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(RESEARCH ARTICLE)

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Comprehensive Study on Authentication, Isolation, Extraction, Phytochemical Screening and Standardization of Datura Plant

Arati Anil Waghmare *, Prachi Nandkumar Padwal, Sayali Vilas Bhujbal, Yogita Shivaji Warghade, Komal Raju Waghmare and Jayashri Haribhau Zaware

Samarth Institute of Pharmacy, Belhe, Pune, Maharashtra, India.

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Abstract

With a focus on the extraction and phytochemical profile of components from the raw plant material, this study provides a thorough analysis of Datura metel. Significant differences in atropine content between plant parts were noted, with important ramifications for medical uses and pharmaceutical development. The results emphasize the need for more research into Datura metel's medicinal potential and production methods by highlighting its rich and varied phytochemical composition. Datura metel's bioactive components, which have demonstrated effectiveness in conditions including bronchitis and asthma, are responsible for its therapeutic qualities. Using a Soxhlet device and variety of solvents, leaf extracts were made. With a maximum extract recovery of 33.28%, the aqueous extract showed the highest yield among all. Tropane alkaloids like scopolamine, atropine, and hyoscyamine, together with withanolides and other related substances, are among the many active ingredients found in datura. The substantial pharmacological potential of withanolides—which have anticancer,cytotoxic, anti-inflammatory, antibacterial, hepatoprotective, sedative, cytostatic, and immunosuppressive qualities—has been notably brought to light by recent studies. These bioactive chemicals were isolated, purified, and characterized from different sections of the Datura metel plant in the current study. Numerous methods have been employed to identify ingredients, according to survey of literature currently in publication, however the data is still dispersed throughout scholarly sources. Both primary metabolites and secondary metabolites have been identified by preliminary qualitative phytochemical screening. These results underline the necessity of more research into Datura metel's therapeutic qualities in order to expand our knowledge and encourage possible uses in pharmaceutical development.

Keywords: Chemical Constituents; Pharmacological Action; Datura Fastuosa; Datura Metel; Datura Stramonium; TLC; Extraction Solvent; Atropine; Scopolamine.

1. Introduction

Devil's Trumpet, or Datura metel, is a perennial plant that is well-known for its diverse range of bioactive substances, which include triterpenoids, alkaloids, tannins, steroids, flavonoids, and saponins [1]. It is known as Shivashehara in ancient Indian literature, and because its blooms are associated with Lord Shiva, they are symbolically tied to him [7].

Among its numerous phytochemicals, the Solanaceae family, particularly Atropa belladonna and Datura species, are the traditional source of atropine, a useful tropane alkaloid. The naturally high amounts of important alkaloids like scopolamine and hyoscyamine, which function as atropine precursors, make Datura metel particularly promising for in vitro atropine production.Researchers can now optimize the plant's biochemical pathways, resulting in increased atropine yield and purity and lower production costs overall, thanks to developments in genetic engineering and biotechnology [2]. Although the concentration of belladonna alkaloids varies by plant part, they are present in all parts

* Corresponding author: Arati Anil Waghmare.

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of the Datura plant species. Petioles and flowers usually have the highest levels, followed by stems, fruits (particularly seeds), leaves, and roots [3]. The separation and characterisation of alkaloids in Datura species have been the subject of in-depth research since 1925. Due to a complex mixture of more than 30 distinct alkaloids, these plants are well renowned for their strong poisonous and therapeutic effects.Scopolamine levels in Datura can vary from 0.0029% to 0.32%, while the overall alkaloid content of the dried plant material can range from 0.02% to 0.52%. The plant's geographic origin, the particular portion examined, and the stage of growth at the time of collection are some of the variables that affect these values [5]. This study examined the possibility of Datura ferox and Datura stramonium as sources of atropine and scopolamine alkaloids by extracting these compounds from both plants. Many species of many plant groups, particularly those in the Solanaceae, Erythroxylaceae, Proteaceae, and Convolvulaceae families, naturally contain tropane alkaloids like atropine. Atropine, a racemic combination of hyoscyamine, is used as a nerve agent to dilate the pupil for retinal exams or as an antidote to organophosphate insecticides. Among other things, hyoscine or scopamine is used to cure motion sickness.[6] Because the blooms are thought to be connected to Lord Shiva, Datura is known as Shivashehara in ancient Indian literature.[7]

