A Comprehensive Review Of Some Medicinal Plants Possessing Antidiabetic Properties

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Abstract
Plants have been identified as a potent source of drugs for many diseases. From ancient times onwards many plants were consumed by the tribes to cure their ailments. Nowadays diabetes is considered as a popular life style disease. The number of diabetic patients are alarmingly increasing day by day. Many medicinal plants growing in our locality possess antidiabetic properties which were clinically proven. This review describes some locally available medicinal plants in Kerala possessing antidiabetic properties.

Key words: Plants, diabetes, antidiabetic properties.

Introduction

The history of medicine and surgery is as old as the origin of the human race. As there is no proper documentation of treatment practices in the prehistoric times, we are not aware about that. In those days the subject of human illness and the alleviation were closely associated with religion myth and magic. In India, the Rig Veda is considered as the oldest record of some properties of medicinal plants. The indigenous tribal people of the country were aware about many plants and their medicinal properties. Many attempts have been made to document this traditional knowledge. These studies are now classified as a special branch of Botany known as Ethnobotany. Since ancient times, plants have been considered as a valuable source of drugs in Ayurveda as well as in other alternate systems of medicine.
Diabetes is considered as a chronic disease and it occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. As per the World Health Organization, the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. WHO estimates that diabetes was the seventh leading cause of death in 2016. Recent researches revealed that many locally available plants show antidiabetic properties. There has been growing interest to investigate novel antidiabetic compounds from herbal products. This review describes some medicinal plants possessing antidiabetic properties.

Materials and Methods

Extensive literary survey has been conducted to prepare this review. The locally available plants in the state of Kerala are only considered for the present study. The collected information has been properly documented.

Results and Discussion

Around 20 locally available plants have been considered for the present study.

1. *Aegle marmelos* Corr. (Rutaceae)

The methanol and aqueous leaf extracts of the plant shows a significant hypoglycemic effect in rabbits (1). The aqueous extracts of the fruit also exhibit hypoglycemic effect in female albino Wistar rats (2).

2. *Alpinia galanga* (L.) Willd. (Zingiberaceae)

The rhizome is used in the treatment of diabetes. The methanolic and aqueous extracts of the rhizome powder significantly lowered the blood sugar in normal rats (3). Methanolic extract of aerial parts of *A. galanga* was effective in controlling blood glucose level and improve lipid profile in euglycemic as well as diabetic rats (4).

3. *Azadirachta indica* A. Juss. (Meliaceae)

The alcoholic extract of neem root bark has antihyperglycemic and hypoglycemic activity (5).

4. *Bauhinia variegate* L. (Fabaceae)

The hydro-alcoholic extract of the dried stem bark exhibited significant antihyperglycemic effects which may be attributed to increased glucose metabolism when when administered to healthy Wistar rats (6). The ethanolic extract of the bark also has hypoglycemic effect (7).

5. *Benincasa hispida* (Thunb.) Cogn. (Cucurbitaceae)

The stem chloroform extract of Benincasa hispida has significant hypoglycemic activity in normal male Wistar rats. The maximum reduction in blood glucose levels with stem extract of Benincasa hispida was recorded at a dose of 200 mg/kg bw (8). The methanolic extract of the fruit has significant hypoglycemic activity in dexamethasone induced diabetic rat models (9).

6. *Cassia fistula* L. (Fabaceae)

The use of gold nanoparticles synthesized from *C. fistula* stem bark for the treatment of rats with streptozotocin-induced diabetes reduced serum blood glucose concentrations, induced favorable changes in body weight, improved transaminase activity, achieved a better lipid profile, and reversed renal dysfunction to a greater extent that did aqueous extracts from the same plant (10). In streptozotocin induced diabetic rats, the aqueous bark extract of *C.fistula* significantly inhibited the glucose absorption from the small intestine and provoked glycogen accumulation in liver and skeletal muscle (11).

7. *Cassia occidentalis* L. (Fabaceae)

The whole plant aqueous extract of *C. occidentalis* exhibited significant antihyperglycemic activity in normal and alloxan-induced diabetic rats (12). A significant antihyperglycemia action on the fasting blood glucose and plasma insulin was observed after 45 days treatment of diabetic rats with different doses of methanol fraction of *C. occidentalis* leaves (13).

8. *Catharanthus roseus* (L). G.Don

The traditional usage of the fresh leaves by Ayurvedic physicians for the control of diabetes has been evaluated by Nammi et al (14) and reported significant antidiabetic activity of *C. roseus* leaf extracts. Islam et al. reported the significant role of ethyl acetate fractions from the ethanolic extract of the leaves of *C.roseus* in reducing the blood sugar level in diabetic rats (15).

