CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187

Available online at: http://www.iajps.com *Research Article*

FORMULATION AND EVALUATION OF POLYHERBAL ANTIDIABETIC TABLET

Sakshi.A.Waybht [1], Priyanka.R.Nagargoje [2], Dr. Kumar P.Surwase[3]

[1]Department of Pharmacy Aditya Institute of Pharmaceutical Beed-431122

[2] Department of pharmaceutical chemistry Aditya Institute of Pharmaceutical Beed-431122

[3]Department of Pharmaceutical Chemistry Aditya Institue of Pharmaceuticals,Beed-431122

Abstract:

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Despite the availability of various synthetic antidiabetic agents, their long-term use often leads to adverse effects such as hypoglycemia, weight gain, and organ toxicity. In recent years, herbal medicines have gained attention due to their safety, affordability, and holistic approach. The present study focuses on the formulation and evaluation of a polyherbal antidiabetic tablet composed of five medicinally important plant-based ingredients: Jamun seed (Syzygium cumini), Neem leaf (Azadirachta indica), Tulsi leaf (Ocimum sanctum), Karela fruit (Momordica charantia), and Honey. These herbs are traditionally known for their potent antihyperglycemic, antioxidant, and pancreatic β-cell regenerative activities.The tablets were formulated using the wet granulation method and evaluated for various physicochemical parameters such as hardness, friability, weight variation, disintegration time, and drug content uniformity. In vitro antidiabetic activity was assessed using alpha-amylase and alpha-glucosidase inhibition assays. The results indicated that the prepared tablets met all pharmacopoeial standards and showed promising antidiabetic activity, comparable to standard drugs. The study concludes that polyherbal formulations can be an effective and natural alternative for diabetes management, supporting the integration of traditional knowledge with modern pharmaceutical practices.

Corresponding author:

Sakshi.A.Waybht,

Department of Pharmacy

Aditya Institute of Pharmaceutical Beed-431122

QR code

Please cite this article in press Sakshi.A.Waybht et al., ***Formulation And Evaluation Of Polyherbal Antidiabetic Tablet.,*** *Indo Am. J. P. Sci, 2025; 12(05).*

INTRODUCTION:-

Traditional medicine is described as the knowledge ,practices and skills based on the cultural belies ,experiences handed over from generation to generation,used in the diagnosis ,prevention, improvement or treatment of physical ,mental illness to maintain health and other treatment which many not be explained in modern medicine.Traditional medicine is also kwon as folk medicine or indigenous Medicine there are different traditional method s system presents in the world which are based on the culture geographical area and environment.this includes Indian system of Medicine Arvada, Siddha, and Unani traditional Chinese medicine, traditional Korean medicine, ancient Iranian medicine ,Islamic medicine, Tibetan medicine. the philosophy and Practices of each system very but a common philosophy is holistic approaches to life giving promises to health medicine is still playing a visual role the people in a developing countries still depend on the traditional practitioners and herbal medicine for their pharmacy care in Indian 70% of the populations and Africa up to 90% meet their healthcare needs for traditional medicine.

1]. Background:-

Polyhedral formulation have been cornerstone of traditional pharmacopia's particularly in Ayurveda Siddha and Yunani System of Medicine the rotational behind coming herbs lies in the concepts of yogavahi when on a herb service as catalyst To enhance the efficiency of authors murder pharmacological investigation confirmed that such combinations can produce synergies throughout complimentary mechanisms arranging from insulin secretion to improve glucose uptake and inhibitions of carbohydrate digesting enzymes the present study aims to develop a robust tablet dosge From using direct compression technology to ensure those uniformity patient compliance and stability formulation optimization includes selection of a suitable recipient's evolution of a flow properties of granules and determination of critical purpose parameter.

