EJPMR, 2026, 13(1), 161-164 **Research Article** **Impact Factor 7.065**

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

ISSN (O): 2394-3211
ISSN (P): 3051-2573
Coden USA: EJPMAG

ROLE OF PHYTOMEDICINE IN DIABETES

Mohd. Arkan*, Shivam Verma*, Prof. Dr. Rohit Mohan

Department of Pharmacy- Nandlal Prabhu Devi Professional Institute Alapur, Barabanki.

***Corresponding Author: Mohd. Arkan**

Department of Pharmacy- Nandlal Prabhu Devi Professional Institute Alapur, Barabanki.

DOI: https://doi.org/10.5281/zenodo.18085502

How to cite this Article: Mohd. Arkan*, Shivam Verma*, Prof. Dr. Rohit Mohan. (2026). Role of Phytomedicine In Diabetes. European Journal of Pharmaceutical and Medical Research, 13(1), 161–164.

Article Received on 22/11/2025 **Article Revised on 12/12/2025** **Article Published on 01/01/2026**

ABSTRACT

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Despite the availability of several synthetic antidiabetic agents, their long-term use is often associated with side effects and limited efficacy. In this context, phytomedicine—plant-based therapeutics—has emerged as a promising alternative or complementary approach for diabetes management. This paper reviews the role of phytomedicine in the management of diabetes, highlighting bioactive compounds, mechanisms of action, and clinical evidence supporting their efficacy and safety. It is commonly known that plants and natural foods consist of thousands of phytochemicals. Further, majority of us are increasingly understanding the relevance of natural elements in improving health and preventing diseases. Oxidative stress development is definitely connected with diabetes mellitus. Hyperglycemia triggers excessive free radical generation, frequent oxidation of stable macromolecules, destabilizing conformation of antioxidative enzymes and transcription factors, modulating metabolic pathways, and promoting inflammatory reactions, and ultimately leads to endothelial dysfunctions and vasculopathy. Conventional diabetes care techniques frequently have numerous negative side effects and are proven to be insufficient to address all of these related health problems. Phytotherapy in the form of complementary and alternative medicine has attracted attention in the treatment of diabetes throughout the years..

KEYWORDS:-Phytomedicine, Diabetes Mellitus, Medicinal Plants, Insulin Sensitivity, Antioxidants, Hypoglycemic Agents.

1. INTRODUCTION

Diabetes mellitus is a global health challenge, affecting more than 500 million people worldwide as of 2025. The condition increases the risk of cardiovascular disease, neuropathy, nephropathy, and retinopathy. Current pharmacological treatments include insulin, sulfonylureas, metformin, and SGLT2 inhibitors; however, these are not devoid of adverse effects and may not achieve optimal glycemic control in all patients.[1] Traditional medicine systems, including Ayurveda, Traditional Chinese Medicine, and African ethnomedicine, have long used plant-based remedies to treat diabetes.[2] Phytomedicine offers a holistic, cost-effective, and potentially safer alternative, with increasing scientific validation supporting its role in glycemic regulation. Bringing these bioactive components and formulations that promote and regulate wellbeing from the bench to the bedside has always been the congruent goal. The unifying factor in these illnesses seems to be inflammation.[3] Therefore, focusing on selecting components that govern the underlying biological response modifiers may prove important to establishing effective disease treatment modalities.[4] With this history and viewpoint in mind, we hope to shed light on the necessity and applicability of plant-basedtraditional medicine in two difficult but linked clinical conditions—diabetes and related cardiovascular diseases.[5]

2. Phytochemicals with Antidiabetic Properties

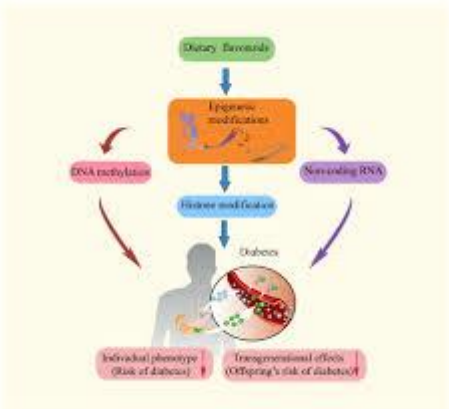
Phytomedicines contain a wide array of bioactive compounds such as alkaloids, flavonoids, terpenoids, saponins, and phenolic acids. These compounds act via multiple mechanisms, including enhancement of insulin secretion, improvement of glucose uptake, inhibition of carbohydrate-digesting enzymes, and modulation of oxidative stress.[6]