9. *Coccnia grandis* L. (Cucurbitaceae)

The antihyperglycemic effect of C. grandis leaf extract in diabetic rats has been studied by Doss and Dhanapalan (16). Attanayake et al., explained that the antidiabetic activity of C. grandis leaf extract is through the increased biosynthesis of insulin probably by β cell regeneration in the pancreas of streptozotocin induced diabetic rats (17).

10. *Cocos nucifera* L. (Arecaceae)

Traditionally, the juice of young spadix is used to treat diabetes. Naskar et al., reported that there is a significant reduction in fasting blood sugar in the diabetic rats treated with the hydro methanol extract of *Cocos nucifera* (18). The coconut kernel protein has potent anti-diabetic activity through reversal of glycogen levels, activities of carbohydrate metabolizing enzymes and the pancreatic damage to the normal levels due to its effect on pancreatic β-cell regeneration by means of arginine (19).

11. *Curcuma longa* L. (Zingiberaceae)

Curcumin, the yellow coloured bioactive compound isolated from Curcuma longa reduces blood glucose, and the levels of glycosylated hemoglobin in diabetic rat through the regulation of polyol pathway (20). The antidiabetic properties of freeze dried rhizomes are also been evaluated (21).

12. *Dioscorea alata* L. (Dioscoreaceae)

It was found that the ethanolic extract of the tubers of Dioscorea alata L. exhibit an antidiabetic activity in alloxan diabetic rats (22).

13. *Hibiscus rosa-sinensis* L. (Malvaceae)

The role of ethanolic extract of the flowers in reducing the blood glucose level has been reported by Venkatesh et al (23). The antidiabetic properties of the leaf extract has also been evaluated (24).

14. *Ipomoea batatas* (L.) Lam. (Convolvulaceae)

This plant exhibits remarkable antidiabetic activity and improves the abnormality of glucose and lipid metabolism by reducing insulin resistance (25). The flavones extracted from the plant has an important role in controlling the blood sugar levels in diabetic rats (26). *Ipomoea batatas* has been considered as a beneficial food and it is useful in the prevention and improvement of diabetic symptoms (27).

15. *Mangifera indica* L. (Anacardiaceae)

Aderibigbe et al., reported that the hypoglycemic activity of the aqueous leaf extracts of Mangifera indica L. may be due to an intestinal reduction in the glucose absorption (28). It has been proved that the antidiabetic activity of *M. indica* is probably at least, partly due to inhibition of glucose absorption in the gut (29).

16. *Momordica charantia* L. (Cucurbitaceae)

The hypoglycemic efficacy of the aqueous extract of the seeds has been evaluated in diabetic rats (30). It has been reported that the oral administration of the fruit juice or seed powder causes a reduction in fasting blood glucose and improves glucose tolerance in normal and diabetic animals and in humans (31).

17. *Phyllanthus emblica* L. (Euphorbiaceae)

Quercetin, a bioactive constituent present in the methanolic extract of the fruit is considered as a potential drug with antidiabetic and hypoglycemic action (32). Krishnaveni et al., also reported the antidiabetic activity of *P. emblica* fruits in diabetic rats (33).

18. *Polyalthia longifolia* (Sonn.) Thwaites (Annonaceae)

The ethanol and chloroform extracts of the leaves show α amylase and α glucosidase enzymes inhibitory activity and thus proves the antidiabetic activity of the plant (34). The gross glucose lowering effect of the leaf extract has been reported by Nair et al (35). The antihyperglycemic effect of the methanolic extract of the stem bark has also been reported (36).

19. *Pterocarpus marsupium* Roxb. (Fabaceae)

It has been found that the butanol subfraction of the alcohol extract of *Pterocarpus marsupium* exhibits significant antidiabetic activity and corrects the metabolic alterations in diabetic rats and this activity may resemble insulin-like properties (37). Maruthupandian and Mohan reported that the antidiabetic effect of ethanol extract of *P. marsupium* may be due to the presence of more than one antihyperglycemic principles and their synergistic effects (38).

20. *Rauvolfia serpentina* Benth. (Apocynaceae)

The methanolic root extract of *R. serpentina* was found hypoglycaemic, hypolipidemic and hepato-protective in alloxan-induced diabetic rats (39, 40).

Conclusion

Various compounds obtained from plants have been used in the treatment of diabetes and other diseases. There are many evidences that a variety of active ingredients from plants could act as antihyperglycemic agents. Many pharmacological studies have been conducted to confirm the efficacy of the plant compounds as antidiabetic agents. Plants other than mentioned in this review also possess antidiabetic properties. Extensive researches must be conducted to isolate the antihyperglycemic compounds from plants and should be commercialized in an effective way.

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