and lowered total cholesterol, HDL, low-density lipoprotein (LDL), and triglycerides within 14 days.²¹ Another small human pilot study demonstrated lipid-lowering effects in a familial hypercholesterolemic population reducing total cholesterol, LDL, and HDL cholesterol, triglycerides, glucose, and uric acid.²² *Opuntia* was found to lower total cholesterol, HDL, LDL, and triglycerides in as little as 14 days in patients with metabolic syndrome,¹⁹ a condition that often leads to type II diabetes. Human clinical trials have shown a reduction in systemic oxidative stress.⁴

Safety in Pregnancy and Breastfeeding

Being a traditional food, prickly pear is considered safe in pregnancy and lactation.

General Safety

Rat studies found no significant toxic effects or histopathological changes with high doses of *Opuntia dillenii* and its constituent opuntioside.⁸

Dosage

Powders and concentrated extracts of fruit, leaf, or stem are taken 200–500 mg at a time, two or three times daily. Smaller amounts are often taken when prickly pear is combined with other similar acting herbs in a formula.

Traditional Uses

Opuntia ficus indica, the prickly pear cactus, has been cultivated and domesticated not only for the edible fruit and pads, referred to as nopales in Mexico, but also for the cochineal insect that frequently infests the leaf pads and is a valuable magenta dye. Because of its vitamin C content, *Opuntia* fruits, like citrus, were sometimes stocked on ships set for long voyages to prevent scurvy.

Prickly pear cactus has been used folklorically for elevations in all lipids and glucose, and some modern research is emerging to confirm age-old reports.^{19,23}

References

¹ **J Agric Food Chem.** 2008;56(14):5758–64. *Identification and quantification of betalains from the fruits of 10 mexican prickly pear cultivars by high-performance liquid chromatography and electrospray ionization mass spectrometry.* Castellanos-Santiago E, Yahia EM.

² **J Agric Food Chem.** 2008;56(22):10487–92. *In vitro digestion of betalainic foods. Stability and bioaccessibility of betaxanthins and betacyanins and antioxidative potential of food digesta.* Tesoriere L, Fazzari M, Angileri F, Gentile C, Livrea MA.