2. Diabetes mellitus:

Diabetes melatonin is defined as metabolic disorder of a multiple ethology characterized by a corny hyperglycemia glycemia with the disturbance in a carbohydrates 14 and fat metabolism resulting from defects in insulin secretion action are both diabetes my letters also gives rise to microvascular complications like diabetic nephropathy nephropathy retinopathy and microvascular complications like soccernia or tree disease stroke and peripheral atrial disease.The high blood sugar produces the symptoms of polyuria[excessive urination],polydipsia[Increase thrust] and polyphagia[Increase appetite] diabetes can be diagnosed by the Sign and symptoms with elevated blood glucose level and of weight loss the most recommended method to detect diabetes my letters is based upon the level of glucose in a blood as a diabetes is the 3rd leading disease to cause death in the most development countries and it is considered to be the major health problem.

V **Types of diabetes mellitus**:

1.Type I diabetes mellitus [insulin dependent diabetes mellitus/ IDDM juvenileonset diabetes]

a.Immune mediated

b.Idiopathic

2. Type II diabetes mellitus [non-insulin-dependent mellitus/ NIDDM) a.Obese

b.Non-obese

3.Diabetic prone states

a. Gestational diabetes mellitus (GDM)

b. Impaired glucose tolerance (IGT)

c. Impaired fasting glycemia (IFG)

4. Secondary to other known causes

a. Endocrinopathies (Cushing's disease, thyrotoxicosis, acromegaly)

b. Drug induced (steroids, beta blockers, etc.,)

c. Pancreatic diseases (chronic pancreatitis, fibrocalculous of pancreatitis, Hemochromatosis, cystic fibrosis).

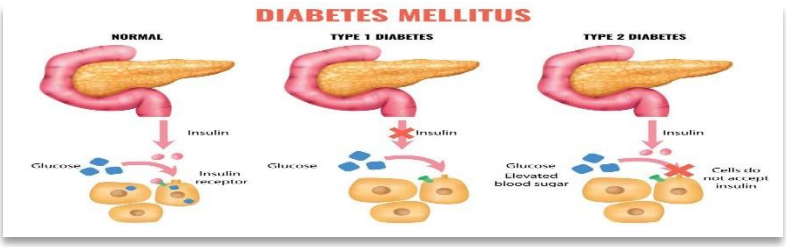


Fig.No.1.Types of Diabetes mellitus

MATERIALS AND METHODS:-

1. Materials

The following raw materials were used in the formulation of the polyherbal antidiabetic tablet:

Plant Ingredients:

- Jamun Seed Powder (Syzygium cumini) - antidiabetic, antioxidant
- Neem Leaf Powder (Azadirachta indica) - hypoglycemic, anti-inflammatory
- Tulsi Leaf Powder (Ocimum sanctum) - antidiabetic, adaptogenic
- Karela Fruit Powder (Momordica charantia) - insulin-like activity
- Honey - natural binder, antioxidant

Excipients:

- Starch - disintegrant
- Talc - glidant
- Magnesium Stearate - lubricant
- Microcrystalline Cellulose (MCC) - diluent and binder
- Distilled Water - used as granulating agent

All materials were of pharmaceutical grade and were procured from certified herbal and chemical suppliers.

Table No.1. Material and method of polyherbal Antidiabetic tablet

Sr.No.	*Ingredient*	*Scientific Name*	*Function*	*Quantity*
1	Jamun seed Extract	Syzygium cumini	Enhancing carbohydrates metabolism	50gm
2	Neem leaf Extract	Azadirachta indica	Enhances insulin activity	50gm
3	Tulsi Leaf Extract	cimum sanctum	Hypoglycemic,Antiinflammatory	50gm
4	Honey	-	Natural sweetner,Antimicrobial Natural binder.	10ml
5	Satarch[binder]	-	-	10gm
6	Talc[glidant]			10mg
7	Magnesium stearate	-	-	10mg
8	Karela fruit Extract	Momordica charantia	Enhancing insulin secretion and glucose utilization	50gm

2.METHODOLOGY:-

2.1. Preparation of Herbal Powders

- Fresh plant parts (Jamun seeds, Neem leaves, Tulsi leaves, and Karela fruit) were collected, shade dried,and ground to a fine powder using a mechanical grinder.
- Powders were sieved through sieve no. 60 to ensure uniform particle size.
- The powders were stored in airtight containers in a cool and dry place until use.

