



Gymnema sylvestre

Gymnema

Indications

Diabetes (type 1 and 2), hypoglycemia, and obesity.

Mechanism of Action

Numerous active phytoconstituents including a group of triterpene saponins^{1,2} known as gymnemic acids,³ gymnemasaponins, and the polypeptide gurmardin⁴ have been identified in *Gymnema* and credited with various antioxidant, hypoglycemic, and beta cell–regenerative effects.

Gymnemic acids are a class of chemical compounds isolated from the leaves that are considered sweetness inhibitors, because after chewing the leaves, solutions sweetened with sugar taste like water.⁵ These acids suppress the sweetness of most of sweeteners including intense artificial sweeteners such as aspartame and natural sweeteners such as thaumatin. The antisweet activity is reversible, but sweetness recovery on the tongue can take more than 10 minutes.⁶

More than 20 homologs of gymnemic acid are known, the central structure of which is the aglycone gymnemagenin.⁷ Gymnemagenins may inhibit the glycation of proteins⁸ and inhibit sodium-dependent glucose transporters⁹ that are found in high levels in brush-border membranes of intestinal epithelial cells. Animal studies suggest that the antioxidant effects of *Gymnema* occur via reduced lipid peroxidation in the serum, liver, and kidneys and support hepatic glutathione peroxidase and serum glutamate pyruvate transaminase levels¹⁰, among other effects.

Gymnema extracts may promote the production of insulin in weak or damaged beta cells^{11,12,13} and possibly increase the number of pancreatic beta cells and islets of Langerhans^{14,15,16} according to histological assessments in diabetic animals. Conduritol A is one *Gymnema* constituent credited with beta cell regeneration.¹⁷ One mechanism of beta cell function seems to be via an increase in Ca(2+) influx through voltage-gated calcium channels and protein kinase activation,¹⁸ leading to an increase in intracellular calcium and thereby insulin secretion.¹⁹ Contrary to some hypotheses that insulin secretion is the result of beta cell destruction, no damage to islets was seen.

Evidence-Based Research

Modern research has focused on the hypoglycemic, hypolipidemic, metabolism supportive, diuretic, and beta cell–regenerating actions of *Gymnema*.²⁰ Both animal and a few human studies have shown *Gymnema* to have antiobesity and antidiabetic properties and to significantly reduce body weight and improve laboratory markers of glycemic control.

Gymnema has been shown to improve numerous biochemical markers of inflammation and glycemic and metabolic control in diabetic animals. Dosages of 120–200 mg/kg of various *Gymnema* extracts are shown to improve a wide array of metabolic markers in animal models of diabetes in approximately 1 month. In summary, positive effects have been demonstrated on body mass index; blood pressure; heart rate; hemodynamic parameters; serum leptin; insulin; glucose; lipids including lactate dehydrogenase, low-density lipoprotein-C, total cholesterol, triglycerides, and apolipoprotein levels; lipid peroxide levels; myocardial apoptosis; antioxidant enzymes; and organ and visceral fat pad weights. In histopathological studies, cardiac Na(+)/K(+)-ATPase and antioxidant enzymes levels were significantly decreased.^{21,22,23} Histopathological assessments in these animal studies showed no pathological changes to be associated with the use of *Gymnema* preparations.

Human pilot studies have shown *Gymnema* to increase insulin and C-peptide release from human beta cells and to significantly reduce fasting and postprandial blood glucose.²⁴ One pilot study with type II diabetics showed *Gymnema* to improve polyphagia, fatigue, and blood glucose in both fasting and postprandial situations and normalize glycosylated hemoglobin and lipid profiles at a dose of 500 mg/day.²⁵ Another human pilot investigation dosed medicated diabetic patients with *Gymnema* at a dose of 400 mg/day in tandem with conventional oral hypoglycemic agents. After 18–20 months a significant reduction in blood glucose, glycosylated hemoglobin, and glycosylated plasma proteins was demonstrated, and 5 of the 22 subjects were able to discontinue their pharmaceuticals altogether, and the majority decreased their dosage of prescription drugs.²⁶

One randomized controlled trial dosed 400 mg of *Gymnema* to insulin-dependent diabetics and reported that fasting glucose and hemoglobin A1c was reduced, along with significant reductions in serum lipids to near normal levels. No such improvements were seen in a control group receiving insulin alone. Researchers hypothesize that *Gymnema* may be able to regenerate or revitalize residual beta cells in the pancreas of insulin-dependent diabetics based on the histological findings in animals, combined with the clinical outcomes and laboratory findings in human subjects.²⁷

Safety in Pregnancy and Breastfeeding

There are no published studies specifically investigating *Gymnema* in pregnancy or lactation.

General Safety

There has been one anecdotal report associating the use of *Gymnema* by humans to induce liver injury.²⁸ However, the various human pilot and other studies have not reported any significant toxicity, and there are also reports of hepatoprotection from the triterpenoids saponins.²⁹

An animal toxicity study was conducted wherein *Gymnema* was determined to be safe when administered at high doses for 1 year.³⁰

Dosage

Doses between 120 and 500 mg/kg have been used in animal studies; however, some human trials have dosed only 500 mg of total of a quantified *Gymnema* marker compound.

Gymnema is generally considered safe and is dosed at 400–600 mg/daily, standardized to 24% Gymnemic acids.

Traditional Uses

Gymnema sylvestre is referred to as *gurmar* in Hindi. This term translates as “sugar destroyer” because of its ability to abolish the sweet taste of various foods as well as control sugar cravings. It has been used for thousands of years to treat obesity as well as the symptoms of diabetes, arthritis, anemia, osteoporosis, hypercholesterolemia, heart disease, asthma, constipation, microbial infections, indigestion, and general systemic inflammation.³¹

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