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Oualitative, Quantitative Phytochemical Screening Of Musa Accuminata Barks Extract

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ABSTRACT

Background: Medicinal plants have been widely explored for their bioactive compounds, contributing to their therapeutic potential. Musa acuminata (Musaceae family) is traditionally known for its pharmacological properties, but limited studies focus on the phytochemical composition of its bark extract. This study aims to perform qualitative and quantitative phytochemical screening of Musa acuminata bark extract to assess its bioactive constituents.

Methods: The bark extract of Musa acuminata was obtained using by hydraulic pressure methods. Standard techniques were employed to conduct qualitative phytochemical screening to detect glycosides, alkaloids, flavonoids, phenolics, tannins, saponins, and terpenoids. The Folin-Ciocalteu method and the aluminum chloride method were utilized in order to carry out quantitative assessments of the total concentrations of phenolic compounds, flavonoids, tannins, and saponins, respectively.

Results: According to the findings of the qualitative research, the plant contains a number of important phytochemicals, including alkaloids, flavonoids, tannins, and phenolics, all of which contribute to the plant's medicinal properties. With a 0.12 mg standard deviation, total alkaloid content was 4.25 mg GAE/g. The sample had 35.67 ± 0.85 mg GAE/g phenolic content, 18.34 ± 0.65 mg QE/g flavonoid content, 22.18 ± 0.48 mg GAE/g tannin content, and 6.75 ± 0.30 mg GAE/g saponin content. The sample has high bioactive chemical concentrations, according to the findings.

Conclusion: The findings suggest that Musa acuminata bark extract is a rich source of bioactive phytochemicals, supporting its potential use in pharmaceutical and nutraceutical applications.

Keywords: *Musa accuminata bark, Phyto-chemical screening, Qualitative analysis, Quantitative estimations and bio-active compounds.*

1. INTRODUCTION

Medicinal plants have always been essential to traditional medicine worldwide. The bioactive components of these plants have provided medicinal medicines. The banana plant, Musa acuminata, is grown extensively in tropical and subtropical countries. The fruit is praised for its nutritional value, but the bark and other plant parts have been used in traditional medicine. 1. The broad variety of bioactive components in medicinal plants has helped develop novel drugs. The banana, Musa acuminata, is a Musaceae plant grown in tropical and subtropical climates. The fruit, peel, and leaves of the Musa acuminata tree have been extensively studied for their nutritional and medicinal properties, but the bark, which may contain therapeutic phytochemicals, has not. Bioactive secondary metabolites such alkaloids, flavonoids, tannins, phenolics, terpenoids, glycosides, and saponins are identified using phytochemical screening. This screening is required. These chemicals have antioxidant, antibacterial, anti-inflammatory, and wound-healing properties, making them appealing for pharmaceutical and biological usage. The bark of Musa acuminata has been proven to have several beneficial compounds, although it has not been thoroughly studied. A qualitative and quantitative phytochemical investigation is needed.4.

2. MATERIAL AND METHODS:

Collection of plant and authentication of plant material

The selected fresh plant of Musa acuminata bark was collected from Sangiyam village, it is away from 25 kilometer in Thiruvannamalai, Tamilnadu, India. The taxonomic authentications of plant were done by Siddha Central Research Institute, Chennai, and Tamilnadu, India.

Preparation of Extract

The fresh Musa acuminata bark was collected by using knife. Then it was washed by using tap water for the removal of matters. Washed barks were cut on small pieces of 20 cm length. Then the fresh extract was obtained by using hydraulic pressure, followed by filtration through muslin cloth to remove debris. The filtrate was stored at 4°C until further analysis.6-7 The active compounds present in the fresh extract Musa acuminata were identified and confirmed by various qualitative, and quantitative phytochemical investigations such as flavonoids, alkaloids, glycosides saponins, tannins, phytosterols, terpenoids and corresponding biological activities of those compound have supported in the process of wound healing.

PHYTOCHEMICAL SCREENING OF MUSA ACCUMINATA BARK EXTRACT

The collected fresh extract is subjected to phytochemical investigation such as quantitative and qualitative analysis in the process of wound healing by the following tests.

I. Qualitative Test of Fresh Musa Acuminata Bark Extract

The fresh Musa acuminata bark extract was subjected to qualitative phytochemical screening using standard protocols (Harborne, 1998; Kokate, 2001) to detect the presence of bioactive compounds.8-10.

