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Review

Medicinal Plants in the Management of Diabetes Mellitus - A Comprehensive Review

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Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by spersistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The global rise in diabetes prevalence has intensified the search for effective, safe, and affordable therapeutic strategies. Medicinal plants have long been used in traditional systems of medicine for the management of diabetes and its associated complications, and they continue to attract scientific interest as potential sources of novel antidiabetic agents. Numerous plant species have demonstrated antidiabetic activity through various mechanisms, including enhancement of insulin secretion, improvement of insulin sensitivity, inhibition of carbohydrate-digesting enzymes, reduction of intestinal glucose absorption, and protection of pancreatic β-cells through antioxidant and anti-inflammatory effects. Bioactive phytoconstituents such as alkaloids, flavonoids, phenolics, terpenoids, and saponins are believed to play a crucial role in these pharmacological actions. Preclinical and clinical studies have provided evidence supporting the efficacy of several medicinal plants, such as *Momordica charantia*, *Gymnema sylvestre*, *Trigonella foenum-graecum*, and *Allium sativum*, in glycemic control and metabolic regulation. This article highlights the potential of medicinal plants in the management of diabetes mellitus, emphasizing their mechanisms of action, and the need for further standardization, toxicity evaluation, and well- designed clinical trials to establish their safety and efficacy for integration into modern diabetes management.

Keywords: Medicinal plants, Diabetes mellitus, Hypoglycemia, Anti-diabetic agents.

1. INTRODUCTION

Diabetes mellitus is a highly prevalent metabolic disorder that affects populations in both developed and developing nations worldwide. It is estimated that approximately 25% of the global population suffers from this condition. The disease arises due to disturbances in carbohydrate metabolism, which are associated with inadequate insulin levels in the blood or reduced responsiveness of target tissues to insulin [1]. Despite significant advances in diabetes management using oral hypoglycemic agents, the search for new drugs continues due to the limitations of existing synthetic medications. Although herbal drugs with antidiabetic activity are well recognized in traditional medicine, they have not yet been widely developed into modern pharmaceutical formulations [2]. Medicinal plants possess a variety of bioactive chemical constituents that are responsible for their therapeutic effects in the treatment of various diseases [3].

Diabetes mellitus is broadly classified into two types: insulin-dependent (Type I) and non-insulin-dependent (Type II). Type I diabetes, also called juvenile diabetes, requires insulin therapy and affects about 5% of the diabetic population, whereas Type II diabetes commonly occurs in individuals over 40 years of age. Persistent hyperglycemia in diabetes is known to cause damage to various organs of the body [4].

The degree of organ damage induced by hyperglycemia is influenced by the duration of diabetes and the level of glycemic control. Common clinical manifestations of the disease include increased thirst, frequent urination, blurred vision, and loss of body weight [5].

2. ROLE OF MEDICINAL PLANTS IN DIABETES MANAGEMENT

Medicinal plants play an important role in diabetes management due to their accessibility, affordability, and comparatively low toxicity. Bioactive compounds such as flavonoids, alkaloids, glycosides, terpenoids, phenolic compounds, and polysaccharides contribute to their antidiabetic effects. These compounds exert pharmacological actions by stimulating insulin secretion, enhancing peripheral glucose uptake, inhibiting carbohydrate- digesting enzymes, and protecting pancreatic β-cells from oxidative stress [6].

3. ANTI-DIABETIC EFFECT OF MEDICINAL PLANTS

Brassica juncea

Brassica juncea is commonly used as a spice in a variety of food items in Tamil Nadu and is also recognized as a traditional medicinal plant belonging to the family Cruciferae. Studies have shown that the aqueous seed extract of *B. juncea* possesses notable hypoglycemic activity, which was evaluated in streptozotocin-induced diabetic male albino rats, with effective doses reported at 250, 350, and 450 mg/kg [7].

Gymnema sylvestre

Gymnema sylvestre (GS) is a well-known medicinal herb with significant antihyperglycemic activity and is widely used as a supportive treatment for patients with diabetes mellitus (DM) [8]. It is cultivated in the southern regions of Asia and the East Indies. Both the roots and leaves of GS possess medicinal properties, although the precise mechanism of action remains unclear. The plant extracts are known to suppress sweet taste perception and enhance enzyme activity involved in glucose uptake and utilization. In addition, GS extract stimulates pancreatic cell function and increases insulin secretion [9]. Several studies have reported that GS extract lowers blood glucose levels and exhibits antisweet and hepatoprotective effects. Recent findings have also shown that GS leaf extract demonstrates significant antihypoglycemic activity and reduces blood cholesterol levels in streptozotocin-induced diabetic rats [10].