2.1 Alkaloids

Berberine (from Berberis vulgaris) improves insulin sensitivity by activating AMP-activated protein kinase (AMPK). Studies have shown its efficacy in lowering fasting blood glucose and HbA1c levels comparable to metformin.[7]

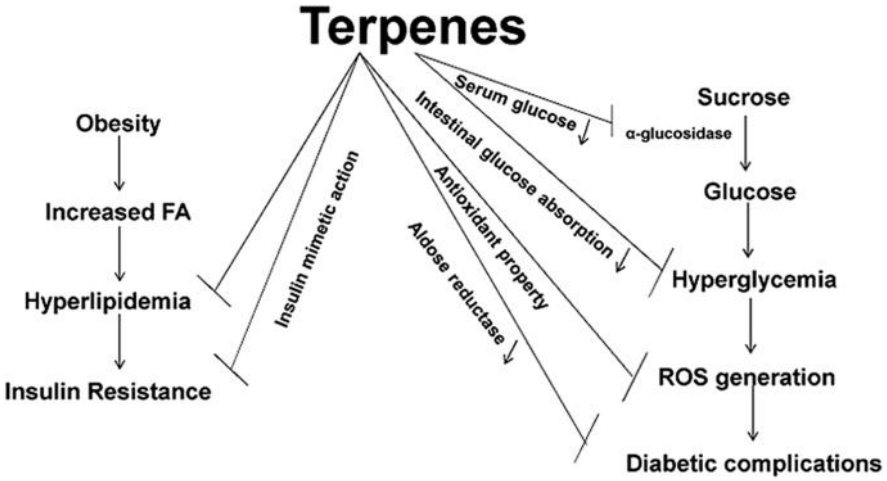
2.2 Flavonoids

Quercetin, kaempferol, and rutin found in Morus alba and Allium cepa exert antioxidant and insulin-mimetic effects. They enhance glucose uptake in muscle cells and inhibit aldose reductase, reducing diabetic complications.[8]

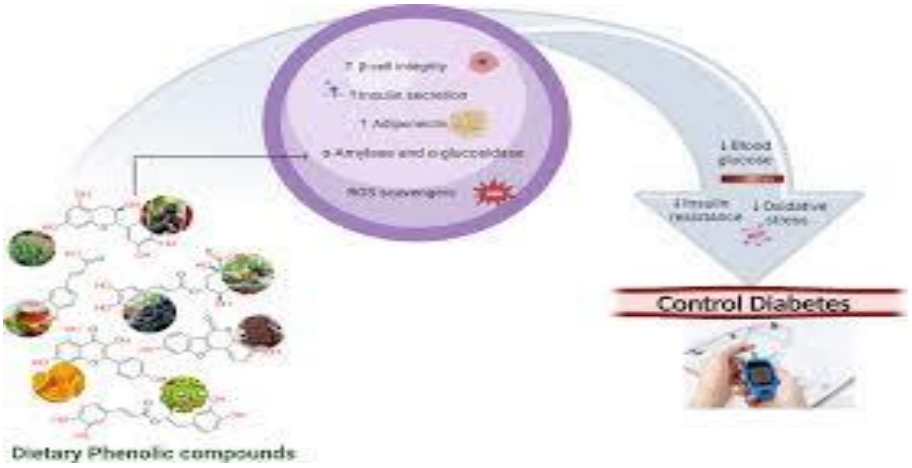


2.3 Terpenoids

Gymnemic acids (from Gymnema sylvestre) regenerate pancreatic β-cells and inhibit intestinal glucose absorption. Similarly, ginsenosides from Panax ginseng improve insulin sensitivity and lipid metabolism.[9]



2.4 Phenolic Compounds: Curcumin (from Curcuma longa) and resveratrol (from grapes) reduce inflammation and oxidative stress through modulation of the gut microbiota.[10]



