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## Research Article

# Formulation, Development, and Evaluation of Herbal Tablets of *Wattakaka volubilis* for Antidiabetic Activity

S. Jayaprakash\*, J. Anthony Kalaiyarasi, A. Antony David, V. Arivarasan, A. Arthi, S. Arunachalam, Dr. S. K. Senthilkumar

Department of Pharmaceutics, Arunai College of Pharmacy, Tiruvannamalai – 606603, Tamil Nadu, India

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## ABSTRACT

The present study aimed to formulate, develop, and evaluate herbal tablets of *Wattakaka volubilis* for their in vitro antidiabetic activity. The plant material was collected, authenticated, shade-dried, and subjected to preliminary phytochemical screening, which confirmed the presence of alkaloids, flavonoids, tannins, phenolics, saponins, glycosides, and triterpenoids, indicating potential therapeutic activity. Herbal tablets were prepared using the wet granulation method with different concentrations (5%, 7.5%, and 10%) of polymers such as Hydroxypropyl Methylcellulose (HPMC), Polyvinyl Pyrrolidone (PVP), and Gellan gum. Preformulation studies demonstrated good flow properties, with angle of repose ranging from 25.48° to 29.22°, Carr's index from 7.5% to 25.80%, and Hausner's ratio from 1.08 to 1.34. Postformulation evaluation revealed that all formulations complied with pharmacopoeial standards, showing acceptable weight variation, hardness, thickness, friability (<1%), and disintegration time (2–29.6 minutes). Among the formulations, F5 (PVP 7.5%) exhibited optimal performance with balanced mechanical strength and disintegration characteristics. The in vitro antidiabetic activity was evaluated using the yeast glucose uptake assay, which demonstrated a concentration-dependent increase in glucose uptake. The formulation showed 53.53% glucose uptake at 500 µg/mL, comparable to the standard drug metformin (57.65%). The IC<sub>50</sub> value was found to be 460.02 µg/mL, indicating moderate antidiabetic activity. The study concludes that *Wattakaka volubilis* can be successfully formulated into stable and effective herbal tablets with satisfactory pharmaceutical properties and promising antidiabetic potential. These findings support its potential as a natural alternative for diabetes management; however, further in vivo and clinical studies are required to establish its therapeutic efficacy and safety.

## INTRODUCTION

\*Corresponding Author: S. Jayaprakash

Address: Department of Pharmaceutics, Arunai College of Pharmacy, Tiruvannamalai – 606603, Tamil Nadu, India

Email ✉: [drjayaprakashpharma@gmail.com](mailto:drjayaprakashpharma@gmail.com)

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Herbal medicine represents one of the oldest systems of healthcare, deeply rooted in ancient civilizations and traditional knowledge. Over centuries, medicinal plants have served as a primary source of therapeutic agents, significantly contributing to the development of modern pharmacotherapy. Even in contemporary medicine, a substantial proportion of drugs are derived from plant sources; it is estimated that nearly 25% of prescription medications contain at least one plant-derived active constituent (1;2). The systematic documentation of herbal remedies has led to the establishment of well-defined pharmacopoeias, forming a scientific basis for traditional medicine.

According to the World Health Organization, approximately 80% of the global population relies on herbal medicines for primary healthcare needs, particularly in developing countries. India, being one of the richest biodiversity regions, possesses around 45,000 plant species, of which a significant number exhibit medicinal property (3). Herbal medicinal products are defined as formulations containing plant-derived active ingredients intended for therapeutic use, health promotion, or disease prevention. Their increasing acceptance as complementary and alternative medicine is attributed to advantages such as safety, affordability, cultural acceptance, and minimal side effects.

Despite these benefits, conventional herbal formulations such as decoctions, infusions, and tinctures often suffer from limitations including poor stability, short shelf life, and inconvenience in administration. To overcome these drawbacks, the development of solid oral dosage forms such as tablets has gained considerable attention. Tablets offer improved stability, accurate dosing, ease of administration, and better patient

compliance, making them an ideal choice for herbal drug delivery.

Diabetes Mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. It is a major global health concern associated with severe complications such as cardiovascular diseases, neuropathy, nephropathy, and retinopathy. The global prevalence of diabetes continues to rise, with millions of individuals affected worldwide, particularly due to sedentary lifestyles and dietary habits (4). Although synthetic antidiabetic agents are available, their long-term use is often associated with adverse effects, leading to increased interest in plant-based alternatives.

