COMMENTARY

Herbal Treatment of Diabetes

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ABSTRACT:
Diabetes has become one of the most challenging health problems of the 21st century, with increasing prevalence throughout the world. Drugs recently used for the treatment of diabetes have several adverse effects. There is an immense need to explore plant resources to develop a better oral hypoglycemic agent.More than 400 plants are found to have hypoglycemic effect like Acacia Arabia, Aeglemarmelos, Alium cepa, Alium sativum ,Azadirachta indica,Caesalpinia bonducella, Coccinia indica, Eugenia jambolana,Mangifera indica, Momordica charantia and Ocimum sanctum. These are found to act by various mechanisms to produce antidiabetic effect. Moreover, various biologically active compounds with hypoglycemic effect are identified from these plants. including alkaloids, flavonoids, glycosides and polysaccharides. This commentary presents an overview of antidiabetic plants and their suggested hypoglycemic mechanisms.
Keywords: Plants, hypoglycemia, antidiabetic mechanism, biologically active compounds

INTRODUCTION:

The earliest known documentation for plant derived treatment of diabetes is found in Ebers papyrus in about 1500 BC. Renewed attention to natural products has stimulated a new wave of research interest in traditional practices. More than 400 plants are found to have hypoglycemic effect.Various biologically active compounds with hypoglycemic effect are identified from these plants including, alkaloids, flavonoids, glycosides and polysaccharides, for example, an alkaloid derived from seeds of castanospermine, austral, epicatechin, a flavonoid isolated from heartwood of pterocarpus marsupium and noemyritillin ,a glycoside isolated from vaccinium myrtillus,were claimed to exert hypoglycemic effect[1].

There is great interest to develop and utilize antidiabetic plants.[1]Epidemiological survey in a large Chinese population has shown that consumption of vegetables (including cruciferous vegetables, green leafy vegetables, yellow vegetables, allium vegetables, tomatoes and others) and legumes (including soybean, peanut) is inversely associated with the risk of type 2 diabetes[2]. Compounds derived from natural products play a key role in the expansion of new drugs.This implies the screening of extracts for the presence of unique compounds and exploration of their biological activities. Metformin is developed from Galega officianalis which is a herb[3].

Plants act by various mechanisms to produce antidiabetic effect like,blocking the potassium channels of pancreatic β cells, cAMP stimulation ,[4] stimulation of insulin secretion from β cells of islets or/and inhibition of insulin degradative processes,decline in insulin resistance,[5] supplying certain essential elements like calcium, zinc, magnesium, manganese and copper for the β cells, regenerating pancreatic β cells, increasing the size and number of cells in the islets of Langerhans,[6] stimulation of glycogenesis and hepatic glycolysis ,[7] protective effect on the damage of β cells,[8]preventing oxidative stress that is possibly involved in pancreatic β-cell dysfunction found in diabetes[9].

Botanical products can improve glucose metabolism and overall condition of the individual not only by hypoglycemic effect but also by improving lipid metabolism, antioxidant status and capillary function.[1]

Below are some important plants/herbs which showed significant hypoglycemic effect in experimental diabetes model:

Acacia arabica: The plant extract induces hypoglycemia by causing release of insulin from pancreatic β cells.[10]

Aeglemarmelos: Aqueous extract of this plant reduced blood sugar in alloxanized rats as compared to control. This extract also prevented peak rise in blood sugar at 1h in oral glucose tolerance test[11].

Allium Cepa: Administration of a sulfur containing amino acid from allium cepa, S-methyl cysteine sulphoxide (SMCS) (200 mg/kg for 45 days) to alloxan induced diabetic rats significantly controlled blood glucose and normalized the activities of liver hexokinase, G-6-P and HMG Co A reductase[12].

Allium sativum: Allicin, a sulphur-containing compound in allium sativum is found to have hypoglycemic effect.Moreover,S-allylcysteinsulfoxide (SACS), the precursor of allicin and garlic oil, is a sulphur containing amino acid, also showed hypoglycemic effect.SACS also stimulated in vitro insulin secretion from β-cells which were isolated from normal rats[13].

Azadirachta indica: Hydroalcoholic extracts of this plant showed anti-hyperglycemic activity in streptozotocin treated rats because of increase in glucose uptake and glycogen deposition in isolated rat hemidiaphragm[14].

Caesalpinia bonducella: The aqueous and 50% ethanolic extracts of Caesalpinia bonducella seeds showed antihyperglycemic and hypolipidemic activities in streptozotocin (STZ)-diabetic rats[15].

Coccinia indica: Dried extracts of Coccinia indica were

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administered to diabetic patients for 6 weeks in a dose of 500mg/kg body weight. These extracts restored the activities of enzyme lipoprotein lipase, G-6-P and lactate dehydrogenase, involved in diabetes .[16]

Eugenia jambolana: Aqueous and alcoholic extract as well as lyophilized powder showed antihyperglycemic effect. The extract of jamun pulp showed the hypoglycemic activity in streptozotocin induced diabetic mice within 30 min of administration while the seed of the same fruit required 24 hrs. The oral administration of the extract resulted in increase in serum insulin levels in diabetic rats.These extracts also inhibited insulinase activity from liver and kidney.[17]

Mangifera indica: Antidiabetic activity was seen when the extract and glucose were administered simultaneously and also when the extract was given to the rats 60 min before glucose. The hypoglycemic effect could be due to reduction of intestinal absorption of glucose.[18]

Momordica charantia: Extracts of fruit pulp, seed, leaves and whole plant was shown to have hypoglycemic effect in various animal models. Polypeptide P, isolated from fruit, seeds and tissues of M. charantia showed significant hypoglycemic effect when administered subcutaneously to langurs and humans.[19]

Ocimum sanctum: The aqueous extract of leaves of Ocimum sanctum showed significant reduction in blood sugar level in both normal and alloxan induced diabetic rats. Oral administration of plant extract (200 mg/kg) for 30 days lead to decrease in plasma glucose level by approximately 9.06 and 26.4% on 15 and 30 days of the experiment respectively. Renal glycogen content increased 10 fold while skeletal muscle and hepatic glycogen levels decreased by 68 and 75% respectively in diabetic rats as compared to control.[20]

CONCLUSION:

Exploration of natural products has become an important area of research in pharmacology during this decade as evaluation of biological activities of crude herbal extracts later on leads to drug development. Hypoglycemic effect of crude extracts of various plants is well reported in literature. Efforts should be made to identify the active constituents so as to lead to drug discovery.

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