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Antidiabetic Potential of *Lantana camara* Flower Extract: Phytochemical analysis and enzyme inhibition studies

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ABSTRACT

Lantana camara, a medicinal herb with a wide geographical presence, has been traditionally used for various therapeutic purposes. In this study, the ethanol extract of *Lantana camara* was investigated for its bioactive constituents and in-vitro antidiabetic activity. Preliminary phytochemical screening confirmed the presence of key secondary metabolites including flavonoids, alkaloids, phenolics, and terpenoids compounds known for their pharmacological properties. Advanced characterization techniques such as UV–Visible spectroscopy, FTIR, and GMS were employed to further analyze the extract. UV–Visible analysis suggested the presence of conjugated systems typical of polyphenolic compounds. FTIR spectroscopy indicated characteristic peaks corresponding to functional groups like hydroxyl (-OH), carbonyl (-*C* = *O*), and ketone, all associated with potential antidiabetic action. GCMS analysis revealed various phytochemicals with reported bioactivities, supporting the medicinal value of the extract. To evaluate the antidiabetic potential, in-vitro enzyme inhibition assays were conducted targeting α-amylase and β-glucosidase enzymes, The IC_{5n} value of the ethanol extract for α-amylase inhibition was found to be 318.95 ± 2.73 µg/mL, and for β-glucosidase inhibition, it was 313.95 ± 2.45 µg/mL. These were compared with the standard drug acarbose, which showed IC_{5n} values of 58.24 ± 1.38 µg/mL and 44.41 ± 0.097 µg/mL respectively under similar conditions. Although the extract exhibited a lower potency than the standard, it showed a notable inhibitory effect, suggesting the potential of *Lantana camara* as a natural source for managing diabetes through enzyme inhibition mechanisms.

Abbreviations: Ferric chloride; Sulfuric acid; Hydrochloric acid; Fourier Transform Infrared Spectroscopy; Gas Chromatography Mass spectroscopy; Ultraviolet-Visible Spectroscopy

1. Introduction

Lantana camara, belonging to the family Verbenaceae which has drawn significant interest due to its potential for medicinal benefits especially particularly in diabetes control [1]. Diabetes, which is a chronic metabolic disorder with ongoing hyperglycemia, is a global health problem due to its expanding prevalence and implications [2]. The conventional therapies, including insulin therapy and oral hypoglycemic drugs, are likely to have some drawbacks, such as side effects and reduced long-term effectiveness [3], which has triggered a growing interest in phytotherapeutic interventions [4]. *Lantana camara* contains bioactive compounds, such as flavonoids, alkaloids, tannins, saponins, terpenoids and polyphenols, which exert antioxidant, anti-inflammatory and antidiabetic activities [5,6]. These compounds improve glucose regulation, enhance insulin sensitivity and maintain pancreatic β-cell function [5,2,7]. Studies suggest that they have inhibitory actions on enzymes in carbohydrate metabolism [4,8] and reduce pancreatic damage by oxidative stress [5,9]. *Lantana camara*, native to the tropical and subtropical Central and South American countries, has attained worldwide spread by virtue of its impressive propensity to survive a variety of climatic conditions [10,11]. Leaf decoctions are used as anti-inflammatory and to treat respiratory infections in Nigeria. Leaf and flower extracts are used as analgesics and antimicrobials in South American ethnomedicine (e.g., in Brazil for treating cuts and gastrointestinal disorders) [12]. *Lantana camara* has received significant attention in traditional medicine practices due to its antibacterial, anti-inflammatory, antimicrobial and analgesic activities [13]. Varying parts of the plant, including leaves, flowers, stems, and roots are used in controlling a range of health condi-

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Fig. 1. Sample Collection.

Fig. 2. Sample kept for shade drying.

tions, from dermatological infections and respiratory conditions to gastrointestinal conditions [12]. It has wound-healing activity, alleviation of respiratory conditions, fever reduction and treatment of snakebite indicate its medicinal diversity [14]. However, the toxicity of the plant, especially with immature fruits need requires careful formulation and regulation of dosage to guarantee safety [15,16]. The objective of this research is to investigate the pharmacological potential of *Lantana camara* especially focus on the floral part, with emphasis on its bioactive compounds and therapeutic uses, particularly in diabetes regulation.

2. Materials and methods

2.1. Collection and extraction of samples

2.1.1. Collection of lantana camara flower samples

The fresh aerial flowers were collected from Vel Tech High Tech College campus, Morai, Tamil Nadu, India, for the analysis of its phytochemical properties and anti-diabetic activity (Fig. 1). After the collection of samples, they were kept in the shade dry for 1 week (Fig. 2) and was grinded into fine powder for maceration extraction (Fig. 3).

2.1.2. Preparation of lantana camara flower extract

Flowers of *Lantana camara* were dried in shade and powdered. About 10 g of powdered floral part were soaked in 150 ml ethanol for one week in a beaker and mixture was stirred every 12 h using a shaking incubator for maceration [17–19].

Fig. 3. Dried sample.

2.2. Phytochemical analysis

Qualitative analysis was performed for the liquid extracts (Ethanol) of the floral part using standard protocols [20,21].