In this context, *Wattakaka volubilis* (family: Apocynaceae), also known as *Dregea volubilis*, has gained attention for its therapeutic potential. It is a perennial climbing plant widely distributed in tropical and subtropical regions. Traditionally, it has been used in the management of diabetes, as well as for treating conditions such as fever, cough, rheumatism, snake bites, skin disorders, and jaundice. Phytochemical investigations have revealed the presence of bioactive constituents such as flavonoids, alkaloids, saponins, tannins, and glycosides, which are known to exhibit antidiabetic, antioxidant, and anti-inflammatory properties (5).

Considering the therapeutic potential of *Wattakaka volubilis* and the advantages of solid dosage forms, the present study aims to formulate and evaluate herbal tablets containing this plant extract for antidiabetic activity. The development of such formulations may provide a safe, effective, and patient-friendly alternative for the management of diabetes.



## METHODOLOGY:

### 1. Collection and Authentication of Plant Material

Fresh whole plants/leaves of *Wattakaka volubilis* (Family: Apocynaceae) were collected from Tiruvannamalai, Tamil Nadu, India, during the appropriate growth season. The collected plant materials were carefully inspected to ensure they were free from disease, insect infestation, and physical damage. The material was washed thoroughly with running tap water followed by distilled water to remove adhering soil and extraneous matter, in accordance with World Health Organization guidelines for Good Agricultural and Collection Practices (6).

Botanical authentication was carried out by a qualified taxonomist. Morphological characteristics such as leaf structure, stem morphology, and inflorescence pattern were compared with standard taxonomic descriptions (13,14). A voucher specimen was prepared and preserved in the departmental herbarium for future reference.

### 2. Preparation of Plant Material

The collected plant material was shade-dried at room temperature (7–10 days) under adequate ventilation to prevent degradation of thermolabile constituents. Shade drying helps preserve bioactive compounds such as flavonoids and phenolics by minimizing photodegradation (15).

The dried material was coarsely powdered using a mechanical grinder and passed through sieve No. 40 to obtain uniform particle size. The powdered drug was stored in airtight containers in a cool and dry place until further use (6).

### 3. Preliminary Phytochemical Screening

Qualitative phytochemical screening of the powdered drug was carried out using standard procedures to detect the presence of alkaloids, flavonoids, tannins, phenolics, glycosides, saponins, and triterpenoids (13,15).

The extract was subjected to various chemical tests such as Dragendorff's and Wagner's tests for alkaloids, Shinoda and alkaline reagent tests for flavonoids, froth test for saponins, ferric chloride and lead acetate tests for tannins and phenolics, Keller–Killiani test for cardiac glycosides, and Salkowski and Liebermann–Burchard tests for triterpenoids. Observations were recorded based on color change or precipitate formation.

### 4. Formulation of Herbal Tablets

Herbal tablets of *Wattakaka volubilis* were prepared using the wet granulation method, which improves flowability, compressibility, and content uniformity of herbal powders (7,8).

A fixed quantity of herbal powder (250 mg) was used as the active ingredient. Polymers such as Hydroxypropyl Methylcellulose (HPMC), Polyvinyl Pyrrolidone (PVP), and Gellan gum were incorporated in varying concentrations (5%, 7.5%, and 10%) as binders and matrix-forming agents. Microcrystalline cellulose was used as a disintegrant and filler, lactose as diluent, talc as glidant, and magnesium stearate as lubricant.

The herbal powder and excipients (except lubricants) were mixed thoroughly. A suitable binder solution was prepared and added gradually to form a cohesive mass. The wet mass was passed through sieve No. 16 to form granules and dried at 40–50°C. The dried granules were passed through sieve No. 20 and lubricated with talc and magnesium stearate. The final blend was compressed into tablets using a single punch tablet compression machine.



