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Medicinal Plants Promise New Insights for Management of Diabetes

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Diabetes is a human-threatening disease can cause a high percentage of morbidity and mortality due to chronic complications (1, 2). The international diabetes federation estimated that, in 2014, 387 million people had diabetes; this number is expected to reach to 592 million by 2035 (3). Because of the increasing prevalence of this disease and the adverse effects of commonly used anti-diabetic drugs, it is vital to screen natural anti-diabetic remedies.

According to written documents, the use of phytoremedies dates back more than 5000 years. One-third to one-half of medicines currently in use was derived from herbs (4). For example Galega officinal is (Leguminosae) contains guanidine-type compounds that decrease blood sugar levels by reducing insulin resistance with toxicity. Galegin, an alkaloid isolated from a plant with less toxicity, was not effective in diabetes clinical trials. On the other hand, metformin, which is currently being used in medications that manage diabetes, has a biguanide structure (5).

Unlike traditional uses of phytomedicines, there are four major concerns that cause a lack of conviction in their usefulness in western medicine: controversial reports of efficacy in different studies (6); insufficient information about the exact mechanisms of effect (6) and safety (7); the absence of well-designed clinical trials (6) and concerns about kinetic and unwanted reactions in the co-administration of herbal medicines and conventional drugs (7). Crude herbal extracts are complex mixtures of many bioactive phytochemicals, so preparing standardized products seems to be vital (8).

Today, the treatment of diabetes has shifted from that of monotherapy to multiple therapies working in conjunction. Combination therapy is not capable of curing diabetes completely because the molecular etiology of diabetes has not been investigated. Insulin secretion and resistance, α-glycosidase activity, and in cretin production are the targets of present medicines. Botanicals are complex mixtures of compounds with multiple targets, which makes clinical trials complicated (9).

Considering the complicated etiology of diabetes, an herbal remedy with glucose regulation at several levels in different tissues could be effective (6). Despite the prevalent use of phytoremedies, the mechanism of action for only some of them has been investigated. Botanicals may exert their beneficial effects in diabetes management by reducing insulin resistance (licorice, dioscorea, blueberry, astragalus, cinnamon, fenugreek, and lychee); improving β-cell function (papaya, Silybium marianum, Gymnema sylvestre); regulating GLP-1 homeostasis (fructans, monounsaturated fatty acids); and regulating glucose absorption and α-glycosidase activity (safflower, kelp).

Some botanicals exert their antidiabetic effects via multiple mechanisms; examples of these botanicals are berberine, bitter melon, capsaicin/chili pepper, ginseng, turmeric, mate tea, ginger/gingerol, Chinese tea, soybean, Aloe vera, quercetin, resveratrol, and coffee (9). Thus, the scope of our investigation is finding the exact mechanism of function, molecular targeting, and standardization of herbal formulations besides using well-designed clinical trials (9).

Footnote

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