1. Alkaloids (Wagner's Test)

Through the utilization of Wagner's reagent, which is comprised of iodine in potassium iodide solution, it was possible to determine whether or not the extract included any alkaloids. The presence of alkaloids was successfully confirmed with the assistance of a precipitate that had a hue that was somewhere between reddish-brown and golden.

2. Flavonoids (Alkaline Reagent Test)

Flavonoids were identified by adding 10% sodium hydroxide solution to the extract. The emergence of a yellow hue, which vanished following acidification, validated the existence of flavonoids.

3. Tannins & Phenolic (Ferric Chloride Test)

In order to ascertain whether or not tannins and phenolics were present, the extract was mixed with a solution of ferric chloride ($FeCl_2$) that had a concentration of one percent. This was done in order to determine whether or not these compounds were present. A pigmentation that was either blue-black or greenish in hue conveyed the message that these individuals were present in the environment.

4. Saponins (Foam Test)

To detect saponins, mix the extract with distilled water. Saponins worked when they formed a foam that lasted at least 10 minutes.

5. Glycosides (Keller-Killiani Test)

The extract included cardiac glycosides after exposure to glacial acetic acid, ferric chloride, and elevated sulfuric acid. The observation of a reddish-brown ring near the interface validated their presence.

6. Terpenoids (Salkowski Test)

The extract was combined with strong chloroform and sulphuric acid to detect terpenoids. Terpenoids were characterized by a bottom layer that was a distinct reddish-brown color.

7. Steroids (Liebermann-Burchard Test)

The introduction of acetic anhydride and strong sulfuric acid into the extract allowed for the determination of the presence of steroids. The appearance of a green or bluish-green color served as evidence that they were in fact present.

8. Carbohydrates (Benedict's test)

The presence of carbohydrates was determined by heating the extract with Benedict's reagent. A It was because of the presence of reducing carbs that the brick-red precipitate was observed.

9. Proteins (Biuret Test)

For the purpose of determining whether or not proteins are present, the extract was subjected to treatment with a solution of 1% copper sulfate and a solution of 10% sodium hydroxide. The appearance of a violet color served as concrete evidence

that proteins do in fact exist.

10. Phenols (Ferric Chloride Test)

A total of two milliliters of the extract was subjected to a treatment with FeCl2 at a concentration of five percent. Depending on the description, phenols were stated to have a colored appearance that was either blue, green, or black.

11. Anthraquinones (Borntrager's Test)

In a mixture consisting of benzene and 10% ammonium hydroxide, 2 milliliters of extract was added. In the ammoniacal layer, the presence of anthraquinones can be confirmed by the appearance of a pink, crimson, or violet hue.

12. Steroids (Libermann-Burchard Test)

Highly concentrated acetic anhydride and sulfuric acid were combined with two milliliters of extract. Steroids appeared as a green or blue-green ring.

II. Quantitative Test of Fresh Extract

1. Alkaloids

In the research that was conducted by Harborne (1998) and Shamsa et al. (2008), the Gravimetric Method was utilized for the aim of assessing the total alkaloid content of fresh Musa acuminata bark extract. This allowed for the determination of the total alkaloid content. A quantity of two hundred milliliters is required after it has been dissolved in a mixture of acetic acid and ethanol at a concentration of ten percent. the extract stood for four hours. Filtration and concentration reduced the solution to one-fourth of its initial volume after precipitation with concentrated ammonium hydroxide. After filtration, the precipitate was washed with diluted NH3OH, dried at 60°C, and weighed. Total alkaloid concentration was calculated using the method:[8,11]

$$\text{Percentage of alkaloids} = \frac{\text{weight of residue}}{\text{weigh of sample}} \times 100$$

2. Phenolic Compounds

It was determined that the Folin-Ciocalteu method was the most effective method for assessing the total phenolic content (TPC) of fresh Musa acuminata bark extract (Singleton et al., 1999). After everything was said and done, a single milliliter of the extract was mixed with the Folin-Ciocalteu reagent and sodium carbonate at a concentration of 7.5%. Following a period of thirty minutes in which the solution was left in darkness, the absorbance of the solution was determined by employing a UV-Vis spectrophotometer at a wavelength of 765 nm. The total phenolic component content in the extract was milligrams per gram. The Musa acuminata bark extract's high phenolic content indicates its antioxidant properties. The sample's phenolic content is calculated using this formula.:[8,12]

$$\text{Percentage of phenolic content} = \frac{\text{mg of gallic acid equalent}}{\text{weigh of sample}} \times 100$$

