IJARSCT

International Journal of Advanced Research in Science, Communication and Technology

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

ISSN: 2581-9429

Volume 6, Issue 11, May 2026

Impact Factor: 8.2

Phytochemical Insights and In Vitro Antidiabetic Screening of Cryptostegia madagascariensis Leaf Extract

Vaishnavi Awatade[1], Pratiksha Babar[2], Dr. Nitin Mali[3]

Vidya Niketan College of Pharmacy, Lakhewadi, Indapur, Maharashtra

vaishnaviawatade164@gmail.com, pratikshababar45@gmail.com , nitinmalivncop@gmail.com

Abstract: *Rich in bioactive phytoconstituents, Cryptostegia madagascariensis is a medical plant that has garnered interest for its potential therapeutic uses. Elevated blood glucose levels are the feature of diabetes mellitus, a chronic metabolic disease that continues to be a major global health concern. Due to their potential effectiveness, fewer side effects, and affordability, the hunt for plant-based antidiabetic drugs has increased. The current study used conventional screening techniques to evaluate the in-vitro antidiabetic potential of Cryptostegia madagascariensis extract. The plant material was obtained, confirmed, dried, ground into a powder, and extracted using proper solvents using standard methods of extraction. To find secondary metabolites like alkaloids, flavonoids, tannins, saponins, glycosides, phenolic compounds, and terpenoids, a preliminary phytochemical screening of the extract was completed. The biological function and possibly antidiabetic advantages of these phytoconstituents are popular.Using in vitro tests including the glucose adsorption assay and the α-amylase inhibition assay, the antidiabetic efficacy was evaluated. The extract showed glucose-binding ability and concentration-dependent inhibitory activity against α-amylase, suggesting that it may lessen the absorption of glucose and the digestion of starches. The presence of active phytochemical components in the plant extract may be linked to the reported activity.According to the results, Cryptostegia madagascariensis extract may be a natural source for the creation of herbal antidiabetic formulations and has promising in-vitro antidiabetic potential. To verify its effectiveness and mode of action, more research involving the isolation of active molecules and in vivo assessment is required. The use of medicinal plants as alternative therapies in the management of diabetes has been backed by this study.*

Keywords: Cryptostegia madagascariensis,Phytochemical insights,In vitro antidiabetic activity,Leaf extract, Hypoglycemic potential

I. INTRODUCTION

Native to Madagascar (Africa), Cryptostegia madagascariensis Bojer ex Decne. (Apocynaceae) is a scandent shrub that occurs as a shrub or someone who climbs plant in dry forests, disturbed areas, and riverbanks. It has become an invasive species in northeastern Brazil, as it has mostly established dense communities close to rivers. This species' ability to produce a large number of seeds during a single reproduction event that are distributed by the wind and germinate in large quantities is one of its traits. One of the regions where C most frequently invades. Madagascariensis in Brazil are the riverine "carnaubais", locations marked by high water availability for a portion of the year and the prominent presence of the endemic carnauba palm, Copernicia prunifera (Mill.) H. E. Moore. Therefore, it may be useful to understand the traits that allow C. madagascariensis to invade Brazilian semiarid regions by knowing how abiotic factors (such as temperatures, light, water, and saline stresses) affect germination and how water availability, the most limiting factor for the establishment of seedlings in dry regions, interferes with its initial growth. This will also assist in determining the region most vulnerable to invasion and tracing control tactics according to the elements that

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2

encourage their establishment. I through C are our hypotheses. Madagascariensis has great germination rates and can withstand a wide range of temperatures; II. Because it mostly invades damaged regions, light availability promotes germination; III. Because increased water availability conditions concentrate the invaded areas, reduced water availability has a detrimental impact on germination and its capacity for invasion. Therefore, our goals were to assess the effects of a water deficit on the early growth of seedlings of the invasive C. madagascariensis and how abiotic variables interfere with germination.