Centaurium erythrea

Diabetes was induced by a single intraperitoneal administration of streptozotocin (STZ) at 65 mg/kg. Oxidative stress was evaluated by measuring malondialdehyde (MDA) levels in pancreatic tissue, along with the activities of antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx). In diabetic rats treated with *Centaurium erythrea* aqueous leaf extract, a significant reduction in pancreatic TBARS levels was observed compared to untreated diabetic animals. Moreover, the activities of pancreatic antioxidant defense enzymes, including SOD, CAT, GPx, and glutathione S-transferase (GST), were markedly increased, demonstrating the antioxidant effect of *C. erythrea* [11].

Axonopus compressus

The antidiabetic activity of the methanolic leaf extract of *Axonopus compressus* was studied in alloxan-induced diabetic rats. Diabetes was induced by alloxan administration, and the extract was given orally at doses of 250, 500, and 1000 mg/kg body weight. Treatment with the methanolic leaf extract at all dose levels significantly reduced blood glucose levels by 31.5%, 19.8%, and 24.5%, respectively, when compared with the diabetic control group. These results indicate that *A. compressus* exhibits notable antidiabetic activity [12].

Berberis vulgaris

The hypoglycemic effect of *Berberis vulgaris* L. was evaluated in streptozotocin-induced diabetic rats. *B. vulgaris* is a traditional medicinal plant belonging to the family Berberidaceae. The findings revealed that the aqueous extract and saponin fraction produced a significant reduction in blood glucose levels. In addition, elevated serum cholesterol and triglyceride levels in diabetic rats were significantly reduced following treatment[13].

Coccinia grandis

The hypoglycemic activity of *Coccinia grandis* leaves has been evaluated using alcoholic extracts.

Oral administration of the alcoholic leaf extract at a dose of 600 mg/kg body weight produced a significant reduction in blood glucose levels in normal fasted rats, indicating notable hypoglycemic potential [14].

Alangium lamarckii

The antidiabetic activity of *Alangium lamarckii* has been investigated using alcoholic leaf extracts.Administration of the extract at doses of 250 and 500 mg/kg body weight showed significant antidiabetic effects in streptozotocin–nicotinamide-induced diabetic rats [15].

Chaenomeles-sinensis

The ethyl acetate fraction of *Chaenomeles sinensis* (Thouin) Koehne fruits, a member of the family Rosaceae, exhibited significant antidiabetic activity. Effective antihyperglycemic effects were observed at doses of 50 and 100 mg/kg body weight [16].

G:Albizia-odoratissima

The methanolic bark extract of *Albizia odoratissima* (250 and 500 mg/kg body weight) produced significant antidiabetic effects in alloxan-induced diabetic mice, including reductions in serum cholesterol, triglycerides, SGOT, SGPT, alkaline phosphatase, and total protein levels [17].

Caesalpinia-digyna

Bergenin from the roots of *Caesalpinia digyna* showed antidiabetic activity. In diabetic rats, plasma total cholesterol (TC), triglycerides (TG), and LDL-C levels were significantly increased, while HDL-C levels were decreased compared to controls. Oral administration of bergenin (10 mg/kg) significantly improved the lipid profile, similar to glibenclamide (10 mg/kg). Antioxidant enzyme activities, such as SOD and CAT, were reduced and TBARS levels were elevated in diabetic rats; bergenin treatment significantly increased SOD and CAT activities and lowered TBARS levels. These results indicate that bergenin has potent antidiabetic properties [18].

3. CONCLUSION

Management of diabetes mellitus remains a global health challenge, and medicinal plants offer a promising complementary approach. Plant-derived compounds provide accessible, cost-effective, and relatively safe options for controlling blood glucose levels and associated complications. The ethnobotanical knowledge of antidiabetic plants can guide the development of new therapeutic agents. Integrating these plant-based remedies with conventional treatments may enhance diabetes management and improve patient outcomes, highlighting the importance of continued research in this field.

