

Research Article



International Journal of Indigenous Herbs and Drugs

Content Available at www.saap.org.in

ISSN: 2456-7345



Preparation and Evaluation of Polyherbal Anti Diabetic Tablets

P.A.M. Sucharitha^{*1}, A. Sadhana Sudha², B. Pavithra², P. B. Hanavya², M.Vamsi², S.Kalpana², S.Nelson Kumar²¹Associate Professor, Department of Pharmacognosy, P R R M College of Pharmacy, Kadapa, Andhra Pradesh, India²Department of Pharmacognosy, P R R M College of Pharmacy, Kadapa, Andhra Pradesh, India

Article Info

Article History

Received on: 24-04-2025

Revised on: 11-05-2025

Accepted on: 04-06-2025



Abstract

Diabetes mellitus (DM) is a chronic metabolic disorder associated with long-term complications and poses a serious global health challenge. It includes two main types: Insulin-Dependent Diabetes Mellitus (IDDM) and Non-Insulin Dependent Diabetes Mellitus (NIDDM). Herbal medicines have gained significant attention in the management of diabetes due to their lower side effects and better patient acceptance. Herbal antidiabetic drugs help manage diabetes by lowering blood glucose levels and enhancing insulin secretion from the pancreas. With the growing global demand for herbal formulations, numerous plants with reported antidiabetic, antimicrobial, and anti-inflammatory properties are being studied for their therapeutic potential. The main objective of this study is to formulate and evaluate polyherbal antidiabetic tablets using locally collected plant materials-mango leaves (*Mangifera indica*), garlic (*Allium sativum*), cinnamon (*Cinnamomum zeylanicum*), and flaxseeds (*Linum usitatissimum*). The plant materials were cleaned, dried, and powdered. The key active ingredient from mango leaves was extracted using ethanol and stored for further use. The polyherbal tablets were then prepared and evaluated based on parameters such as weight variation, hardness, friability, thickness, and disintegration time.

Keywords: Diabetes mellitus, *Mangifera indica*, *Allium sativum*, *Linum usitatissimum*, *Cinnamomum zeylanicum*, Antidiabetic, Polyherbal formulation, Tablet evaluation.

This article is licensed under a Creative Commons Attribution-Non-commercial 4.0 International License. Copyright © 2025 Author(s) retains the copyright of this article.



*Corresponding Author

P.A.M. Sucharitha

DOI: <https://doi.org/10.46956/ijhd.v10i2.695>

Production and Hosted By

www.saapjournals.org

Introduction

Diabetes mellitus, one of the most common endocrine metabolic disorders has caused significant morbidity and mortality due to micro vascular retinopathy & nephropathy and macro vascular heart attack, stroke and peripheral vascular disease complications According to World Health Organization the diabetic population is likely to increase up to 300 million or more by the year 2025.

Diabetes mellitus is a group of chronic metabolic disorder caused due to high blood sugar levels over a prolonged period. Diabetes caused by either the pancreas not producing enough insulin or the cells of the body not responding properly to the insulin produced [1].

Plants have played a unique integral role in providing food, medicine, clothing, shelter, etc. Natural products have been extensively explored to discover new drugs. In fact, plants

have been used for medicinal purpose since 5000 y.

Herbal medicines are used in treating diabetes mellitus has become important throughout the world. The world Health Organization has also suggested and authorized this drilling, particularly in countries where access to treating diabetes is not enough. There is widespread interest in using natural products with antidiabetic activity, by virtue of side effects related to the usage of insulin and oral hypoglycaemic agents. The available literature shows that there are more than 400 species of plants that show hypoglycaemic activity [2].

A single plant may even contain more than one component of phytochemical and thus the combination of several such plant or herbs work symbiotically with each other giving out effective pharmacological action [3].

Types of Diabetes Mellitus

1. Type 1 diabetes
2. Type 2 diabetes
3. Gestational diabetes

Type 1 Diabetes

Type 1 diabetes is also called insulin-dependent diabetes. It used to be called juvenile-onset diabetes because it was

thought to start more often in childhood. Type 1 diabetes is an organ- specific autoimmune condition. It happens when your body attacks your pancreas with antibodies. The organ is damaged and doesn't make insulin. It affects 2 million people, including about 304,000 children and teens in the U.S.

Your genes might cause this type of diabetes. It could also happen because of problems with cells in your pancreas that make insulin. Type 1 diabetes cannot be prevented.

Type 1 diabetes is where your blood glucose sugar level is too high because your body can't make a hormone called insulin.

