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FORMULATION AND EVALUATION OF FAST DISSOLVING HERBAL TABLETS of *CYATHEA GIGANTEA* FOR MANAGEMENT OF DIABETES

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ABSTRACT

The present study aimed at the formulation and evaluation of fast-dissolving herbal tablets of *Cyathea gigantea* for the management of diabetes. Various extracts of *Cyathea gigantea*, including chloroform, acetone, ethanolic, and aqueous extracts, were prepared and analyzed for yield and phytochemical constituents. The ethanolic and aqueous extracts exhibited the highest concentrations of phenolic compounds and flavonoids, which are known for their antioxidant and anti-diabetic properties. Tablets were formulated using these extracts, and pre- and post-compression parameters were evaluated. The tablets showed good flow properties, acceptable hardness, and low friability. The drug content uniformity was found to be satisfactory across all formulations. Notably, the disintegration time of the tablets varied, with formulation F4 showing the fastest disintegration time of 36 seconds. The release kinetics of F4 followed the Higuchi model (r^2 = 0.9975), indicating a controlled release pattern. The results suggest that *Cyathea gigantea* fast-dissolving tablets, particularly formulation F4, may offer a promising alternative for diabetes management, combining ease of use and effective drug release.

Keywords: *Cyathea gigantea*, herbal tablets, fast-dissolving, diabetes management, phytochemical analysis, phenolic compounds, flavonoids, drug release kinetics.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels due to defects in insulin secretion, action, or both. It has become a global public health concern, with increasing prevalence worldwide. According to the International Diabetes Federation (IDF), the number of people with diabetes is expected to rise to 700 million by 2045 (Saad *et al.*, 2020). The long-term complications of diabetes include cardiovascular diseases, nephropathy, retinopathy, and neuropathy, which significantly affect the quality of life and increase mortality rates (Patterson *et al.*, 2019). Currently, the management of diabetes includes lifestyle modifications and pharmacotherapy, with insulin and oral hypoglycemic agents being the mainstay of treatment. However, conventional drug therapy often presents challenges such as side effects, high costs, and the development of drug resistance, leading to the exploration of alternative therapeutic options.

In recent years, there has been a growing interest in the use of herbal medicine for the management of diabetes due to their natural origin, minimal side effects, and affordability. Many plants have demonstrated anti-diabetic potential through mechanisms such as improving insulin sensitivity, inhibiting α-glucosidase, enhancing insulin secretion, or decreasing glucose absorption (Rasool *et al.*, 2020). Among these, *Cyathea gigantea*, a species of fern native to tropical regions, has gained attention due to its reported medicinal properties. Traditionally, *Cyathea gigantea* has been used in folk medicine for the treatment of various ailments, including diabetes. Studies have indicated that the plant possesses anti-diabetic, anti-inflammatory, and antioxidant properties, which could be beneficial in managing blood glucose levels (Hassan *et al.*, 2018).

The need for an effective and convenient dosage form for herbal medicines has led to the development of fast-dissolving herbal tablets. These tablets dissolve rapidly in the oral cavity without the need for water, providing faster onset of action and greater patient compliance, particularly in individuals with difficulty swallowing pills. Fast-dissolving tablets (FDTs) are ideal for pediatric, geriatric, and bedridden patients, offering an alternative to conventional oral dosage forms (Patil *et al.*, 2021). The formulation of *Cyathea gigantea* extract into a fast-dissolving tablet form holds the potential to provide a quick and effective solution for diabetes management, enabling easier drug delivery and enhancing the bioavailability of active compounds.

This study aims to formulate and evaluate fast-dissolving herbal tablets of *Cyathea gigantea* for the management of diabetes. The objectives include optimizing the formulation for rapid dissolution, evaluating its physicochemical properties, and assessing its anti-diabetic efficacy. The study also investigates the stability of the developed tablets to ensure their shelf-life and therapeutic potential.

MATERIALS AND METHODS

Collection of plant material

The leaves of the selected plant were collected from in and around the local area of Pachmarhi village in moist open area at altitude of above 600 m (M. P.).