2. Plant Profile

Synonym: Brugmansia waymannii Paxton, Datura aegyptiaca Vis., Datura alba as attributed by both Rumphius ex Nees and F. Muell, Datura alba var. africana Mattei, and Datura bojeri Delile are some examples of historical and botanical synonyms or classifications linked to species in the Datura and Brugmansia genera. Datura chlorantha Hook., Datura cornucopia (as cited by several authors), Datura dubia Rich. and Datura dubia Bianca ex Tod., and Datura fastuosa L., which has been further subdivided into alba Bernh., flaviflora O.E. Schulz ex O.C. Schmidt, glabra Bernh., parviflora Nees, rubra Bernh., and tuberculata Bernh. are other entries. Datura fruticosa Hornem., Datura humilis Desf., Datura hummatu Bernh., and Datura laevis Schkuhr are some other noteworthy names. Lastly, var. dentata Schltdl. & Cham. and var. fastuosa (L.) Saff. both exhibit Datura metel forms [11].



Figure 1 Datura Plant

Taxonomic classification: Plantae is the kingdom; Magnoliophyta is the division; Angiospermae is the subdivision; Magnoliopsida is the class; Asterids is the subclass; Solanales is the order; Solanaceae is the family; Datura is the genus; Datura fastuosa (Datura metel) is the species [11].

Description: This annual plant usually reaches a height of 0.5 to 1.5 meters and, as it ages, becomes glabrescent, or almost hairless. Its stems are frequently a vivid shade of dark violet. Petioles that range in length from 2 to 6 cm attach leaves. The leaf blades have a thin (membranous) texture and are elliptical to broadly oval, measuring 5–20 cm in length and 4–15 cm in width. They have a truncate or wedge-shaped (cuneate) base that is noticeably asymmetrical, and they are also glabrescent. With four to six pairs of veins and an acuminate (pointed) tip, leaf margins can be irregularly sinuate-dentate, lobed, or whole. Each flower is carried on a pedicel that is around 1 cm long and oriented erect. The calyx is tubular and ranges in length from 4 to 9 cm. The funnel-shaped corolla, which can be white, yellowish, or pale purple, can be found in single, double, or triple forms. It is 14–20 cm long, with an enlarged part (limb) that is 6–10 cm

in diameter. The lobes of the corolla are long. The anthers are between 1 and 1.2 cm long. Fruits are deflexed, nodding capsules that are roughly spherical (subglobose) and have a diameter of 3 cm. Their surfaces are divided into four uneven valves and are tuberculate, or covered in tiny bumps. Parts of the persistent calyx are still present at the base of every fruit. The seeds are around 3 mm across, kidney-shaped to disc-like (reniform-discoid), and pale brown in color.[11]



Figure 2 Datura Fruits



Figure 3 Datura Seeds

Traditional Uses: Because of their narcotic, antispasmodic, antitussive, bronchodilator, anti-asthmatic, and hallucinogenic qualities, the plant's dried leaves, blossoms, and roots were used. Additionally, it was used to treat rheumatic pain, hemorrhoids, painful menstruation, burns, wounds, diarrhea, skin problems, epilepsy, hysteria, and skin ulcers. It was categorized as bitter, acrid, astringent, germicidal, anodyne, antiseptic, anti-inflammatory, narcotic, and sedative in Ayurvedic medicine. The plant's seeds, blossoms, root bark, and leaves are all considered therapeutic aspects.[11]

Physicochemical Characteristics: The following outcomes were obtained from the physicochemical examination of dried Datura fastuosa seeds: Water-soluble ash made up 4.5% of the overall ash content, which was 5.6% w/w. With a foaming index of 18.18 and a swelling index of 2.6 ml/g, the water-soluble extractive had a measurement of 26.35 mg/g. The crude fiber content was 17.5% w/w, the moisture content was 1.4%, and the drying loss was 390 mg.[11].