3. Mechanisms of Action of Antidiabetic Phytomedicines

Phytomedicines act through diverse molecular mechanisms, including:

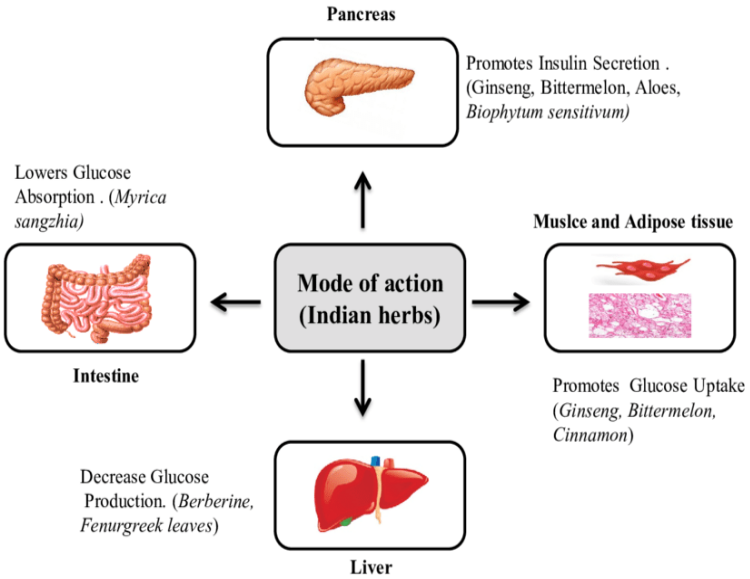
Enhancement of insulin secretion:- e.g., Momordica charantia (bitter melon) stimulates β-cell regeneration.[11]

Improvement of insulin sensitivity: e.g., Trigonella foenum-graecum (fenugreek) activates insulin receptor signaling.[12]

Inhibition of carbohydrate-digesting enzymes: e.g., Salacia oblonga inhibits α-glucosidase and α-amylase.[13]

Antioxidant and anti-inflammatory effects: Reduce oxidative stress-related β-cell damage.

Modulation of gut microbiota: Certain phytochemicals influence gut flora, improving glucose homeostasis.[14]



4. Clinical Evidence

Numerous preclinical and clinical studies support the antidiabetic potential of phytomedicine. Randomized controlled trials have demonstrated the efficacy of formulations such as:

Bitter melon extract:- Reduced fasting plasma glucose by 15–20% in type 2 diabetic patients.[15]

Fenugreek seeds:- Lowered postprandial glucose and improved insulin resistance.[16]

Aloe vera gel:- Significantly decreased fasting glucose and triglyceride levels.

However, variability in plant composition, dosage, and preparation methods remains a limitation in achieving consistent clinical outcomes.[17]

5. Safety, Standardization, and Regulatory Challenges:- Despite their potential, phytomedicines face challenges related to safety, standardization, and quality control. Adulteration, incorrect identification, and variable bioactive content can compromise efficacy. The lack of standardized dosage and limited pharmacokinetic data hinder integration into mainstream medicine. Regulatory frameworks must enforce good manufacturing practices (GMP), phytochemical profiling, and clinical validation.[18]

6. Future Prospects

Future research should focus on

Bioassay-guided fractionation to isolate potent antidiabetic compounds.

Nanotechnology to improve bioavailability of plant-based drugs.[19]

Integrative medicine approaches combining phytomedicine with conventional therapies.

Systems biology and metabolomics to elucidate molecular targets of phytochemicals.

Advancements in genomics and pharmacognosy are expected to accelerate the discovery of novel phytotherapeutic agents for diabetes.[20]

CONCLUSION

Phytomedicine offers a promising complementary strategy in diabetes management through its multifaceted mechanisms and favorable safety profile. Continued research and standardization efforts are essential to translate traditional knowledge into evidence-based therapeutic interventions. Integration of phytomedicine with modern pharmacology could significantly enhance diabetes care and patient outcomes.