Preparation of crude drug for extraction

The selected plant leaves were used for the preparation of the extract. The plants leaves were collected and dried under shade and then coarsely powdered with the help of mechanical grinder. The powder was passed through sieve No. 40 and stored in an airtight container for the extraction) (Mukherjee; 2007).

The selected plant leaves were used for the preparation of the extract. The plants leaves were collected and dried under shade and then coarsely powdered with the help of mechanical grinder. The powder was passed through sieve No. 40 and stored in an airtight container for the extraction.

Extraction of dried leaves by using various solvents of increasing polarity

The collected, cleaned and powdered leaves of plant were used for the extraction purpose. 100 gm of powdered material was evenly packed in the soxhlet apparatus. It was then extracted with various solvents from non-polar to polar such as petroleum ether, chloroform, acetone, ethanol and water. Petroleum ether solvent used for defatting of

fats and oil from plant powder (Mukherjee; 1994). The solvents used were purified before use. The extraction method used was continuous hot percolation and carried out with various solvents, for 72 hrs. The extracts were concentrated by vacuum distillation to reduce the volume to 1/10; the concentrated extracts were transferred to 100ml beaker and the remaining solvent was evaporated on a water bath. Then they were cooled and placed in a dessicator to remove the excessive moisture. The dried extracts were packed in airtight containers and used for further studies.

Preliminary phytochemical studies

A) Tests for Carbohydrates and Glycosides

A small quantity of the extracts was dissolved separately in 4 ml of distilled water and filtered. The filtrate was subjected to various tests to detect the presence of Carbohydrates.

1) Molisch's test

Filtrate was treated with 2-3 drops of 1% alcoholic α - napthol solution and 2 ml of Conc. sulpuric acid was added along the sides of the test tube. Appearance of brown ring at the junction of two liquids shows the presence of carbohydrates.

Another portion of the extract was hydrolysed with hydrochloric acid for few hours on a water bath and the hydrolysate was subjected to Legal's and Borntrager's test to detect the presence of different glycosides (Audu *et al.*, 2007).

2) Legal's test

To the hydrolysate 1 ml of pyridine and few drops of sodium nitropruside solutions were added and then it was made alkaline with sodiumhydroxide solution. Appearance of pink to red colour shows the presence of glycosides.

3) Borntrager's test

Hydrolysate was treated with chloroform and then the chloroform layer was separated. To this equal quantity of dilute ammonia solution was added. Ammonia layer acquires pink color, showing the presence of glycosides.

B) Test for Alkaloids

A small potion of the solvent free alcoholic and aqueous extracts were stirred separately with few drops of dilute hydrochloric acid and filtered. The filtrate was tested with various reagents for the presence of alkaloids.

Dragondorff's test

To a small amount of the filtrate, add 1ml of Dragendorff's reagent. Appearance of reddish brown precipitate indicates the presence of alkaloids.

Wagner's test

To a small amount of filtrate, add 1ml of Wagner's reagent. Appearance of reddish brown precipitate indicates the presence of alkaloids.

Mayer's reagent

To a small amount of filtrate, add 1ml of Mayer's reagent. Appearance of cream coloured precipitate indicates the presence of alkaloids.

C) Test for Proteins and Free Amino Acids

1) Million's test

Small quantities of the extracts were dissolved in few ml of water and treated with Millon's reagent. Appearance of red color shows the presence of proteins and free amino acids.

2) Ninhydrin test

Small quantities of the extracts were dissolved in few ml of water and treated with Ninhydrin reagent. Appearance of violet color shows the presence of proteins and free amino acid.

3) Biuret's test

The extracts were dissolved in a few ml of water and equal volumes of 5% sodium hydroxide solution & 1% copper sulphate solution were added. Appearance of pink or purple color shows the presence of proteins and amino acids.

D) Test for Phenolic Compounds and Tannins

1) Ferric chloride test

Small quantities of the extracts were dissolved in water and dilute Ferric chloride solution (5%) was added. Appearance of violet or blue color indicates presence of phenolic compounds and tannins.

2) Gelatin test

Small quantities of the extracts were dissolved in water and 1% solution of gelatin containing 10% sodium chloride was added. Formation of white precipitate indicates presence of phenolic compounds and tannins.