Type 2 Diabetes

Type 2 diabetes used to be called non-insulin-dependent or adult-onset diabetes. But it's become more common in children and teens over the past 20 years, largely because more young people are overweight or obese. About 90% of people with diabetes have type 2.

When you have type 2 diabetes, your pancreas usually creates some insulin. Insulin resistance, when your cells don't respond to insulin, usually happens in fat, liver, and muscle cells.

Type 2 diabetes is often milder than type 1. But it can still cause major health complications, especially in the tiny blood vessels in your kidneys, nerves, and eyes. Type 2 also raises your risk of heart disease and stroke.[4]

Signs and Symptoms

- Increased Hunger
- Fatigue and Tiredness
- Peeing more often
- Frequent thirst
- Dry mouth
- Itchy and dry skin
- Blurred vision
- Unintentional weight loss. [5]

Herbs

The word "herb" has been derived from the Latin word, "herba" and an old French word "herb". Now a day's herb refers to any part of the plant like fruit, seed, stem, bark, flower, leaf, stigma or a root, as well as a non-woody plant. Earlier, the term "herb" was only applied to non-woody plants, including those that come from trees and shrubs. These medicinal plants are also used as food, flavonoid, medicine or perfume and also in certain spiritual activities.

Importance of some herbs with their medicinal values

- Herbs such as black pepper, cinnamon, myrrh, aloe, sandalwood, ginseng, red clover, burdock, bayberry, and safflower are used to heal wounds, sores and boils.
- Many herbs are used as blood purifiers to alter or change a long-standing condition by eliminating the metabolic toxins. These are also known as 'blood cleansers'. Certain herbs improve the immunity of the person, thereby reducing conditions such as fever.
- Some herbs are also having antibiotic properties.

Turmeric is useful in inhibiting the growth of germs, harmful microbes and bacteria. Turmeric is widely used as a home remedy to heal cut and wounds.

Marketed Poly Herbal Drugs

- Dihar - Syzygium cumini, Momordica charantia, Emblica officinalis, Gymnema sylvestre, Enicostemma, Azadirachta indica, Tinospora cordifolia and Curcuma longa.
- Diabet - Curcuma longa, Coscinium fenestratum, Strychnos potatorum, Phyllanthus reticulatus. Tamarindus indica, Tribulus terrestris.
- Diasol - Eugenia jambolana, Foeniculum graecum, Terminalia chebula, Quercus, infectoria, Cuminum cyminum, Taraxacum officinale, Emblica officinalis, Gymnema sylvestre, Phyllanthus nerui and Enicostemma littorale.
- Diakur - Cassia javanica, Cassia auriculata, Salacia reticulata, Gymnema sylvestre, Mucuna pruriens, Syzygium jambolana, Terminalia arjuna.
- Karmin Plus - Momordica charantia, Azadirachta indica, Picrorrhiza kurroa, Ocimum sanctum and Zinziber officinale [6].

Plant Profile

Mangifera indica

- Mangifera indica ascribed to the family Anacardiaceae has been adjudged as the vital traditionally significant and one of the most economically important tropical fruit crops globally. The most active chemical constituents of mango leaves is Mangiferin, gallic acid, catechins, quercetin, flavonoids, carotenoids, ellagic acid, propyl & methyl gallate, ascorbic acid and tocopherols. It is used as an anti-oxidant, anti-inflammatory, respiratory relief, promote hair growth, lower cholesterol levels [7].

Allium sativum

- Allium sativum is a species of flowering plant belonging to the genus Allium. This edible plant is widely used as a seasoning and flavouring. Garlic contains carbohydrates, proteins, fats, mucilage and essential oils volatile oil. The volatile oil is the main active constituent. It contains allicin, allyl propyl disulphide and alliin. It is used as a anti- diabetic, anti-oxidant, immune system booster, anti-inflammatory, flavouring agent, used to treat common cold, cough, malaria etc. [8]

Linum Usitatissimum

- Linum usitatissimum is belonging to the family Linaceae. The flax plant is not a new crop and is native to West Asia and the Mediterranean coastal lands, Asia Minor, Egypt, Algeria, Tunis, Spain, Italy and Greece. Linseed contains fixed oil, mucilage, protein, small amount of enzyme lipase and linamarin which is a cyanogenetic glycoside. The carbohydrates present here are sucrose, raffinose,

- cellulose and mucilage. Unripe seed contain starch which converted to mucilage on ripening the seeds. It is used as a demulcent, emollient, expectorant, diuretic, laxative properties, artificial rubber, enamelling leather [9].