**Table 1: Composition of herbal tablets formulation (500 mg)**

Ingredients	F1	F2	F3	F4	F5	F6	F7	F8	F9
HPMC	5%	7.50%	10%	-	-	-	-	-	-
PVP	-	-	-	5%	7.50%	10%	-	-	-
Gellan Gum	-	-	-	-	-	-	5%	7.50%	10%
Herbal Powder	250	250	250	250	250	250	250	250	250
Lactose	25	37.5	50	25	37.5	50	25	37.5	50
Microcrystalline Cellulose	160	147.5	135	160	147.5	135	160	147.5	135
Talc	5	5	5	5	5	5	5	5	5
Magnesium stearate	5	5	5	5	5	5	5	5	5
Lactose (q.s)	55	55	55	55	55	55	55	55	55
Total	500	500	500	500	500	500	500	500	500

## 5. Preformulation Studies

Preformulation studies were carried out to evaluate the physicochemical and micromeritic properties of the powdered drug of *Wattakaka volubilis*, which are essential for the development of a stable and effective tablet dosage form. The organoleptic characteristics such as color, odor, and appearance of the powder were assessed to ensure the quality and purity of the raw material. Particle size analysis was performed by sieve method to obtain uniform particle distribution, which plays a crucial role in flow properties and content uniformity. Bulk density and tapped density were determined to evaluate the packing ability and compressibility of the powder blend. The flow behavior was further assessed by measuring the angle of repose using the funnel method, where lower values indicate better flowability. Carr's compressibility index and Hausner ratio were calculated from bulk and tapped density values to determine the compressibility and flow characteristics of the powder. These parameters collectively provided essential information for selecting suitable excipients and optimizing the formulation process to ensure uniform die filling and consistent tablet quality (7,8,9).

## 6. Postformulation Studies

Postformulation studies were conducted to evaluate the quality, mechanical strength, and performance characteristics of the formulated herbal tablets of *Wattakaka volubilis*. The prepared tablets were initially examined for general appearance, including color, shape, odor, and surface texture to ensure uniformity and absence of defects. Weight variation test was performed by weighing individual tablets and calculating the deviation from the average weight as per pharmacopoeial standards. Tablet hardness was measured using a Monsanto hardness tester to assess mechanical strength and ability to withstand handling. Thickness of the tablets was determined using a digital Vernier calliper to ensure uniform compression. Friability test was carried out using a Roche friabilator to evaluate the resistance of tablets to abrasion, with acceptable values below 1%. Disintegration time was measured using a standard disintegration apparatus maintained at  $37 \pm 2^\circ\text{C}$  to determine the time required for tablets to break down into smaller particles, which is essential for drug release. These evaluation parameters confirmed the quality, stability, and suitability of the formulated tablets for oral administration (7,10,11).

## 7. In-Vitro Antidiabetic Activity

### 7.1 Glucose Uptake Assay Using *Saccharomyces cerevisiae*



The glucose uptake assay was performed to evaluate antidiabetic activity based on glucose utilization by yeast cells. A 10% yeast suspension was prepared and incubated with glucose solution and test sample at 37°C. After incubation, the mixture was centrifuged, and the glucose concentration in the supernatant was estimated.

$$\% \text{ Glucose Uptake} = (A_c - A_s) / A_c \times 100$$

Where:

A<sub>c</sub> = Absorbance of control

A<sub>s</sub> = Absorbance of sample

Metformin (100 µg/mL) was used as standard.

## 7.2 Glucose Estimation by DNS Method

Glucose concentration was determined using the DNS method. In this method, reducing sugars react with 3,5-dinitrosalicylic acid under alkaline conditions to form an orange-red colored complex measurable at 540 nm (21). A standard calibration curve was prepared using glucose, and sample concentration was determined accordingly.

## 8. Stability Studies

Stability studies were conducted as per ICH guidelines (22). The formulated tablets were stored at accelerated conditions (40 ± 2°C / 75 ± 5% RH) for a period of 3 months. Samples were evaluated at regular intervals for physical appearance, hardness, friability, disintegration time, and drug release to assess stability.

## RESULTS AND DISCUSSION:

The present study was undertaken to formulate and evaluate antidiabetic herbal tablets containing *Wattakaka volubilis* using the wet granulation method and to assess their in vitro antidiabetic activity using the yeast glucose uptake assay. Wet

granulation was selected due to its ability to improve powder flow, compressibility, and content uniformity, particularly for herbal powders that generally exhibit poor flow properties due to their fibrous nature (7,8).

## 1. Preliminary Phytochemical Analysis

Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, saponins, tannins, phenolics, cardiac glycosides, and triterpenoids. Alkaloids were confirmed by positive Dragendorff's and Wagner's tests, indicating nitrogen-containing compounds known for diverse pharmacological activities (13).