2.2. Formulation of Polyherbal Tablets (Wet Granulation Method)

1. Weighing: All herbal powders and excipients were weighed accurately according to the formulation design.
2. Mixing: The powders were mixed uniformly in a mortar or planetary mixer.
3. Granulation: A wet mass was prepared by adding honey and a small quantity of distilled water.
4. Sieving: The wet mass was passed through sieve no. 10 to form granules.
5. Drying: The granules were dried in a hot air oven at 40-50°C until constant weight was achieved.
6. Lubrication: Dried granules were mixed with talc and magnesium stearate.
7. Compression: The final granules were compressed into tablets using a single punch tablet machine orrotary tablet press.

2.3. Evaluation of Polyherbal Tablets

a. Pre-Compression Parameters:

1.Weight Variation Test

Average Weight: 250 mg

- Angle of Repose
- Bulk Density
- Tapped Density
- Carr's Index- Hausner's Ratio

b. Post-Compression Parameters:

- Weight Variation
- Hardness
- Friability
- Disintegration Time
- Thickness and Diameter
- Drug Content Uniformity

2.4. In-Vitro Antidiabetic Activity

a. Alpha-Amylase Inhibition Assay:

-The ability of the formulation to inhibit alpha-amylase enzyme was tested using standard procedures.

-The % inhibition was calculated and compared with standard antidiabetic drugs.

b.Alpha-Glucosidase Inhibition Assay (if applicable):

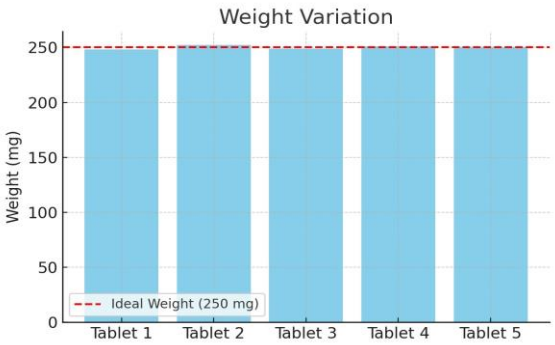
RESULT AND DISSCUSION:-

The polyherbal Anti-diabetic tablets are stable under various storage conditions, with no significant degradation in the active ingredients. Overall, the results indicate that the polyherbal antidiabetic tablet is effective, stable, and meets the required quality standards, making it a promising natural remedy for diabetes management. Preliminary phytochemical analysis of the formulated polyherbal tablet revealed the presence of bioactive constituents such as alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compounds. These phytochemicals are known to contribute significantly to antidiabetic activity through mechanisms such as improving insulin sensitivity, enhancing glucose uptake, and inhibiting carbohydrate-digesting enzymes.

% Deviation: ±0.8%

Limit (as per IP/BP): ±5% for tablets weighing 250 mg or more.

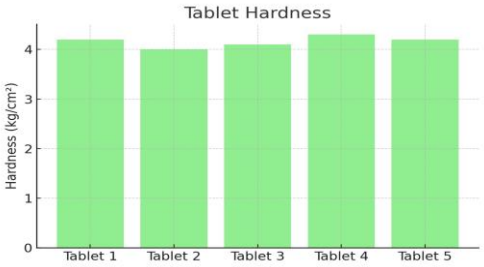
Discussion: All tablets were within the acceptable limit of weight variation. This indicates uniform die filling and proper flow of granules during compression.



2.Hardness Test

Average Hardness: 4.16 kg/cm²

Discussion: Hardness was found to be satisfactory, ensuring the mechanical integrity of tablets during handling, packaging, and transportation.