1. Alkaloids: [Mayer's Test] 1 ml of extract + 2 drops of Mayer's Reagent was added.
2. Steroids: [Salkowski Test] 1 ml of extract dissolved in minimum of chloroform + 2 ml acetic anhydride + two drops of concentrated H_2SO_4 were added.
3. Phenolics: [Ferric Chloride Test] 1 ml of extract + 5 ml of distilled water + 2 drops of 5 % $FeCl_3$ were added.
4. Tannins: [Ferric Chloride Test] 1 ml of extract +5 ml of distilled water + 2 drops of 5 % $FeCl_3$ were added.
5. Flavonoids: [Shinoda Test] 1 ml of extract + 5 ml of alcohol magnesium ribbon concentrated HCL were added and heated in a water bath.
6. Glycosides: [Borntrager's Test] 1 ml of extract + 1 ml of H_2SO_4 + 1 ml of Chloroform and few drops of 10 % Ammonia solution.
7. Terpenoids: [Liebermann-Burchard Test] 1 ml of extract + 2 ml of Chloroform + acetic anhydride and few drops of H_2SO_4 were added.
8. Quinones: [Sulphuric Acid Test] 1 ml of extract few drops of concentrated H_2SO_4 were added.
9. Saponins: [Frothing Test] 1 ml of extract + distilled water made up to 20 ml. Shaken in graduated cylinder for 15 min.

2.3. Characterization

2.3.1. Fourier transform infrared spectroscopy

The pellet sample of ethanol extracted *Lantana camara* (2 μl) was analyzed using FTIR (Fourier transform infrared spectroscopy) on Thermo Nicolet iS5 to identify functional groups in the extract. To improve the spectra, background air spectra were removed from spectra recorded between 4000–650 cm^{-1} at 16 cm^{-1} resolution. The ATR (Attenuated Total reflectance) crystal (sample spotting spot) was cleaned after each reading with 70 % ethanol [22,23].

2.3.2. Gas chromatography mass spectroscopy

2 μl ethanol extract of *Lantana camara* was used for GCMS analysis at the Sathyabama Institute of Science and Technology in' Chennai, Tamil Nadu, India. GCMS system (GCMS-QP2010, Shimadzu Kyoto, Japan) was employed, which included an auto-injector (AOC-20i), a headspace sampler (AOC-20 s), and a silica capillary column (Rtx-5). Initially, the oven temperature was set at 50 °C, gradually increasing to 280 °C. The MS detector detected a unique peak. Compounds were identified based on retention time and their mass was determined using

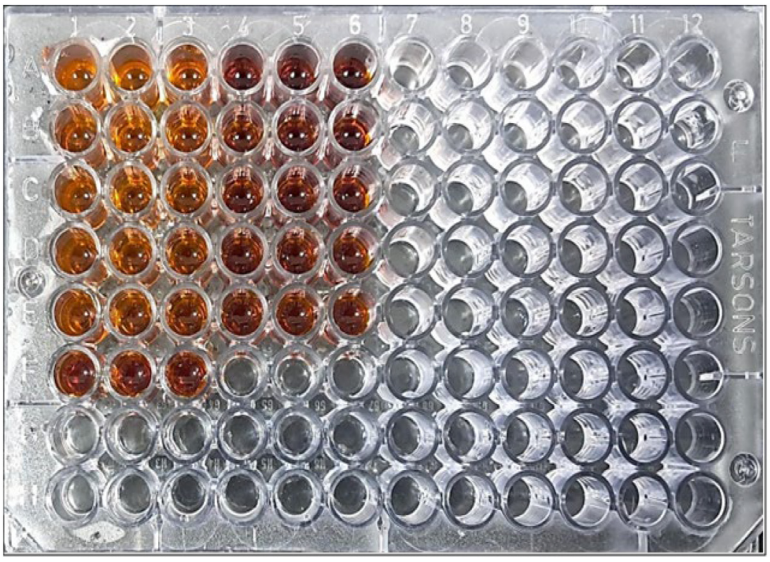

Fig. 4. α-Amylase inhibition assay showing color development in different concentrations (1000–50 µg/mL) of standard acarbose (Wells 1A-3E) and *Lantana camara* extract (Wells 4A-6E), with controls (Wells F1-F3).

GCMS under comparable conditions [24,25]. Peak area was utilized to quantify chemicals. The resulting spectral data for peaks was compared to library data providing mass spectra (WILEY8 and NIST23). The total running duration of the GCMS was 33 min. Peak area normalization was used to compare the relative percentages of individual constituents [26].

2.3.3. UV–VIS spectroscopy

2 μl of sample (ethanol extract of *Lantana camara*) was used for UV–VIS analysis at the Sathyabama Institute of Science and Technology in‘ Chennai, Tamil Nadu, India. The analysis was turned on and allowed to stabilize, with the wavelength range set to 200–1000 nm.

2.4. Antidiabetic property

Anti-diabetic assays are essential experimental techniques used to assess how well chemicals, extracts, or substances work to improve insulin sensitivity and lower blood glucose levels [27,28]. These tests can be carried out in vitro, for example, by evaluating the inhibition of digestive enzymes like α-amylase and α-glucosidase, or by assessing the uptake of glucose in cells that are sensitive to insulin [29,30]. Fig 4