Flavonoids were identified by Shinoda and alkaline reagent tests, suggesting antioxidant potential that may contribute to antidiabetic activity through free radical scavenging and improved glucose metabolism (14, 15). The presence of saponins was confirmed by stable froth formation, indicating their role in enhancing membrane permeability and exhibiting hypoglycemic effects.

Tannins and phenolics, detected by ferric chloride and lead acetate tests, are known for their antioxidant properties and protective effects against oxidative stress associated with diabetes (14). Cardiac glycosides and triterpenoids were confirmed by Keller–Killiani and Salkowski tests, respectively. Triterpenoids are widely reported to possess antidiabetic and anti-inflammatory activities.

Overall, the presence of these bioactive phytoconstituents supports the therapeutic potential of the plant and justifies its pharmacological evaluation (13).

## 2. Formulation of Herbal Tablets

The tablets were successfully formulated using the wet granulation method, which converted fine herbal powder into uniform, free-flowing granules, thereby ensuring proper die filling and uniform tablet formation. A constant drug content (250 mg) was maintained, and lactose was used as a diluent to achieve a total tablet weight of 500 mg. Microcrystalline cellulose enhanced compressibility and disintegration, while talc and magnesium stearate improved flow and lubrication during compression (12).

Polymers such as HPMC, PVP, and Gellan gum were incorporated at varying concentrations (5%, 7.5%, and 10%) to study their influence on tablet properties. These polymers functioned as binders and matrix-forming agents, enhancing granule cohesion and tablet integrity. The successful preparation of all nine formulations (F1–F9) as mentioned in table 1 confirms the suitability of the selected excipients and the effectiveness of the wet granulation technique (7, 16).

### 3. Preformulation Studies

#### 3.1 Organoleptic Evaluation

The powdered drug exhibited light brown to greenish-brown color, characteristic odor, and

uniform appearance without contamination or degradation. These findings confirm the purity and quality of the crude drug and are consistent with standard pharmacognostic descriptions (13, 14).

#### 3.2 Micromeritic Properties

The micromeritic evaluation (Table 2) demonstrated that all formulations exhibited good flow properties, with angle of repose values ranging from 25.48° to 29.22°. Bulk density and tapped density values indicated satisfactory packing ability. Carr's index ranged from 7.5% to 25.80%, and Hausner's ratio ranged from 1.08 to 1.34.

Among all formulations, F5 (PVP 7.5%) showed the best flow properties, with the lowest Carr's index (7.5%) and Hausner ratio (1.08), indicating excellent compressibility and minimal inter-particle friction. These results confirm that wet granulation significantly improved flow behavior and ensured uniform die filling.

The findings are in agreement with previous studies (23) and standard pharmaceuticals criteria, which state that angle of repose <30°, Carr's index <25%, and Hausner ratio <1.35 indicate good flow properties (7,8).

**Table No. 2: Evaluation of Pre-compression (Micromeritic) Parameters of Herbal Tablet Prepared by Wet Granulation Method**

Formulation Code	Angle of Repose (°)	Bulk Density (gm/ml)	Tapped Density (gm/ml)	Carr's Index (%)	Hausner's Ratio
F1 (HPMC 5%)	28.18±0.8	0.48±0.02	0.62±0.02	22.58±1.5	1.29±0.02
F2 (HPMC7.5%)	29.22±0.7	0.55±0.02	0.68±0.02	19.11±1.2	1.23±0.02
F3 (HPMC 10%)	28.35±0.6	0.44±0.01	0.57±0.02	22.80±1.4	1.29±0.02
F4 (PVP5 %)	27.31±0.5	0.54±0.02	0.69±0.02	22.09±1.3	1.27±0.02
F5 (PVP7.5%)	27.16±0.5	0.37±0.01y	0.40±0.01	7.5±0.8	1.08±0.01
F6 (PVP10%)	26.28±0.6	0.63±0.02	0.82±0.02	22.86±1.5	1.29±0.02
F7 (Gellan Gum 5%)	25.55±0.5	0.38±0.01	0.51±0.02	25.49±1.6	1.34±0.03
F8 (Gellan Gum 7.5%)	26.30±0.6	0.43±0.01	0.56±0.02	23.21±1.4	1.30±0.02
F9 (Gellan Gum 10 %)	25.48±0.5	0.46±0.02	0.62±0.02	25.80±1.7	1.34±0.03

#### 4. Post-formulation Evaluation

The postformulation parameters (Table 3) demonstrated that all tablets complied with pharmacopeial standards. Weight variation ranged from  $497\pm 5$  mg to  $505\pm 5$  mg, confirming uniform die filling and content uniformity.

