International Journal of Medical and Pharmaceutical Sciences
Open access peer-reviewed Journal
Volume 2, Issue 4, Page 22-31.
https://doi.org/10.5281/zenodo.19425888

Research Article

Formulation and Evaluation of Chewable Tablets of Catharanthus Roseus Leaf

Minakshi Khairnar*[1], Darshana Desale[2], Shubham Kale[2], Harshvardhan Deore[2], Rohit Thakre[2], Darshan Bhadane[2], Sohail Shaikh[3]

[1]Assi. Prof., Department of Pharmaceutics, Rupesh Badhan Institute of Pharmacy, Pimpalner (MH.), India
[2]Student, Rupesh Badhan Institute of Pharmacy, Pimpalner (MH.), India
[3]Asso. Prof., Department of Pharmacology, Dnyansadhana College of Pharmacy, Parbhani. (MH.), India

The present study was aimed at the formulation and evaluation of chewable tablets containing leaf powder of Catharanthus roseus with a focus on in vitro antidiabetic and anticancer activities. The leaf powder was incorporated into chewable tablets using the direct compression method with suitable excipients to enhance palatability and patient compliance. Six formulations (F1–F6) were developed and evaluated for pre-compression and post-compression parameters. All formulations exhibited satisfactory flow properties and complied with pharmacopeial limits for weight variation, hardness, friability, and drug content. In vitro dissolution studies demonstrated that drug release was influenced by the concentration of excipients, particularly mannitol and microcrystalline cellulose. Among all batches, formulation F3 was identified as the optimized formulation, showing a balanced profile in terms of mechanical strength and drug release. The optimized formulation exhibited significant in vitro antidiabetic activity, as evidenced by α-amylase and α-glucosidase inhibition assays, showing dose-dependent enzyme inhibition. Additionally, anticancer activity assessed by MTT assay using MCF-7 cell lines revealed moderate cytotoxic effects. Stability studies conducted under accelerated conditions confirmed that the optimized formulation remained stable with minimal changes in drug content and dissolution profile. In conclusion, the developed chewable tablets of Catharanthus roseus demonstrate promising potential as a herbal formulation for the management of diabetes, with additional anticancer benefits, thereby offering a patient-friendly and effective alternative to conventional dosage forms.

Keywords: Catharanthus Roseus, Chewable Tablets, Anticancer, Antidiabetic, Formulations.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both [1]. It has emerged as one of the most significant global health challenges, affecting millions of individuals worldwide [2]. The long-term complications associated with diabetes, including neuropathy, nephropathy, retinopathy, and cardiovascular diseases, considerably reduce the quality of life and increase mortality [3]. Although several synthetic antidiabetic agents are available, their use is often associated with limitations such as adverse effects, high cost, and poor patient compliance, particularly in long-term therapy [4]. These drawbacks have prompted increasing interest in the exploration of safer and more effective alternatives, especially those derived from natural sources [5]. In recent years, herbal medicines have gained considerable attention due to their therapeutic efficacy, minimal side effects, and better patient acceptance [6]. Plants have historically served as a rich source of bioactive compounds with diverse pharmacological properties [7]. Among these, Catharanthus roseus (commonly known as Sadabahar or Madagascar periwinkle) is a well-known medicinal plant belonging to the family Apocynaceae [8]. It is