2.4.1. In vitro α-Amylase inhibition assay

The α-amylase inhibition assay was performed using the chromogenic DNSA (3,5-dinitrosalicylic acid) method [31] with slight modifications. The assay mixture contained 500 μL of test samples/standard drug (acarbose) at different concentrations (50, 100, 250, 500, 1000 µg/mL), 500 μL of 0.02 M sodium phosphate buffer (pH 6.9 with 0.006 M NaCl), and 500 μL of α-amylase solution (0.5 mg/mL in buffer). After 10 min of incubation at 25 °C, 500 μL of 1 % starch solution (in 0.02 M sodium phosphate buffer, pH 6.9) was added and incubated for additional 20 min at 25 °C. The reaction was stopped by adding 1 mL of DNSA color reagent (96 mM 3,5-dinitrosalicylic acid, 5.31 M sodium potassium tartrate in 2 M NaOH). The test tubes were incubated in boiling water bath for 5 min, then cooled to room temperature. Each mixture was diluted with 10 mL of distilled water, and absorbance was measured at 546 nm using a UV–visible spectrophotometer. Sodium phosphate buffer (0.02 M, pH 6.9) was used as control [32]. All experiments were performed in triplicate, and the percentage of inhibition was calculated using the formula:

$$I\% = (A_c - A_s)/A_c \times 100 \quad (1)$$

where A_c is the absorbance of the control

A_s is the absorbance of the sample

2.4.2. In vitro β -Glucosidase inhibition assay

A mixture of 10 µL β-glucosidase (0.1U/mL) and 20 µL of varying sample concentrations (50, 100, 250, 500, 1000 μg/mL) (Fig. 5) was combined with 50 µL of 100 mM sodium phosphate buffer (pH 6.8) and incubated at 37 °C for 20 min. Subsequently, 20 µL of 1 % maltose was introduced, and the mixture underwent an additional 30-minute incubation at 37 °C. To halt the reaction, 50 µL of Sodium carbonate (0.1 M) was added. The positive control comprised a buffer instead of the sample, while the negative control involved the addition of sodium carbonate to inhibit enzyme activity. Absorbance was measured at 410 nm, and the activity was calculated using the provided formula [33].

$$I\% = (A_c - A_s)/A_c \times 100 \quad (2)$$

where A_c is the absorbance of the control

A_s is the absorbance of the sample.

2.5. Statistical analysis

All experiments were performed in triplicate, and data are presented as mean ± standard deviation (SD). Statistical analysis was performed using GraphPad Prism software (version 8.0, GraphPad Software Inc., San Diego, CA, USA). The IC50 values (concentration causing 50 % inhibition) were calculated using non-linear regression analysis [34]. One-way analysis of variance (ANOVA) followed by Tukey's post-hoc test was used to determine significant differences between multiple groups. P values < 0.05 were considered statistically significant. IC50 values were determined using the non-linear regression analysis feature of GraphPad Prism software (version 8.0). The dose-response curves were plotted with the log of concentration on the X-axis and the percentage inhibition on the Y-axis. Each experiment was conducted in triplicate ($n = 3$), and results are expressed as mean ± standard deviation. The goodness of fit was evaluated using the R^2 value, with values closer to 1.0 indicating better fitting of the model [35].

3. Results

3.1. Phytochemical profiling and spectroscopic characterization

3.1.1. Authentication and validation of sample

The floral part of *Lantana camara* was authenticated at Siddha Central Research Institute Chennai and the authentication certificate is shown in Fig. 6.

Fig. 5. β-Glucosidase inhibition assay demonstrating enzyme inhibition patterns at varying concentrations (1000–50 µg/mL) of acarbose standard (Wells 1A-3E) and *Lantana camara* extract (Wells 4A-6E), with corresponding controls (Wells F1-F3).

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Forma No. PCOG002-ACF 13.01.2025

AUTHENTICATION CERTIFICATE FOR 1077.13012501

Certified that the sample submitted by Ponmozhi M, B.Tech Biotechnology, Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Avadi was identified as:

Code	Botanical Name	Part
L13012501C	*Lantana camara* L.*	Inflorescence

L13012501C

*WFO (2025): *Lantana camara* L. Published on the Internet; http://www.worldfloraonline.org/taxon/wfo-0000223016; Accessed on 13 Jan 2025

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Fig. 6. Authentication certificate for *Lantana camara* species obtained from Siddha Central Research Institute, Chennai.

3.1.2. Preliminary phytochemical screening

The qualitative study of *Lantana camara* reveals the presence of a number of secondary metabolites which have therapeutic values and that are considered to be good constituents which leads to elucidation of the value based secondary metabolite component which is indulged in *Lantana camara.* The phytochemical studies with ethanol extracts of floral part of *Lantana camara* showed (Table 1) to possess secondary metabolites according to their established biosynthetic origin and classification in reputable literature and phytochemical databases

3.1.3. FTIR spectral results

FTIR spectroscopy identifies pharmacologically active molecules in natural products using peak values from the FTIR spectrum. The FTIR spectra of bioactive chemicals differ from one another, providing a unique qualitative analysis and chemical fingerprint [36,37]. (FTIR analysis was used to determine the functional group of *Lantana camara* floral extract. The floral extract revealed the existence of many functional groups. Fig. 1 shows that both extracts include a variety of functional metabolite groups, as indicated by many peaks (Fig. 7). The extracts contained N–H, C–H, OH, and $C = O$ skeletal vibrations, indicating the presence of metabolites like amines, phenolics, alkanes, ester, and aldehydes [38,39]. FTIR spectroscopy alone is insufficient to identify different types of molecules in an extract [40,41].

3.1.4. GC–MS profiling of bioactive compounds

The ethanol extract of *Lantana camara* for its phytochemical constituents by using GCMS analysis method and revealed the occurrence of 10 components (Fig. 8). The components were; Lipids such as 1,2,3-Propanetriol (Glycerol), tetradecanoic acid (Myristic Acid), and n-Hexadecanoic acid (Palmitic Acid) that play critical roles in cell membrane stability, energy metabolism, and insulin sensitivity modification, all of which contribute to possible metabolic regula-

Table 1
Phytochemical analysis of *Lantana camara* floral part.