Tablet hardness ranged from  $0.6\pm 0.1$  to  $1.9\pm 0.3$  kg/cm<sup>2</sup>, with higher values observed in PVP-based formulations due to stronger binding properties. Thickness ranged from  $3.7\pm 0.1$  mm to  $4.4\pm 0.2$  mm, indicating uniform compression. Friability values were below 1%, confirming excellent mechanical strength (17,12).

Disintegration time varied from 2 to 29.6 minutes. Gellan gum formulations showed faster disintegration due to hydrophilicity and swelling, whereas higher concentrations of HPMC and PVP delayed disintegration due to stronger matrix formation (7).

Among all formulations, F5 (PVP 7.5%) was identified as the optimized formulation, exhibiting balanced properties including uniform weight, optimal hardness ( $1.8\pm 0.3$  kg/cm<sup>2</sup>), minimal friability (0.005%), and acceptable disintegration time (20.3 minutes). This indicates an optimal balance between mechanical strength and tablet performance.

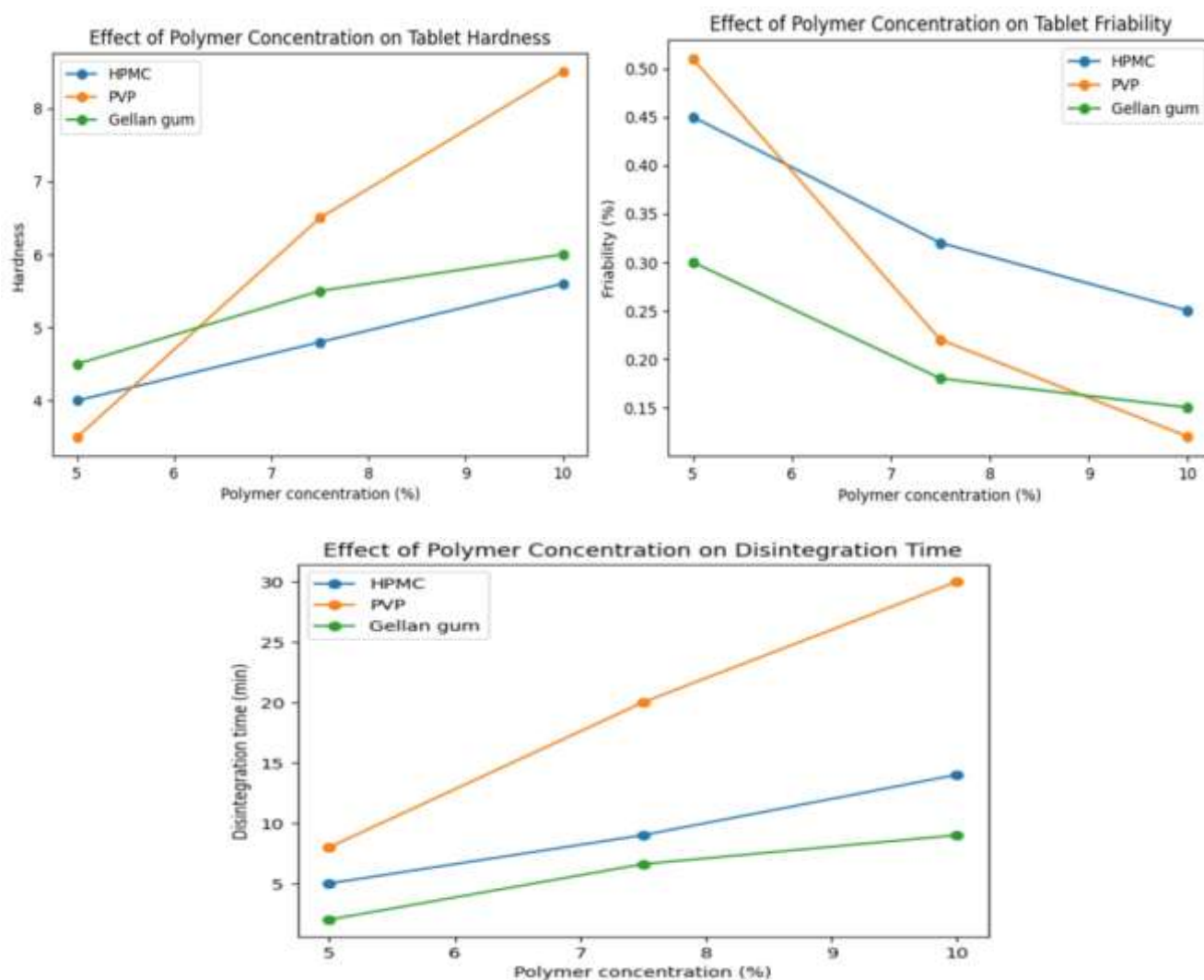
**Table No. 3: Post-formulation studies for herbal tablets**