3) Lead acetate test

Small quantities of the extracts were dissolved in water and 10% lead acetate solution was added. Formation of white precipitate indicates presence of phenolic and tannins.

E) Test for Flavonoids

1) Sodium hydroxide test

Small quantities of each extracts were dissolved separately in aqueous sodium hydroxide solution. Appearance of yellow to orange indicates presence of flavonoids.

2) Sulphuric acid test

To a portion of the extract, add Conc. sulphuric acid. Appearance of yellow orange colour shows the presence of flavonoids.

3) Shinoda's test

Small quantities of the extract were dissolved in alcohol, to them piece of magnesium followed by Conc. hydrochloric acid dropwise added and heated. Appearance of magenta color shows the presence of flavonoids.

F) Test for Saponins

1) Foam Test

Place 2ml of the solution of the extract in water in a test tube and shake well. Formation of stable foam (froth) indicates the presence of Saponins.

G) Test for Fixed oils and Fats

1) Spot test

Small quantities of various extracts were separately pressed between two filter papers. Appearance of oil stain on the paper indicates the presence of fixed oils and fats.

2) Saponification test

Add few drops of 0.5N alcoholic potassium hydroxide to a small quantity of the extract and heat on a water bath for 1-2 hrs. Formation of soap or partial neutralization of the alkali shows the presence of fixed oils and fats.

H) Test for Phytosterols

Small quantities of various extracts were dissolved separately in 5ml of water. Then this solution was subjected to the following tests.

1) Salkowski test

The solution was treated with few drops of conc.sulphuric acid. Formation of red colour indicates presence of phytosterols.

2) Libermann- Bucchard's test

The solution was treated with few drops of acetic anhydride, boil and cool. Then add conc. Sulphuric acid through the sides of the test tube. Formation of brown ring at the junction of two layers indicates the presence of phytosterols.

Determination of percentage yield

The percentage yield of each extract was calculated by using following formula:

$$\text{Percentage yield} = \frac{\text{Weight of Extract}}{\text{Weight of powdered drug}} \times 100$$

Quantitative studies of phytoconstituents

Total phenol content estimation

Principle: The total phenol content of the extract was determined by the modified folin-ciocalteu method (Audu *et al.*, 2019).

Preparation of Standard: 10 mg Gallic acid was dissolved in 10 ml methanol, various aliquots of 10- 50µg/ml was prepared in methanol.

Preparation of Extract: 10 mg of dried extract was dissolved in 10 ml methanol and filter. Two ml (1mg/ml) of this extract was for the estimation of phenol.

Procedure: 2 ml of extract and each standard was mixed with 1 ml of folin-ciocalteu reagent (previously diluted with distilled water 1:10 v/v) and 1 ml (7.5g/L) of sodium carbonate. The mixture was vortexed for 15s and allowed to stand for 10min for colour development. The absorbance was measured at 765 nm using a spectrophotometer.

Total flavonoids content estimation

Principle: Determination of total flavonoids content was based on aluminium chloride method (Audu *et al.*, 2019).

Preparation of standard: 10 mg quercetin was dissolved in 10 ml methanol, and various aliquots of 5- 25µg/ml were prepared in methanol.

Preparation of extract: 10 mg of dried extract was dissolved in 10 ml methanol and filter. Three ml (1mg/ml) of this extract was for the estimation of flavonoids.

Procedure: 1 ml of 2% $AlCl_3$ solution was added to 3 ml of extract or each standard and allowed to stand for 15min at room temperature; absorbance was measured at 420 nm.

Formulation development of fast dissolving herbal tablet of ethanolic extract

Preparation of fast dissolving tablets by direct compression method

Fast dissolving tablets of herbal extract were prepared by direct compression. All the ingredients (except granular directly compressible excipients) were passed through # 60-mesh separately. Then the ingredients were weighed and mixed in geometrical order. Powder blend was evaluated for bulk density, tapped density, Carr's index and Hauser's ratio. Compressed into tablets of 150mg using 8mm round flat punches on 10-station rotary tablet machine (Clit) (Okuda *et al.*, 2011).

