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Research Paper

Preliminary Phytochemical Investigation and IR Spectroscopic Charecterization of Mimosa Pudica and Clitoria Ternatea Plant Extract

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The present study was aimed at evaluating the synergistic in-vitro antidiabetic activity of hydroalcoholic extracts of Mimosa pudica and Clitoria ternatea using the a-amylase inhibition assay. Plant materials were collected, shade-dried, powdered, and extracted using Soxhlet and maceration techniques. Preliminary phytochemical screening confirmed the presence of bioactive constituents such as flavonoids, alkaloids, tannins, phenolic compounds, saponins, terpenoids, and steroids in both extracts. Infrared spectroscopy (FTIR) analysis identified important functional groups including O-H, C=O, C-O, C-N, and aromatic C=C bonds, indicating the presence of phenolic and flavonoid compounds responsible for biological activity. The antidiabetic activity of the plant extracts will be evaluated by pancreatic a-amylase inhibition using the DNSA method. The extracts are expected to demonstrate significant enzyme inhibitory activity, indicating their potential to reduce carbohydrate breakdown and glucose absorption. Furthermore, the combined extracts of Mimosa pudica and Clitoria ternatea are expected to show enhanced inhibitory effects, suggesting a synergistic action in controlling postprandial hyperglycemia. The presence of phytoconstituents such as flavonoids, phenolic compounds, tannins, and alkaloids may contribute to this activity. These findings may indicate that both plants possess promising natural antidiabetic potential and could serve as safer herbal alternatives for diabetes management. However, further in-vivo studies and clinical investigations will be required to confirm their therapeutic efficacy, mechanism of action, and safety profile

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INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by high blood glucose levels due to insufficient insulin production or ineffective insulin action. Insulin is a hormone produced by the pancreas that helps glucose enter body cells to provide energy. When insulin is absent or does not function properly, glucose accumulates in the bloodstream, resulting in hyperglycemia.

The main types of diabetes are Type 1, Type 2, and gestational diabetes. Type 1 diabetes occurs when the body's immune system destroys insulin-producing cells, leading to complete insulin deficiency. Type 2 diabetes is the most common form and develops due to insulin resistance and reduced insulin production. Gestational diabetes occurs during pregnancy and may increase the risk of developing Type 2 diabetes later in life.

Common symptoms include frequent urination, excessive thirst, increased hunger, fatigue, blurred vision, slow wound healing, and unexplained weight loss. If not properly managed, diabetes can lead to complications affecting the heart, kidneys, eyes, nerves, and blood vessels.

Diagnosis is based on blood glucose tests such as fasting blood glucose, HbA1c, and oral glucose tolerance tests. Management involves maintaining normal blood sugar levels through a balanced diet, regular physical activity, blood glucose monitoring, oral antidiabetic medications, and insulin therapy when necessary. Proper management helps prevent complications and improves quality of life.

PLANT PROFILE:

Mimosa pudica:

Common Names:

Sensitive plant, Touch-me-not, Sleepy grass, Action plant, Shame plant

Botanical Source:

Mimosa pudica L.

Family:

Fabaceae (Leguminosae)

Geographical Source:

Asia: India, Sri Lanka, South Asia

Southeast Asia: Thailand, Philippines, Indonesia

Africa: West Africa, Madagascar

Scientific Classification:

- **Kingdom:** Plantae
- **Phylum:** Anthophyta
- **Class:** Dicotyledoneae
- **Order:** Fabales
- **Family:** Fabaceae
- **Genus:** Mimosa
- **Subfamily:** Mimosoideae

Parts Used:

• Leaves

Tamil Name:

[1] Thotta sinungi

Morphological Characters:

- **Shape:** Linear to oblong (leaflets); compound bipinnate leaves
- **Surface:** Slightly pubescent (hairy), especially on lower surface
- **Colour:** Bright to dark green
- **Odour:** Faint, not characteristic
- **Taste:** Slightly bitter, astringent

Texture and Size:

- **Texture:** Soft, delicate, sensitive to touch
- **Leaf Length:** 3–6 cm (entire leaf)
- **Width (leaflet):** 1–2 mm

Chemical Constituents:

- Alkaloids: Mimosine
- Flavonoids:quercetin,kaempferol
- Terpenoids
- Phenolic compounds
- Saponins
- Tannins
- Glycosides

Pharmacological Activities:

- Antioxidant
- Anti-inflammatory
- Antimicrobial
- Anticancer
- Antidiabetic
- Wound healing
- Neuroprotective effect

Description:

Mimosa pudica is a creeping perennial herb from the Fabaceae family, widely known for its thigmonastic movement—its leaves fold rapidly when touched. It is commonly called the "touch-me-not" plant and is distributed across tropical regions.

