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PHYTOCHEMICAL ANALYSIS OF DIFFERENT SOLVENT EXTRACTS OF *DATURA METEL* LEAVES AND FLOWERS

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Abstract

The present study was conducted to evaluate the phytochemical composition of different solvent extracts of *Datura metel* leaves and flowers. The plant, widely known for its medicinal and pharmacological properties, was subjected to extraction using solvents of varying polarity such as aqueous, ethanol, methanol, chloroform, and petroleum ether. The extracts were screened for the presence of major phytochemical constituents, including alkaloids, flavonoids, tannins, saponins, steroids, terpenoids, phenols, and glycosides, using standard qualitative methods. The results revealed that the methanolic and ethanolic extracts showed a higher concentration and broader range of phytochemicals compared to non-polar extracts, indicating that polar solvents are more effective in extracting bioactive compounds. Leaves of *Datura metel* exhibited a greater diversity of secondary metabolites than the flowers, suggesting their potential for medicinal applications such as antimicrobial, anti-inflammatory, and antioxidant activities. Alkaloids and flavonoids were found abundantly in both plant parts, which are known to contribute to the plant's pharmacological efficacy. The variation in phytochemical content among different solvent extracts highlights the importance of solvent selection in natural product research. This study supports the traditional use of *Datura metel* in herbal medicine and provides a scientific basis for further isolation, characterization, and evaluation of its bioactive compounds for potential therapeutic applications.

Keywords: Datura metel, Methanolic extract, Ethanolic extract, Aqueous extract, Chloroform extract and Phytochemicals.

1. Introduction

The medicinal plant *Datura metel* (DM) (Fam. Solanaceae) has been used in ethno-therapeutic management of asthma, insomnia and rheumatic pain. The smoke from the burning leaf is inhaled for the relief of asthma and bronchitis. The fruit juice is applied to the scalp for the treatment of falling hair and dandruff. Seeds and leaves of *D. metel* were reportedly used to sedate hysterical and psychotic patients [1].

WHO defined traditional medicine as the health practices, approaches, knowledge, and beliefs incorporating plant, animal and mineral-based medicines, spiritual therapies, manual techniques, and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain wellbeing [2]. The bitter narcotic plant relieves

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pain and encourages the healing process. The seeds of the plant are medicinally the most active. Externally, the plant is used as a poultice in treating fistulas, abscesses wounds and severe neuralgia [3]. It has been reported that inappropriate use of traditional medicines or practice can have negative or dangerous effects and that further research is needed to ascertain the efficiency and safety of several of the practice and medicinal plants used by traditional medicinal systems.

The growing interest in herbal medicine demands toxicity risk assessment of the various indigenous preparations used in the treatment of disease [4]. Crude as well as ethanolic extract of some plant extracts including *Datura sp*. Have been tested by many workers for their efficacy against several pathogenic fungi in vitro. *Datura metel* L. is a sub-glabrous shrubby herb which belongs to the family Solanaceae and grows throughout India. The dried leaves of the plant have long been known in India for their narcotic and anti-spasmodic properties [5]. It is one of the most important medicinal herbs used worldwide due to its anti-inflammatory property, and several studies also reported the use of the plant for its antibacterial and antioxidant activities [6].

2. Experimental selections

2.1 Collection of Plant material

The fresh leaves and flowers of Datura metel were collected from healthy, mature plants growing in their natural habitat during the flowering season. The plant materials were carefully identified and authenticated based on their morphological characteristics. The collected samples were thoroughly washed with distilled water to remove dust and impurities. They were then shade-dried at room temperature for several days to preserve their phytochemical constituents. Finally, the dried leaves and flowers were ground into a fine powder and stored in airtight containers for further analysis.

Fig. 1. *Datura metel* leaves and flowers

2.1.1 Taxonomic Classification

Kingdom: Plantae

Subkingdom: Tracheobionta (Vascular plants)

Superdivision: Spermatophyta (Seed plants)

Division: Magnoliophyta (Flowering plants)

Class: Magnoliopsida (Dicotyledons)

Subclass: Asteridae

Order: *Solanales*

Family: Solanaceae (Nightshade family)

Genus: Datura

Species: *Datura metel L.*

2.2 Extraction of sample

About 5gm of the fine powder of the leaf and flower of Datura metel are taken in a thimble which is placed in an overnight extractor for the purpose of extraction of phytochemicals present in the leaf and flower. The extraction is carried out using Ethanol, aqueous, acetone and chloroform. The extracts obtained are collected separately and the solvents are evaporated using vacuum distillation and dried. The dried samples are stored in an airtight container for further analysis [7].

2.3 Qualitative Phytochemical Screening

The qualitative tests were carried out in leaf and flower of *Datura metel* by adopting standard procedure [8] [9]. The ethanol, aqueous, acetone and chloroform extracts were screened for the presence of phytochemicals.