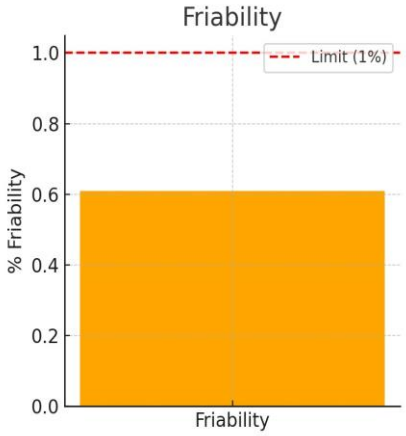
3.Friability Test

Initial Weight: 6.500 g

Final Weight: 6.460 g

% Friability = 0.61%

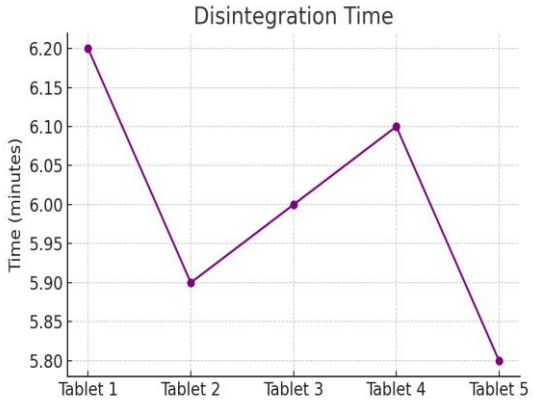
Discussion: The friability value was below the IP limit of 1%, confirming that the tablets have adequate mechanical strength.



4.Disintegration Time

Average Disintegration Time: 6.0 minutes

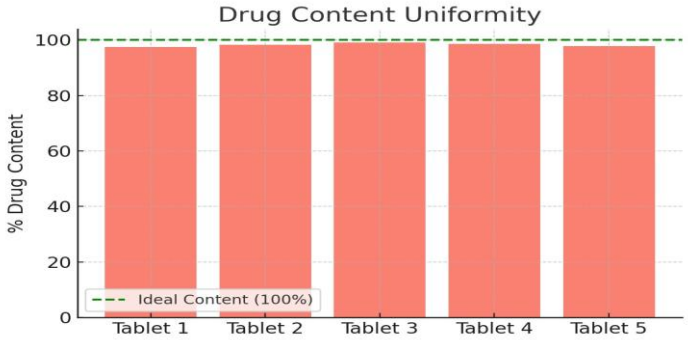
Discussion: All tablets disintegrated within 15 minutes, which complies with standard limits for uncoated tablets. The presence of starch as a disintegrant played a major role in this.



5.Drug Content Uniformity

Average Drug Content: 98.22%

Discussion: All tablets contained more than 97% of the labeled amount of active ingredients, indicating excellent blend uniformity and consistent formulation.



6.In-Vitro Dissolution Study

Medium: Phosphate buffer pH 6.8

% Drug Released:

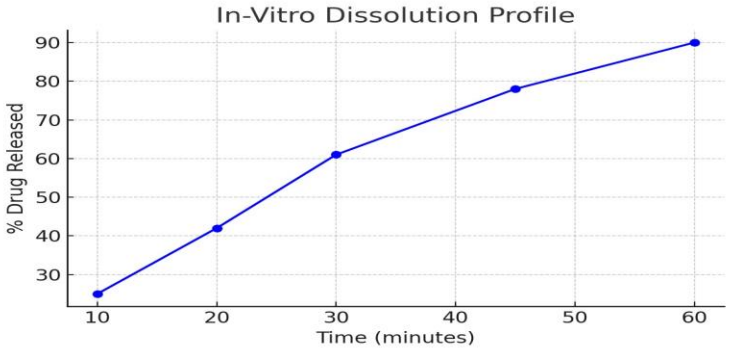
10 min - 25%

20 min - 42%

30 min - 61%

45 min - 78%

60 min - 90%



Discussion:

The formulation and evaluation of a polyherbal antidiabetic tablet aimed to create a stable, effective, and patient-compliant dosage form combining the therapeutic benefits of multiple medicinal plants traditionally used for diabetes management. The selection of herbal ingredients was based on ethnopharmacological evidence and existing scientific literature supporting their antidiabetic potential. Each selected plant extract was chosen for

its complementary mechanism of action— such as insulin sensitization, enzyme inhibition (e.g., α-amylase, α-glucosidase), βcell protection, or antioxidant effects. A direct compression method was employed due to its simplicity and cost-effectiveness, especially suitable for heatsensitive herbal components. The formulated tablets met all standard pharmacopeial requirements. Hardness and friability tests confirmed adequate mechanical strength to withstand handling. Disintegration time was within acceptable limits, ensuring prompt release of active constituents in the gastrointestinal tract. Uniformity of weight and drug content indicated proper blending and distribution of active herbal ingredients.