Pre-compression Studies of blend powder

Various formulations and process variables were involved in mixing of ingredients and all these can affect the properties of the blends produced. Various evaluation parameters of blends tested are given below and data is represented in table 5.

Bulk density: The sample under test was screened through sieve no.20, the sample equivalent to 25 gm (50 cm^3) was accurately weighed and filled in a 100 ml graduated cylinder, the powder was leveled and the unsettled volume, V_o was noted. The bulk density was calculated in g/cm^3 by the formula:

$$\text{Bulk density} = M/V_o$$

Where, M = mass of powder taken, and V_o = apparent unstirred volume

Tapped Density: The sample under test was screened through sieve no.20 and the weight of sample equivalent to 25 g was filled in 100 ml graduated cylinder. The mechanical tapping of the cylinder was carried out using

tapped density tester at a nominal rate of 300 drops per minute for 500 times initially and the tapped volume V_o was noted. Tapping was proceeding further for an additional tapping 750 times and tapped volume V_b was noted. The difference between two tapping volume was less than 2%, so V_b was considered as a tapped volume V_f. The tapped density was calculated in g/ cm3 by the formula:

$$\text{Tapped density} = M/V_f$$

Where, M = weight of sample taken, and V_f = tapped volume

Compressibility Index: The bulk density and tapped density was measured and compressibility index was calculated using the formula. Grading of the powders for their flow properties according to carr's index is given in table 5.

$$\text{Compressibility Index} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}} \times 100$$

Hausner ratio: Tapped density and bulk density were measured and the Hausner ratio was calculated using the formula:

$$\text{Hausner ratio} = \frac{\text{Tapped density}}{\text{Bulk density}}$$

If the value for Hausner ratio < 1.24 than it shows good flow properties.

Angle of repose

Angle of repose indicates the frictional forces in a loose powder. It can be defined as the maximum angle between the slope of pile of powder and its base. The Angle of repose was determined using funnel method, designed by Newmann. The blend was poured through a funnel that could be raised vertically until a specified cone height (h) was obtained. Radius of the heap (r) was measured and angle of repose (θ) was calculated using the formula:

$$\tan \theta = h / r$$

$$\textbf{Therefore } \theta = \tan^{-1} h / r$$

Where

θ = angle of repose

H = height of cone

R = radius of cone

Evaluation of fast dissolving Tablet

Hardness: Hardness is amount of strength of tablet to withstand mechanical shocks of handling in manufacture, packaging and shipping and tablet should be able to withstand reasonable abuse when in the hand of consumer. Hardness of tablet was evaluated by Monsanto hardness tester or Pfizer tester. Hardness was measured in kg/cm^2 and for tablet it is above 4-6 kg/cm^2.

Friability: This test is applicable to compressed tablets and is intended to determine the physical strength of tablets. It was evaluated by Roche Friabilator with 100 revolution rotating 25 per minute for 4 min by using 6 tablets. According to USP tablet should have limit < 1% for acceptance. Following formula was used to calculate the friability.

$$\% F = 1 - (\text{loss in weight/initial weight}) 100$$

Weight variation:

Weight variation was calculated as per method describe in USP. 20 tablets were weighed individually and the average was calculated. The requirements are met if the weight of not more than 2 of tablets differ by more than percentage listed in the tablet and no tablets differ by in weight by more than double that percentage.

Disintegration test

Disintegration test was measured using disintegration test apparatus. One tablet was placed in each of the six tubes of disintegration test apparatus. I.P. method was

followed without using disc. The time required for complete disintegration of tablet in each tube was determined using stop watch.

Thickness variation

Ten tablets from each formulation were taken randomly and their thickness was measured with a micrometer screw gauge.

Uniformity of drug content

The test is mandatory for tablets with 10 mg or less weight of active ingredient. Ten randomly selected tablets from each formulation (F1 to F6) were finely powdered and Drug equivalent to 10mg of drug dissolved in 10 ml phosphate buffer pH 6.8) sonicate it for 20 minutes, till the entire drug leached out from complex, then the solution was filtered through whatman filter paper No. 41. From this Solution take 1 ml and Diluted up to 100 ml with 0.1 N HCl and the drug content was determined spectrophotometrically at 232nm (Parmar *et al.,* 2009).