II. MATERIALS AND METHOD:

Physicochemical Investigation

- Collection and Authentication
- Standardization Parameters.
- Extraction of leaves of Cryptostegia madagascariensis Bojer ex Decne

Physicochemical Investigation

- Phytochemical Screening

Pharmacological Investigation

- In-Vitro Study

Physicochemical Investigation

1. Collection and Authentication of Cryptostegia madagascariensis Bojer ex Decne. Plant (Leaves)

The plant , Cryptostegia madagascariensis Bojer ex Decne. Was collected in the drie area in Akluj. Identified at Deparment of Botany , Shankarrao Mohite Mahavidyalaya, Akluj . A voucher specimen has been maintained in the museum of our deparment for further reference.

1. Collection of plant materials

Fresh and healthy leaves of , Cryptostegia madagascariensis Bojer ex Decne. Were collected from local areas of Akluj during the morning hrs to avoid moistureloss deu to high temperature.

The collected plant materials was carefully inspect to remove:

- Diseased leaves
- Damaged leaves
- Dust and soli particals
- Foreign plant materials

The plant was Authenticatedby an expert from the deparment of pharmacognosy/ Botony to confirm its botanical identity.

- Purpose

Authentication ensure that the correct medicinal plant is used for extraction and analysis.

2. Cleaning and Drying of plant materials

Washing

The collected leaves were washed under running tap water to remove dirt and debris.

After this,the leaves were rinsed 2-3 times with distilled water to remove any remaing contamination.

Drying

The washed leaves were spread on clean blotting paper and dried under shade at room temperature(25-30°C)for 7-10 days.

The leaves were turned daily for uniform drying.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 11, May 2026 Impact Factor: 8.2

Direct sunlight was avoided beacause it can:
Destory heat-sensitive phytochemicals
Reduce phenolic content
After medicinal activity

- **Purpose:**

Shade drying preserves active constituents.

3. Pulverization (Powder Preparation)

After complete drying, the leaves became brittle. The dried leaves were crushed using:

- Mechanical grinder

Purpose:

Fine powder increases surface area, allowing better solvent penetration during extraction.

2. Standardization of Cryptostegia madagascariensis Bojer ex Decne.

Botanical evaluation of Cryptostegia madagascariensis Bojer ex Decne.

Fig1. Cryptostegia madagascariensis

Synonym: Purple rubber vine, Madagascar rubber vine, Rubber vine .

Family : Apocynaceae.

Description

Cryptostegia madagascariensis, commonly known as Madagascar rubber vine or purple rubber vine, is a fast-growing, woody perennial climber belonging to the Apocynaceae family. Native to Madagascar, it is widely distributed in tropical and subtropical regions. The plant may grow as a shrub about 2–4 meters tall or climb up to 10–15 meters when support is available, often forming dense thickets. Its stems are woody, grey to brown, and contain a toxic milky latex. The leaves are arranged oppositely, are ovate to elliptic in shape, and have a thick, leathery, glossy dark green surface. The plant produces large, attractive, funnel-shaped flowers that are pink to purple in color and usually appear in clusters. The fruits are paired pod-like structures (follicles) that split open when mature to release numerous seeds, each having silky hairs that aid in wind dispersal. This plant thrives in tropical climates, commonly found along roadsides, riverbanks, and open lands, but it is also considered highly invasive due to its rapid growth and ability to spread easily.

Chemical constituents:

- Cardiac glycosides (cardenolides) – major toxic principles responsible for cardiotoxic activity
- Flavonoids – antioxidant compounds

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2

- Phenolic compounds (polyphenols) – contribute to antioxidant and pharmacological effects
- Steroids – present as secondary metabolites Triterpenoids – important for anti-inflammatory activity
- Proteins and primary metabolites
- Latex constituents (cis-polyisoprene type hydrocarbons) – rubber-like compounds
- Fatty acids (in related species studies) such as oleic, linoleic, and linolenic acids

