Karalla, Bitter Melon, Bitter Gourd, Momordica

Botanical Name: *Momordica charantia* (family Curcubitaceae)

The fruit contains several biologically active constituents that include glycosides e.g. momordicins I and II, 25ξ-isopropenylchole-5, taiwacin A(1),23,24,25,26,27-pentanorcucurbitane, and steroidal saponins e.g. charantins, Kuguacin J.

References:

- Liu P et al. A new C30 sterol glycoside from the fresh fruits of Momordica charantia. Chi. J. Nat. Med 10.2 (2012):88–91.
- Lin K-W et al. Antioxidant constituents from the stems and fruits of Momordica charantia. Food Chem 127.2 (2011): 609–14.
- Pitchakarn P et al. Kuguacin J, a triterpenoid from Momordica charantia leaf, modulates the progression of androgen-independent human prostate cancer cell line, PC3. Food Chem Toxicol 50(2012): 840–47.

Antidiabetic Property:

In traditional medicine, this fruit has been used to treat diabetes. Thus in modern times, it is intensively studied for its antidiabetic claim. Here we present a very brief summary of over 140 studies on this potential of various constituents of *Momordica charantia* in animal models and human studies.

References:

- Ahmed I et al. Beneficial effects and mechanism of action of Momordica charantia juice in the treatment of streptozotocin-induced diabetes mellitus in rat. Mol Cell Biochem 261 (2004): 63–70.
- Bailey CJ et al. Cerasee, a traditional treatment for diabetes: studies in normal and streptozotocin diabetic mice. Diabetes Res 2 (1985): 81–84.
- Chaturvedi P. Role of Momordica charantia in maintaining the normal levels of lipids and glucose in diabetic rats fed a high-fat and low-carbohydrate diet. Br J Biomed Sci 62.3 (2005): 124–126.
- Day C et al. Hypoglycaemic effect of Momordica charantia extracts. Planta Med 56 (1990): 426–429.
- Harinantenaina L et al. Momordica charantia constituents and antidiabetic screening of the isolated major compounds. Chem Pharm Bull (Tokyo) 54.7 (2006): 1017–1021.

The aqueous extract of fresh, unripe, whole fruits reduced fasting blood glucose by 50%, which was consistent until the study ended. These observations have special significance when one con- siders that the whole bitter gourd is cooked in water and consumed in many cultures, particularly in India

Reference:

- Virdi J et al. Antihyperglycemic effects of three extracts from Momordica charantia. J Ethnopharmacol 88 (2003): 107–111.

It appears to stimulate pancreatic insulin secretion, improves peripheral glucose uptake and improves insulin sensitivity and signaling.

References:

- Fernandes NP et al. An experimental evaluation of the antidiabetic and antilipidemic properties of a standardized Momordica charantia fruit extract. BMC Complement Altern Med 7 (2007): 29.
- Welihinda J et al. The insulin-releasing activity of the tropical plant Momordica charantia. Acta Biol Med Ger 41 (1982): 1229–1240.
- Welihinda J, Karunanayake EH. Extra-pancreatic effects of Momordica charantia in rats. J Ethnopharmacol 17 (1986): 247–255.
- Sridhar MG et al. Bitter gourd (Momordica charantia) improves insulin sensitivity by increasing skeletal muscle insulin-stimulated IRS-1 tyrosine phosphorylation in high-fat-fed rats. Br J Nutr 99.4 (2008): 806–812.

It has been demonstrated that *Momordica charantia* has a protective effect on pancreatic β-cells via downregulation of mitogen-activated protein kinases and nuclear factor kappa-light-chain enhancer of activated B cells

Reference:

- Kim K, Kim HY. Bitter melon (Momordica charantia) extract suppresses cytokineinduced activation of MAPK and NF-κB in pancreatic β-Cells. Food Sci. Biotechnol 20.2 (2011): 531–5.

Also, other biochemical and physiological processes such as glucose utilisation in skeletal muscles, intestinal glucose uptake inhibition and suppression of gluconeogenic enzymes have been inferred through in vivo and in vitro studies

References:

- Ahmed I et al. Beneficial effects and mechanism of action of Momordica charantia juice in the treatment of streptozotocin-induced diabetes mellitus in rat. Mol Cell Biochem 261 (2004): 63–70.
- Jayasooriya AP et al. Effects of Momordica charantia powder on serum glucose levels and various lipid parameters in rats fed with cholesterolfree and cholesterol-enriched diets. J Ethnopharmacol 72 (2000): 331–336.
- Kar A et al. Comparative evaluation of hypoglycaemic activity of some Indian medicinal plants in alloxan diabetic rats. J Ethnopharmacol 84 (2003): 105–108.
- Kumar GS, et al. Modulatory effect of bitter gourd (Momordica charantia Linn.) on alterations in kidney heparan sulfate in streptozotocin-induced diabetic rats. J Ethnopharmacol 115.2 (2008): 276–283.
- Mamun MD. A study on hypoglycemic effects of Momordica charantia (wild variety) in alloxan induced type 2 diabetic Long-Evans rats. Clin Biochem 44.13(2011): S116.
- Miura T et al. Hypoglycemic activity of the fruit of the Momordica charantia in type 2 diabetic mice. J Nutr Sci Vitaminol (Tokyo) 47 (2001): 340–344.
- Ojewole JA, et al. Hypoglycaemic and hypotensive effects of Momordica charantia Linn (Cucurbitaceae) whole-plant aqueous extract in rats. Cardiovasc J S Afr 17.5 (2006): 227–232.
- Reyes BA et al. Anti-diabetic potentials of Momordica charantia and Andrographis paniculata and their effects on estrous cyclicity of alloxan-induced diabetic rats. J Ethnopharmacol 105 (2006): 196–200.
- Sarkar S, et al. Demonstration of the hypoglycemic action of Momordica charantia in a validated animal model of diabetes. Pharmacol Res 33 (1996): 1–4.
- Shibib BA et al. Hypoglycaemic activity of Coccinia indica and Momordica charantia in diabetic rats: depression of the hepatic gluconeogenic enzymes glucose-6-phosphatase and fructose-1,6-bisphosphatase and elevation of both liver and red-cell shunt enzyme glucose-6-phosphate dehydrogenase. Biochem J 292 (1993): 267–270.
- Shetty AK et al. Effect of bitter gourd (Momordica charantia) on glycaemic status in streptozotocin induced diabetic rats. Plant Foods Hum Nutr 60.3 (2005): 109–112

The hypoglycaemic activity is attributed to a mixture of steroidal saponins known as charantins, insulin-like peptides and alkaloids that are concentrated in the fruit whereas several different fractions of M. charantia extract may make different contributions to its cell-repairing activity and its ability to stimulate insulin secretion

References:

- Grover JK, Yadav SP. Pharmacological actions and potential uses of Momordica charantia: a review. J Ethnopharmacol 93 (2004): 123–132.

- Xiang L et al. The reparative effects of Momordica charantia Linn. extract on HIT-T15 pancreatic beta-cells. Asia Pac J Clin Nutr 16 (Suppl 1) (2007): 249–252.

Bitter melon has shown promising effects in prevention as well as delay in progression of diabetic complications (e.g. nephropathy, neuropathy, cataract and insulin resistance) in experimental animals.

Reference:

- Grover JK, Yadav SP. Pharmacological actions and potential uses of Momordica charantia: a review. J Ethnopharmacol 93 (2004): 123–132.

Lipid Lowering:

Lipid-lowering activity has been reported in studies of normal and diabetic animals for the fruit extract, flavonoids extracted from bitter melon or a methanolic fraction of the plant. Typically, decreases in triglyceride and low-density lipoprotein levels and increases in high-density lipoprotein levels are seen.

References:

- Ahmed I et al. Hypotriglyceridemic and hypocholesterolemic effects of anti-diabetic Momordica charantia (karela) fruit extract in streptozotocininduced diabetic rats. Diabetes Res Clin Pract 51 (2001): 155–161.
- Anila L, Vijayalakshmi NR. Beneficial effects of flavonoids from Sesamum indicum, Emblica officinalis and Momordica charantia. Phytother Res 14 (2000): 592–595.
- Chaturvedi P. Role of Momordica charantia in maintaining the normal levels of lipids and glucose in diabetic rats fed a high-fat and low-carbohydrate diet. Br J Biomed Sci 62.3 (2005): 124–126
- Chaturvedi P et al. Effect of Momordica charantia on lipid profile and oral glucose tolerance in diabetic rats. Phytother Res 18 (2004): 954–956.
- Senanayake GV et al. The effects of bitter melon (Momordica charantia) extracts on serum and liver lipid parameters in hamsters fed cholesterol-free and cholesterol-enriched diets. J Nutr Sci Vitaminol (Tokyo) 50 (2004): 253–257.
- Singh N et al. Effects of long term feeding of acetone extract of Momordica charantia (whole fruit powder) on alloxan diabetic albino rats. Indian J Physiol Pharmacol 33 (1989): 97–100.

A study on human preadipocytes treated with bitter melon juice demonstrated inhibition of lipogenesis and stimulation of lipolysis.

Reference:

- Nerurkar PV et al. Momordica charantia (bitter melon) inhibits primary human adipocyte differentiation by modulating adipogenic genes. BMC Complement Altern Med 10.1(2010): 34.