Bitter Melon (*Momordica charantia*) and the Effects of Diabetes Disease

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Abstract: Bitter melon (*Momordica charantia*) is an alternative therapy that has primarily been used for lowering blood glucose levels in patients with diabetes mellitus. Bitter melon's hypoglyecemic ingredients have been shown in animal and human studies.

Key Words: Bitter melon, Diabetes, Hypoglicemic effect.

Kudret Narı (*Momordica charantia*) ve Diyabet Hastalığında Etkileri

Özet: Kudret narı (*Momordica charantia*) diyabetli hastaların kan glukoz seviyelerinin düşürülmesi için kullanılmış öncelikli bir alternatif tedavidir. Hayvan ve insanlarda yapılan çalışmalar kudret narında hipoglisemik maddelerin var olduğunu göstermiştir.

Anahtar Kelimeler: Kudret narı, Diyabet, Hipoglisemik etki.

Purpose

Insulin is the mainstay for patients with type 1 diabetes and it is also important in type 2 when blood glucose levels cannot be controlled by diet, weight loss, exercise and oral medications (Kumar and Clark, 2002).

Clinical conditions for which *M. charantia* extracts (primarily from the fruit) are currently being used include diabetes, dyslipidemia, microbial infections, and potentially as a cytotoxic agent for certain types of cancer.

In numerous studies, at least three different groups of constituents found in all parts of *momordica* have clinically demonstrated hypoglycemic properties or other actions of potential benefit against diabetes mellitus (Sharma et al., 2009).

Bitter Melon increase the number of beta cells in the pancreas. Bitter melon has been shown to increase the number of beta cells in the pancreas thereby improving the body's ability to produce insulin (Shetty et al., 2005).

The Mechanisms of Action

These blood sugar lowering chemicals include a mix of steroidal saponins (known as charantins), insulin-like peptides, and alkaloids. Charantin is composed of a mixture of beta-sitosterol-beta-D-glucoside and 5.25 stigmadien-3-beta-ol glycoside. This hypoglycemic effect is more pronounced in the fruit of bitter melon where these chemicals are found in greater abundance (Kumar et al., 2010).

Momordica also contains an insulinlike polypeptide, polypeptide-P, which lowers blood sugar levels when injected subcutaneously into type 1 diabetic patient. Polypeptide-p, a plant insulin, charantin, vicine, glycosides, and karavilosides improve blood sugar levels by increasing glucose uptake and glycogen synthesis in the liver, muscles, and fat cells (Yadav et al., 2005).

Momordica charantia increase glucose utilization by liver, decrease gluconeogenises via inhibition of two key enzyme glucose -6-phasphat and fructose -1,6 bisphosphatase and improve glucose oxidation through the shunt pathway by activating glucose -6-phasphate dehydrogenase (Shibib et al., 1993; Platel and Srinivasan, 1997).

Bitter melon (Momordica charantia) extract promotes a balanced storage of glucose in the liver as glycogen, supports healthy insulin secretion by the islets of Langerhans, promotes peripheral glucose utilization, and healthy serum protein levels according to in vivo and in vitro studies.

Bitter melon is another botanical that has reduced insulin resistance in animals, partly through its ability to improve the function of insulin receptors in the liver. It also been widely researched in animal studies for its ability to improve glucose and insulin tolerance (Nerurkar et al., 2008).

Fruit juice extracts of M. charantia can stimulate glucose and amino acid uptakes into L6 muscle cells just like insulin. A research indicates MC extracts modify the immune response in cancer patients via decreased intestinal secretion of interleukin-7, reduced lymphocyte number, and increased T-helper and natural killer cell populations (Manabe et al., 2003).

In rats, oral bitter melon juice has been found to potentiate the glucose-lowering effects of the sulfonylurea tolbutamide (Cummings et al., 2004).

Bitter melon notably contains phyto-nutrient, polypeptide-P; a plant insulin known to lower blood sugar levels. In addition it also contain hypoglycemic agent called charantin. Charantin increases glucose uptake and glycogen synthesis in the cells of liver, muscle and adipose tissue. Together, these compounds are thought to be responsible for reduction of blood sugar levels in the treatment of type-2 diabetes. They also improve insulin release from pancreatic beta cells, and repair or promote new growth of insulin-secreting beta cells. p-Insulin, a polypeptide from the fruits and seeds rapidly decreased and normalized the blood sugar level in rats (Sarkar et al., 1996).

Studies have shown both the aqueous and alcoholic extracts of the fruit possess hypoglycaemic activity in streptozotocin-induced diabetic rats by inhibiting the enzyme fructose 1, 6-diphosphatase and glucose 6 phosphatase and at the same time stimulating the enzyme glucose 6 phosphate dehydrogenase (Bailey et al., 1990; Kulkarni and Gaitonde, 1962).

Blood sugar support can be achieved by taking a combination of bitter melon, N-acetyl cysteine, goat's rue, cinnamon, vanadium, quercetin, vitamin C, vitamin E and B6. Components of bitter melon (Momordica charantia) extract appear to have structural similarities to animal insulin (Basch et al., 2003).

At least three different groups of constituents in the bitter gourd appeared to have hypoglycemic, blood sugar lowering, actions of potential benefit in diabetes mellitus. It is believed that these include a mixture of steroidal saponins known as charantin, insulin-like peptides, and alkaloids. The bitter melon is believed to improve glucose tolerance in Type II diabetes. Active constituents are believed to be oleanolic acid glycosides and Momordins which prevent absorption of sugar (Mitra and Bhattacharya, 2006).

Vanadyl sulfate can work with goat's rue, bitter melon, and quercetin to help support healthy blood sugar levels. In one of the newest studies on this mineral, it protected against damaging changes that occurred in the aortas of rats with experimental diabetes (Akgün et al., 2007).

Conclusion

This fruit has also shown the ability to enhance cells' uptake of glucose, to promote insulin release, and to potentiate the effect of insulin (Jayasooriya et al., 2000).

Bitter melon has reduced blood glucose and lipids in both normal and diabetic animals, protected beta cells, enhanced insulin sensitivity and reduced oxidative stress (Shih et al., 2009).

M. charantia fruit juice acts like insulin to exert its hypoglycaemic effect and moreover, it can stimulate amino acid uptake into skeletal muscle cells just like insulin. Some studies have suggested that *M. charantia* juice and its extract can stimulate peripheral glucose uptake and moreover, regulate the amount of glucose taken up by the gut (Platel and Srinivasan, 1997).

Bitter melon is used medicinally mainly for the treatment of type 2 diabetes mellitus. Some preliminary evidence suggests that the consumption of bitter melon as a whole fruit, extract or dried powder may reduce blood sugar levels. Adaptogenic properties are indicated by the delay in the appearance of cataracts, the secondary complications of diabetes and relief in neurological and other common symptoms even before the hypoglycaemia occurred (Oishi et al., 2007).

Taken together, the results support the beneficial use of *M.charantia* in the treatment of diabetes mellitus. Adverse effects are also known. Nevertheless, bitter gourd has the potential to become a component of the diet or a dietary supplement for diabetic and prediabetic patients.

In obese humans with diabetes, vanadyl sulfate may improve a defect in insulin signaling specific to type 2 diabetes. Bitter melon can help protect against free radical damage while supporting healthy insulin levels.

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