Uses

1. Medicinal Uses

Antidiabetic activity-extract are studied for reducing blood glucose level.
Antiovidant- due to flavonoids and phenolic compounds.
Anti-inflammatory- helps reduce inflammation in experimental studies.
Antimicrobial-shows activity against some bacteria and fungi.
Cardiotonic (traditional use) – due to cardiac glycosides (use with caution due to toxicity)

2. Industrial Uses

Natural rubber source –latex contains rubber-like compounds(cis-polyisoprene)
Fiber production- stem fibers can be used for making ropes and cords

3. Traditional / Folk Uses

Latex sometimes applied externally for skin diseases
Used in small quantities in traditional remedies (not widely recommended due to toxicity)

4. Ornamental Use

Grown as an ornamental climber because of its attractive purple flowers.Traditional / Folk Uses

III. METHODOLOGY

3. Extraction of leaves of Cryptostegia madagascariensis Bojer ex Decne .

Fresh leaves of Cryptostegia madagascariensis were collected and authenticated. The collected leaves were washed thoroughly with distilled water to remove dust and impurities and shade-dried at room temperature for 10–15 days. After complete drying, the leaves were coarsely powdered using a mechanical grinder and stored in an airtight container.

Soxhlet extraction method:

About 100 g of powdered leaf material was packed in a thimble and placed in a Soxhlet apparatus. Extraction was carried out using 500–700 mL of ethanol (70% or 95%) as the solvent. The extraction process was continued for 6–8 hours or until the solvent in the siphon tube became colorless, indicating complete extraction.

The obtained extract was filtered and concentrated using a rotary evaporator or evaporated on a water bath at 40–45°C to remove the solvent. The concentrated extract was dried to obtain a semisolid mass and stored in an airtight container at 4°C for further phytochemical and antidiabetic studies.

Percentage yield formula:

$$\text{Percentage Yield} = \frac{\text{Weight of dried extract}}{\text{Weight of powdered drug}} \times 100$$

DOI: 10.48175/IJARSCT-35854

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2


Fig. no.2 Soxhlet extraction apparatus

Physicochemical Investigation

1. Phytochemical Screening

A. Alkaloid test:

TEST	OBSERVATION
1. Mayer's Test: Take2-3 ml of plant extract in a test tube. Add few drops of dil.HCL and warm gently. Add Mayer's reagent.	Pale yellow precipitate.
2. Dragendroff's Test: Take 2-3 ml of plant extract in test tube. Add few drops of dil.HCL and warm gently. Add Dragendroff 's reagent.	Reddish-brown precipitate.
3. Wagner's Test: Take 2-3 ml of plant extract in a test tube . Add few drops of dil.HCL and warm gently. Add Wagner's reagent.	Reddish-brown precipitate.

Table no.1

B. Flavonoids Test:

1. Shinoda Test: Take 2-3 ml of plant extract in a test tube. Add small Zinc Dustm Add few drops of dil.HCL.	Reddish-brown precipitate.

Table no. 2

C. Saponin Test:

1. Foam Test (Forth test): Take 1ml plant extract Add 5-10ml distilled water. Shake vigorously for 30 sec. Let it stand for 10-15 min.	Persistent Foam (≥ 1 cm height)

Table no. 3

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2

D. Tannin Test & Phenol Test:

1.Ferric Chloride Test: Take 2ml of plant extract. Add 2-3 drops of $fecl_3$ solution.	Black colour observed.

Table no. 4

E. Terpenoids & Steroids Test:

1.Salkowski's Test: Take 2ml plant extract. Add 2ml choloform. Carefully add 2-3 ml conc.H_2SO_4. Along the side of the test tube.	Brown ring at junction.