Chemical Constituent's: Tropane alkaloids are the most prominent of the several chemical compounds found in the Datura plant. These alkaloids, which have therapeutic qualities, include scopolamine, hyoscyamine, and atropine. Glycosides, saponins, flavonoids, phenols, and phlobatannins are also abundant in the plant, mostly in the leaves. It is known that the plant's seeds contain oxalate, tannin, and phytate. One of the main components of tropane alkaloids is atropine, a strong anticholinergic substance that is employed in medicine for a number of therapeutic applications. Alongside atropine, hyoscyamine is another anticholinergic alkaloid that is frequently present.

The alkaloid scopolamine, commonly known as hyoscine, is an anticholinergic drug in addition to its sedative and antiemetic properties. Several bioactive components, such as alkaloids, tannins, cardiac glycosides, flavonoids, carbohydrates, amino acids, and phenolic compounds, were found in the methanolic and hydroalcoholic extracts made from the dried seeds of Datura fastuosa after a preliminary phytochemical screening. According to a proximate analysis, the seeds' nutritional composition was as follows: 14.72% fat, 51.22% carbohydrate, 20.73% protein, 4.63% moisture, 5.14% ash, 5.63% total sugars, 2.65% reducing sugars, and 17.35% crude fiber. Calcium (174.0 mg), phosphorus (690.0 mg), potassium (0.50 mg), sodium (0.085 mg), iron (16.8 mg), zinc (2.63 mg), copper (6.9 mg), and magnesium (390.0 mg) were also detected as trace mineral elements per 100 grams.



Figure 4 Datura Seeds

Unsaturated fatty acids (81.74%) outnumbered saturated fatty acids (18.03%) in the fatty acid composition, with monounsaturated fatty acids accounting for 27.49% and polyunsaturated fatty acids for 54.25%. Palmitic acid (15.31%), stearic acid (2.72%), oleic acid (25.97%), linoleic acid (54.25%), and palmitoleic acid (1.52%) were all included in the comprehensive fatty acid profile. Different portions of Datura metel were hydrodistilled to separate the essential oils, which were then subjected to GC-MS analysis. Ketones made up the majority of the floral essential oil (23.61%) and ethyl palmitate (15.84%). Ketones (18.84%) and phytol (18.71%) were the primary characteristics of leaf oils, but petioles had notable concentrations of both compounds (39.45%) and phytol (31.32%). Ethyl linoleate (21.56%) and palmitic acid (30.60%) were abundant in seed oils. Palmitic acid made up the majority of the roots (52.61%), whereas ethyl linoleate (17.38%) and palmitic acid (38.38%) dominated the stem oils.[11].