3. Flavanoids

Chang et al. (2002) used AlCl2 to calorimetrically measure the total flavonoid concentration (TFC) of fresh Musa acuminata bark extract. The protocol was strictly followed: 1 ml of extract, 4 ml purified water, and 0.3 ml 5% sodium nitrate were mixed. The combination received 0.3 millilitres of 10% sodium chloride after a 5-minute pause. Two millilitres of sodium hydroxide at one million was added after six minutes, and filtered water was added to make ten millilitres To determine the absorbance, a UV-Vis spectrophotometer was utilized, and the wavelength that was used was 415 nm. For the purpose of determining the quantity of flavonoids, milligrams of pure flavonoids were utilized for each gram of concentrated extract. These studies show that flavonoids exist, suggesting antioxidant and medicinal effects.[13]

4. Tannins

Makkar et al. (1993) measured fresh Musa acuminata bark extract's TTC using the Folin-Ciocalteu technique. One milliliter of extract, The decision was made to combine a mixture that had a concentration of thirty-six percent sodium carbonate and five milliliters of Folin-Ciocalteu reagent. The sodium carbonate was ten milliliters each. After 30 minutes at room temperature, a UV-Vis spectrophotometer measured the solution's absorbance. The absorbance was 700 nm. Tannic acid equivalents (mg TAE/g) were used to evaluate tannin concentration per gram of extract. Tannins may help antioxidants and antibacterials work.[14]

5. Saponins

Obadoni and Ochuko (2001) used the Gravimetric Method to measure fresh Musa acuminata bark extract saponin content. Five grams of the extract were dissolved in 100 milliliters of 20% ethanol at 55 degrees Celsius with constant stirring. Following the filtration of the mixture, the residue was extracted once more using 100 mL of ethanol at a concentration of 20%. A separating funnel was used after the amalgamated filtrate was concentrated to 25% of its volume in a water bath. After twenty milliliters of n-butanol were added to the mixture, it was rinsed twice with a sodium chloride suspension that contained five percent sodium chloride. The residual solution was evaporated in a pre-weighed dish at 60 degrees Celsius, and the saponin yield was determined as a percentage.[15]

$$\text{Percentage of saponin} = \frac{\text{Weight of dried saponin extract}}{\text{weigh of sample}} \times 100$$

3. RESULTS:

Phytochemicals Screening of Musa Accuminata Extract

The collected fresh extract is subjected to analyses the phytochemical investigation such as quantitative and qualitative are listed below,

I. Qualitative Test of Fresh Extract

From the phytochemical investigation of Musa accuminata, we found that the followed chemical constituents are present in the fresh extract of Musa accuminata barks are,

Table: 4. Phytochemical Screening of Fresh *Musa acuminata* Bark Extract

S. No	Phytochemical	Test Name	Observation	Inference
1.	Alkaloids	Wagner's Test	Reddish-brown precipitate	Present
2.	Flavonoids	Alkaline Reagent Test	Yellow coloration (disappears with acid)	Present
3.	Tannins	Ferric Chloride Test	Blue-black or greenish coloration	Present
4.	Saponins	Foam Test	Stable foam formation for 10 min	Present
5	Phenolics	Ferric Chloride Test	Blue-black or greenish coloration	Present
6.	Glycosides	Keller-Killiani Test	Reddish-brown ring at the interface	Present
7.	Terpenoids	Salkowski Test	Reddish-brown coloration at the bottom layer	Present
8.	Steroids	Liebermann-Burchard Test	Green or bluish-green coloration	Present
9.	Carbohydrates	Benedict's Test	Brick-red precipitate	Present
10.	Proteins	Biuret Test	Violet coloration	Present
11.	Phenols	Ferric Chloride Test	Blue, green, or black coloration	Present
12.	Anthraquinones	Borntrager's Test	Pink, red, or violet in ammoniacal layer	Present

The fresh extract of Musa acuminata comprises many secondary metabolites inherent to the extract.

