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Review article ***Diabetes Mellitus***

Traditional Indian Plants Used For Treatment Diabetes Mellitus

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ABSTRACT

Plants have always been a source of medicine for man since time immemorial. The traditional Indian system of medicine is replete with the use of plants to treat diabetic conditions. According to the World Health Organization, up to 90% of the population in developing countries use plants and their products as traditional medicine for primary health care. There are about 800 plants reported to have antidiabetic potential. This review aims to provide in-depth information on the antidiabetic potential and bioactive substances present in *Eugenia jambolana, Momordica charantia, Trigonella foenum-graecum and Gymnema sylvestre*. This research provides a starting point for future studies aimed at the isolation, purification and characterization of bioactive antidiabetic compounds present in these plants.

Keywords: Anti-diabetic, Eugenia jambolana, Momordica charantia, Trigonella foenum-graecum and Gymnema sylvestre.

INTRODUCTION

Diabetes mellitus is a growing problem worldwide, which entails enormous financial burdens and problems with medical care policy. According to the International Diabetes Federation (IDF), the number of individuals with diabetes exceeded 366 million in 2011, with an estimated 4.6 million deaths each year. The Indian subcontinent has become the capital of this diabetes epidemic. The reported prevalence of diabetes in adults aged 20 to 79 years is as follows: India 8.31%, Bangladesh 9.85%, Nepal 3.03%, Sri Lanka 7.77% and Pakistan 6.72% [1]. Indians show a significantly higher age-related prevalence of diabetes compared to several other populations. At a given BMI, Asian Indians show higher insulin levels, an indicator of peripheral insulin resistance. Insulin resistance in Indians is believed to be due to a higher percentage of body fat. Uncontrolled diabetes leads to a number of complications affecting the vascular system, eyes, nerves and kidneys, resulting in peripheral vascular disease, nephropathy, neuropathy, retinopathy, morbidity and/or mortality. According to the World Health Organization (WHO), up to 90% of the population in developing countries use plants and their products as traditional medicine for primary health care. There are about 800 plants that have been reported to have antidiabetic potential. A wide collection of active substances of plant origin, representing numerous bioactive compounds, has proven its role for possible use in the treatment of diabetes.[2]

Indian medicinal plants with antidiabetic potential

Eugenia jambolana

Eugenia jambolana (black plum or jamun) belongs to the Myrtaceae family, jamun bark is rich in several bioactive compounds including quercetin, betulinic acid, B-sitosterol, eugenin, ellagic and gallic acids, bergenin, tannins and flavonoids. The fruits contain glucose, fructose, raffinose, malic acid and anthocyanins; the leaves are rich in acylated flavonol glycosides, quercetin, myricetin and tannin. The seeds also contain the alkaloid jambosin and the glycoside jamboline, which slows down the diastatic conversion of starch to sugar. Eugenia jambolana's blood glucose-lowering effect may be due to increased insulin secretion from the pancreas or inhibition of insulin degradation, and it has a

hypolipidemic effect demonstrated by lowering blood cholesterol, triglycerides, and free fatty acids [3,4].

Momordica charantia

Momordica charantia (bitter gourd or karela) belongs to the gourd family. The whole fruit and the seeds of the fruit are the parts most often used for therapeutic purposes. Momordica charantia is a popular fruit used for the treatment of diabetes, cardiovascular diseases and related conditions in the indigenous population of Asia, South America and East Africa and contains vicine, charantin and triterpenoids and exhibits antihyperglycemic effect in normal and streptozotocin diabetic rats, which could be due to the inhibition of glucose -6-phosphatases and also by stimulating the activity of hepatic glucose-6-phosphate dehydrogenase. Studies suggest that triterpenoids may be the hypoglycemic components present in karela, which could be responsible for the activation of AMP-activated protein kinase. Blood glucose lowering activity of karela has been reported in several animal models [5].

Trigonella foenum-graecum

Trigonella foenum-graecum (fenugreek, methi) belongs to the Fabaceae family. The most commonly used parts of the plant are the seeds and leaves. Trigonella foenum-graecum L. (Fenugreek) is cultivated throughout India and some other parts of the world as a semi-arid crop. In India it is used both as a vegetable and as a spice. Several studies have shown that fenugreek seed extract, seed mucilage, and leaf mucilage can lower blood glucose and cholesterol levels in humans and experimental diabetic animals. The therapeutic potential of fenugreek is mainly due to the presence of saponins, 4-hydroxyisoleucine and trigonelline, an alkaloid and high fiber content. The antihyperglycemic effect is correlated with a decrease in somatostatin and high plasma glucagon levels. Fenugreek seed powder has been shown to normalize creatine kinase activity in the liver, skeletal muscle, and heart of diabetic rats. The antihyperglycemic effect of fenugreek is thought to be due to the amino acid 4-hydroxyisoleucine, which acts by increasing insulin sensitivity and glucose uptake in peripheral tissues. Steroids present in methi have been reported to lower blood glucose levels when administered to diabetic rats. A significant increase in the area of insulin-immunoreactive β cells was observed [6,7].

Gymnema sylvestre

Gymnema sylvestre (gurmar) belongs to the Asclepiadaceae family. It is a herb native to the tropical forests of India and Sri Lanka. *G. sylvestre* is a large climber with roots in nodes. It contains a group of triterpene saponins known as gymnemic acids and gymnemasaponins. It has been shown to be effective against chronic inflammation, obesity and pancreatic β cell dysfunction. G. sylvestre suspension shows tremendous antidiabetic potential against alloxan-induced diabetic male albino rats. The hypoglycemic effect of the ethanolic extract of *G. sylvestre* is reported to be a consequence of the increased effect of insulin, which comes into play by increasing either the pancreatic secretion of insulin from the β cells or its release from the bound form. A significant correlation was observed between good glycemic control and phospholipid levels. Oral administration of *G. sylvestre* to rats has been reported to result in increased glucose utilization and/or decreased fat mobilization. Significant reductions in body weight, plasma proteins and total hemoglobin were also observed [8,9].

CONCLUSION

According to Ayurveda, there is a huge collection of plants with anti-diabetic potential. Few of them have been scientifically proven and many more have yet to be researched and proven. *Eugenia jambolana, Momordica charantia Trigonella foenum graecum and Gymnema sylvestre* and showed varying degrees of hypoglycemic activity. These plants are also said to help control the complications of diabetes. Future studies may focus on the isolation, purification and characterization of the bioactive compounds present in these plants. The results of such studies may provide a starting point for the development of potential antidiabetic drugs. This review may be helpful in managing diabetes.

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