widely distributed in tropical and subtropical regions and has been traditionally used in various systems of medicine for the management of diabetes and other ailments [9]. The pharmacological potential of *Catharanthus roseus* is attributed to its rich phytochemical profile, particularly the presence of indole alkaloids such as vincristine, vinblastine, vindoline, and catharanthine [10]. While vincristine and vinblastine are extensively used in cancer chemotherapy, several studies have also demonstrated the antidiabetic potential of leaf extracts of the plant [11]. These extracts are reported to reduce blood glucose levels through multiple mechanisms, including enhancement of insulin secretion, improvement of glucose utilization, and inhibition of carbohydrate-digesting enzymes [12]. In addition, the antioxidant properties of the plant help in reducing oxidative stress, which plays a crucial role in the progression of diabetes and its complications [13]. Despite its significant therapeutic potential, the clinical application of *Catharanthus roseus* is often limited by issues related to dosage form, palatability, and patient adherence [14]. Conventional dosage forms such as decoctions or tablets may not be suitable for all patient populations, particularly pediatric and geriatric groups [15]. In this context, chewable tablets represent an attractive alternative dosage form, offering advantages such as ease of administration without water, improved patient compliance, enhanced palatability, and faster onset of action [16]. Furthermore, chewable tablets can be formulated to mask the bitter taste of herbal extracts, thereby improving acceptability [17].

Figure 1: *Catharanthus roseus*

In addition to its antidiabetic properties, *Catharanthus roseus* also possesses well-established anticancer activity due to the presence of vinca alkaloids, which interfere with microtubule formation and inhibit cell division [18]. This dual therapeutic potential makes the plant a promising candidate for the development of multifunctional herbal formulations [19]. Therefore, the present study aims to formulate and evaluate chewable tablets containing *Catharanthus roseus* leaf extract with a primary focus on antidiabetic activity, while also exploring its potential anticancer properties [20]. The study involves extraction of bioactive constituents, formulation of chewable tablets using suitable excipients, and evaluation of physicochemical as well as pharmacological parameters to assess the efficacy and quality of the developed formulation.

MATERIALS AND METHODS

MATERIALS

Fresh leaves of Catharanthus roseus were collected from the local region of Nashik, Maharashtra, India, and authenticated by a qualified botanist. The leaves were washed, shade-dried, and powdered for further use. The following excipients were used for the formulation of chewable tablets: mannitol (diluent and sweetening agent), microcrystalline cellulose (MCC PH-102) as a binder and filler, sodium saccharin as an artificial sweetener, talc as a glidant and magnesium stearate as a lubricant. For *in vitro* pharmacological evaluation, MCF-7 human breast cancer cell lines (ATCC) were used for anticancer studies. RPMI-1640 medium, fetal bovine serum (FBS) and MTT reagent were used for cell culture and

cytotoxicity assays. For *in vitro* antidiabetic studies, α-amylase and α-glucosidase enzymes along with their respective substrates were used. Acarbose was used as a standard reference drug. All chemicals and reagents used in the study were of analytical grade.

METHODS

Collection and Authentication of Plant Material

Fresh leaves of *Catharanthus roseus* were collected from the Nashik region, Maharashtra, India and authenticated by a botanist.

Preparation of Leaf Extract

The collected leaves were washed thoroughly and shade-dried for 7–10 days. The dried leaves were powdered using a mechanical grinder. The powdered material was subjected to Soxhlet extraction using ethanol as a solvent for 6–8 hours. The extract was filtered and concentrated under reduced pressure using a rotary evaporator [21]. The concentrated extract was dried and stored in a desiccator until further use.

Pre-compression Evaluation of Powder Blends

Prior to compression, the prepared powder blends were evaluated for various micromeritic properties to assess flowability and packing characteristics. This included bulk density, tapped density, angle of repose, Carr's index and Hausner's ratio.

Bulk Density: A pre-weighed quantity of the powder blend was carefully transferred into a 100 mL graduated measuring cylinder without compacting. The initial volume occupied by the powder was recorded as the bulk volume [22]. Bulk density was calculated using the following formula:

Bulk density = Mass of the powder / Bulk volume

Tapped Density: The same sample was then subjected to 100 mechanical tappings using a tapped density apparatus. The volume after tapping was recorded as the tapped volume [22]. Tapped density was calculated using the formula:

Tapped density (g/cm³) = Weight of the powder / Tapped volume

Angle of Repose: The angle of repose was determined using the fixed funnel method. The funnel was positioned vertically and the powder blend was allowed to flow through it onto a flat surface, forming a conical pile. The height (h) of the cone and the radius (r) of its base were measured. The angle of repose (θ) was then calculated using the formula:

$\tan \theta = h / r$

Carr's Index: Carr's compressibility index was calculated to evaluate the flowability and compressibility of the blend using the formula [22,23]:

% Carr's index = Tapped density - Bulk density / Tapped density X 100

Hausner's Ratio: Hausner's ratio was calculated to further assess powder flow characteristics using the following equation [22,23]:

Hausner's ratio = Tapped density / Bulk density X 100

Formulation of Chewable Tablets

Chewable tablets were prepared by the direct compression method. The extract and excipients were passed through sieve no. 60, mixed uniformly, and lubricated with talc and magnesium stearate before compression.

Table 1: Formulation Composition of Chewable Tablets

Component (mg/tablet)	F1	F2	F3	F4	F5	F6
C. roseus leaf powder	250	250	250	250	250	250
Mannitol	130	140	150	160	170	180
MCC	100	90	80	70	60	50
Saccharin	5	5	5	5	5	5
Talc	10	10	10	10	10	10

Magnesium stearate	5	5	5	5	5	5
Total Weight (mg)	**500**	**500**	**500**	**500**	**500**	**500**

Post-formulation Evaluation

Thickness and Diameter

Three tablets from each formulation batch were randomly selected, and their thickness and diameter were measured using a digital vernier caliper. The values were recorded individually, and the average measurements were calculated to ensure uniformity among the tablets [23].

Hardness

The hardness of the tablets was determined using a Monsanto type hardness tester. Three tablets from each batch were tested, and the force required to break each tablet was recorded. The average hardness was then calculated and expressed in kg/cm².

Percentage Friability

Friability testing was performed using a Roche friabilator. Twenty pre-weighed tablets were placed in the apparatus and rotated at 25 rpm for 4 minutes. After the test, the tablets were dedusted and reweighed. The percentage friability was calculated using the following formula:

% Friability = (Initial Weight−Final / Weight Initial Weight) × 100

Weight Variation

The weight variation test was conducted in accordance with Indian Pharmacopoeia (IP) 2007 guidelines. Twenty tablets were randomly selected from each batch and individually weighed using a digital balance. The average weight was calculated, and individual weights were compared to ensure that no more than two tablets deviated by more than ±5% from the average weight [23,24].

Drug Content Uniformity

Drug content uniformity was determined to ensure uniform distribution of the active constituent in the formulated chewable tablets of Catharanthus roseus. Twenty tablets from each formulation batch were accurately weighed and finely powdered. An amount of powder equivalent to 100 mg of *C. roseus* extract was transferred into a 100 mL volumetric flask and dissolved in a suitable solvent (e.g., methanol or ethanol). The solution was sonicated for 15–20 minutes to ensure complete extraction of the active constituents and then filtered through Whatman filter paper. The filtrate was appropriately diluted with the same solvent, and absorbance was measured using a UV–visible spectrophotometer at the predetermined λmax of the extract. A calibration curve of the extract was used to determine the drug content [24,25]. The drug content was calculated using the following formula:

% Drug Content=Actual amount of drug present / Theoretical amount of drug ×100

In Vitro Dissolution Study

The in vitro dissolution study of chewable tablets of Catharanthus roseus was performed using the USP Type II (paddle) dissolution apparatus. The dissolution medium consisted of 900 mL phosphate buffer (pH 6.8), maintained at a temperature of 37 ± 0.5°C, and stirred at a constant speed of 50 rpm. One tablet from each formulation batch was placed in the dissolution medium. At predetermined time intervals (5, 10, 15, 20, 30, 45, and 60 minutes), 5 mL samples were withdrawn and filtered. An equal volume of fresh dissolution medium was replaced to maintain sink conditions. The collected samples were analyzed using a UV–visible spectrophotometer at the λmax of the extract. The cumulative percentage drug release was calculated using a previously prepared calibration curve. The dissolution profile of each formulation was plotted as percentage cumulative drug release versus time and the optimized formulation was selected based on maximum drug release and acceptable tablet properties [24,25].