Clitoria ternatea:

Common Names:

Butterfly pea, Blue pea, Asian pigeonwings, Bunga Telang

Scientific name:

Clitoria ternatea

Family:

Fabaceae (Leguminosae)

Geographical Source:

• Native to tropical Asia, particularly India.

• Widely distributed throughout South and Southeast Asia including Sri Lanka, Thailand, Malaysia, Indonesia and the Philippines.

• Also found in tropical regions of Africa and Australia.

Parts Used:

• Leaves

Tamil Names:

• Sangu pushpam

• Sangu poo ilai

Scientific Classification:

• **Kingdom:** Plantae

• **Phylum:** Tracheophyta (Magnoliophyta)

• **Class:** Magnoliopsida

• **Order:** Fabales

• **Family:** Fabaceae

• **Genus:** Clitoria

• **Subfamily:** Faboideae

Morphological Characters:

• **Shape:** Ovate to elliptic

• **Surface:** Glabrous on upper surface and slightly pubescent on lower surface

• **Colour:** Bright to dark green

• **Odour:** Very subtle, mild faint scent

• **Taste:** Mild, earthy, slightly grassy

Texture and Size:

• **Texture:** Soft and thin, sometimes slightly hairy

• **Length:** 2–5 cm

• **Width:** 1.5–3 cm

Chemical Constituents:

• Flavonoids

• Anthocyanin glycosides

• Terpenoids

• Steroids
• Tannins
• Proteins

Authentificated by: Dr.J.Suresh Kumar.

Pharmacological Uses:

• Improves memory function
• Antioxidant activity
• Anti-inflammatory activity.

Authentifacted by: Dr. J. Suresh Kumar.

Description:

Clitoria ternatea is a perennial herbaceous plant belonging to the Fabaceae family. It is widely distributed in tropical and subtropical regions and is easily recognized by its vivid blue or white flowers. It is commonly known as butterfly pea and has been extensively used in traditional medicine systems such as Ayurveda.

The plant contains diverse phytoconstituents such as flavonoids, anthocyanins (especially delphinidins), alkaloids, and cyclotides. These compounds are responsible for their wide biological activities and medicinal importance.

MATERIALS AND METHOD:

1.1 COLLECTION OF PLANT:

Fresh plant material of *Mimosa pudica* and *Clitoria ternatea* was collected from a suitable location and thoroughly cleaned to remove adhering dirt and impurities. The material was shade-dried at room temperature for several days to preserve active phytoconstituents and prevent degradation caused by direct sunlight. After completing drying, the plant material was coarsely powdered using a mixer grinder and stored in a clean container for further use.

1.2 PREPARATION OF PLANT EXTRACT:

Extraction process of *clitoria ternatea*:

Approximately 100 g of the dried powder was accurately weighed and transferred into a clean, dry beaker. A hydroalcoholic solvent system was prepared using ethanol (700 mL) and distilled water (300 mL) and added to the powdered material to ensure complete immersion. The mixture was then subjected to maceration by keeping it covered at room temperature for 5–7 days, with occasional shaking or stirring to enhance the extraction of phytoconstituents into the solvent. After completion of the maceration process, the mixture was filtered using muslin cloth to separate the marc from the extract. The filtrate obtained was placed in a desiccator for slow evaporation of the solvent, which helps in preventing degradation of heat-sensitive constituents. A semi-solid extract was thus obtained, further dried, and stored in an airtight container for experimental use.

Extraction process of *Mimosa pudica*:

For extraction, about 60 g of the dried powdered material was accurately weighed and placed in the extraction chamber of the Soxhlet apparatus. A hydroalcoholic solvent mixture consisting of ethanol (175 mL) and single distilled water (75 mL) was prepared and taken in a round bottom flask attached to the Soxhlet extractor. The apparatus was assembled and heated on a heating mantle, allowing the solvent to boil, evaporate, and condense into the chamber containing the plant material, facilitating continuous extraction.

1.3 PHYTOCHEMICAL SCREENING:

A) *Clitoria ternatea:*

1. Alkaloids

Wagner's test:

Add Wagner's reagent → brown/reddish precipitate.

Dragendorff's test:

Add Dragendorff's reagent → reddish-brown precipitate.

2. Flavonoids

Ferric chloride test:

Add $FeCl_3$ → green colour.