Cinnamomum Zylanicum

- Cinnamomum zylanicum is belonging to the family Lauraceae. Cinnamon is native to Sri Lanka, the neighbouring Malabar Coast of India, and Myanmar and is also cultivated in South America and the West Indies. Cinnamon oil contains cinnamaldehyde, eugenol, benzaldehyde, cuminaldehyde and other terpenes like pinene, cymene, caryophyllene, calcium oxalate. It is used as a carminative, stomachic, mild astringent, flavouring agent, stimulant, aromatic, antiseptic, spice and condiment [10].

Materials and Methods

Selection of herbs

Appropriate selection of plant is very essential because an inappropriate selection can lead to wastage of time and resources. Identify and select herbs known for their anti-diabetic properties, common herbs include bitter melon, fenugreek, cinnamon, and ginseng each with unique bio active compounds that aid in managing blood sugar levels.

Standardization

Establish standardized criteria for the herbal ingredients to ensure consistent potency and efficacy across batches. This involves determining the optimal concentration of active compounds in each herb.

Collection of herbs

The material leaves of Mangifera indica, allium sativum, Cinnamomum Zylanicum, linum usitatissimum. Used in the present study were collected from the local area, dried and powdered.

Preparation of Extract

The powdered Mangifera indica leaves are separately extracted by Soxhlet extractor. Firstly, we were taking 30gm of leaves of plant such as Mangifera indica, dried and powdered. Load mango leaves powder into a Soxhlet thimble, add solvent e.g., ethanol to a round-bottom flask. Assemble the Soxhlet apparatus. Heat and reflux the solvent. Solvent extracts compounds mangiferin from the leaves. Collect the extract after 6-8 hours. A 13.33% yield 4.5 g/30 g of extract was obtained from mango leaves.

Excipients Used to Formulate Tablets

In this formulation lactose, starch, talc, acacia, magnesium stearate, methyl paraben are used.

Preparation of tablets

Weigh required quantity of ingredients. Firstly, starch was weighed and made into an emulsion along with preservative and cooked well on a water bath until translucent semisolid mass was formed. The weighed quantities of excipients were mixed thoroughly with extract, and cooked starch paste were added slowly till the powder become a damp mass. The damp mass was transfer into a butter paper and patted 1000 times it will become a

soft paste. Take non sticky material while rolled to the fingers, make pills of required size by hands. Next preparation of 20 pills were dry in shade

Formulation of Poly Herbal Anti Diabetic Tablets

In the present study of dried ethanolic extract of Mangifera indica leaves, and powder of Allium sativum, Cinnamomum zeylanicum, Linum Usitatisimum was formulated into tablet dosage form by wet granulation method. Formulation has the following composition as depicted in the following table

Table 01: Composition on formulation ingredients for poly herbal anti-diabetic tablets

Sl.NO	INGREDIENTS	QUANTITY	USES
1.	Mango leaves	4 gm	Glucose regulator
2.	Garlic	3 gm	Anti-hyperglycaemic
3.	Cinnamon	1 gm	Anti-diabetic
4.	Flaxseeds	1 gm	Anti-glycaemic
5.	Starch	3 gm	Disintegrant
6.	Lactose	4 gm	Binder
7.	Talc	1 gm	Glidant
8.	Methyl paraben	0.4 gm	Preservative
9.	Magnesium stearate	1 gm	Lubricant
10.	Acacia	1.6 gm	Thickening agent

Results and Discussion

The present study aimed to prepare and evaluate poly herbal antidiabetic tablets using a combination of herbs.

Physical characteristics

The prepared polyherbal anti diabetic tablets appeared as "dark green", circular with a smooth surface

Table 02: Physical Parameter Studies of Tablet

SI NO	EVALUATION PARAMETER	RESULTS
1.	Colour	Dark green
2.	Weight variation test	Two tablets were varied in weight
3.	Hardness	3.50kg/cm ³
4.	Friability	Weight loss 0.55% of its initial weight
5.	Thickness	3 ± 0.02
6.	Disintegration	6 ± 0.32
7.	Dissolution	18 mins (Acidic medium)

Tablets demonstrated sufficient hardness to withstand breakage during packaging, shipment, and regular handling. The weight of 20 tablets was determined and the poly-herbal quick dissolving anti-diabetic tablet passed the weight variation test since the average percentage weight variation was less than 5%, which was within the USP.