1. Test for alkaloids

Mayer's test: small portion of solvent free extract was stirred with few drops of diluted HCl and filtered. The filtrate was then tested for following colour test. (a) 1.36 gm of mercuric chloride was dissolved in 60 ml distilled water. (b) 5gms of potassium iodide was dissolved in 20 ml of distilled water (a) and (b) was mixed and the volume adjusted to 100ml with distilled water. Appearance of cream colour precipitate with Mayer's reagents showed the presence of alkaloids.

2. Test for flavonoids

Shinoda's test: 5 ml of 20% sodium hydroxide was added to equal volume of the extract. A yellow solution indicates the presence of flavonoids.

3. Test for steroids

Liebermann Buchard test: A small amount of sample is treated with 2ml of acetic an-hydride followed by the addition of 3ml of H2SO4 Solution. Color changes from violet to green or blue indicates the presence of steroids.

4. Test for terpenoids

Salkowski Test: To 1ml of extract add 0.5ml of chloroform followed by a few drops of concentrated sulphuric acid, formation of reddish-brown precipitate indicates the presence of terpenoids.

5. Test for Saponins

Froth test: 5ml of extract is diluted with 20ml of distilled water and agitated for 10 minutes. Foam is formed which indicates the presence of saponins.

6. Test for Carbohydrates

Fehling test: Two milliliters of each plant extract were hydrolyzed with dilute HCl, neutralized with alkali, and then heated with Fehling's solution A and B. The formation of a red precipitate was an indication for the presence of a reducing sugar.

7. Test for tannins and phenolic compounds

Lead Acetate test: 10% lead acetate solution, 0.5g of the extract was added and shaken to dissolved. A white precipitate observed indicate the presence of tannins and phenolic compounds.

8. Test for glycosides:

Keller-Killani test: To 2ml of extract, glacial acid, one drop 5% ferric chloride and concentrated sulphuric acid were added. Appearance of reddish-brown color at the

junction of the two liquid layers indicates the presence of gly cosides.

9. Test for Quinones

Sulfuric acid test: One drop of concentrated sulfuric acid was added to 5 ml of each extract dissolved in isopropyl alcohol. Formation of red color indicates the presence of quinones.

10. Test for Phenols

The sample solution is treated with few drops of 10% ferric chloride. Formation of blue or green colour indicates the presence of phenols.

11. Test for saponins

To 2ml of distilled water was added with the sample solution and shakes well. Formation of foams indicates the presence of saponins.

3. Results and Discussions

3.1. Phytochemical analysis of *Datura metel*

The analysis of preliminary phytochemical screening using ethanol extract of *Datura* metel leaf concludes that presence of Carbohydrates, Tannins, Alkaloids, Quinones, Terpinoids & Steroids. The analysis of preliminary phytochemical screening using chloroform extract of *Datura metel* leaf concludes that absence of Saponins, Flavonoids, Glycosides & Phenols.

The analysis of preliminary phytochemical screening using Ethanol extract of *Datura metel* flower concludes that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids,

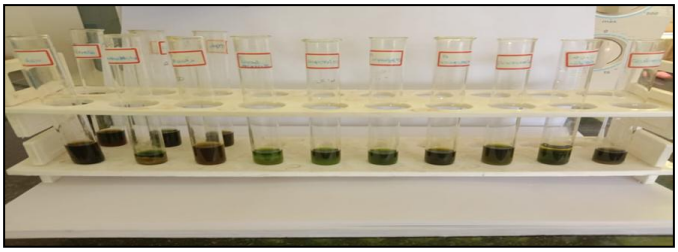

Fig. 2. Photochemical analysis of ethanol extract of *Datura metel* leaf

Quinones, Phenols, Terpinoids & Steroids. The analysis of preliminary phytochemical screening using ethyl acetate extract of D*atura metel* concludes that absence of Saponins & Glycosides.