Conc. H_2SO_4 test:

Add conc. H_2SO_4 → orange colour.

3. Phenolic Compounds

Ferric chloride test:

Add 5% $FeCl_3$ → dark green/blue green colour.

Iodine test:

Add iodine → transient red colour.

4. Tannins

Bromine water test:

Add bromine water → decolorization.

Lead subacetate test:

Add lead subacetate → creamy precipitate.

5. Saponins

Foam test:

Shake with water → persistent foam.

6. Anthocyanins

HCl test:

Add HCl → pink/red; add ammonia → blue/violet.

B) *Mimosa pudica:*

1.Alkaloids

Dragendroffs test:

Add a few drops of reagent.

Orange or reddish-brown precipitate

Hager's test:

Add few drops of Hager`s reagent to the extract solution

Yellow precipitate is formed.

2. Flavonoids

Lead acetate test:

Add 1 ml of 10% lead acetate solution to 2ml of extract

Yellow precipitate.

Ferric Chloride Test:

Add $FeCl_3$ solution.

Green/black color → Flavonoids present

3. Saponins

Foam test:

Take 1ml of plant extract in a test tube

Let it stand for 10-15 minutes

Persistent froth/ foam of at least 1 cm height

Add 10 ml of distilled water, shake vigorously for 15-30sec

Emulsification Test:

Add oil + shake.

Emulsion formation → Saponins present

Lead acetate test:

Add 1 ml of 10% lead acetate solution to 2ml of extract

Yellow precipitate.

4. Glycosides

Keller–Kiliani Test (Cardiac glycosides):

Add glacial acetic acid + $FeCl_3$

Carefully add conc. H_2SO_4 along side

Brown ring at interface → Cardiac glycosides present

5. Terpenoids & Steroids

Salkowski Test:

Add chloroform + conc. H_2SO_4

Reddish-brown color → Terpenoids present

6. Tannins

Ferric Chloride Test:

Add $FeCl_3$ solution.
Blue-black or green color → Tannins present

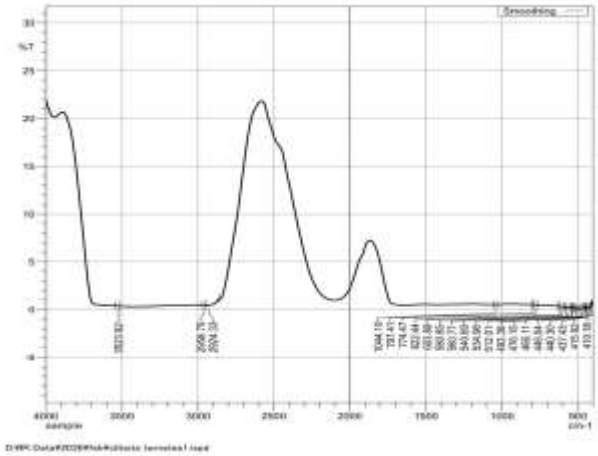
Iodine Test:
Add iodine solution.
Pale/blue color → Tannins present

Ammonium Hydroxide Test:
Add NH_4OH to extract.
Dark color → Tannins present

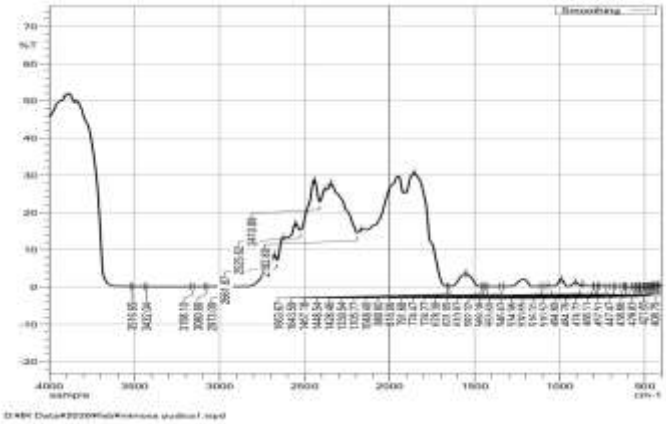
Lead Acetate Test:
Add lead acetate.
White precipitate → Tannins present

1.4 INFRARED SPECTROSCOPY:

In the procedure of infrared spectroscopy, the sample (solid, liquid, or gas) is first prepared appropriately (e.g., KBr pellet for solids or thin film for liquids). The IR radiation from a source is passed through the sample using an instrument such as a Fourier Transform Infrared (FTIR) spectrometer. Some wavelengths are absorbed while others pass through. The transmitted radiation is detected and converted into a spectrum of absorbance (or transmittance) versus wavenumber. The resulting spectrum is then analyzed to identify functional groups and molecular structure. The method is rapid, non-destructive, and requires minimal sample preparation.