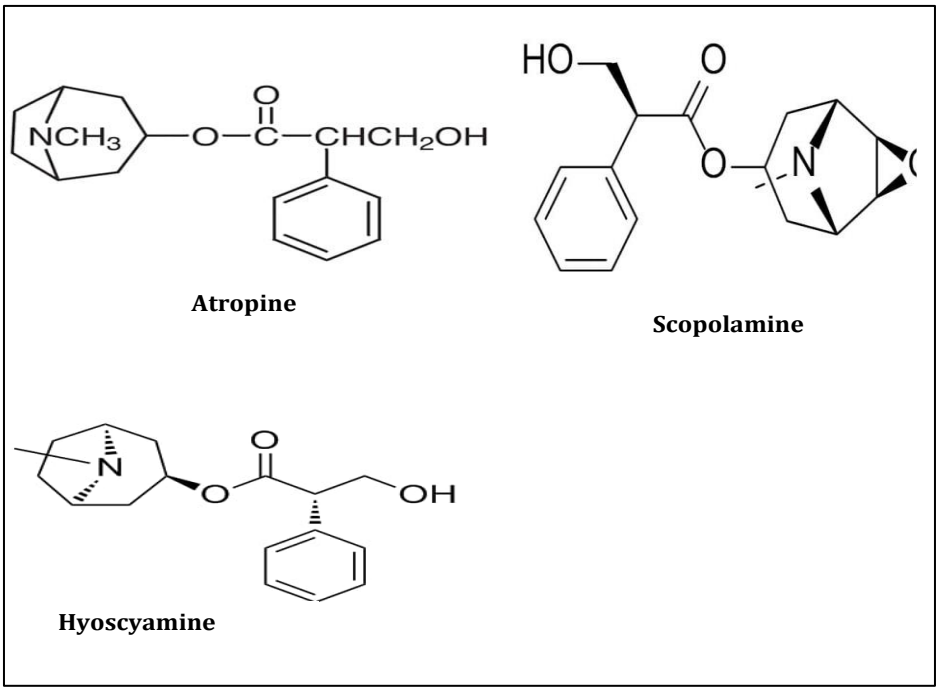


Figure 5 Structures of Alkaloids

3. Extraction Method

Solvents and Reagents: To guarantee experimental accuracy, all of the chemicals and solvents used in this investigation were of analytical quality. Ethanol, methanol, ethyl acetate, chloroform, acetone, n-hexane, and dimethyl sulfoxide (DMSO) were among the solvents utilized for the extraction process [4].

Preparation of Plant Crude Extracts: To start, fresh plant materials were properly cleansed under running water to get rid of any surface impurities. To preserve phytochemicals, the cleaned samples—which included stems, fruits, and leaves—were subsequently shade-dried for three weeks at room temperature with active ventilation. Each plant portion was separately ground into a fine powder using an electric knife mill once it had completely dried. To preserve their integrity until extraction, the resultant powders were kept in sealed containers. [4]

- **Extraction Procedure:** A 1000 ml Erlenmeyer flask containing 40 grams of powdered plant material and 400 ml of chosen solvents was used for the extraction process. The following solvents were employed either singly or in 1:1 binary combinations:
    - -Hexane (Nh)
    - Chloroform (C)
    - Acetone (A)
    - Ethanol + Chloroform (EC) Ethyl acetate + Acetone (EthA) Ethyl acetate (Eth)
    - Chloroform + Methanol (MC)
    - Methanol + Ethyl Acetate (MEth) Ethyl Acetate + Ethanol (EthE)
    - Ethanol (E) and Methanol (M)
    - Disilled water
- After 24 hours of maceration at room temperature, an ultrasonic bath was used for 30 minutes of room temperature extraction with ultrasonic assistance. To optimize yield, this procedure was carried out twice for every sample, and all extractions were carried out in triplicate.

- Whatman No. 1 filter paper was used after the mixed extracts had first been filtered through muslin cloth. The final crude extracts were obtained by drying the filtrates in a vacuum oven (Yamato, Japan) at 45 °C after they had been concentrated using a rotary evaporator under reduced pressure (Buchi, Switzerland) and the remaining solvents were eliminated [4].

3.1. Phytochemical Analysis

Tests for Carbohydrates: To identify the presence of carbohydrates, a series of standard chemical tests were performed as described below:

- Molisch's Test: This test looks for carbs in general. Two milliliters of the sample solution and two milliliters of Molisch's reagent were put to a clean test tube. After giving the mixture a gentle shake, strong sulfuric acid (H_2SO_4) was cautiously added along the test tube's inner wall to create a distinct layer. A good result for carbs was shown by the formation of a violet or purple ring at the interface of the two layers after the tube had been left undisturbed for approximately one minute.[8]

- Benedict's Test: Benedict's solution, which includes sodium hydroxide and copper sulfate, is used to identify reducing sugars. Four milliliters of the aqueous test solution were mixed with one milliliter of Benedict's reagent for this test. After that, the mixture was brought almost to a boil. Depending on the proportion of reducing sugars, a color shift from green to brick-red indicated a successful outcome. The reduction of copper (II) ions to cuprous oxide is what gives the hue.[8]

- Barfoed's Test: Monosaccharide's can be distinguished from other sugars using this test. After dissolving the sample in water, a tiny quantity of Barfoed's reagent was added. For a short while, the solution was heated. Within two minutes, a crimson cuprous oxide precipitate formed, indicating the presence of monosaccharides.[8]