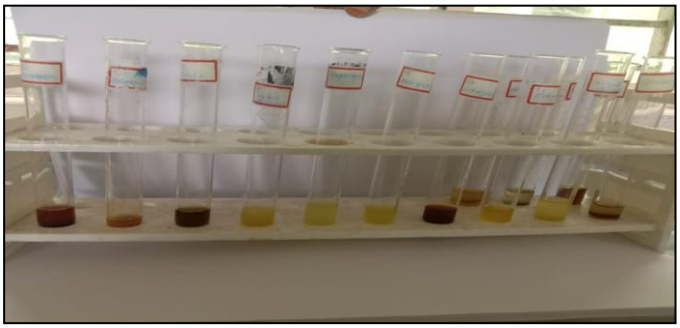

Fig. 3. Photochemical analysis of ethanol extract of *Datura metel* flower

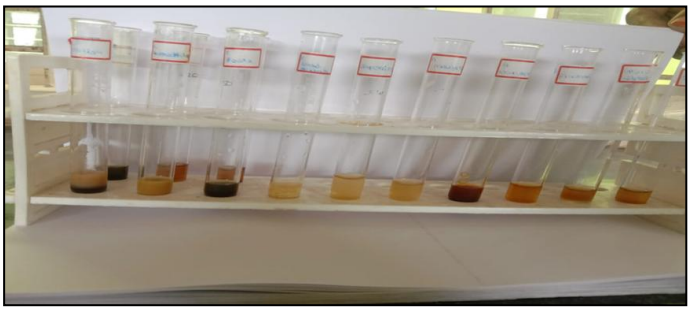

Fig. 4. Phytochemical analysis of aqueous extract of *Datra metel* leaf

The analysis of preliminary phytochemical screening using aqueous extract of D*atura metel* leaf concludes that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids,

Quinones, Phenols, Terpenoids & Steroids. The analysis of preliminary phytochemical screening using aqueous extract of D*atura metel* leaf concludes that are absence of Saponins, Glycosides.

The analysis of preliminary phytochemical screening using aqueous extract of *Datura metel flowers* concludes that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids, Quinones & Phenols. The analysis of preliminary phytochemical screening using aqueuous extract of *Datura metel* concludes that absence of Saponins, Glycosides, Terpinoids, & Steroids.

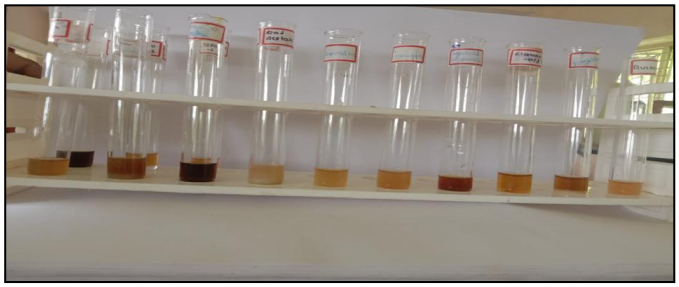

Fig. 5. Phytochemical analysis of aqueous extract of *Datra metel* flowers

The analysis of preliminary phytochemical screening using Acetone extract of *Datura metel* leaf concludes that presence of Carbohydrates, Tannins, Alkaloids, Quinones, Phenols & Terpenoids. The analysis of preliminary phytochemical screening using acetone extract of *Datura metel* concludes that absence of Saponins, Flavonoids, glycosides & Steroids.

The analysis of preliminary phytochemical screening using Acetone extract of *Datura metel* flower concludes

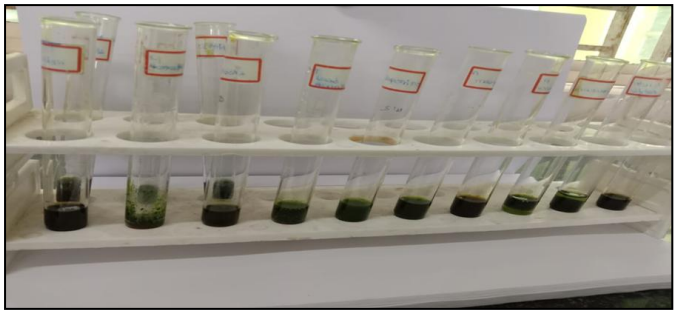

Fig. 6. Phytochemical analysis of Acetone extract of *Datura metel* of leaf

that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids, & Steroids. The analysis of preliminary phytochemical screening using acetone extract of *Datura metel* concludes that absence of Saponins, Glycosides, Quinones, Phenols & Terpinoids.

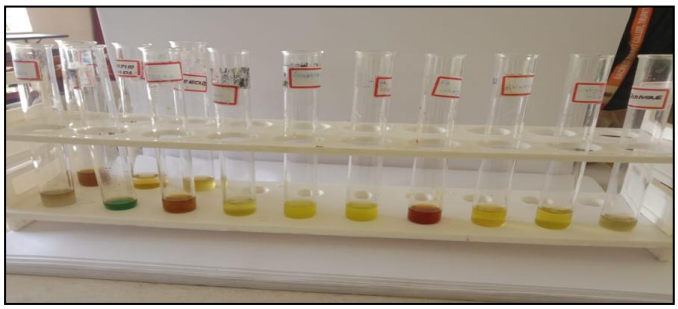

Fig. 7. Phytochemical analysis of Acetone extract of *Datura metel* of flower

The analysis of preliminary phytochemical screening using Chloroform extract of *Datura metel* leaf concludes that presence of Carbohydrates, Tannins, Alkaloids & Terpinoids. The analysis of preliminary phytochemical screening using acetone extract of *Datura metel* concludes that absence of Saponins, Flavonoids, Glycosides, Quinones, Phenols & Steroids.