Formulation Code	Weight Variation (mg)	Hardness (kg/cm <sup>2</sup> )	Thickness (mm)	Friability (%)	Disintegration Time (min)
F1 (HPMC5%)	503±4	0.9±0.2	4.1±0.1	0.097±0.02	3.3±0.5
F2 (HPMC7.5%)	503±4	1.1±0.2	4.2±0.1	0.08±0.02	14.6±1.2
F3 (HPMC10%)	501±4	1±0.2	4.1±0.1	0.034±0.01	11.3±1.0
F4 (PVP5%)	497±5	0.6±0.1	3.7±0.1	0.51±0.05	9.6±1.0
F5 (PVP7.5%)	504±4	1.8±0.3	4.1±0.1	0.005±0.01	20.3±1.5
F6 (PVP10%)	504±4	1.9±0.3	4.4±0.2	0.013±0.01	29.6±2.0
F7 (Gellan Gum 5%)	505±5	0.7±0.2	4.1±0.1	0.079±0.02	2±0.5
F8 (Gellan Gum 7.5%)	502±4	0.9±0.2	4.1±0.1	0.023±0.01	6.6±0.8
F9 (Gellan Gum 10%)	530±5	0.7±0.2	4.3±0.2	0.064±0.02	4.3±0.6

#### 5. Effect of Polymer Concentration

The study demonstrated that increasing polymer concentration increased tablet hardness and disintegration time while decreasing friability

(Fig-1). PVP showed superior binding efficiency, resulting in stronger tablets, whereas Gellan gum facilitated faster disintegration due to its swelling nature.



**Fig. No. 1: Effect of Polymer Concentration on Tablet Hardness, friability and disintegration time herbal tablet**

These observations confirm that polymer type and concentration play a crucial role in determining tablet characteristics, and optimization is necessary to achieve a balance between mechanical strength and drug release (12, 16).

## 6. In Vitro Antidiabetic Activity

### 6.1 DNS Calibration Curve

The DNS method showed excellent linearity with regression equation:

$$A = 0.0063C - 0.0009$$

with  $R^2 = 0.99976$ , indicating high accuracy and reliability for glucose estimation. The DNS method is widely used for quantification of reducing sugars due to its sensitivity and reproducibility (20).

### 6.2 Yeast Glucose Uptake Assay

The in vitro antidiabetic activity was evaluated using *Saccharomyces cerevisiae*. The results showed a concentration-dependent increase in glucose uptake. The test sample exhibited 53.53% glucose uptake at 500  $\mu\text{g/ml}$ , which was comparable to Metformin (57.65% at 100  $\mu\text{g/ml}$ ).



The IC<sub>50</sub> value (460.02 µg/ml) indicates moderate antidiabetic activity. The observed activity may be attributed to:

- Enhancement of glucose transporter activity

- Increased cellular glucose utilization
- Presence of flavonoids and phenolics that improve glucose metabolism (19)