Phytochemicals	Test	Blank	Ethanol extract
Alkaloids	Mayer's Test	–	–
Steroids	**Salkowski Test**	**–**	**Light pink ring → "++"**
Phenolics	**Ferric chloride Test**	**–**	**Blue – black → +++**
Tannins	**Ferric chloride Test**	**–**	**Blue - black→ +++**
Flavonoids	**Shinoda Test**	**–**	**Pinkish-red coloration → ++**
Glycosides	**Borntrager's test**	**–**	**Light pink at the interface → +**
Terpenoids	**Liebermann-Burchard Test**	**–**	**Blue-green → ++**
Quinones	**Sulphuric acid Test**	**–**	**Bright red → +++**
Saponins	**Frothing Test**	–	–

Strong presence + + +; Moderate presence ++; Mild Presence +; Absent –.

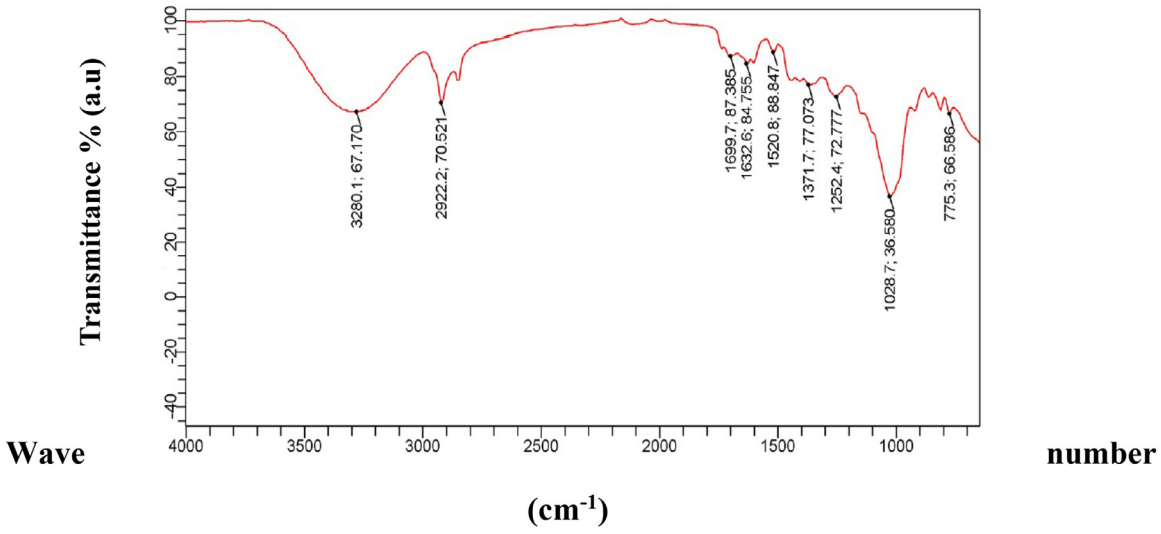


Fig. 7. FTIR spectrum of *Lantana camara* flower extract showing characteristic absorption peaks corresponding to functional groups present in bioactive compounds.

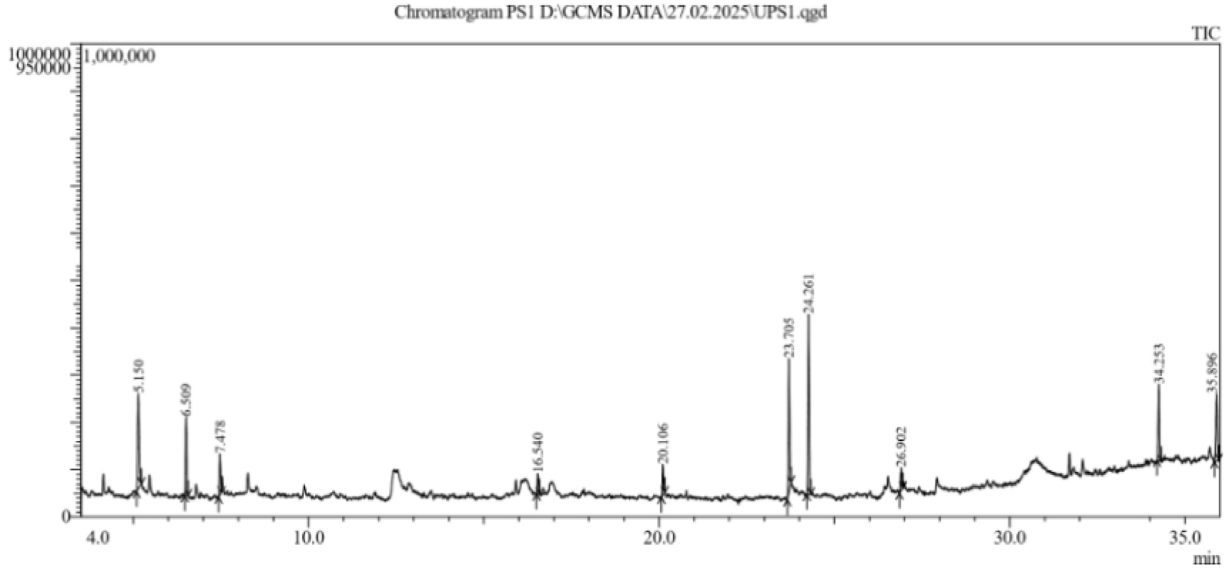


Fig. 8. GC–MS chromatogram of *Lantana camara* flower extract revealing the presence of various bioactive phytoconstituents.

tion [42]. Phenolic substances, such as Benzenepropanoic acid (a phenylpropanoid derivative) and Diethyl Phthalate (a phthalate ester), have antioxidant and anti-inflammatory properties that aid in oxidative stress reduction and enzyme modulation, making them useful in diabetes treatment [43,44]. Terpenoids like Squalene, a triterpenoid, and Tetrapentacontane, a long-chain hydrocarbon found in plant waxes, help regulate glucose metabolism, protect pancreatic β-cells, and boost antioxidant defense, improving insulin function [45,46].