- Fehling's Test : Reducing sugars can also be found using Fehling's test. Fehling's solution, which is made up of equal parts Solution A (0.5% copper sulfate) and Solution B (sodium potassium tartrate), must be newly mixed. Two milliliters of the sample were added to one milliliter of each solution, and the mixture was cooked for five to ten minutes in a water bath. Reducing sugars were present because a red precipitate formed.[8]

3.2. Tests for Alkaloids:

To detect the presence of alkaloids in a given sample, the following qualitative tests were conducted:

- Mayer's Test: Using this approach, two milliliters of the test solution were combined with two milliliters of Mayer's reagent, a potassium mercuric iodide solution. A white or pale yellow precipitate formed, indicating a successful outcome. It's crucial to remember that some alkaloid families, such purine derivatives, might not react with this test.[8]

- Dragendroff's Test: Dragendorff's reagent, which is made up of potassium iodide and bismuth subnitrate, was mixed with two milliliters of the test solution for this test. The formation of an orange-colored precipitate indicated a favorable response and verified that the sample contained alkaloids.[8]

- Wagner's Test: In this process, the sample solution was directly mixed with a few drops of Wagner's reagent, which is a diluted iodine solution. Alkaloids were present because a reddish-brown precipitate formed.[8]

- Hager's Test: For this test, Hager's reagent—a saturated aqueous solution of picric acid—was employed. The presence of alkaloids in the solution was confirmed by the orange-yellow precipitate that formed when it was added to the test filtrate.[8]

3.3. Test for Amino Acids:

- Ninhydrin Test: A common technique for determining whether proteins contain free amino groups and which α-amino acids is the Ninhydrin test. A specific color, usually deep blue or occasionally pale yellow, is produced by a chemical reaction that takes place when the sample solution is heated with the ninhydrin reagent. The presence of the free amino acids in the sample is confirmed by this color shift, which represents the interaction between ninhydrin and their amino nitrogen.[8]

3.4. Tests for Proteins:

To confirm the presence of proteins in a sample, the following qualitative tests were performed:

- Biuret's Test : Water was used to dissolve a small amount of the sample residue. One milliliter of 4% sodium hydroxide and a drop of 1% copper sulfate solution were added to this mixture. The presence of peptide bonds, which indicate proteins in the sample, was confirmed by the emergence of a violet or pink coloring.[8]

- Xanthoproteic Test: A tiny quantity of the sample was mixed with two milliliters of water for this test, and then 0.5 milliliters of strong nitric acid was added. A good reaction was shown by the formation of a yellow coloring, which suggested that proteins contain aromatic amino acids.[8]

- Millon's Test: A tiny amount of the test sample was mixed with a few milliliters (2–3 ml) of Millon's reagent. The presence of proteins containing tyrosine was demonstrated by the production of a white precipitate that gradually turned pink when left to stand.[8]

3.5. Test for Saponins

- Foam Test: A tiny amount of the sample was put in a test tube with a pinch of sodium bicarbonate and a little water, and it was shaken vigorously. The presence of saponins in the test sample was indicated by the development of a steady, honeycomb-like froth that lasted for a while.[8]

3.6. Test for Glycosides

- Brontrager's Test: One milliliter of benzene was added to an ethanolic extract of the material, and then 0.5 milliliters of diluted ammonia solution was added. The mixture's reddish-pink coloring suggested that glycosides were present, which was a positive finding.[8]

3.7. Test for Phenolic Compounds

First, the extract was heated gradually after being diluted with water. The heated liquid was then mixed with two milliliters of ferric chloride solution. A good reaction was shown by the development of a green or blue coloring, which verified that the material contained phenolic chemicals.[8]

3.8. Test for Flavonoids:

- Shinoda Test: Five milliliters of 95% ethanol were used to dissolve a tiny portion of the sample. About 0.5 grams of magnesium metal and a few drops of strong hydrochloric acid were added to this solution. Within a few minutes, the hue turned pink, crimson, or magenta, indicating the presence of flavonoid chemicals.[8]

3.9. Test for Steroids:

- Salkowski Test: Two milliliters of chloroform were added to a test tube containing a little amount of the extract. To create a distinct layer, 2 cc of concentrated sulfuric acid was carefully applied along the test tube's side. The existence of steroidal chemicals was suggested by the formation of a red hue after a few minutes of gently stirring the mixture.[8]