Accelerated stability testing over a period of 3 months revealed no significant changes in tablet appearance, hardness, disintegration time, or drug content. This confirms the stability of the formulation under standard storage conditions. In vitro enzyme inhibition assays showed that the polyherbal formulation had considerable inhibitory effects on α-amylase and α-glucosidase.

This supports its use in managing postprandial hyperglycemia by slowing carbohydrate digestion.

Summary:

Polyherbal antidiabetic tablets are formulated using extracts from medicinal plants known for their blood sugar-lowering effects, such as Moringa oleifera, Withania somnifera, Ocimum sanctum, Honey. These tablets are prepared using standard pharmaceutical techniques like wet granulation or direct compression, along with suitable excipients. The formulation is evaluated through pre- and post-compression tests including hardness, disintegration, weight variation, and dissolution. Phytochemical screening confirms the presence of bioactive compounds, while in vitro and in vivo studies demonstrate significant antidiabetic activity. The tablets are found to be effective, stable, and a promising natural alternative for diabetes management.

CONCLUSION:

The successful formulation of a polyherbal antidiabetic tablet with good mechanical properties and promising in vitro activity suggests its potential as an effective alternative therapy for diabetes mellitus. The evaluation parameters confirmed the tablet's stability, uniformity, and efficacy, providing a foundation for future in vivo and clinical investigations.

REFERENCES:

1].Jone BE. Pharmaceutical capsules 2nd ed. Edited by Podczeck F. Pharmaceutical press. 2004; 91, 242, 449.

2].Van Hostetler. Hard Capsules. In: Leon Lachman, Herbert AL, Joseph LK. The Theory and Practice of Industrial Pharmacy. 3rd ed. Varghese Publishing House, Bombay. 1991; 374.

3].Sahoo HB, Asati AK, Toppo FA, Kori ML; Evaluation of polyherbal formulation for diuretic activity in albino rats. Asian Pacific J Tropical Disease, 2012; 2(Suppl1):S442-S445.

4].Aulton ME; Pharmaceutics: The science of Dosage form. Churchill Livingstone, 1996; 304: 10.

5].Lachman L, Lieberman HA, Kanig JL. The theory and practice of industrial pharmacy, 3rd edition. Varghese Publishing House, New Delhi, 1987; 293-639.

6].Jone BE. Pharmaceutical capsules. 2nd ed. Edited by podczeck F and John BE, Pharmaceutical press 2004; 91, 242,449.

7].Harborne JB. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis.
2nd ed. London, Chapman and hall. 1973; 434.

8].Kokate CK, Purohit AP, Gokahle SB. Pharmacognosy. 24thed.Vallabh Prakashan, Pune. 2003; pp.108-109.

9].Doshi G, UneH. Quantification of Quercetin and Rutin from Benincasahispida Seeds and Carissa Congesta Roots by High- performance Thin Layer Chromatography and Highperformance Liquid Chromatography. Pharmacognosy Research. 2016; v.8(1).

10].Harborne JB. London Chapman and Hall; 1988. The Flavanoids. Advances in Research Since 1980.

11].Bharti J, Rashmi R. Quantitative analysis of quercetin Pueraria tuberosa by using high performance liquid chromatography. Journal of Chemical, biological and physical sciences, 2014; 2(4):1688-92.

12].Chandrappa CP, Govindappa M, Anil Kumar NV, Channabasava R Chandrasekar N, Umashankar T, Mahabaleshwara K. Identification and separation of Quercetin from Ethanol Extract of Carmona retusa by Thin Layer Chromatography and High Performance Liquid Chromatography with Diode Array Detection. World Journal of Pharmaceutical science.2014; Vol 3, issue 6.