In Vitro Antidiabetic Activity

α-Amylase Inhibition Assay

The assay was carried out using the DNSA method. The reaction mixture containing α-amylase enzyme and sample solution was incubated with starch substrate. The reaction was terminated using DNSA reagent and absorbance was measured at 540 nm [26]. % Inhibition was calculated using:

% Inhibition=Ac−As / Ac × 100

Where,

Ac = Absorbance of the **control** (enzyme + substrate without sample)
As = Absorbance of the **test sample** (enzyme + substrate + extract/formulation)

α-Glucosidase Inhibition Assay

The assay was performed using p-nitrophenyl-α-D-glucopyranoside as substrate. After incubation with enzyme and sample, absorbance was measured at 405 nm. IC_{50} values were calculated from the inhibition data [26,27].

In Vitro Anticancer Activity

MCF-7 cells were cultured in RPMI-1640 medium supplemented with 10% FBS and incubated at 37°C in a humidified atmosphere containing 5% CO_2.

MTT Assay

Cells were seeded in 96-well plates and treated with different concentrations of the extract/tablet formulation. After incubation, MTT reagent was added and incubated for 3–4 hours. The formed formazan crystals were dissolved using DMSO and absorbance was measured at 570 nm. IC_{50} values were calculated to determine cytotoxic activity [28].

% Cell Viability=As / Ac × 100

Where,

Ac = Absorbance of the **control** (enzyme + substrate without sample)
As = Absorbance of the **test sample** (enzyme + substrate + extract/formulation).

Stability Study

Stability studies were carried out on the optimized formulation (F3) under accelerated conditions of 40°C ± 2°C and 75% ± 5% relative humidity (RH) for a period of three month. Individual tablets were packed in butter paper, sealed in aluminum foil and stored in a stability chamber. After the specified period, the samples were evaluated for physical appearance, drug content and in vitro drug release [23,25].

Statistical Analysis

All experiments were performed in triplicate, and results were expressed as mean ± standard deviation (SD). Statistical analysis was performed using one-way ANOVA, and $p < 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Pre-compression Parameters

The powder blends of all six formulations exhibited satisfactory flow properties, indicating their suitability for direct compression. The angle of repose values ranged from 28.5° to 26.2°, suggesting good flowability. Bulk density and tapped density values showed minimal variation, while Carr's index (14.2–16.0%) and Hausner ratio (1.16–1.19) confirmed acceptable compressibility.

Table 2: Results of Pre-compression Parameters

Parameter	F1	F2	F3	F4	F5	F6
Angle of repose (°)	28.5	27.8	27.2	26.9	26.5	26.2
Bulk density (g/cm³)	0.42	0.44	0.45	0.46	0.47	0.48
Tapped density (g/cm³)	0.50	0.52	0.53	0.54	0.55	0.56
Carr's index (%)	16.0	15.3	15.1	14.8	14.5	14.2
Hausner ratio	1.19	1.18	1.17	1.17	1.16	1.16

Post-compression Evaluation

All formulations complied with pharmacopeial limits for weight variation, hardness, friability, and drug content. Among them, F3 demonstrated the most balanced characteristics, with adequate hardness (4.0 kg/cm²), low friability (0.65%), and uniform drug content (98.1%). While F6 showed higher drug content, its lower hardness reduced mechanical strength, making F3 more suitable overall.

Table 3: Results of Post-compression Evaluation

Parameter	F1	F2	F3	F4	F5	F6
Weight variation (mg)	498 ± 3	500 ± 2	501 ± 2	499 ± 3	500 ± 2	502 ± 3
Hardness (kg/cm²)	4.5	4.3	4.0	3.8	3.5	3.2
Friability (%)	0.72	0.68	0.65	0.60	0.58	0.55
Thickness (mm)	3.8	3.9	4.0	4.1	4.2	4.3
Drug content (%)	96.5	97.2	98.1	99.0	99.4	99.8

In Vitro Dissolution Study

The dissolution studies indicated that drug release increased with increasing mannitol concentration. However, F3 exhibited an optimal balance between drug release and tablet integrity, achieving 95% drug release within 60 minutes. Although F6 showed slightly higher release (99%), F3 was selected as optimized due to better mechanical strength and overall performance.