4. REFERENCES

[1] Maiti R, Jana D, Das UK, Ghosh D. Antidiabetic effect of aqueous extract of seed of Tamarindus indica in streptozotocin induced diabetic rats. J Ethnopharmaco 2004; 92: 85-91.

[2] Wadkar KA, Magdum CS, Patil SS, Naikwade NS. Antidiabetic potential and Indian medicinal plants. J Herbal Med Toxicol 2008; 2: 45-50. Sofowora

[3] Medicinal Plants and Traditional Medicine in Africa Johnwiley, New York, 1984, 256-257.

[4] Huang THW, Peng G, Kota BP, Li GQ, Yamahara J, Roufogalis BD et al. Anti- diabetic action of Punica granatum flower extract: activation of PPAR-c and identification of an active component. Toxicol App Pharmacol 2005; 207:160-169.

[5] Sperling, M.; Tamborlane, M.; Batteling, T.; Weinzimer, S.; Phillip, M. Pediatric endocrinology. In Chapter 19: Diabetes mellitus, 4th ed.; Elsevier:

Amsterdam, The Netherlands, 2014.

[6] Saravanan G, Pari L. Hypoglycemic and antihyperglycemic effect of *Syzygium cumini* bark in diabetic rats. J Pharmacol Toxicol. 2008;3:1-10.

[7] Thirumalai T, Therasa VS, Elumalai EK, David E. Hypoglycemic effect of Brassica juncea (seeds) on streptozotocin induced diabetic male albino rat. Asian Pac J Trop Biomed 2011; 4: 323-325.

[8] Nadkarni, A. K. Gymnema sylvestre, R. Br. or Asclepias geminata. Indian Mater. Med. 1954, 1:596−599.

[9] Rana, A. C.; Avadhoot, Y. Experimental evaluation of hepatoprotective activity of Gymnema sylvestre and Curcuma zondoania. Fitoterapia 1992, 63:60−62.

[10] Devi Priya M, E.A. Siril, Traditional and Modern Use of Indian Madder (Rubia cordifolia L.): An Overview, Int. J. Pharm. Sci. Rev. Res., 25(1), Mar – Apr 2014; Article No. 27, Pages: 154 164.

[11] Sefi M, Fetoui H, Lachkar N, Tahraoui A, Lyoussi B, Boudawara T, et al. Centaurium erythrea (Gentianaceae) leaf extract alleviates streptozotocin-induced oxidative stress and 毬- cell damage in rat pancreas. J Ethnopharmacol 2011; 135: 243-250.

[12] Ibeh BO, Ezeaja MI. Preliminary study of antidiabetic activivty of the methanolic leaf extract of Axonopus compressus (P.Beauv) in alloxan induced diabetic rats. J Ethnopharmacol 2011; 138: 713-716.

[13] Meliani N, Amine Dib ME, Allali H, Tabti B. Hypoglycaemic effect of Berberis vulgaris L. in normal and streptozotocin induced diabetic rats. Asian Pac J Trop Biomed 2011; 6: 468-471.

[14] Ajay SS. Hypoglycemic activity of Coccinia indica (Cucurbitaceae) leaves. Int J Pharm Tech Res 2009; 1(3): 892-893.

[15] Rajesh Kumar, Dinesh Kumar Pate, Satyendra Kuldip Prasad, Kirshnamurthy Sairam, Siva Hemalatha. Antidiabetic activity of alcoholic leaves extract of Alangium lamarckii Thwaites on streptozotocin- nicotinamide induced type 2 diabetic rats. Asian Pac J Tropical Med 2011; 904-909.

[16] Sancheti S, Sancheti S, Seo SY. Antidiabetic and antiacetylcholinesterase effects of ethyl acetate fraction of Chaenomeles sinensis (Thouin) Koehne fruits in streptozotocin-induced diabetic rats. Exp Toxicol Pathol 2011; 65(1-2): 55-60.

[17] Dinesh Kumar, Sunil Kumar, Sonia Kohli, Renu Arya, Jyoti Gupta. Antidiabetic activity of methanolic bark extract of Albizia odoratissima Benth. in alloxan induced diabetic albino mice. Asian Pac J Trop Med 2011; 900-903.

[18] Kumar R, Patel DK, Prasad SK, Laloo D, Krishnamurthy S, Hemalatha S. Type 2 antidiabetic activity of bergenin from the roots of Caesalpinia digyna Rottler. Fitoterpia 2012; 83(2): 395-401.