Table no. 5

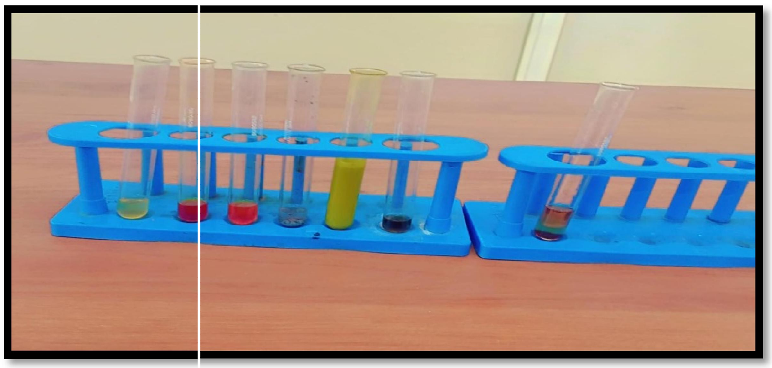

Fig.no.3 Preliminary Phytochemical screening Tests

2. ASH VALUE:

The ash value of Cryptostegia madagascariensis is determined by the incineration (heating) method used in pharmacognosy to measure the inorganic residue left after burning the plant material.

Principle:

When the powdered drug is heated at high temperature,all organic matter burns off and the remaining residue is called ash. It indicates the presence of:

- Natural mineral content
- Adhering dirt,sand or impurities
- Adulteration
- Heating / incineration method for Ash Value Determination

Procedure:

1. Weigh about 2-3 g of air-dried powdered Cryptostegia madagascariensis.
2. Place it in a previously ignited and weighed silica crucible.
3. Heat gently at first to avoid loss due to smoke. become
4. Then incinerate in a muffle furnace at about 450-600°C unit the sample become white, indicating absence of carbon.
5. cool in a desiccator and weight the ash.

Formula:

$$\text{Ash Value (\%w/w)} = \frac{\text{Weight of Ash}}{\text{Weight of air dried crude drug}} \times 100$$

3. LOSS OF DRYING

Principle:

The powdered drug is heated at 105°C until constant weight is obtained. The weight loss indicates moisture and volatile components removed during drying.

Procedure :

1. Weigh about 2–5 g of powdered drug.
2. Place in a previously dried and weighed evaporating dish.
3. Dry in hot air oven at 105°C.
4. Cool in desiccator and weigh.
5. Repeat until constant weight is obtained.

Formula:

$$\text{Loss of Drying (\%w / w)} = \frac{\text{Initial weight} - \text{Finial weight}}{\text{Initial weight}} \times 100$$

IV. PHARMACOLOGICAL ACTIVITY:

1. ANTI-DIABETIC ASSAY BY TITRATION METHOD:

Principle-

Diabetic reaction leaves free reducing sugars in solution. These are estimated by titration. The lower the titration volume, the higher the anti-Diabetic activity.

Key Idea-Instead of control flask:

Use 0 µg/mL (blank mixture) as reference titre value

Then compare all test samples against it.

Materials-

Fructose (1% or 0.5%), Gelatin or egg albumin, Plant extract (20–100 µg/mL),Fehling's solution A & B, Methylene blue indicator, Distilled water.

Procedure-

1. Prepare Reaction Mixture

For each tube:

2 ml fructose solution

2 ml protine solution

1 ml extract (or water for blank)

2. Set of Tubes

You prepare :

TUBE	EXTRACT
Blank (V_o)	0 µg / mL
T1	20 µg / mL
T2	40 µg / mL
T3	60 µg / mL

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2

T4	80 µg / mL
T5	100 µg / mL

Table no.6

Incubation-
60°C water bath for1 hour.
Titration:
For each Tube :
1. Take Fehling's A + B (5 mL each)
2. Boil gently
3. Titrate with incubated sample
4. Add methylene blue near endpoint
5. Record volume

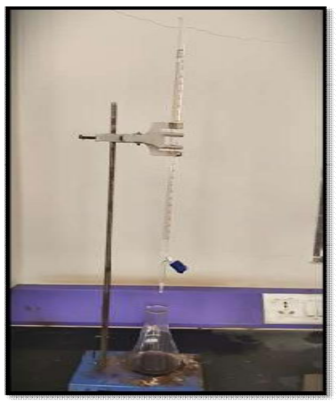

Fig no. 4 Anti-Diabetic Assay By Titration Method

V. RESULTS AND DICUSSION :

Preliminary Phytochemical screeningTests:
Alkaloid Test:

TEST	OBSERVATION	INFERENCE
1.Mayer's Test: Take 2-3 ml of plant extract in a test tube. Add few drops of dil. HCL and warm gently. Add Mayer's reagent.	Pale yellow precipitate.	Alkaloid is present.
2. Dragendroff's Test: Take 2-3 ml of plant extract in test tube. Add few drops of dil.HCL and warm gently. Add Dragendroff 's reagent.	Reddish-brown precipitate.	Alkaloid is present.
3. Wagner's Test: Take 2-3 ml of plant extract in a test tube .	Reddish-brown precipitate.	Alkaloid is present.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2

Add few drops of dil.HCL and warm gently. Add Wagner's reagent.		

Table no.7 Result Alkaloid Test

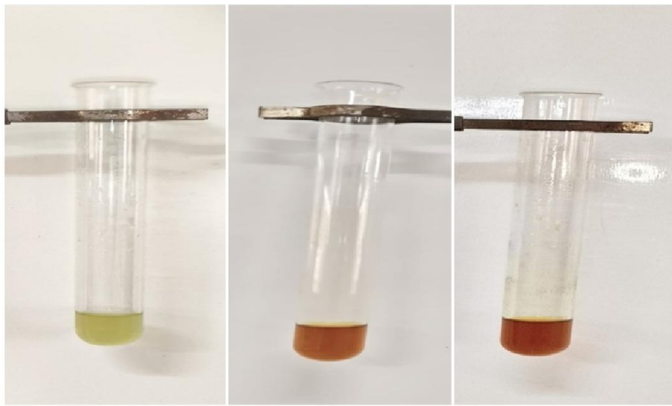

Table no.5 Result Alkaloid Test

Flavonoids Test

1. Shinoda Test: Take 2-3 ml of plant extract in a test tube. Add small Zinc Dust.Add few drops of dil.HCL.	Reddish-brown precipitate.	Flavonoid is present.

Table no. 8 Result Flavonoids Test

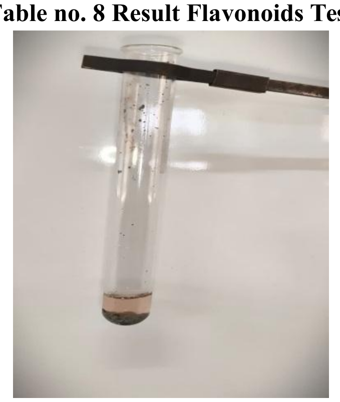

Fig no. **6 Result Flavonoids Test**

Saponin Test

1. Foam Test (Forth test): Take 1ml plant extract Add 5-10ml distilled water. Shake vigorously for 30 sec. Let it stand for 10-15 min.	Persistent Foam (≥ 1 cm height)	Saponin is present.

Table no.9 Result Saponin Test

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2

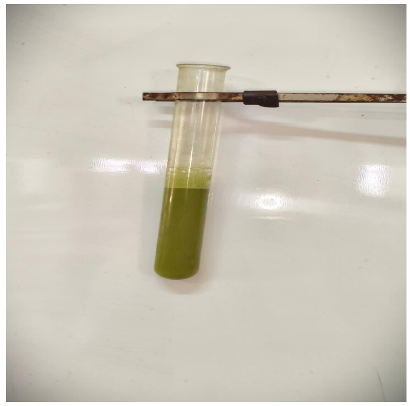

Fig no. 7 Result Saponin Test

Tannin Test & Phenol Test:

1.Ferric Chloride Test: Take 2ml of plant extract. Add 2-3 drops of $fecl_3$ solution.	Black colour observed.	Tannin is present.