13].Deore S, Nikole K, Baviskar B, Khadabadi S. Isolation and Quantitative Estimation of Quercetin in Lagenariasiceraria Fruit. Chromatography Separation Techniques 2013; 4-6.

14].Panchal H, Amin A, Shah M. Development of Validated High-performance Thin-layer Chromatography Method for Simultaneous

Determination of Quercetin and Kaempferol in Thespesiapopulnea. Pharmacognosy Research. 2017; 9(3): 277– 281.
15].Dsouza N. Lakshmidevi. Models to study in vitro antidiabetic activity of plants a review International Journal of Pharma and Bio Sciences 2015; 6(3):732741. 5
16]Das M, Devi G. In vitro Cytotoxicity and Glucose Uptake Activity of Fruits of Terminalia bellirica in Vero, L-6 and 3T3 cell lines. Journal of Applied Pharmaceutical Science, 2015; 5(12):092-095.
17].Banerjee A, Maji M, Mukherjee S, Chaudhuri K, Sea T. In Vitro Antidiabetic and
Antioxidant Activities of Methanol al of Applied Biology Biotechnology 2017;5(03):061-067.
18].MinLin G, Chen Pei Y, Chang L. Antihyperglycemic and antioxidant activities of twig extract from Cinnamomumo smophloeum. Journal of Traditional and Complementary Medicine 2016; 6(3):281-288.
19].GMP in Pharmaceutical Industry - Global cGMP and Regulatory Expectations. Trupti Patil Dongare.
20].WHO Fact sheet No.138 – Diabetes Mellitus, Dfinition, types.
21].Jone BE. Pharmaceutical capsules 2nd ed. Edited by Podczeck F. Pharmaceutical press.
2004; 91, 242, 449.
22].Van Hostetler. Hard Capsules. In: Leon Lachman, Herbert AL, Joseph LK. The Theory and Practice of Industrial Pharmacy. 3rd ed. Varghese Publishing House, Bombay. 1991; 374. 23].Sahoo HB, Asati AK, Toppo FA, Kori ML; Evaluation of polyherbal formulation for diuretic activity in albino rats. Asian Pacific J Tropical Disease, 2012; 2(Suppl1):S442-S445. 24] Aulton ME; Pharmaceutics: The science of Dosage form. Churchill Livingstone, 1996; 304: 10.
25]Lachman L, Lieberman HA, Kanig JL. The theory and practice of industrial pharmacy, 3rd edition. Varghese Publishing House, New Delhi, 1987; 293639.
26].Jone BE. Pharmaceutical capsules. 2nd ed. Edited by podczeck F and John BE, Pharmaceutical press 2004; 91, 242,449.
27].Harborne JB. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. 2nd ed. London, Chapman and hall. 1973; 434.
28].Kokate CK, Purohit AP, Gokahle SB. Pharmacognosy. 24thed.Vallabh Prakashan, Pune. 2003; pp.108-109.
29].Doshi G, UneH. Quantification of Quercetin and Rutin from Benincasahispida Seeds and Carissa Congesta Roots by High- performance Thin Layer Chromatography and Highperformance Liquid Chromatography. Pharmacognosy Research. 2016; v.8(1). 30].Harborne JB. London Chapman and Hall; 1988. The Flavanoids. Advances in Research Since 1980.
31].Bharti J, Rashmi R. Quantitative analysis of quercetin Pueraria tuberosa by using high performance liquid chromatography. Journal of Chemical, biological and physical sciences, 2014; 2(4):1688-92.
32].Chandrappa CP, Govindappa M, Anil Kumar NV, Channabasava R Chandrasekar N, Umashankar T, Mahabaleshwara K. Identification and Separation of Quercetin from Ethanol Extract of Carmona retusa by Thin Layer Chromatography and High Performance Liquid Chromatography with Diode Array Detection. World Journal of Pharmaceutical science. 2014; Vol 3, issue 6.