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Letter to the Editor

Anti-diabetic and hypolipidemic effects of the aqueous leaf extract of *Bougainvillea* species

Sir,

Diabetes mellitus (DM) is a chronic, metabolic disorder characterized by altered carbohydrate, fat and protein metabolism and an increased risk of micro and macrovascular complications. It is projected to become one of the world's main disablers and killers within the next 25 years.

Despite the significant achievements in treatment modalities and preventive measures, its prevalence has risen exponentially in the last decade. Thus, there is a continued need for newer and more effective therapies, which would improve diabetic control and also reduce associated risk factors like hyperlipidemia, hypertension and so on. A lot of alternative therapies have emerged with herbal medicine inclusive. Thus, the need of the hour is to shift toward these different alternative, indigenous plants and herbal formulations having least side-effects.

More than 400 plant species having hypoglycemic activity have been available in literature, however, searching for newer anti-diabetic drugs from natural plants is still an attractive approach because they contain substances which demonstrate alternative and safe effects on DM. Some such herbal therapies, like the Konjac-Mann,¹ honey,² *Azadirachta indica*,³ *Bougainvillea glabra*, glucolevel (a combination of four anti-diabetic plants used in the traditional Arab herbal medicine),⁴ have all shown ameliorating effects in the control of hyperglycemia in DM.

Bougainvillea (with the common name Glory of the Garden), originated from South America and it is a popular plant in Southern California, Florida, the Caribbean and other areas with tropical and warm climates. It is a thorny woody plant with flowers ranging from pink, purple, red, orange, yellow colors and especially white. Among the *Bougainvillea*'s varieties include *B. glabra*, *Bougainvillea spectabilis*, and *Bougainvillea harrisi*.

B. glabra is grown for its decorative purposes in tropical regions and in the temperate. Both *B. spectabilis* and *glabra* are used in herbal combinations for the treatment of diabetes. The leaves of these *Bougainvillea* plants are used as a traditional treatment for diabetes in Asia and the West Indies.⁵

D-pinitol (1D-3-0-methyl-chiroino-sitol), a 3-methoxy analogue of D-chiroinositol, has been identified as an active

principle, and is reported to reduce glucose concentrations in alloxan diabetic rats.⁵ The mechanism of action of D-pinitol does not augment the effect of insulin, but might involve an interaction with part of a cellular signaling pathway that links insulin with glucose transport (Holman & Kasuga, 1997).^{6,7} Various beneficial components like alkaloids, flavonoids, saponins and cardiac glycosides are also present in the *B. glabra* plant extract.⁵

The name pinitol is derived from "pine," as it was first isolated from a pine tree. Apart from *B. spectabilis*, it also occurs prevalently in other plants such as *Gliricidia sepium*, *Tamarindus indica* Linn., *Glycine max* L Merr. (Soybean). Leguminosae, Fabaceae, Pinaceae, *Nyctaginaceae*, *Aristolochiaceae*, Sapindaceae, Caryophyllaceae, Boraginaceae, Zygophyllaceae, and Santaraceae families of plants are found to be the best sources of pinitol. Leaves, stems, roots, fruits, flowers, heartwood, seeds, pericarps and aerial parts of plants have been taken up for the isolation of pinitol extract. Pinitol or an extract of plants containing pinitol have accelerated therapeutic effects including anti-diabetic, anti-inflammatory, antioxidant and immunomodulatory effects.⁸

Information also exists about the use of *B. glabra* in the cure of ulcer, diarrhea, and having anti-microbial activities.⁹ Information from some traditional medical practitioners show that some beetles that feed on any *Bougainvillea* stems are dried, crushed into powder and added as main ingredient in popular herbal combinations used in the treatment of DM.

It is also observed that *B. glabra* and *B. spectabilis* have some anti-lipidemic effects. high-density lipoprotein-cholesterol levels increased in the diabetic mice groups who were administered the *Bougainvillea* extracts. Major complications of diabetes include aberrant lipid metabolism and vascular wall function. Since alterations in serum lipid profiles are known in diabetes which are likely to increase the risk of coronary heart disease, a reduction in serum lipids, particularly total cholesterol, low-density lipoprotein-cholesterol and triglycerides levels should be considered as beneficial in long-term prognosis of diabetic patients. *B. glabra* extract will thus have a potential therapeutic value in combating multifactorial atherosclerotic disorders, which are parts of the major complications of DM. Reducing the risk of atherosclerosis will thus lead to the development of effective and better management of hyperlipidemia.¹⁰

In conclusion, the aqueous extract of the leaves of *B. glabra* and *B. spectabilis* have anti-diabetic and anti-lipidemic effects. These observations justify the traditional uses of the plant leaves for the treatment of diabetes.

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