REFERENCE

1. American Diabetes Association (2013). "Economic costs of diabetes in the U.S. in 2012.". Diabetes Care, 36(4): 1033-46. doi:10.2337/ dc12-2625.
2. Cooke, D.W. and Plotnick, L. (2008). "Type 1 diabetes mellitus in pediatrics". Pediatr, Rev., 29(11): 374-84. quiz 385. doi:10.1542/ pir.29-11-374.
3. Duthie, J.F. (1905). Catalogue of the plants of Kumaon and the adjacent portions of Garhwal and Tibet, based on the collections of Strachey and Winterbottom during the years 1846-1849. (London), 269.
4. Gaur, R.D. (1999). Flora of the District Garhwal: North West Himalaya (with Ethnobotanical Notes). Transmedia, Srinagar (Garhwal): 810.
5. Joshi, S.R. and Parikh, R.M. (2007). India - diabetes capital of the world: now heading towards hypertension. J. Assoc. Physicians India, 55: 323-4.
6. Kumar, A.; Goel, M.K.; Jain, R.B.; Khanna, P. and Chaudhary, V. (2013). India towards diabetes control: Key issues. Australias Med. J., 6(10): 524-31.
7. Modak, M.; Dixit, P. J.; Londhe, J.; Ghaskadbi, S. and Devasagayam, T.P.A. (2007). Indian herbs and herbal drugs used for the treatment of diabetes. J. of Clinical Biochem. and Nutrition, 40(3): 163-173.
8. Naithani, B.D. (1984). Flora of Chamoli-Vol. 1, Botanical Survey of India, Howarah, 379.
9. Patil, R. and Ahirwar, B. (2011). Current status of Indian medicinal plants with antidiabetic potential: a review. Asian Pacific Journal of Tropical Biomedicine, 1(2): s291-s298.
10. Polunin, O. and Stainton, A. (1984). Flowers of the Himalaya. Oxford University Press, Delhi, 580.
11. Poretsky, L. (2009). Principles of diabetes mellitus (2nd ed.). New York: Springer, 3. ISBN 978-0-387-09840-1.
12. Tiwari, B.K.; Pandey, K.B.; Abidi, A.B. and Rizvi, S.I. (2013) Therapeutic potential of Indian medicinal plants in diabetic condition. Ann. Phytomed., 2(1): 37-43.
13. Tripathi, A.K.; Bhoyar, P.K.; Baheti, J.K.; Biyanim, D.M.; Khaliquem, M.; Kothmirem, M.S.; Yogesh, M.; Amgaonkar, Y.M. and Bhanarkar, A.B. (2011). Herbal antidiabetics-a review. Int. J. Res. Pharm. Sci., 2(1): 30-37.
14. Uniyal, B.P., Sharma, J.R., Chaudhari, U. and Singh, D.K. (2007). Flowering Plants of Uttarakhand (A Checklist). Bishan Singh Mahendra Pal Singh. Dehradun, 404.
15. Whiting, D.R.; Guariguata, L.; Weil. C. and Shaw, J. (2011). IDF diabetes Atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res. Clin. Pract., 94(3): 311-21. doi: 10.1016/j.diabetes.
16. Modilal MRD, Daisy P (2011) Hypoglycemic effects of Elephantopus scaber in Alloxan-induced diabetic rats. Indian Journal of Novel Drug Delivery, 3: 98-103.
17. Daisy P, Santhosh K, Rajathi M (2009) Antihyperglycemic and antihyperlipidemic effects of Clitoria ternatea Linn. in alloxan induced diabetic rats. Afr J Microb Res., 3: 287-291.
18. Badran M, Laher I (2012) Type II Diabetes Mellitus in Arabic-Speaking Countries. Int J Endocrinol, 2012: 902873. IDF Diabetes Atlas (2013) International Diabetes Federation2013 (6thedn).
19. Barik R, Jain S, Qwatra D, Joshi A, Tripathi GS, et al. (2008) Antidiabetic activity of aqueous root extract of Ichnocarpus frutescens in streptozotocinnicotinamide induced type-II diabetes in rats. Indian J Pharmacol, 40: 19-22.
20. Chan JC, Malik V, Jia W, Kadowaki T, Yajnik CS, et al. (2009) Diabetes in Asia: epidemiology, risk factors, and pathophysiology. JAMA, 301: 2129-2140.