A. *Clitoria ternatea*



B. *Mimosa pudica*

RESULT:

PHYTOCHEMICAL ANALYSIS:

Table 1: Phytochemical Constituents:

Phytochemical Test	*Clitoria ternatea*	*Mimosa pudica*
Alkaloids	Present (+)	Present (+)
Flavonoids	Present (+)	Present (+)
Phenolic compounds	Present (+)	Present (+)
Tannins	Present (+)	Present (+)
Saponins	Present (+)	Present (+)
Glycosides	Not specified / Trace	Present (+)
Terpenoids	Present (+)	Present (+)
Steroids	Present (+)	Present (+)
Anthocyanins	Present (+)	Absence (-)

IR SPECTROSCOPY ANALYSIS:

Table 2: IR Spectral Analysis – *Clitoria ternatea:*

Wavenumber (cm^{-1})	Functional Group	Interpretation
3523.82	O–H stretching	Alcohols / Phenols
2958.75,2924.33	C–H stretching	Alkanes
1044.19	C–O stretching	Alcohol, ether
791.47,774.47	C–H (bending)	Aromatic
622.44,603.80	C-Cl stretching	Halogenated compounds
580.85-410.18	C–Cl/C-Br stretching	Halogen containing compounds

Table 3: IR Spectral Analysis – *Mimosa pudica*:

Wavenumber (cm^{-1})	| Functional Group	Interpretation
3516.65,3432.04	O–H stretching	Phenols / Alcohols
3158.10	N–H stretching	Amines
3080.66	=C-H stretching	Aromatic compounds
2973.09	C-H stretching	Alkanes
1663.67, 1643.59	C=C /C=O stretching	Alkene /Aldehyde
1467.17,1435.45	C–H bending	Alkane
1339.54	C-N stretching	Amine
1157.47,1048.40	C-O stretching	Ether
880.60 - 638.25	C-H bending	Aromatic compounds

DISCUSSION

The present study was carried out to investigate the phytochemical constituents and FTIR spectral characteristics of hydroalcoholic extracts of *Mimosa pudica* and *Clitoria ternatea.* Preliminary phytochemical screening revealed the presence of several bioactive compounds including alkaloids, flavonoids, tannins, phenolic compounds, saponins, and terpenoids in both plant extracts. Additionally, steroids and anthocyanins were identified in *Clitoria ternatea,* while glycosides

were detected in *Mimosa pudica*. These phytoconstituents are well known for their antioxidant, anti-inflammatory, and antidiabetic properties.

FTIR spectral analysis further confirmed the presence of important functional groups associated with these bioactive compounds. In *Clitoria ternatea*, the absorption peak at 3523.82 cm^{-1} indicated O–H stretching of phenolic and alcoholic compounds, while peaks at 2958.75 and 2924.33 cm^{-1} corresponded to C–H stretching of alkanes. The peak at 1044.19 cm^{-1} confirmed C–O stretching vibrations, suggesting the presence of alcohols and ethers. In *Mimosa pudica,* peaks at 3516.65 and 3432.04 cm^{-1} indicated hydroxyl groups, whereas the peak at 3158.10 cm^{-1} suggested N–H stretching of amines. The presence of carbonyl and aromatic groups was confirmed by peaks observed at 1663.67 and 1643.59 cm^{-1}.

The occurrence of phenolic compounds, flavonoids, and tannins in both plants may contribute significantly to their pharmacological activities, particularly antioxidant and antidiabetic effects. The FTIR findings support the phytochemical screening results and indicate that these plants contain a variety of bioactive constituents that may be responsible for their therapeutic potential. Therefore, both plant extracts can be considered promising sources of natural medicinal compounds for further pharmacological investigations.

CONCLUSION

The present study demonstrated that *Mimosa pudica* and *Clitoria ternatea* possess a rich variety of phytochemical constituents, including alkaloids, flavonoids, phenolic compounds, tannins, saponins, terpenoids, and steroids. FTIR spectroscopy confirmed the presence of characteristic functional groups such as O–H, N–H, C=O, C–O, and aromatic C=C, which are associated with biologically active compounds. The combined phytochemical and spectroscopic findings suggest that both plants possess significant medicinal potential and may serve as valuable sources of natural therapeutic agents.

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