3.10. Tests for Tannins:

- Ferric Chloride Test: 90% alcohol was used in the preparation of a 5% ferric chloride solution. A tiny amount of the test filtrate was mixed with a few drops of this reagent. The appearance of a deep blue or dark green hue verified that tannins were present.[8]

- Lead Acetate Test: The filtrate was mixed with a 10% (w/v) solution of basic lead acetate that had been dissolved in distilled water. The presence of tannins in the sample was demonstrated by the precipitate's development.[8]

- Potassium Dichromate Test: The test filtrate was mixed with a potassium dichromate solution. Tannins were present when a dark coloring started to emerge.[8]

3.11. Confirmatory Tests:

- Thin Layer Chromatography (T.L.C.)

Fluorescent indicator-containing TLC plates covered with a 0.25 mm layer of silica gel 60 F254 were used. The dimensions of each plate were 2 cm in width and 10 cm in length. The pre-coated plates were activated by drying for one and a half hours at 105°C in a hot oven before use.

The sample's alcoholic extract serves as the test solution.

The preparation of the mobile phase involved creating a solvent combination with a 6:3:1 ratio of toluene, ethyl acetate, and formic acid.

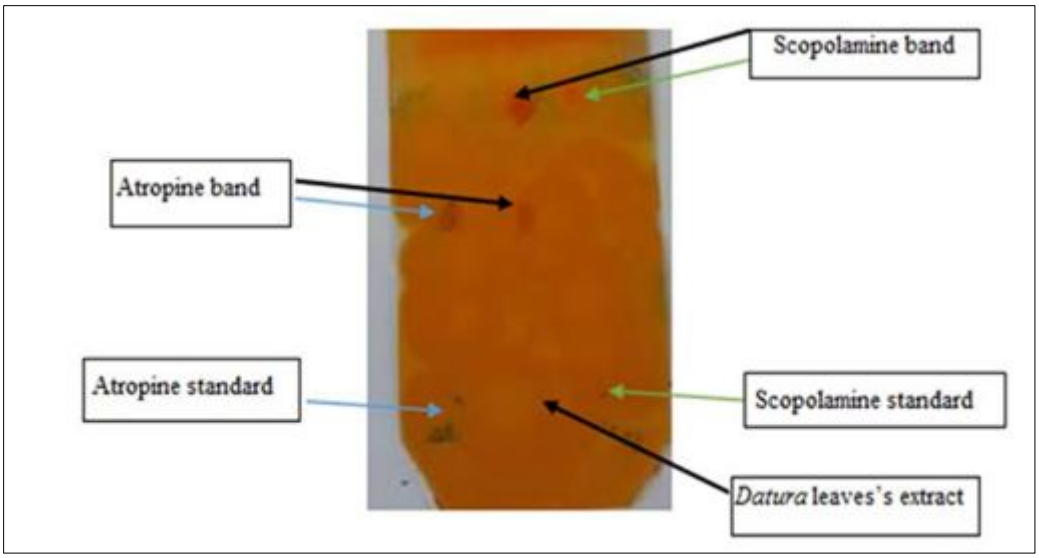


Figure 6 Thin Layer Chromatography

Visualization: To see the dots, the produced plates were exposed to iodine fumes.

To determine the Rf value, the distance that each spot traveled from the origin was measured and divided by the distance that the solvent front covered.[8]

- Vitali Morin Colour Reaction: About 0.2 milliliters of fuming nitric acid (HNO_3) were added to a few milligrams of hyoscyamine or atropine, and the mixture was then evaporated using a water bath until it was completely dry. A freshly made 3% potassium hydroxide (KOH) solution in methanol (0.5 ml) was added to the dry residue. This resulted in a vivid purple hue that progressively turned crimson before going colorless. Note: Alkaloids like strychnine, apomorphine, veratrine, or physostigmine can be detected in as low as 0.0001 mg by this extremely sensitive reaction.[7]