3.1.5. *UV–Vis spectral analysis of* lantana camara *flower extract*

Based on the Fig. 9, the optimum wavelength for absorption in the visible light region is 330 nm, which characterizes coloured compounds [47,48].

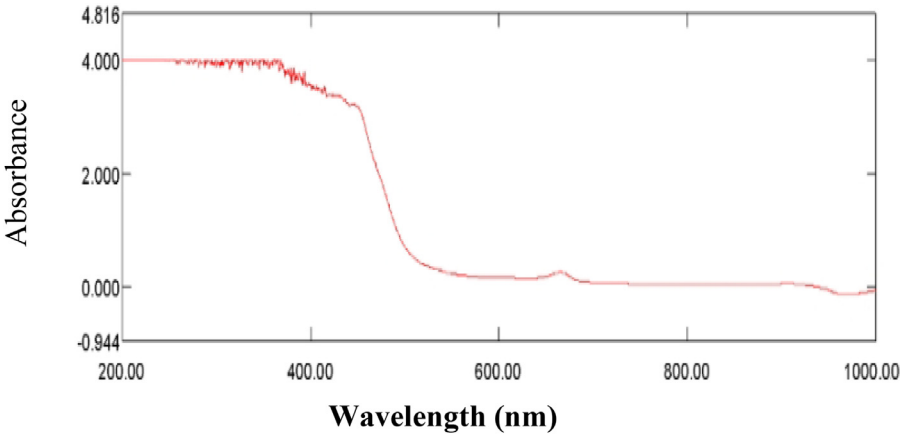


Fig. 9. UV–VIS absorption spectrum of *Lantana camara* flower extract showing characteristic peaks in the 200–1000 nm wavelength range.

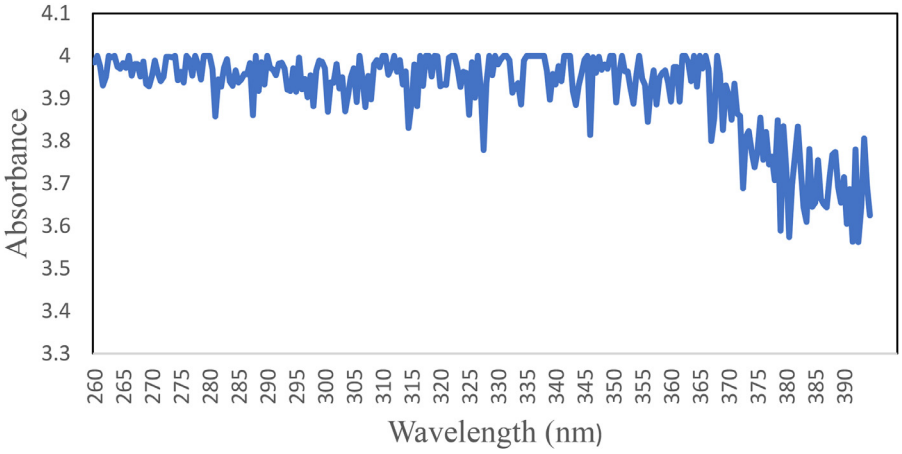


Fig. 10. Detailed UV–VIS absorption spectrum (260–440 nm) of *Lantana camara* flower extract highlighting the region associated with flavonoids and phenolic compounds.

