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Qualitative Phytochemical Analysis of Thespesia Populnea Seed Coat Extracts

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Abstract

The present study was carried out to evaluate the qualitative phytochemical constituents present in water and diethyl ether Testa (Seed Coat) extracts of *Thespesia populnea*. Medicinal plants are important sources of bioactive compounds with significant therapeutic potential. The Testa (Seed Coat) of *Thespesia populnea* was collected, shade-dried, powdered, and extracted separately using water and diethyl ether solvents. The obtained extracts were subjected to standard qualitative phytochemical screening methods for the detection of alkaloids, flavonoids, tannins, saponins, glycosides, phenols, terpenoids, and steroids. The results revealed the presence of several phytochemical constituents in both extracts. Water extract showed a higher presence of polar compounds such as tannins, saponins, flavonoids, and phenols, whereas the diethyl ether extract exhibited a strong presence of terpenoids and steroids due to its non-polar nature. Alkaloids, flavonoids, glycosides, and phenolic compounds were detected in both extracts. These phytochemicals are known to possess antioxidant, antimicrobial, anti-inflammatory, and medicinal properties. The study concludes that the Testa extracts of *Thespesia populnea* contain valuable bioactive compounds that may contribute to traditional medicinal uses and can be explored further for pharmacological applications.

Keywords: Phytochemical analysis; *Thespesia populnea* and Pharmacological uses.

1. Introduction

Medicinal plants have been widely used in traditional medicine due to the presence of biologically active phytochemicals such as alkaloids, flavonoids, tannins, saponins, glycosides, terpenoids, and phenolic compounds. These phytochemicals possess various pharmacological activities, including antioxidant, antimicrobial, anti-inflammatory, antidiabetic, and anticancer properties [1]. *Thespesia populnea*, commonly known as the Portia tree, belongs to the family Malvaceae. The plant is widely distributed in tropical coastal regions of India and other Asian countries. Different parts of the plant, such as leaves, bark, flowers, fruits, and Testa (Seed Coat), are traditionally used for treating skin diseases, inflammation, diabetes, ulcers, and liver disorders [2]. Plant *Thespesia populnea* was Testa (Seed Coat) extracts contains several secondary metabolites that contribute to therapeutic activities. The extraction solvent plays an important role in isolating phy-

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tochemical constituents because compounds differ in polarity and solubility. Water extracts mainly dissolve polar compounds, whereas diethyl ether extracts contain non-polar or moderately polar constituents [3]. Therefore, the present study was carried out to perform qualitative phytochemical analysis of water and diethyl ether Testa (Seed Coat) extracts of *Thespesia populnea* in order to identify the presence of important bioactive compounds.

2. Materials And Methods

2.1. Collection of Plant Material

Fresh Testa (Seed Coat) of *Thespesia populnea* was collected from Tirupattur. The collected Testa (Seed Coat) was washed thoroughly with distilled water to remove dust and impurities. The material was shade-dried for 7–10 days and powdered using a mechanical grinder.

2.2. Preparation of Extracts

2.2.1. Water Extract

About 10 g of powdered *Thespesia populnea* Testa (Seed Coat) material was soaked in 100 mL of distilled water for 24 hours with occasional stirring. The extract was filtered using Whatman No.1 filter paper and concentrated using a water bath. The concentrated extract was stored at 4°C for further analysis.

2.2.2. Diethyl Ether Extract

About 10 g of powdered *Thespesia populnea* Testa (Seed Coat) material was extracted with 100 mL of diethyl ether using a Soxhlet apparatus for 6–8 hours. The extract was filtered and concentrated by evaporating the solvent. The concentrated extract was preserved for phytochemical screening.

2.3. Phytochemical Analysis

The plant extract solutions were assessed for the existence of the phytochemical analysis by using the following standard methods. [4].

The Fig.1. shows the *Thespesia populnea* and its Testa (Seed Coat) are below,

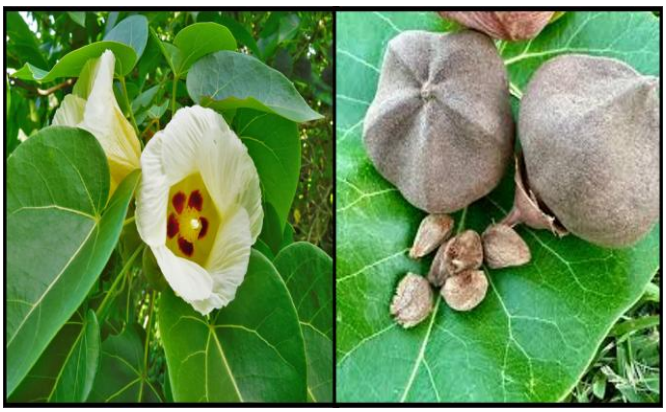

Fig.1. *Thespesia populnea* and its Testa (Seed Coat)

2.3.1. Test for Carbohydrate

To 0.5ml of the extract of the plant sample, 1ml of water and 5-8 drops of Fehling's solution were added at a hot temperature and observed for brick red precipitate.

2.3.2. Test for Alkaloid

The solvent-free extract (50mg) was stirred with one ml of dilute hydrochloric acid and filtered. The filtrate was tested for alkaloids. Mayer's Test: To the filtrate, a drop of Mayer's reagent was added along the sides of the test tube. A white precipitate indicates the test as positive.

2.3.3. Tests for Flavonoid

Taken 2 ml of 2.0% NaOH mixture was mixed with plant extracts; a concentrated yellow colour was produced, which became colourless when we added 2 drops of diluted acid to the mixture. This result showed the presence of flavonoids [5].