Table no.10 Result Tannin Test

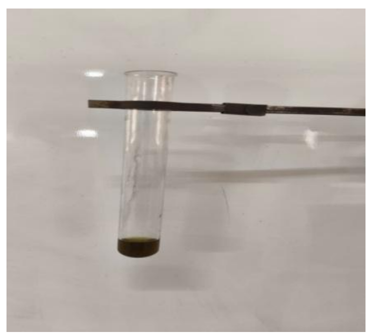

Fig no. 8 Result Tannin Test

Terpenoids Test

1.Salkowski's Test: Take 2ml plant extract. Add 2ml choloform. Carefully add 2-3 ml conc.H_2SO_4. Along the side of the test tube.	Brown ring at junction.	Terpenoid is present.

Table no.11 Result Terpenoids Test

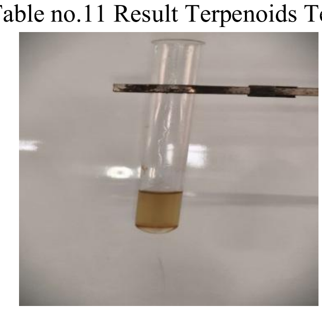

Fig no.9 Result Terpenoids Test

Ash value:

Ash Value (% w/ w) = 5 % w/w

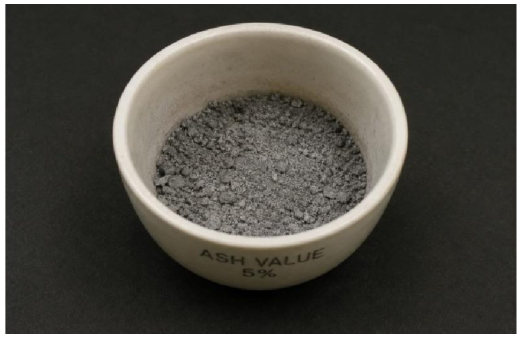

Fig no.10 Ash Value

Loss of Drying

Loss of Drying (% w/w) = 10% w/w


Fig no.11 Loss of Drying

Anti-Diabetic Assay By Titration Method:

Observation Table:

Concentration (µg/mL)	Initial reading	Final reading	Titre value	Percentage Inhibition
0 (Blank)	0.0	10.0	10.0	-
20	0.0	9.5	9.5	5%
40	0.0	8.7	8.7	13%
60	0.0	6.5	6.5	35%
80	0.0	6	6	40%
100	0.0	5	5	50%

Table no. 12 Observation Table of Anti-Diabetic Assay

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 11, May 2026
Impact Factor: 8.2

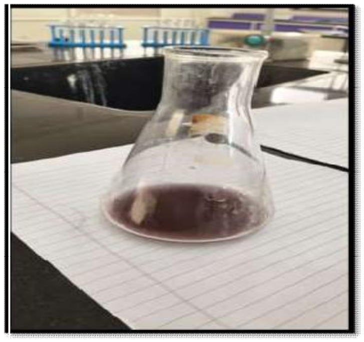

Fig no. 12 Result of Anti-Diabetic Assay By Tiration Method

VI. CONCLUSION

The present study was conducted to investigate the phytochemical constituents, physicochemical parameters, and antidiabetic potential of Cryptostegia madagascariensis leaf extract. The plant leaves were collected, authenticated, shade dried, powdered, and extracted by Soxhlet extraction using ethanol as the solvent. The extraction method successfully yielded a concentrated extract containing biologically active compounds.

Preliminary phytochemical screening revealed the presence of important secondary metabolites such as alkaloids, flavonoids, saponins, tannins, phenolic compounds, and terpenoids. These phytoconstituents are known for their therapeutic significance and may contribute to various pharmacological activities including antioxidant, anti-inflammatory, antimicrobial, and antidiabetic effects. The presence of flavonoids and phenolic compounds particularly indicates strong antioxidant potential.

The physicochemical evaluation of the crude drug showed an ash value of 5% w/w and loss on drying of 10% w/w. These values indicate acceptable purity, low inorganic contamination, and suitable moisture content, thereby supporting the quality and standardization of the plant material.