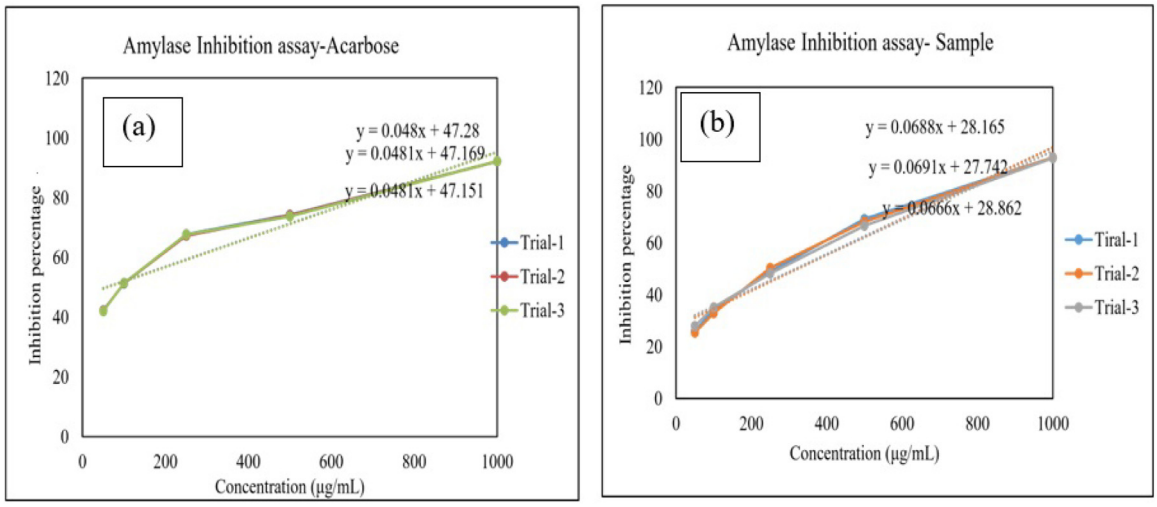


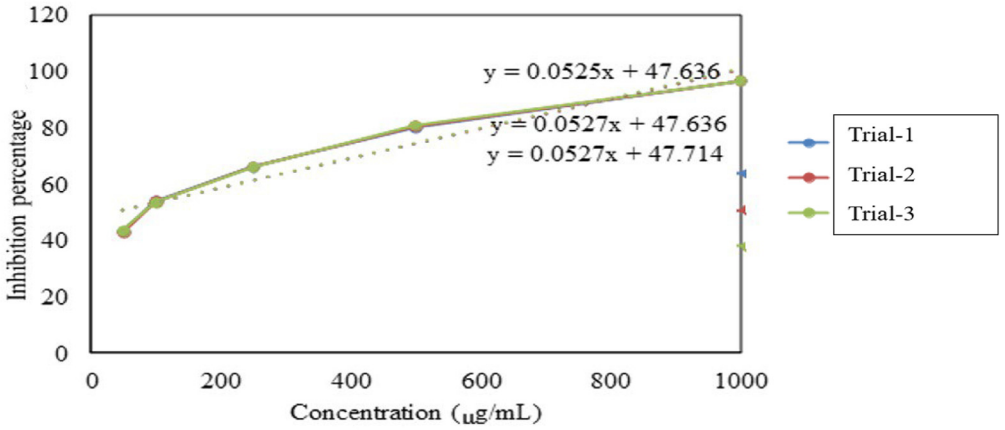
Fig. 11. (a) & (b) Comparative analysis of α-amylase inhibition: (a) Dose-response curve of standard acarbose; (b) Dose-response curve of *Lantana camara* flower extract showing IC_{5n} values.

UV–VIS data (Fig. 10) indicates a substantial absorbance (~4) between 200–233 nm, possibly due to excessive concentration or instrument saturation [47]. Between 234 and 360 nm, absorbance decreases significantly (~3.89), suggesting modest electronic transitions typical of aromatic compounds [38,49]. From 360 to 500 nm (~0.7), there is a progressive drop, indicating that chromophores absorb less. Beyond 500 nm, absorbance reduces to <0.2, indicating negligible visible light absorption. Negative values between 940 and 1000 nm may suggest baseline correction difficulties. The spectrum indicates significant UV absorption, typical of conjugated systems, flavonoids, or phenolics, with little to no visible light absorption.

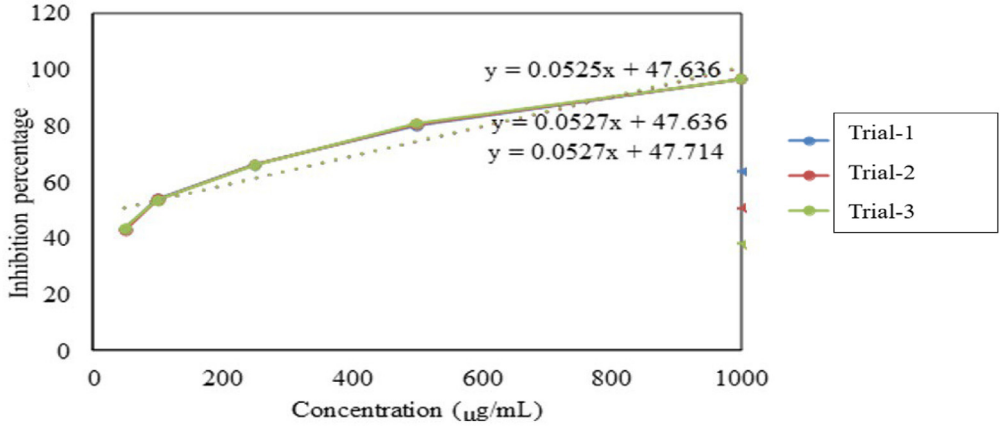
3.2. *Evaluation of antidiabetic efficacy of* lantana camara *flower extract*

3.2.1. *Assessment of antidiabetic activity via α amylase inhibition*

Anti-diabetic assay of ethanol extract of *Lantana camara* (Fig. 11) and α-amylase enzyme inhibitory activity was IC_{50} 318.95±2.73 µg/mL respectively with reference to standard acar-



(a) Glucosidase Inhibition assay-Acarbose



(b) Glucosidase Inhibition assay- Sample

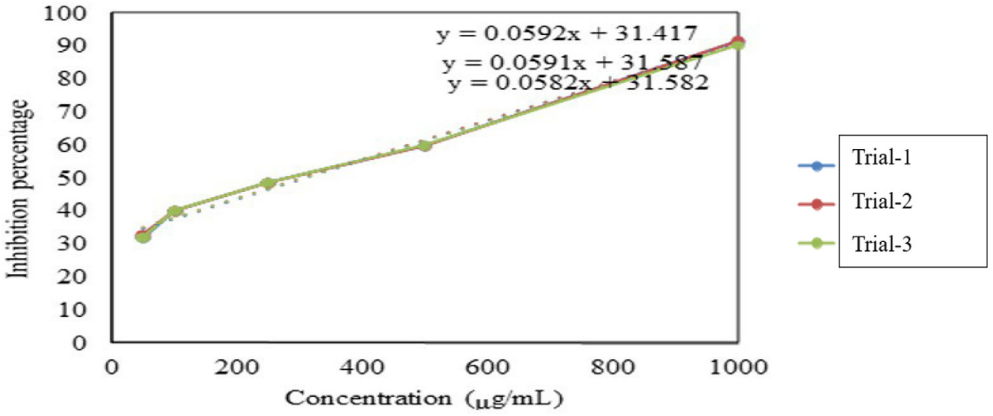


Fig. 12. (a) & (b). Comparative analysis of β-glucosidase inhibition: (a) Dose-response curve of standard acarbose; (b) Dose-response curve of *Lantana camara* flower extract showing IC_{5_n} values.

bose IC_{50} of 58.24±1.38 µg/mL under similar experimental conditions [32,50].