***In vitro* dissolution rate studies**

The prepared tablets were evaluated for *in vitro* drug release. The drug release studies were carried out using USP XXII paddle type Dissolution test apparatus. The dissolution study was carried out in 900 ml dissolution medium which was stirred at 50rpm maintained at 37±0.2°C. A tablet placed in dissolution media (900 ml) at 37±0.2°C. Samples were withdrawn at different time interval and compensated with same amount of fresh dissolution medium. Volume of sample withdrawn was made up to 10ml 0.1 N HCl. The samples withdrawn were assayed spectrophotometrically at 232nm using UV visible spectrophotometer (Prameela *et al.,* 2010).

RESULTS AND DISCUSSION

The formulation and evaluation of fast-dissolving herbal tablets of *Cyathea gigantea* for the management of diabetes was carried out with the objective of developing an effective, easy-to-administer dosage form using the herbal extract. The study involved the extraction of the plant's active ingredients, formulation of tablets, and evaluation of various pharmacological properties, including dissolution rates, drug content, and disintegration time.

Yield and Extraction Efficiency: From Table 2, it is observed that the aqueous extract of *Cyathea gigantea* gave the highest yield (8.2%), followed by the ethanolic extract (6.5%), acetone extract (2.5%), and chloroform extract (1.6%). The higher yield of aqueous extract suggests that water may be a more effective solvent for extracting bioactive compounds from *Cyathea gigantea*. This could indicate a higher availability of active ingredients in the aqueous extract, making it a suitable choice for therapeutic formulations aimed at managing conditions like diabetes.

Phytochemical Screening: Table 3 provides an overview of the preliminary phytochemical analysis of the extracts. The results reveal the presence of several bioactive compounds in the extracts, which are essential for their medicinal properties. Notably, carbohydrates were present in the ethanolic and aqueous extracts, which could potentially contribute to the management of diabetes by modulating blood sugar levels. Additionally, proteins and amino acids were present in all extracts except for the acetone extract, which is significant as these components can support overall health and metabolic functions. Flavonoids, phenolic

compounds, and saponins were found in the ethanolic and aqueous extracts, all of which have been linked to antioxidant, anti-inflammatory, and potential anti-diabetic effects. These compounds can play a role in reducing oxidative stress associated with diabetes.

Total Phenolic and Flavonoid Content: Table 4 highlights the total phenolic and flavonoid content in different extracts. The ethanolic extract exhibited the highest levels of both total phenols (0.674 mg/100mg) and flavonoids (0.742 mg/100mg), suggesting that this extract has a higher concentration of antioxidant compounds compared to the acetone and aqueous extracts. This finding aligns with the known therapeutic potential of phenolic compounds and flavonoids in controlling blood sugar levels and providing anti-inflammatory and anti-oxidative effects, which are important in the management of diabetes.

Pre-Compression Parameters of Tablet Formulations: The pre-compression parameters (Table 5) for all tablet formulations (F1 to F6) were within acceptable limits for granule flowability, indicating that the tablets would be easy to compress. Carr's index values varied from 13.43% (F5) to 28.60% (F3), with F5 showing the best flow properties and least powder compressibility. The Hausner's ratio for the formulations was also acceptable, with the lowest ratio (1.155) observed in F5, indicating that it would likely exhibit better packing properties during tablet compression.

Post-Compression Parameters: Table 6 provides the results of post-compression tests, including hardness, friability, weight variation, thickness, drug content, and disintegration time. All formulations showed acceptable hardness, with F1, F2, and F5 showing slightly higher hardness, suggesting a more robust tablet structure. The friability values for all formulations were low (ranging from 0.612% to 0.856%), which suggests that the tablets would not be prone to breakage during handling. The drug content for all formulations ranged from 97.74% to 99.25%, demonstrating good uniformity of drug distribution in the tablets.

The disintegration times varied considerably, with F4 (36 seconds) exhibiting the fastest disintegration, followed by F6 (62 seconds). F4 also demonstrated a lower disintegration time, which is an important characteristic for fast-dissolving tablets, especially for patients who require quick relief. The faster the disintegration, the quicker the release and absorption of active ingredients, which is critical for managing diabetes effectively.