2.3.4. Test for Steroid

2 mL of chloroform and concentrated H_2SO_4 were added to the 5 mL of plant extracts. In the lower chloroform layer, red colour appeared, which indicated the presence of steroids [6].

2.3.5. Test for Terpenoid

2.0 ml of chloroform was added to the 5 ml of plant extracts and evaporated on the water path, and then boiled with 3 ml of concentrated H_2SO_4. A grey colour formed, which showed the entity of terpenoids [7].

2.3.6. Test for Tannin

10 ml of bromine water was added to 0.5 g of plant extracts. Decolouration of bromine water showed the presence of tannins [8].

2.3.7. Test for Saponin

Taken 5.0 ml of distilled water was mixed with plant extracts in a test tube, and it was mixed vigorously. The frothing was mixed with a few drops of olive oil and mixed vigorously, and the foam appearance showed the presence of saponins [9].

2.3.8. Test for Glycoside

A solution of glacial acetic acid (4.0 ml) with 1 drop of 2.0% $FeCl_3$ mixture was mixed with the 10 ml plant extracts and 1 ml concentrated H_2SO_4. A brown ring formed between the layers, which showed the entity of cardiac steroidal glycosides [10].

2.3.9. Test for Phenols:

10ml of the extract was treated with a few drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenol. Lead acetate test: 10 ml of the extract was treated with a few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of phenol [11].

2.3.10. Test for Quinone

About five ml of the extract was boiled with10% HCl for a few minutes in a water bath. It was filtered and allowed to cool. An equal volume of Chloroform was added to the filtrate. A few drops of 10% ammonia were added to the mixture and heated. Formation of pink colour indicates the presence of anthraquinone [12].

3. Results and Discussion

Table 1: shows the Qualitative Phytochemical analysis as follows,

Phytochemical Constituents	***Thespesia populnea Testa (Seed Coat)***	
	Water	**Diethyl Ether**
Carbohydrate	+	+
Alkaloid	+	+
Flavonoid	+	+
Tannin	+	+
Saponin	+	+
Glycoside	+	+
Phenol	+	+
Terpenoid	+	+
Steroid	-	+
Quinone	-	+

Indicated ; + = Presence and – = Absence

The qualitative phytochemical analysis revealed the presence of several important secondary metabolites in both

water and diethyl ether Testa (Seed Coat) extracts of *Thespesia populnea.* The water extract showed higher amounts of polar phytochemicals such as tannins, saponins, phenols, and flavonoids due to the polar nature of water. These compounds are known for their antioxidant and antimicrobial activities. The diethyl ether extract predominantly contained non-polar compounds such as terpenoids and steroids. Diethyl ether efficiently extracts lipophilic compounds that may contribute to anti-inflammatory and pharmacological activities. The present investigation revealed that both water and diethyl ether Testa (Seed Coat) extracts of *Thespesia populnea* contain several biologically active phytochemicals. The qualitative screening confirmed the presence of alkaloids, flavonoids, glycosides, phenols, terpenoids, tannins, saponins, and steroids in varying proportions depending on the extraction solvent used. Similar findings were reported in previous phytochemical studies on medicinal plants, where solvent polarity significantly influenced the extraction efficiency of secondary metabolites [13]. The water extract showed a strong presence of tannins, flavonoids, phenols, and saponins. Water, being a polar solvent, is highly effective in extracting hydrophilic compounds such as phenolic compounds and flavonoids [14]. Phenolic compounds are known for their antioxidant properties, which help in scavenging free radicals and preventing oxidative stress-related diseases. Flavonoids possess antimicrobial, anti-inflammatory, and anticancer activities. Earlier studies by [15] also emphasized the medicinal importance of tannins and phenolic compounds in plant extracts.

The diethyl ether extract showed a greater presence of terpenoids and steroids. Diethyl ether is a non-polar solvent and efficiently extracts lipophilic compounds from plant materials [16]. Terpenoids and steroids are associated with anti-inflammatory, analgesic, and antimicrobial activities. The presence of these compounds indicates that the Testa (Seed Coat) extract of *Thespesia populnea* may possess therapeutic potential for treating inflammation and infectious diseases. Similar observations were documented by [17], who reported that non-polar solvents are suitable for isolating steroidal and terpenoid compounds.

Alkaloids were detected in both extracts, suggesting the medicinal significance of the plant Testa (Seed Coat). Alkaloids are important secondary metabolites widely recognized for their pharmacological properties, including analgesic, antimicrobial, and antihypertensive effects. According to [18], alkaloids contribute significantly to the therapeutic value of medicinal plants and are commonly used in traditional medicine.

The occurrence of glycosides in both extracts indicates possible cardioprotective and therapeutic properties of the plant. Glycosides are known to exert various biological activities, including antimicrobial and antioxidant effects [19]. The presence of multiple phytochemical constituents in the Testa (Seed Coat) extracts suggests synergistic interactions among these compounds, which may enhance the medicinal efficacy of the plant [20].

4. Conclusion

The present study revealed that water and diethyl ether Testa (Seed Coat) extracts of *Thespesia populnea* contain

important phytochemicals such as alkaloids, flavonoids, phenols, glycosides, terpenoids, tannins, and steroids. Water extract was rich in polar compounds, while diethyl ether extract contained more non-polar constituents. These bioactive compounds may contribute to the medicinal properties of the plant and support its traditional use in herbal medicine. The findings suggest that the Testa (Seed Coat) extracts of *Thespesia populnea* could serve as a potential source of natural therapeutic agents for future pharmaceutical applications. Further quantitative and pharmacological studies are recommended to identify and evaluate the active compounds.

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Conflict of Interest: Nil

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