The α-amylase inhibition assay showed that the reference medication, Acarbose, had a much lower IC_{5_n} value of 58.24±1.38 µg/mL, indicating considerable inhibitory efficacy. The *Lantana camara* extract had a greater IC_{5_n} value (318.95±2.73 µg/mL), indicating reduced yet significant enzyme inhibition. The extract has potential as a natural α-amylase inhibitor, albeit less powerful than the standard.

3.2.2. *Assessment of antidiabetic activity via β-glucosidase inhibition*

Anti-diabetic assay of ethanol extract of *Lantana camara* and β-glucosidase enzyme inhibitory activity was IC_{50} 313.95±2.45 µg/mL respectively with reference to standard acarbose IC_{50} of 44.41±0.097 µg/m/L (Fig. 12) under similar experimental conditions [51,52].

The α-glucosidase inhibition assay revealed that the standard medication (Acarbose) had a low IC_{5_n} value of 44.41±0.097 µg/mL, indicating high inhibitory capability. The *Lantana camara* extract

Table 2
Major compounds in FE (Floral extract).

S.NO	Wavenumber (cm^{-1})	Intensity	Functional group	Biological Activity
1.	775.28	66.58	C-H Bending (Aromatic compounds or Alkenes)	Antioxidant and Antibacterial effects
2.	1028.74	36.57	C–O Stretching (Alcohols, Ethers or Polysaccharides)	Antimicrobial and Anti-inflammatory effects
3.	1252.38	72.77	C-O Stretching (Esters, Carboxylic acids)	Enzyme Inhibitor and Antiviral activity
4.	1371.66	77.07	C–H Bending (Alkanes)	Structural Role in Lipids
5.	1520.75	88.84	*C = C* Stretching (Aromatic rings)	Cytotoxic effects and Antifungal activity
6.	1632.57	84.75	*C = O* Stretching (Amides, Ketones)	Anti-cancer, Antioxidant and Antidiabetic activity
7.	1699.66	87.38	*C = O* Stretching	Antimicrobial and Antitumor effects
8.	2922.23	70.52	C-H Stretching	Energy Storage in Biomolecules
9.	3280.05	67.16	O–H Stretching (Hydroxyl)	Protein Interaction, Antiviral and Antidiabetic activity

had a higher IC_{5n} value (313.97±2.45 μg/mL), indicating moderate enzyme inhibition. Although less powerful than the standard, the extract shows promising α-glucosidase inhibitory activity, suggesting a possible function in controlling postprandial blood glucose levels.

4. Discussion

The goal of this study was to investigate the antidiabetic potential of flower extract of *Lantana camara*, a traditional medicinal herb with a variety of pharmacological properties [14]. The bioactive chemicals were assessed for their capacity to inhibit important enzymes, including α-amylase and α-glucosidase, involved in the metabolism of carbohydrates [53,54]. The findings highlight the plant's therapeutic potential for the treatment of diabetes and support the ethnomedical claims made about it. The crude extract contained flavonoids, tannins, terpenoids, quinones, and phenolics according to phytochemical examination [5]. By increasing insulin secretion [2], boosting glucose absorption [4] and blocking the enzymes that break down carbohydrates [3], these kinds of drugs have been shown to have antidiabetic effects in the past [55,56]. Certain chemicals, such as lantadene A, oleanolic acid, and ursolic acid, which are known to have hypoglycemic effects, were found by GC–MS and/or HPLC analysis [57].

The α-amylase and α-glucosidase activities were both markedly and dose-dependently reduced by the *Lantana camara* extract, according to in vitro tests. This raises the possibility of a mechanism akin to that of synthetic antidiabetic medications such as acarbose, which work by postponing the intestinal absorption and digestion of carbohydrates [3]. Nonetheless, the extract's natural source might be advantageous in terms of fewer adverse effects and improved patient adherence [58,59].

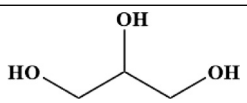
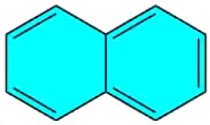
Remarkably, at some dosages, the extract's effectiveness in enzyme inhibition tests was on par with or superior to that of conventional medications, confirming *Lantana camara*'s potential as a medicinal agent. It is crucial to remember that in order to properly evaluate pharmacokinetics, bioavailability, and possible toxicity, these in vitro results must be confirmed in vivo [60,61].

Furthermore, the current findings are supported by the traditional usage of *Lantana camara* in folk medicine to treat diabetes. However, additional toxicological screening is necessary prior to clinical application due to the recognised toxicity associated with certain lantana species, particularly their hepatotoxic and phototoxic effects in animals [62]. All things considered, the study offers strong proof that *Lantana camara* contains bioactive substances with strong antidiabetic effects, indicating that it may be used as an adjuvant or alternative treatment for diabetes. In order to prove efficacy and safety in humans, future research should concentrate on separating pure molecules, clarifying their precise mechanisms of action, and carrying out clinical trials.