- Para- Dimethylamino Benzaldehyde Reagent Test: Two grams of para-Dimethylaminobenzaldehyde were dissolved in six grams of concentrated sulfuric acid (H_2SO_4) with 0.4 milliliters of water added prior to create the PDAB reagent. 2–3 drops of this reagent were added to 5–10 mg of hyoscyamine in an evaporating dish, and the mixture was cooked on a boiling water bath for a few minutes. After chilling, the test's characteristic red coloring turned into a permanent cherry red.[7]

- Gerrard's Test: A fraction of the residue became crimson right away when 1-2 milliliters of a 2% mercuric chloride solution in 50% alcohol were added. Hyoscyamine is the only substance that causes this reaction; hyoscine does not cause any color shift.[7]

4. Standardization Methods:

- Macroscopic Study/ Organoleptic Evaluation: The obtained sample was subjected to a thorough organoleptic analysis with a measuring tape, a magnifying lens, and the unaided eye. As part of the documentation, important pharmacognostic traits like size, shape, color, odor, taste, and appearance were meticulously noted.[8]

- Pharmacognostic/ Quality Control Study:

- Microscopy plays an essential role in the identification of herbal materials.

- Powder Microscopy: This method is essential for identifying samples of medicinal plants, particularly when they are fragmented or powdered. The powdered material is treated with particular chemical reagents that highlight distinguishing characteristics in order to improve the microscopic examination. Microscopic examination is a useful supplementary tool when used with other analytical techniques, even though it might not always yield definitive identification on its own. The accuracy and dependability of the identification process are improved by this combination strategy. One might identify distinctive features that might not be covered in conventional descriptions by comparing the sample under the microscope with a recognized reference material. Otherwise, these characteristics could be mistakenly seen as impurities rather than natural elements of the material.[8]

- Procedure: On a glass slide, a suitable quantity of the powdered material is combined with several chemical reagents. After that, the slide is briefly heated slowly over a low flame. Following heating, a coverslip is placed over the slide and a tiny drop of glycerine is applied. After then, the sample is inspected under a microscope.[8]

4.1. Chemical and Reagent used for Staining includes:

- Safranin
- Dilute Ferric chloride
- Eosin
- Methylene blue

Physicochemical Analysis: Since it looks at the connection between a sample's composition and physical characteristics, physicochemical evaluation is an essential component of formulation development.

4.2. Determination of Loss on Drying at 105°C:

The Ayurvedic Pharmacopeia of India (2007) states that a sample's moisture content indicates how much water it retains; higher moisture levels may jeopardize the sample's stability. A carefully weighed 5-gram sample of the medication was kept in an oven set at 105°C for five hours in order to measure this. The sample was weighed every 30

minutes until it steadied, signifying that all of the moisture had been removed. Before determining the final weight, the sample was chilled for an hour at room temperature in a desiccator.[8]

4.3. Determination of Total Ash:

Both physiological ash, which comes from the plant tissue itself, and non-physiological ash, which comes from outside contaminants like dirt or sand sticking to the plant, are included in the inorganic residue that is quantitatively evaluated by ash content analysis. This technique aids in determining the sample's overall inorganic matter content.

4.4. Acid-Insoluble Ash:

Specifically, this proportion quantifies the sample's siliceous minerals and heavy metals.

4.5. Water-Soluble Ash:

This shows the percentage of inorganic materials that dissolve in water.

A silica crucible was used for the technique; it was cleaned and dried, labeled with glass pencils, and weighed repeatedly until it reached a consistent weight. Next, a thin layer of five grams of the drug powder was equally distributed inside the crucible for ashing. In comparison to the air-dried sample, the percentage of ash was computed.[8]

4.6. Determination of Acid-Insoluble Ash:

The acid-insoluble ash content was determined by boiling the total ash with 25 milliliters of 2M hydrochloric acid for five minutes, in accordance with the Pharmacopoeia of India (1996) recommendations. A Gooch crucible or ashless filter paper was then used to collect the insoluble residue, which was then properly cleaned with hot water and burned. The residue was cooled in a desiccator and then weighed. The percentage of acid-insoluble ash was computed in relation to the drug sample's weight after air drying.[8]