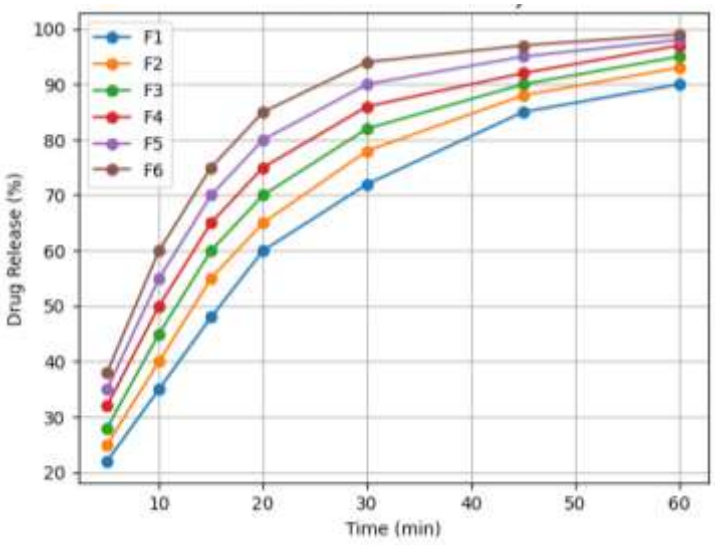

Figure 2: *In-Vitro* Dissolution Study

Table 4: *In-Vitro* Dissolution Study

Time (min)	F1	F2	F3	F4	F5	F6
5	22	25	28	32	35	38
10	35	40	45	50	55	60
15	48	55	60	65	70	75
20	60	65	70	75	80	85
30	72	78	82	86	90	94
45	85	88	90	92	95	97
60	90	93	95	97	98	99

In Vitro Antidiabetic Activity

The optimized formulation (F3) exhibited significant α-amylase and α-glucosidase inhibitory activity in a concentration-dependent manner.

Table 5: α-Amylase Inhibition (F3)

Concentration (µg/mL)	% Inhibition (F3)	Acarbose
50	30.2	45.2
100	42.5	60.3
200	55.0	72.5
400	66.8	82.4
800	77.2	90.1

IC_{50}: ~200 µg/mL

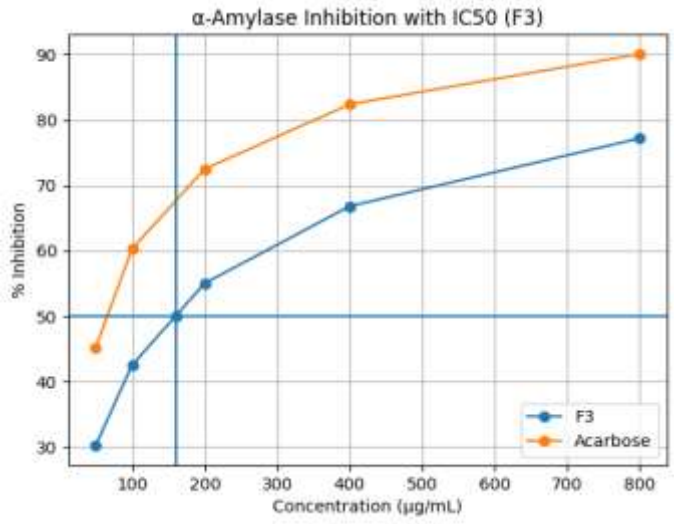

Figure 3: α-Amylase Inhibition with IC50 (F3)

Table 6: α-Glucosidase Inhibition (F3)

Concentration (µg/mL)	% Inhibition (F3)	Acarbose
50	26.8	42.1
100	38.5	55.8
200	52.3	70.4
400	64.7	82.3
800	76.5	91.0

IC_{50}: ~225 µg/mL

In Vitro Anticancer Activity (MTT Assay – MCF-7 Cells)

The optimized formulation (F3) demonstrated moderate cytotoxic activity against MCF-7 breast cancer cell lines.