II. Quantitative Test of Fresh Extract

Extraction of fresh Musa acuminata yields a total phenolic content of 35.67 ± 0.85 mg GAE per 100 grams of the extract.This was achieved using the method. The fresh Musa acuminata extract flavonoid content was determined using the previous approach, the value was found to be of 18.34 ± 0.65mg RE/100 g of the sample. The tannin content in the fresh extract of Musa acuminata ranges from 22.18 ± 0.48mg GAE per 100 g of sample, as determined by the formula given above. The saponin content in the fresh extract of Musa acuminata ranges from 6.75 ± 0.30mg GAE per 100 g of the sample, as calculated using the formula mentioned above.

Table: 5 Quantitative Phytochemical Analysis of Fresh *Musa acuminata* Bark Extract

S. No	Phytochemical	Methodology	Absorbance (nm)	Standard Used	Result (mg/g extract)
1.	Alkaloids	Gravimetric Method	-	Atropine	4.25 ± 0.12
2.	Phenolic Compounds	Folin-Ciocalteu Method	765 nm	Gallic Acid	35.67 ± 0.85
3.	Flavonoids	Aluminum Chloride Method	415 nm	Quercetin	18.34 ± 0.65
4.	Tannins	Folin-Ciocalteu Method	700 nm	Tannic Acid	22.18 ± 0.48
5.	Saponins	Gravimetric Method	-	-	6.75 ± 0.30

4. DISCUSSION

Phytochemical investigation of fresh Musa acuminata bark extract identified various bioactive components. These findings suggest that the extract may be used in wound healing and antimicrobial treatments. Qualitative and quantitative studies found many components that contribute to the substance's pharmacological characteristics. Alkaloids, flavonoids, tannins, saponins, terpenoids, glycosides, phenols, and anthraquinones.

Qualitative Analysis

Qualitative phytochemical analysis of fresh bark extract revealed phenolic components, alkaloids, flavonoids, tannins, saponins, and glycosides. The Wagner test verified the presence of antibacterial and analgesic alkaloids. Alkaline reagent and ferric chloride experiments revealed flavonoids and phenolic substances, indicating antioxidant potential. Wound healing and inflammation reduction require this potential. The Salkowski test revealed the presence of terpenoids, which have anti-inflammatory and antibacterial properties.

Quantitative Analysis

Quantitative phytochemical analysis validated these findings. The total phenolic content (TPC) of 35.67 ± 0.85 mg GAE/g suggests a high antioxidant concentration, aiding in free radical elimination and tissue regeneration. Total flavonoid concentration (TFC) of 18.34 ± 0.65 mg QE/g suggests flavonoids contain anti-inflammatory and antibacterial properties. Its antibacterial and analgesic properties are enhanced by the presence of 4.25 ± 0.12 mg/g alkaloids. This makes it suitable for medicine.

The phytochemicals identified in Musa acuminata bark extract exhibit properties that are beneficial for wound healing, antimicrobial, and anti-inflammatory activities. Flavonoids and phenolics contribute to collagen synthesis and tissue regeneration, while alkaloids and tannins provide antimicrobial and astringent properties that promote wound contraction and healing. The presence of saponins suggests potential immunomodulatory and antimicrobial effects, further validating its traditional use in wound treatment

5. CONCLUSION:

The latest phytochemical study of fresh Musa acuminata bark extract found alkaloids, flavonoids, tannins, saponins, phenolics, glycosides, terpenoids, and anthraquinones. The quantitative investigation also identified high levels of phenolic and flavonoid components, demonstrating the extract's antioxidant, antibacterial, and wound-healing qualities The qualitative examination found several phytochemicals, whereas the quantitative analysis found high quantities. These findings support the traditional medicinal applications of Musa acuminata bark. The presence of phenolic compounds and flavonoids suggests a strong antioxidant potential, which can aid in free radical scavenging, tissue regeneration, and anti-inflammatory activities. Alkaloids and tannins contribute to its antimicrobial efficacy; further validating it is used in wound healing applications. The results align with previous research, emphasizing the medicinal importance of Musa acuminata. In conclusion, the novel Musa acuminata bark extract may be a natural source of bioactive chemicals for pharmacology and therapeutics.

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CONFLICT OF INTERESTS

We have No conflict interest.

AUTHOR CONTRIBUTIONS

Equal contribution for both authors.

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