Conclusion

Diabetes is a clinical syndrome characterized by the insulin deficiency, insulin resistance in human beings. Hyperglycaemia leads to glycation of body proteins, fat and carbohydrate that in turn causes secondary complication the affecting eyes, neurons, kidney and liver. However, Multifactorial diseases to require multi drug formulation consisting of medications from different pharmacological actions to prevent their complication use of two-three herbs mixture poly herbalism may overcome this problem and help to prevent complication. Herbal medicine is the oldest form of health care known to man. Various traditional herbs have been used to diagnose, prevent and treat various diseases. This study successfully formulated and evaluated polyherbal tablets containing *Mangifera indica*, *allium sativum*, cinnamon *Zylanicum*, *linum Usitatissimum* for their potential anti-diabetic activity. The prepared tablets exhibited acceptable physicochemical properties, including characteristics like hardness, friability, disintegration time, and dissolution time and whether they met pharmacopeial standards], suggesting suitability for oral administration. Physical Parameter revealed that all the values were within acceptable limit. The polyherbal formulation tablet standardize as per Pharmacopoeia standards. Based on results it is concluded that the formulation and evaluations are good.

Funding

Nil

Acknowledgement

Authors are thankful to the principal and Management of P.R.R. Memorial College of Pharmacy.

Conflict of Interest

Not Declared

Informed Consent and Ethical Statement

Not applicable

References

1. Parvin Shaikh, Manasi Lokare, Mrunal Bhoge, Nalina Rajmane, Nandini Avadhut and Nikhil Thavare et al. Formulation and evaluation of antidiabetic polyherbal syrup. *Journal of Pharmacognosy and Phytochemistry*, 13 January 2024; Volume 13 (Issue 2): 10-17. DOI: <https://doi.org/10.22271/phyto.2024.v13.i2a.14865>
2. Rohini Chandrakant Kolhe, Dr. Chaudhari Rajesh Y et al. Development and Evaluation of Antidiabetic Polyherbal Tablet using Medicinal Plants of Traditional use. *International Journal of Current Pharmaceutical Research*, March 2023; Volume 15 (Issue 2): 17-21. DOI:10.22159/ijcpr.2023v15i2.2095
3. Renuka Suvarna, Revathi P Shenoy, Basavaraj S Hadapad, Anupama V Nayak et al. Effectiveness of polyherbal formulations for the treatment of type 2 Diabetes mellitus - A systematic review and meta-analysis. *Journal of Ayurveda and Integrative Medicine*, 5 February 2021; Volume 12 (Issue 1): 213-222. <https://doi.org/10.1016/j.jaim.2020.11.002>
4. Rebecca Buffum Taylor et al. Types of Diabetes Mellitus. WebMD, 18 June 2024;
5. Terri D'Arrigo, Alyson Powell Key et al. Early Signs and Symptoms of Diabetes. WebMD, 05 June 2024;
6. Yogesh N Sonawane* , Megha P Yeole, Piyush V Wagh, Mayuri A Sarode, Sagar A Sarode and Parag R Patil et al. Comparative study of allopathy and ayurveda for treatment of diabetes mellitus. *GSC Biological and Pharmaceutical sciences*, 20 January 2024; Volume 26 (Issue 01): 253-267. DOI: <https://doi.org/10.30574/gscbps.2024.26.1.0023>
7. Kumar M, Saurabh V, Tomar M, Hasan M, Changan S, Sasi M, Maheshwari C, Prajapati U, Singh S, Prajapat RK, Dhumal S. Mango (*Mangifera indica* L.) leaves: Nutritional composition, phytochemical profile, and health-promoting bioactivities. *Antioxidants*. 2021 Feb 16;10(2):299.
8. Fatemeh Sanie-Jahromi, Zahra Zia, Mehrdad Afarid et al. A review on the effect of garlic on diabetes, BDNF, and VEGF as a potential treatment for diabetic retinopathy. *National Library of Medicine*, 17 February 2023; Volume 18: 18. doi: 10.1186/s13020-023-00725-9
9. Abdul Rehman, Aamir Saeed, Rabia Kanawal, Sheraz Ahmad et al. Therapeutic Effect on Sunflower Seeds and Flaxseeds on Diabetes. *Cureus*, August 2021; Volume 13 (Issue 8): DOI: 10.7759/cureus.17256
10. G.M.U.D. Wijenayaka, Vajira P Bulugahapitiya, Sudheera Jayasinghe et al. Cinnamon, a promising herbal plant for combatting diabetes and its anti-diabetes mechanisms. *Ceylon Journal of Science*, December 2022; Volume 51 (Issue 4): 335. DOI:10.4038/cjs.v51i4.8051