Table 7: In Vitro Anticancer Activity

Concentration (µg/mL)	Cell Viability (%)
25	88.0
50	75.5
100	63.2
200	52.0
400	40.5
800	28.8

IC_{50}: ~220 µg/mL

Stability Study

The stability study results indicated that the optimized formulation (F3) remained stable throughout the study period under accelerated storage conditions. There were no significant changes observed in the physical appearance of the tablets, indicating the absence of any visible degradation, discoloration, or structural alteration. A slight decrease in drug content was observed over the three-month period, from 98.1% to 97.2%, which remained within acceptable pharmacopeial limits. Similarly, the in vitro drug release showed a minimal reduction from 95.0% to 93.6% at the end of the study. These minor variations may be attributed to environmental factors such as temperature and humidity, which can influence the stability of phytoconstituents. However, the changes were not statistically significant and did not affect the overall performance of the formulation. The results suggest that the chewable tablets of *Catharanthus roseus* possess good stability and maintain their physicochemical integrity and drug release characteristics under accelerated conditions.

Table 8: Stability Study Data of Optimized Batch (F3)

Parameter	Initial	1 Month	2 Months	3 Months
Physical appearance	No change	No change	No change	No change
Drug content (%)	98.1	97.8	97.5	97.2
% Drug release (60 min)	95.0	94.5	94.0	93.6

DISCUSSION

The present study successfully developed chewable tablets of Catharanthus roseus with satisfactory physicochemical and pharmacological properties. The formulation variables, particularly the ratio of mannitol to MCC, significantly influenced tablet characteristics such as hardness, friability, and drug release. Among all formulations, F3 was identified as the optimized batch, as it demonstrated a desirable balance between mechanical strength, drug content, and dissolution profile. While higher mannitol concentrations in F5 and F6 improved drug release, they resulted in reduced hardness, affecting tablet integrity. The in vitro antidiabetic studies confirmed that the optimized formulation exhibited significant enzyme inhibitory activity, supporting its potential in managing postprandial hyperglycemia. Additionally, the anticancer evaluation using MCF-7 cell lines revealed moderate cytotoxic activity, indicating the presence of bioactive compounds responsible for anticancer effects. Overall, the findings suggest that the developed chewable tablet formulation of *Catharanthus roseus* possesses promising therapeutic potential and can serve as an effective herbal alternative for managing diabetes, with added anticancer benefits.

CONCLUSION

The present research successfully formulated and evaluated chewable tablets of Catharanthus roseus leaf powder with an emphasis on improving patient compliance and therapeutic potential. The formulation approach using direct compression proved to be simple, effective, and suitable for the development of herbal chewable dosage forms. All prepared formulations exhibited acceptable physicochemical characteristics, indicating good flow

properties, compressibility, and mechanical strength. The variation in excipient composition significantly influenced the performance of the tablets, particularly in terms of drug release and hardness. Among all batches, formulation F3 was identified as the optimized formulation, demonstrating an ideal balance between tablet integrity and dissolution profile. The in vitro pharmacological evaluation confirmed that the optimized formulation possesses significant antidiabetic activity through inhibition of carbohydrate-digesting enzymes, along with moderate anticancer activity against MCF-7 cell lines. These findings highlight the therapeutic potential of *Catharanthus roseus* as a multifunctional herbal agent. Furthermore, stability studies indicated that the optimized formulation remained stable under accelerated conditions, with no significant changes in physical appearance, drug content, or drug release profile. Overall, the developed chewable tablets offer a promising, patient-friendly, and effective herbal alternative for the management of diabetes, with additional anticancer potential. Future studies involving in vivo evaluation and clinical trials are recommended to further validate the therapeutic efficacy and safety of the formulation.