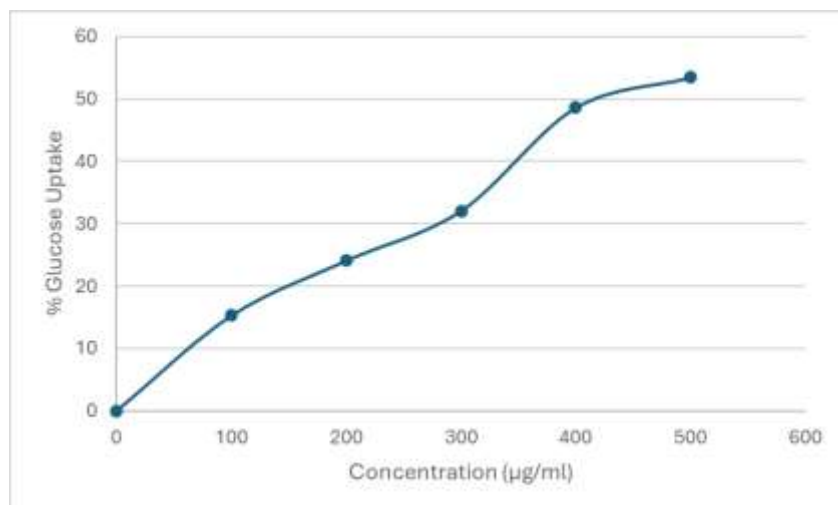


Fig No. 2: Effect of *Wattakaka volubilis* extract on Glucose Uptake by *Saccharomyces cerevisiae*

Yeast cells utilize glucose via facilitated diffusion mechanisms similar to mammalian systems, making this assay a reliable preliminary screening tool (18).

The study successfully demonstrated that herbal tablets of *Wattakaka volubilis* can be formulated using the wet granulation method with acceptable pharmaceutical properties. The optimized formulation (F5) showed superior mechanical strength and balanced disintegration characteristics (Fig-2).

The presence of bioactive phytoconstituents and the significant glucose uptake observed in the yeast model confirm the antidiabetic potential of the formulation. Although the activity was slightly lower than the standard drug, the results indicate promising therapeutic potential.

Further in vivo studies and mechanistic investigations are required to validate the efficacy and explore the clinical applicability of the formulation.

## CONCLUSION

The present study was undertaken to formulate and evaluate herbal tablets of *Wattakaka volubilis* with improved pharmaceutical properties and to investigate the in vitro antidiabetic activity. Herbal medicines have gained considerable attention due to their therapeutic efficacy, safety, and minimal side effects. However, herbal powders often exhibit poor flowability, compressibility, and uniformity, which can affect tablet quality. Therefore, the wet granulation technique was employed in the present work to improve the micromeritic and compression characteristics of the herbal powder and to develop tablets with acceptable pharmaceutical performance.

Nine formulations (F1–F9) were prepared using different concentrations (5%, 7.5%, and 10%) of polymers such as Hydroxypropyl Methylcellulose (HPMC), Polyvinyl pyrrolidone (PVP), and Gellan gum. Pre-formulation studies, including angle of repose, bulk density, tapped density, Carr's index, and Hausner's ratio, were evaluated



to assess the flow properties of the granules. The results showed that the angle of repose ranged from 25.48° to 29.22°, Carr's index ranged from 7.5% to 25.80%, and Hausner's ratio ranged from 1.08 to 1.34, indicating good to excellent flowability and compressibility. These results confirmed the suitability of the granules for tablet compression and ensured uniform die filling and weight consistency.

Post-formulation evaluation of tablets included weight variation, hardness, thickness, friability, and disintegration time. All formulations showed uniform weight variation within pharmacopoeial limits, confirming uniform drug distribution. The hardness of tablets ranged from 0.6 to 1.9 kg/cm<sup>2</sup>, indicating adequate mechanical strength. Friability values were below 1% for all formulations, demonstrating good resistance to mechanical stress and confirming acceptable tablet durability. The disintegration time ranged from 2 to 29.6 minutes, depending on the type and concentration of polymer used. Among the formulations, tablets prepared with Gellan gum showed faster disintegration, while those prepared with higher concentrations of PVP exhibited prolonged disintegration time due to stronger binding properties.

The in vitro antidiabetic activity was evaluated using the yeast glucose uptake assay, which is a reliable model for assessing glucose utilization. The test sample demonstrated concentration-dependent glucose uptake, with maximum uptake observed at higher concentrations. The IC<sub>50</sub> value was found to be 460.02 µg/ml, indicating moderate antidiabetic potential. The increased glucose uptake suggests that the herbal formulation may enhance glucose transport and utilization, thereby contributing to its antihyperglycemic activity.