- ³ **J Agric Food Chem.** 2005;53(2):442–51. *Color, betalain pattern, and antioxidant properties of cactus pear (Opuntia spp.) clones.* Stintzing FC, Herbach KM, Mosshammer MR, Carle R, Yi W, Sellappan S, Akoh CC, Bunch R, Felker P.
- ⁴ **Am J Clin Nutr.** 2004;80(2):391–5. *Supplementation with cactus pear (Opuntia ficus-indica) fruit decreases oxidative stress in healthy humans: a comparative study with vitamin C.* Tesoriere L, Butera D, Pintaudi AM, Allegra M, Livrea MA.
- ⁵ **Ann N Y Acad Sci.** 2004;1028:481–6. *Antioxidant betalains from cactus pear (Opuntia ficus-indica) inhibit endothelial ICAM-1 expression.* Gentile C, Tesoriere L, Allegra M, Livrea MA, D'Alessio P.
- ⁶ **J Pharm Pharmacol.** 2006;58(1):113–9. *Radical scavenging and anti-inflammatory activity of extracts from Opuntia humifusa Raf.* Cho JY, Park SC, Kim TW, Kim KS, Song JC, Kim SK, Lee HM, Sung HJ, Park HJ, Song YB, Yoo ES, Lee CH, Rhee MH.
- ⁷ **Phytother Res.** 2006;20(9):742–7. *Inhibition of nitric oxide synthase expression in activated microglia and peroxynitrite scavenging activity by Opuntia ficus indica var. saboten.* Lee MH, Kim JY, Yoon JH, Lim HJ, Kim TH, Jin C, Kwak WJ, Han CK, Ryu JH.
- ⁸ **Biol Pharm Bull.** 2005;28(10):1844–51. *Hypotensive activity, toxicology and histopathology of opuntioside-I and methanolic extract of Opuntia dillenii.* Saleem R, Ahmad M, Azmat A, Ahmad SI, Faizi Z, Abidi L, Faizi S.
- ⁹ **Biol Pharm Bull.** 2006;29(7):1391–6. *Glycoprotein (90 kDa) isolated from Opuntia ficus-indica var. saboten MAKINO lowers plasma lipid level through scavenging of intracellular radicals in Triton WR-1339-induced mice.* Oh PS, Lim KT.
- ¹⁰ **Bioresour Technol.** 2006;97(16):2136–40. *Evaluation of some biological parameters of Opuntia ficus indica. 2. Influence of seed supplemented diet on rats.* Ennouri M, Fetoui H, Bourret E, Zeghal N, Guermazi F, Attia H.
- ¹¹ **Food Chem Toxicol.** 2008;46(12):3759–63. *Protective effect of cactus (Opuntia ficus indica) cladode extract upon nickel-induced toxicity in rats.* Hfaiedh N, Allagui MS, Hfaiedh M, Feki AE, Zourgui L, Croute F.
- ¹² **Food Chem Toxicol.** 2008;46(5):1817–24. *Cactus (Opuntia ficus-indica) cladodes prevent oxidative damage induced by the mycotoxin zearalenone in Balb/C mice.* Zourgui L, Golli EE, Bouaziz C, Bacha H, Hassen W.
- ¹³ **Food Chem Toxicol.** 2008;46(2):797–802. *Opuntia ficus indica extract protects against chlorpyrifos-induced damage on mice liver.* Ncibi S, Ben Othman M, Akacha A, Krifi MN, Zourgui L.
- ¹⁴ **Phytother Res.** 2005;19(9):796–800. *Opuntia ficus indica (L.) Mill. fruit juice protects liver from carbon tetrachloride-induced injury.* Galati EM, Mondello MR, Lauriano ER, Taviano MF, Galluzzo M, Miceli N.
- ¹⁵ **Food Chem Toxicol.** 2009;47(3):662–7. *The antigenotoxic activities of cactus (Opuntia ficus-indica) cladodes against the mycotoxin zearalenone in Balb/c mice: Prevention of micronuclei, chromosome aberrations and DNA fragmentation.* Zorqui L, Ayed-Boussema I, Ayed Y, Bacha H, Hassen W.
- ¹⁶ **Proc West Pharmacol Soc.** 2003;46:139–42. *Hypoglycemic activity of two polysaccharides isolated from Opuntia ficus-indica and O. streptacantha.* Alarcon-Aguilar FJ, Valdes-Arzate A, Xolalpa-Molina S, Banderas-Dorantes T, Jimenez-Estrada M, Hernandez-Galicia E, Roman-Ramos R.
- ¹⁷ **Zhongguo Zhong Yao Za Zhi.** 2005;30(9):694–6. *Regulative effect of Opuntia powder on blood lipids in rats and its mechanism.* Li CY, Cheng XS, Cui MZ, Yan YG.
- ¹⁸ **Arch Invest Med (Mex).** 1979;10(4):223–30. *Hypoglycemic effect of Opuntia cactus.* Ibañez-Camacho R, Roman-Ramos R.

- ¹⁹ **Cardiovasc Hematol Agents Med Chem.** 2008;6(4):237–52. Medicinal agents in the metabolic syndrome. Baños G, Pérez-Torres I, El Hafidi M.
- ²⁰ **Bioresour Technol.** 2006;97(12):1382–6. *Evaluation of some biological parameters of Opuntia ficus indica. 1. Influence of a seed oil supplemented diet on rats.* Ennouri M, Fetoui H, Bourret E, Zeghal N, Attia H.
- ²¹ **Adv Ther.** 2007;24(5):1115–25. *The effect of NeOpuntia on blood lipid parameters—risk factors for the metabolic syndrome (syndrome X).* Linarès E, Thimonier C, Degre M.
- ²² **Nucl Med Rev Cent East Eur.** 2003;6(1):35–9. *Prickly pear induces upregulation of liver LDL binding in familial heterozygous hypercholesterolemia.* Palumbo B, Efthimiou Y, Stamatopoulos J, Oguogho A, Budinsky A, Palumbo R, Sinzinger H.
- ²³ **Endocr Metab Immune Disord Drug Targets.** 2008;8(2):78–81. *Efficacy of dietary supplementation with botanicals on carbohydrate metabolism in humans.* Cefalu WT, Ye J, Wang ZQ.

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