4.7. Determination of Water-Soluble Ash:

Water-soluble ash was identified by boiling the entire amount of ash with 25 milliliters of water for five minutes, in accordance with the Pharmacopoeia of India (1996). A Gooch crucible or ashless filter paper was used to collect the insoluble fraction, which was then cleaned with hot water and burned for 15 minutes at a temperature of no more than 450°C. The water-soluble ash content was calculated by subtracting the weight of the insoluble stuff from the overall weight of the ash. Next, using the air-dried medication as a reference, the proportion of water-soluble ash was determined.[8]

4.8. Determination of Alcohol-Soluble Extractive:

In a closed flask, five grams of air-dried, coarsely powdered medication were soaked for twenty-four hours in 100 milliliters of alcohol with the designated concentration. A rotary shaker was used to continually stir the mixture for six hours during this time, and it was then allowed to stand undisturbed for another eighteen hours. After passing the solution through filter paper, the filtrate was gathered in a flat-bottomed dish that had been previously weighed. A water bath was used to evaporate the filtrate until it was completely dry. The dried residue-containing plate was then put in an oven set to 105°C until its weight remained constant, at which point it was weighed. The alcohol-soluble extractive percentage was calculated relative to the initial weight of the air-dried drug. This process was conducted in triplicate, and the average value was recorded.[8]

4.9. Determination of Water-Soluble Extractive:

With the exception of substituting distilled water for alcohol, the process for calculating the water-soluble extractive value was the same as that for the alcohol-soluble extractive.

Table 1 Showing Results of Physicochemical Characteristics of Datura Seed

1	**Loss On Drying (%)**	**7.36**
2	Aqueous Extractive Value (%)	17.65
3	Alcoholic Extractive Value (%)	12.25
4	Total Ash (%)	7.26

5	Acid Insoluble Ash (%)	3.65
6	Water Soluble Ash (%)	5.19
7	T.L.C.	Rf value:0.27,0.35,0.41,0.69,0.74,0.89.

5. Conclusion

Review examines the pharmacological characteristics and chemical constituents of Datura fastuosa and Datura stramonium, emphasizing their potential for a range of therapeutic uses because of their diverse range of bioactivities. To determine the best solvent for removing phytochemicals from Datura metel leaves, a comparative analysis was conducted. The results show that methanol is the most effective solvent, producing the largest levels of phenolic and flavonoid chemicals. Chloroform and distilled water, on the other hand, showed the lowest extraction efficiency, most likely as a result of their poor dissolution of the target phytochemicals, which renders them inappropriate extraction solvents.

The crude plant extracts contained different levels of alkaloids, saponins, flavonoids, tannins, and proteins, according to phytochemical screening. Furthermore, atropine content was precisely quantified by spectrophotometric analysis, highlighting the potential for improving in vitro growing conditions to increase alkaloid output. [8]

Result:

Authentication:The *Datura* plant specimens were authenticated by a qualified botanist, and herbarium samples were prepared and deposited in a recognized institution. Morphological characteristics such as leaf shape, flower structure, and seed morphology were compared with standard taxonomic descriptions to confirm the identity as *Datura stramonium* (or other relevant species).

Isolation & Extraction: Fresh or dried parts of the *Datura* plant (primarily leaves and seeds) were subjected to extraction using solvents of increasing polarity, such as petroleum ether, chloroform, methanol, and water. The extracts were concentrated under reduced pressure. Alkaloids like scopolamine and atropine were isolated using column chromatography and identified by thin-layer chromatography (TLC) and melting point analysis.

Screening for phytochemical: Several bioactive substances were detected by preliminary phytochemical testing. Strong concentrations of alkaloids, flavonoids, tannins, glycosides, steroids, and saponins were found in both methanolic and aqueous extracts. The abundance of alkaloids supported the ancient ethnomedical usage of Datura. Extracts made using non-polar solvents had less phytochemicals.

Standardization: Organoleptic characteristics, extractive values, ash values, and moisture content were the basis for standardization. UV/Vis spectrophotometry and TLC fingerprinting were employed to identify the marker compounds. The measurement of atropine and scopolamine was aided using High-Performance Liquid Chromatography (HPLC). For formulations based on Datura, these factors aid in maintaining uniformity and quality control.

Compliance with ethical standards

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