Overall, the study successfully demonstrated that the wet granulation method is suitable for the

preparation of *Wattakaka volubilis* herbal tablets with acceptable pre-compression and post-compression characteristics. The use of different polymers significantly influenced tablet hardness, friability, and disintegration time. Among the tested formulations, Gellan gum-containing tablets showed promising pharmaceutical performance with faster disintegration and acceptable mechanical strength. The in vitro antidiabetic study confirmed the glucose uptake enhancing potential of the formulation, indicating its possible usefulness in diabetes management.

In conclusion, the formulated *Wattakaka volubilis* herbal tablets exhibited satisfactory pharmaceutical properties and significant in vitro antidiabetic activity. These findings support the potential use of this herbal formulation as a natural antidiabetic agent. Further studies, including in vivo evaluation and stability studies, are recommended to confirm its therapeutic efficacy and long-term stability.

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#### REFERENCES

1. Fabricant DS, Farnsworth NR. The value of plants used in traditional medicine for drug discovery. *Environ Health Perspect.* 2001;109(Suppl 1):69–75.
2. Kunle OF, Egharevba HO, Ahmadu PO. Standardization of herbal medicines—a review. *Int J Biodivers Conserv.* 2012;4(3):101–112.



3. Ekor M. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. *Front Pharmacol.* 2014;4:177.
4. Modak M, Dixit P, Londhe J, Ghaskadbi S, Devasagayam TP. Indian herbs and herbal drugs used for the treatment of diabetes. *J Clin Biochem Nutr.* 2007;40(3):163–173.
5. Balekar N, Nakpheng T, Katkam NG, Srichana T. Evaluation of the wound healing potential of *Wattakaka volubilis*. *J Ethnopharmacol.* 2012;139(3):843–850.
6. World Health Organization. WHO traditional medicine strategy 2014–2023. Geneva: WHO; 2014.
7. Aulton ME, Taylor KMG. *Aulton's pharmaceuticals: the design and manufacture of medicines.* 5th ed. London: Elsevier; 2018.
8. Lachman L, Lieberman HA, Kanig JL. *The theory and practice of industrial pharmacy.* 4th ed. New Delhi: CBS Publishers; 2013.
9. Wells JI. *Pharmaceutical preformulation: the physicochemical properties of drug substances.* Chichester: Ellis Horwood; 2002.
10. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia.* Ghaziabad: IPC; 2022.
11. United States Pharmacopeial Convention. *United States Pharmacopeia and National Formulary (USP 46–NF 41).* Rockville: USP; 2023.
12. Allen LV. *Pharmaceutical dosage forms and drug delivery systems.* 11th ed. Philadelphia: Lippincott Williams & Wilkins; 2020.
13. Kokate CK. *Practical pharmacognosy.* 4th ed. New Delhi: Vallabh Prakashan; 2010.
14. Evans WC. *Pharmacognosy.* 16th ed. London: Saunders Elsevier; 2009.
15. Harborne JB. *Phytochemical methods: a guide to modern techniques of plant analysis.* 3rd ed. London: Chapman and Hall; 1998.
16. Rowe RC, Sheskey PJ, Quinn ME. *Handbook of pharmaceutical excipients.* 6th ed. London: Pharmaceutical Press; 2009.
17. United States Pharmacopeia. *USP.* Rockville: USP; 2023.
18. Pitchaipillai R, Ponniah T. In vitro antidiabetic activity of ethanolic leaf extract of *Bruguiera cylindrica* L.—glucose uptake by yeast cells method. *Int Biol Biomed J.* 2016;2(4):171–175.
19. Pulivarthi V, Josthna P, Naidu CV. In vitro antidiabetic activity by glucose uptake of yeast cell assay and antioxidant potential of *Annona reticulata* L. leaf extracts. *Int J Pharm Sci Drug Res.* 2020;12(3):208–213.
20. Kumar TS, Muthusamy P, Radha R, Ilango K. Formulation and evaluation of in vitro antidiabetic polyherbal tablets from some traditionally used herbs. *J Phytopharmacol.* 2021;10(3):173–179.
21. Skoog DA, Holler FJ, Crouch SR. *Principles of Instrumental Analysis.* 7th ed. Boston: Cengage Learning; 2018.
22. International Council for Harmonisation (ICH). *Stability testing of new drug substances and products Q1A(R2).* Geneva: ICH; 2003.
23. Bhati A, Kumar S, Chaudhary R, et al. Design and evaluation of solid lipid microparticles of curcumin for Alzheimer's disease. *Asian J Pharm Technol.* 2022;12(3):193–197.

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