Table 1. Phytochemical screening of various solvent extracts of *Datura metel* leaf

S. No.	Phytochemical compounds	*Datura metel* leaf ethanol extract	*Datura metel* leaf aqueous extract	*Datura metel* leaf acetone extract	*Datura metel* leaf chloroform extract
1	Carbohydrate	+	+	+	+
2	Tannins	+	+	+	+
3	Saponins	_	_	_	_
4	Alkaloids	+	+	+	+
5	Flavonoids	_	+	_	_
6	Glyco-sides	_	_	_	_
7	Quinones	+	+	+	_
8	Phenols	_	+	+	_
9	Terpenoids	+	+	+	+
10	Steroids	+	+	_	_

Symbol (+) indicates positive and (-) indicates negative

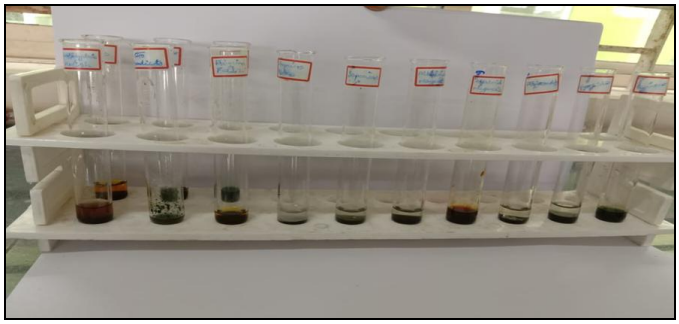

Fig. 8. Phytochemical analysis of chloroform extract of *Datura metel* of leaf

The analysis of preliminary phytochemical screening using Chloroform extract of *Datura metel* flower concludes that presence of Saponins & Alkaloids. The analysis of preliminary phytochemical screening using acetone extract of *Datura metel* concludes that absence of Carbohydrates, Tannins, Flavonoids, Glycosides, Quinones, Phenols, Terpinoids & Steroids.

Table 2. Phytochemical screening of various solvent extracts of *Datura metel* flower

S. No.	Phytochemical compounds	*Datura metel* leaf ethanol extract	*Datura metel* leaf aqueous extract	*Datura metel* leaf acetone extract	*Datura metel* leaf chloroform extract
1	Carbohydrate	+	+	+	_
2	Tannins	+	+	+	_
3	Saponins	_	_	_	+
4	Alkaloids	+	+	+	+
5	Flavonoids	+	+	+	_
6	Glyco-sides	_	_	_	_
7	Quinones	+	+	_	_
8	Phenols	+	+	_	_
9	Terpenoids	+	_	_	_
10	Steroids	+	_	+	-

Symbol (+) indicates positive and (-) indicates negative

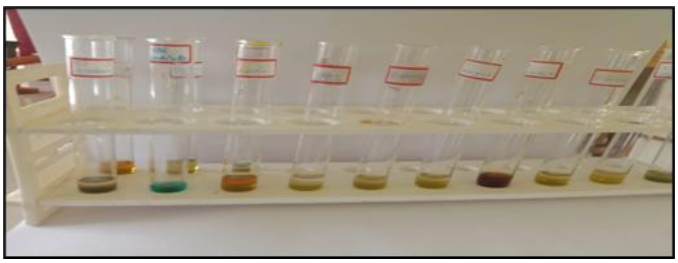

Fig. 9. Phytochemical analysis of chloroform extract of *Datura metel* of flower

5. CONCLUSION

The analysis of preliminary phytochemical screening using ethanol extract of *Datura metel* leaf concludes that presence of Carbohydrates, Taninins, Alkaloids, Quinones, Terpenoids, Steroids. Aqueous extract of *Datura metel* leaf concludes that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids, Quinones, Phenols, Terpinoids & Steroids. The analysis of preliminary phytochemical screening using Acetone extract of *Datura metel* leaf concludes that presence of Carbohydrates, Taninins, Alkaloids, Quinones, Phenols & Terpenoids. Chloroform extract of *Datura metel* leaf concludes that presence of Carbohydrates, Taninins, Alkaloids & Terpenoids. The analysis of preliminary phytochemical screening using ethanolic extract of *Datura metel flower* concludes that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids, Quinones, Phenols, Terpenoids & Steroids. The analysis of preliminary phytochemical screening using Aqueous extract of *Datura metel flower* concludes that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids, Quinones & Phenols. The analysis of preliminary phytochemical screening using acetone extract of *Datura metel flower* concludes that presence of Carbohydrates, Tannins, Alkaloids, Flavonoids & Steroids. The analysis of preliminary phytochemical screening using Chloroform extract of *Datura metel flower* concludes that presence of Saponins, & alkaloids. There are many other traditional uses of *Datura metel* in Ayurveda which serves as the basis for further studies.

Conflict of Interest: Nil

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