Regression Analysis (Release Kinetics): From the regression analysis data in Table 7, it is observed that the Higuchi model best describes the release kinetics for formulation F4 ($r^2 = 0.9975$). The Higuchi model is typically associated with the release of drugs from matrix systems and indicates a controlled release mechanism. This suggests that formulation F4 is likely to offer a sustained release of active compounds, ensuring prolonged therapeutic effects, which is advantageous in chronic conditions such as diabetes. The zero-order and first-order models also provided good fit values, but the Higuchi model remains the most suitable for this particular formulation.

Table 1: Formulation for different batches of Plant extracts tablets

Ingredients	F1	F2	F3	F4	F5	F5
Plant Extract	200	200	200	200	200	200
Mannitol	6	6	6	6	6	6
CP	10	10	10	-	-	-
CCS	-	-	-	10	10	10
Aerosil	30	30	30	30	30	30
Pre-gelatinised Starch	1.5	1.5	1.5	1.5	1.5	1.5
Menthol	1.5	1.5	1.5	1.5	1.5	1.5
Magnesium stearate	1.0	1.0	1.0	1.0	1.0	1.0
Total weight	250	250	250	250	250	250

Table 2: % Yield of *Cyathea gigantea*

S. No.	Extracts	% Yield (w/w)
1.	Chloroform extract	1.6%
2.	Acetone extract	2.5%
3.	Ethanolic extract	6.5%
4.	Aqueous extract	8.2%

Table 3: Preliminary phytochemical studies of various extracts of dried leaves of *Cyathea gigantea*

S. No.	Constituents	Tests	Chloroform extract	Acetone extract	Ethanolic extract	Aqueous extract
1.	Carbohydrates	Molisch's test	-	-	+	+
		Fehling's test	-	-	+	+
2.	Glycosides	Legal's test	-	-	-	-
		Borntrager's test	-	-	-	-
		Baljet test	-	-	-	-
3.	Fixed oil and Fats	Spot test	+	+	-	-
		Saponification test	+	+	-	-
4.	Proteins & Amino acids	Millon's test	+	-	+	+
		Ninhydrin test	+	-	+	+
		Biuret test	+	-	+	+
5.	Saponins	Foam test	-	-	+	+
		$FeCl_3$ test	-	+	+	+

6.	Phenolic comp. and Tannins	Lead acetate test	-	+	+	+
7.	Phytosterols	Salkowski test	-	+	-	-
		Libermann-bucchard test	-	+	-	--
8.	Alkaloids	Dragendorff's test	-	-	-	-
		Mayer's test	-	-	-	-
		Wagner's test	-	-	-	-
		Hager's test	-	-	-	-
9.	Gums & Mucilage	Froth test	-	-	-	+
		Alcoholic test	-	-	-	+
10.	Flavonoids	Lead acetate test	-	+	+	+
		Con. H_2SO_4 test	-	+	+	+
		$FeCl_3$ test	-	+	+	+

Table 4: Estimation of total phenolic and flavonoids content of *Cyathea gigantea* extract

S. No.	Extract	Total phenol content (mg/100mg of dried extract)	Total flavonoids content (mg/ 100 mg of dried extract)
1.	Acetone	0.240	0.325
2.	Ethanolic	0.674	0.742
3.	Aqueous	0.421	0.464

Table 5: Results of pre-compression parameters of *Cyathea gigantean* herbal tablets

Formulation code	Parameters			
	Loose Bulk density(gm/ml)	Tapped bulk density(gm/ml)	Carr's Index (%)	Hausner's Ratio
F1	0.365	0.498	26.71	1.364
F2	0.385	0.488	21.11	1.268
F3	0.332	0.465	28.60	1.401
F4	0.346	0.482	28.22	1.393
F5	0.374	0.432	13.43	1.155
F6	0.382	0.495	22.83	1.296