The in-vitro antidiabetic assay demonstrated that the ethanolic extract exhibited concentration-dependent inhibitory activity. The percentage inhibition increased progressively with increasing concentration of the extract, reaching maximum inhibition of 50% at 100 µg/mL. This suggests significant antidiabetic potential of the plant extract, which may be attributed to the synergistic action of phenolic and flavonoid compounds involved in glucose metabolism and antioxidant defense mechanisms.

Overall, the findings of the study support the medicinal importance of Cryptostegia madagascariensis as a promising natural source of bioactive compounds with antidiabetic activity. However, further detailed pharmacological, toxicological, and clinical investigations are required to isolate the active constituents, determine the exact mechanism of action, and establish its safety and therapeutic efficacy for future herbal drug development.

REFERENCES

1. Harborne JB. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. 3rd ed. London: Chapman & Hall; 1998.
2. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 52nd ed. Pune: Nirali Prakashan; 2016.
3. Trease GE, Evans WC. Pharmacognosy. 16th ed. London: Saunders Elsevier; 2009.
4. Khandelwal KR. Practical Pharmacognosy: Techniques and Experiments. 23rd ed. Pune: Nirali Prakashan; 2015.
5. Sofowora A. Medicinal Plants and Traditional Medicine in Africa. 3rd ed. Ibadan: Spectrum Books; 2008.
6. Evans WC. Trease and Evans Pharmacognosy. 15th ed. Edinburgh: Elsevier; 2002.
7. World Health Organization. Quality Control Methods for Herbal Materials. Geneva: WHO; 2011.
8. Mukherjee PK. Quality Control of Herbal Drugs. New Delhi: Business Horizons; 2007.

9. Kirtikar KR, Basu BD. Indian Medicinal Plants. Vol. 2. Allahabad: Lalit Mohan Basu; 1999.
10. Wagner H, Bladt S. Plant Drug Analysis: A Thin Layer Chromatography Atlas. Berlin: Springer; 2009.
11. Tiwari P, Kumar B, Kaur M, Kaur G, Kaur H. Phytochemical screening and extraction: a review. Int Pharm Sci. 2011;1(1):98-106.
12. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of medicinal plants. Afr J Biotechnol. 2005;4(7):685-688.
13. Parekh J, Chanda S. In vitro antimicrobial activity and phytochemical analysis of medicinal plants. Turk J Biol. 2007;31:53-58.
14. Oyaizu M. Studies on products of browning reaction prepared from glucose amine. Jpn J Nutr. 1986;44:307-315.
15. Brand-Williams W, Cuvelier ME, Berset C. Use of free radical method to evaluate antioxidant activity. LWT Food Sci Technol. 1995;28:25-30.
16. Grover JK, Yadav S, Vats V. Medicinal plants of India with anti-diabetic potential. J Ethnopharmacol. 2002;81:81-100.
17. Bailey CJ, Day C. Traditional plant medicines as treatments for diabetes. Diabetes Care. 1989;12:553-564.
18. Marles RJ, Farnsworth NR. Antidiabetic plants and their active constituents. Phytomedicine. 1995;2:137-189.
19. Kwon YI, Apostolidis E, Shetty K. Evaluation of anti-diabetic activity of plant extracts. Asia Pac J Clin Nutr. 2008;17:1-8.
20. Patel DK, Kumar R, Laloo D, Hemalatha S. Diabetes mellitus and medicinal plants. Asian Pac J Trop Dis. 2012;2:320-330.
21. Gupta RK, Kesari AN, Murthy PS. Hypoglycemic activity of herbal plants. J Ethnopharmacol. 2005;99:75-81.
22. Modak M, Dixit P, Londhe J, Ghaskadbi S, Devasagayam TPA. Indian herbs and herbal drugs used for treatment of diabetes. J Clin Biochem Nutr. 2007;40:163-173.
23. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2014;37:S81-S90.
24. OECD Guidelines for Testing of Chemicals. Repeated Dose Toxicity Studies. Paris: OECD; 2008.