5. Conclusion

This study provides evidence for the antidiabetic potential of *Lantana camara* flower extract through in vitro α-amylase and β-glucosidase inhibition assays. The extract demonstrated moderate inhibitory activity with IC50 values of 318.95 ± 2.73 μg/mL for α-amylase and 313.97 ± 2.45 μg/mL for β-glucosidase, which were statistically significant though less potent than the standard drug acarbose ($p < 0.001$). Phytochemical characterization through FTIR, GCMS, and UV–VIS spectroscopy confirmed the presence of bioactive compounds including phenolics, flavonoids, and terpenoids, which likely contribute to the observed enzyme inhibitory effects. The FTIR analysis identified functional groups associated with antidiabetic properties, particularly hydroxyl and carbonyl groups, while GCMS analysis revealed specific compounds with potential glucose-regulating activities. The findings suggest that *Lantana camara* flower extract could potentially serve as a natural adjuvant in diabetes management, particularly for postprandial hyperglycemia control through carbohydrate-digesting enzyme inhibition. The quantitative phytochemical analysis and toxicological evaluation of Lantana camara extracts also warrant further investigation to ensure safety and efficacy for potential therapeutic applications, especially considering the known toxicity of certain *Lantana* species. Tables 1–5

Table 3
Major compounds in FE through GCMS– analysis.

S.NO	Compound Name	Molecular Formula	Molecular Structure	Ret. Time	Area %	Phytochemical
1.	1,2,3-Propanetriol (Glycerol)	$C_3H_8O_3$		5.150	15.65	Lipids
2.	Naphthalene	$C_{1n}H_8$		6.509	9.71	Aromatic hydrocarbon

(*continued on next page*)

Table 3 (*continued*)

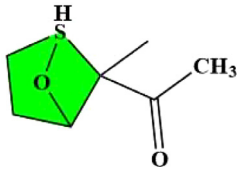
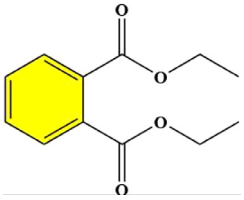
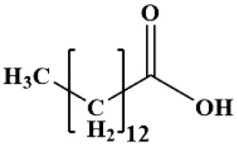
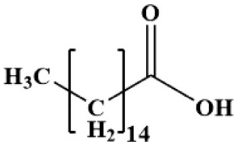
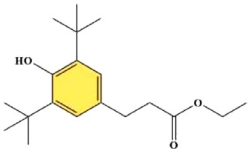
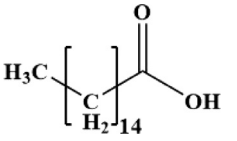
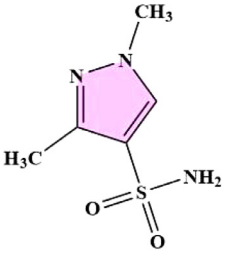
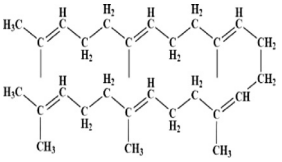
S.NO	Compound Name	Molecular Formula	Molecular Structure	Ret. Time	Area %	Phytochemical
3.	Ketone, methyl 2-methyl-1,3-oxothiolan-2-yl	$C_6H_{1n}O_2S$		7.478	5.17	Ketone
4.	Diethyl Phthalate	$C_{12}H_{14}O_4$		16.540	2.56	Phenolic compound
5.	Tetradecanoic acid (Myristic Acid)	$C_{14}H_{28}O_2$		20.106	3.72	Lipids
6.	n-Hexadecanoic acid (Palmitic Acid)	$C_{16}H_{32}O_2$		23.705	16.52	Lipids
7.	Benzene propanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-, ethyl ester	$C_{19}H_{3n}O_3$		24.261	22.18	Phenolic compound
8.	Hexadecanoic acid (Palmitic Acid)	$C_{16}H_{32}O_2$		26.902	3.12	Lipid
9.	1,3-dimethyl-1H-pyrazole-4-sulfonamide	$C_{54}H_{11n}$		34.253	10.17	Terpenoids
10.	Squalene	$C_{3n}H_{5n}$		35.896	11.19	Terpenoids

Table 4
Inference of α-amylase inhibition assay.

Sl.NO	Treatment	Amylase inhibition (IC_{50}) (µg/mL)
1.	Acarbose (Standard)	58.24±1.38
2.	*Lantana camara* extract	318.95±2.73

Table 5
Inference of β-glucosidase inhibition assay.

Sl.NO	Treatment	Glucosidase inhibition (IC_{50}) (µg/mL)
1.	Acarbose (Standard)	44.41±0.097
2.	*Lantana camara* extract	313.97±2.45

Consent for publication

All authors give their consent for this publication

Ethical statement

This study does not deal with animal or human participants.

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Data availability

The data will be made available from the corresponding author upon reasonable request.

Declaration of competing interest

The authors disclose that they do not have any actual or potential conflict of interest including any financial, personal, or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, their work.

CRediT authorship contribution statement

Sathya Karunakaran: Resources, Project administration. **Ponmozhi Marimuthu:** Investigation, Conceptualization. **Panneerselvam Theivendren:** Validation, Methodology. **Yuvaraj Dinakarkumar:** Writing – review & editing, Validation.

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