Table 6: Results of post-compression parameters of all formulations

F. Code	Hardness test (kg/cm^2)	Friability (%)	Weight variation (%)	Thickness (mm)	Drug content (%)	Disintegration Time (Sec.)
F1	3.7±0.3	0.658±0.025	252±5	1.32±0.05	98.85±0.15	85±5
F2	3.8±0.2	0.612±0.032	250±4	1.25±0.03	97.74±0.31	78±4
F3	3.5±0.5	0.635±0.015	255±6	1.22±0.08	98.25±0.19	69±6
F4	3.6±0.3	0.856±0.033	253±2	1.25±0.02	99.25±0.22	36±4
F5	3.8±0.2	0.742±0.015	248±3	1.33±0.04	97.74±0.14	50±2
F6	3.5±0.2	0.695±0.032	250±5	1.25±0.03	98.32±0.32	62±1

Table 7: Regression analysis data

Batch	Zero Order	First Order	Higuchi
	r^2		
F4	0.9762	0.9616	0.9975

CONCLUSION

The results of this study suggest that *Cyathea gigantea* has promising potential in the development of fast-dissolving tablets for diabetes management. The aqueous and ethanolic extracts, rich in bioactive compounds like phenols, flavonoids, and proteins, appear to be the most effective in terms of both extraction yield and therapeutic potential. Among the tablet formulations, F4 showed the most promising results in terms of drug release profile, disintegration time, and overall tablet quality. Therefore, formulation F4 can be considered the most suitable for future development as a fast-dissolving herbal tablet for managing diabetes. Further studies focusing on in vivo efficacy and safety are recommended to confirm the clinical benefits of *Cyathea gigantea* tablets for diabetes management.

DECLARATION OF INTEREST

The authors declare no conflicts of interests. The authors alone are responsible for the content and writing of this article.

REFERENCES

- Audu, G., & Bharti, D. (2019). Phytochemical investigation and determination of total phenols and flavonoid concentration in leaves extract of *Vitex trifolia* Linn. *Journal of Drug Delivery and Therapeutics, 9*(4-A), 705–707.
- Audu, S. A., Mohammed, I., & Kaita, H. A. (2007). Phytochemical screening of the leaves of *Lophira lanceolata* (Ochanaceae). *Life Science Journal, 4*(4), 75–79.
- Hassan, A., Khan, M., & Raza, S. (2018). Anti-diabetic and antioxidant potential of *Cyathea gigantea*. *Journal of Ethnopharmacology, 211*, 114–123.
- Kokate, C. K. (1994). *Practical pharmacognosy* (4th ed., pp. 112–120). Vallabh Prakashan.
- Mukherjee, P. K. (2007). *Quality control of herbal drugs* (2nd ed., pp. 2–14). Business Horizons.

- Okuda, Y., Irisawa, Y., Okimoto, K., & Yamashita, S. (2011). Further improvement of orally disintegrating tablets using micronized ethylcellulose. *International Journal of Pharmaceutics, 401*(1–2), 1–9.
- Parmar, R., Baria, A., Tank, H., & Faldu, S. (2009). Formulation and evaluation of domperidone fast dissolving tablets. *International Journal of PharmTech Research, 1*(3), 483–487.
- Patil, R. A., Yadav, M. V., & Patel, A. M. (2021). Formulation and evaluation of fast-dissolving tablets: A review. *International Journal of Pharmaceutical Sciences and Research, 12*(6), 1234–1245.
- Patterson, C. C., Dharmalingam, M., & Sicree, R. (2019). Diabetes prevalence and mortality in 2019. *The Lancet Diabetes & Endocrinology, 7*(3), 143–145.
- Prameela, A., Archana, P., Siva Teja, P., & Vikas, M. (2010). Formulation and evaluation of orodispersible metformin tablets: A comparative study on hisapghula husk and crospovidone as superdisintegrants. *International Journal of Applied Pharmaceutics, 2*(3), 15–21.
- Rasool, R., Saini, R. V., & Singh, S. K. (2020). Herbal medicines for diabetes management: A review on potential natural anti-diabetic drugs. *Journal of Diabetes Research, 2020*, 9031657.
- Saad, M. A., Kato, S., & Ali, T. M. (2020). Prevalence and risk factors of diabetes mellitus in developing countries: A case study of the Middle East. *International Journal of Diabetes and Metabolism, 27*(1), 47–58.