REFERENCES

1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2014;37(Suppl 1): S81–90.
2. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: IDF; 2021.
3. Fowler MJ. Microvascular and macrovascular complications of diabetes. Clin Diabetes. 2008;26(2):77–82.
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):163–73.
5. Grover JK, Yadav S, Vats V. Medicinal plants of India with antidiabetic potential. J Ethnopharmacol. 2002;81(1):81–100.
6. Patel DK, Kumar R, Laloo D, Hemalatha S. Diabetes mellitus: an overview on its pharmacological aspects and reported medicinal plants having antidiabetic activity. Asian Pac J Trop Biomed. 2012;2(5):411–20.
7. Ekor M. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. Front Pharmacol. 2014; 4:177.
8. Newman DJ, Cragg GM. Natural products as sources of new drugs. J Nat Prod. 2016;79(3):629–61.
9. van der Heijden R, Jacobs DI, Snoeijer W, Hallard D, Verpoorte R. The Catharanthus alkaloids: pharmacognosy and biotechnology. Curr Med Chem. 2004;11(5):607–28.
10. Noble RL. The discovery of the vinca alkaloids—chemotherapeutic agents against cancer. Biochem Cell Biol. 1990;68(12):1344–51.
11. Singh SN, Vats P, Suri S, Shyam R, Kumria MM, Ranganathan S, et al. Effect of Catharanthus roseus extract on enzymatic activities in diabetic rats. J Ethnopharmacol. 2001;76(3):269–77.
12. Mathew S, Abraham TE. Studies on the antioxidant activities of Catharanthus roseus leaf extract. Indian J Exp Biol. 2006;44(3):235–40.
13. El-Sayed EM, Abd El-Rahman SS, El-Halawany AM. Antidiabetic activity of Catharanthus roseus. J Pharm Res. 2012;5(7):3985–9.
14. Chattopadhyay RR. A comparative evaluation of some blood sugar lowering agents of plant origin. J Ethnopharmacol. 1999;67(3):367–72.
15. Khandelwal KR. Practical Pharmacognosy: Techniques and Experiments. 23rd ed. Pune: Nirali Prakashan; 2015.
16. Aulton ME, Taylor KMG. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. 5th ed. London: Elsevier; 2018.
17. Allen LV, Popovich NG, Ansel HC. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2014.
18. Shukla D, Chakraborty S, Singh S, Mishra B. Mouth dissolving tablets: an overview of formulation technology. Sci Pharm. 2009;77(2):309–26.
19. Patel VF, Liu F, Brown MB. Advances in oral transmucosal drug delivery. J Control Release. 2011;153(2):106–16.
20. Banker GS, Anderson NR. Tablets. In: Lachman L, Lieberman HA, Kanig JL, editors. The Theory and Practice of Industrial Pharmacy. 3rd ed. Mumbai: Varghese Publishing House; 2009. p. 293–345.

21. United States Pharmacopeia. USP 43–NF 38. Rockville: USP Convention; 2020.
22. ICH. Stability testing of new drug substances and products Q1A(R2). Geneva: ICH; 2003.
23. Bernfeld P. Amylases, α and β. Methods Enzymol. 1955; 1:149–58.
24. Kim YM, Jeong YK, Wang MH, Lee WY, Rhee HI. Inhibitory effect of pine extract on α-glucosidase activity. Nutrition. 2005;21(6):756–61.
25. Mosmann T. Rapid colorimetric assay for cellular growth and survival (MTT assay). J Immunol Methods. 1983;65(1–2):55–63.

Cite: Minakshi Khairnar*, Darshana Desale, Shubham Kale, Harshvardhan Deore, Rohit Thakre, Darshan Bhadane, Sohail Shaikh, Formulation and Evaluation of Chewable Tablets of Catharanthus Roseus Leaf, Int. J. Med. Pharm. Sci., 2026, 2 (4), 22-31. https://doi.org/10.5281/zenodo.19425888