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PHYSICOCHEMICAL AND PHYTOCHEMICAL CHARACTERIZATION OF THE FLOWERS OF *IMPATIENS BALSAMINA*

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Keywords:

Impatiens balsamina, Physicochemical analysis, Phytochemical screening, Herbal medicine, Organoleptic properties

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ABSTRACT: Traditional herbal remedies predate all other medicinal systems for thousands of years. The physicochemical and phytochemical analysis of *Impatiens balsamina* flowers reveals valuable insights into its composition, emphasizing its potential in herbal medicine and food science. The total ash content was 7.45 g/100 g, with significant portions of acid-insoluble (2.67 g/100 g) and water-soluble ash (3.28 g/100 g), indicating mineral richness. The extract was more soluble in water (18.32 g/100 g) than in alcohol (12.45 g/100 g), suggesting the predominance of water-soluble bioactive compounds. The low moisture content (8.67 g/100 g) ensures good storage stability. Organoleptic analysis highlighted its pale pink color, soft texture, astringent taste, and floral aroma. Phytochemical screening confirmed the presence of essential bioactive compounds such as flavonoids, alkaloids, terpenoids, phenols, and saponins across various solvent extracts. These results underscore the therapeutic and nutritional potential of *Impatiens balsamina* flowers for diverse applications in pharmaceuticals, nutraceuticals, and cosmetics.

INTRODUCTION: The medicinal plants play a vital role in modern research aimed at discovering novel bioactive compounds for pharmaceutical and therapeutic applications. *Impatiens balsamina*, commonly known as garden balsam or touch-me-not, is an herbaceous annual plant belonging to the Balsaminaceae family [1, 2]. Widely cultivated in tropical and subtropical regions, this plant is renowned for its vibrant flowers and is traditionally used in folk medicine across Asia for its anti-inflammatory, antimicrobial, and wound-healing properties. While substantial research has focused on its leaves and stems, the physicochemical and phytochemical properties of its flowers remain relatively unexplored [3, 4].

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The physicochemical characterization of plant materials is essential for determining the intrinsic properties that influence their chemical composition and biological activity. These properties include moisture content; ash values (such as acid-insoluble and water-soluble ash); and extraction values (in various solvents such as water and alcohol), which are crucial indicators of the material's purity, stability, and quality. In the context of *I. balsamina* flowers, these parameters can provide critical insights into the suitability of flowers for medicinal use, preservation, and potential bioactive compound extraction.

Phytochemical characterization is equally significant, as it involves the identification and quantification of various secondary metabolites, including alkaloids, flavonoids, saponins, tannins, and phenolic compounds, which are the primary drivers behind the plant's medicinal properties [5, 6]. Flowers of medicinal plants are often rich sources of such phytochemicals, making their detailed analysis vital for understanding their therapeutic

potential. Previous studies on the phytochemical constituents of *I. balsamina* have focused primarily on its leaves and roots, with limited attention given to the flowers. Given their potential pharmacological applications, a deeper investigation into the phytochemical profile of flowers can open new avenues for medicinal and nutraceutical applications [7, 8]. The flowers of *I. balsamina* are also noted for their unique pigment composition, which includes anthocyanins, contributing to their bright coloration. Anthocyanins are known for their antioxidant properties, which are linked to several health benefits, such as reducing oxidative stress and mitigating inflammation. In addition to anthocyanins, other flavonoids present in flowers may contribute to their bioactive profile, suggesting potential applications in the treatment of various diseases, including cancer, cardiovascular disorders, and neurodegenerative diseases [9, 10]. The increasing interest in natural compounds for use in pharmaceuticals, cosmetics, and functional foods highlights the need for thorough scientific evaluation of medicinal plants such as *I. balsamina*. By characterizing both the physicochemical and phytochemical properties of the flower, researchers can assess its potential for developing new herbal formulations and nutraceutical products. Furthermore, understanding these properties will help in standardizing the use of *I. balsamina* flowers in traditional medicine, ensuring consistency in their therapeutic applications [11, 12]. This study aims to bridge the gap in the literature by providing a detailed physicochemical and phytochemical analysis of *I. balsamina* flowers. The findings from this research will contribute to a better understanding of the plant's bioactive compounds, their potential health benefits, and the implications for developing natural remedies. Additionally, it will offer valuable information for quality control and standardization of medicinal products derived from this plant [13, 14]. This study will further explore the unique phytochemical constituents of flowers and assess their relevance in modern pharmaceutical sciences, thus paving the way for future research into their medicinal and industrial applications.

MATERIAL AND METHODS:

Plant Collection and Validation: Fresh *Impatiens balsamina* flowers were collected in August 2023 from the Pirhad village area of the Shakti district of Chhattisgarh, India. The plant was identified and confirmed by the Botanical Survey of India (BSI), Central National Herbarium (CNH), Allahabad, U.P., India, and an herbarium file was created. The taxonomic identity of the collected plant samples was confirmed on the basis of their physical characteristics, with plant authentication no. BSI/CRC/Admin./2023-24/540 dated on 16/10/2023.

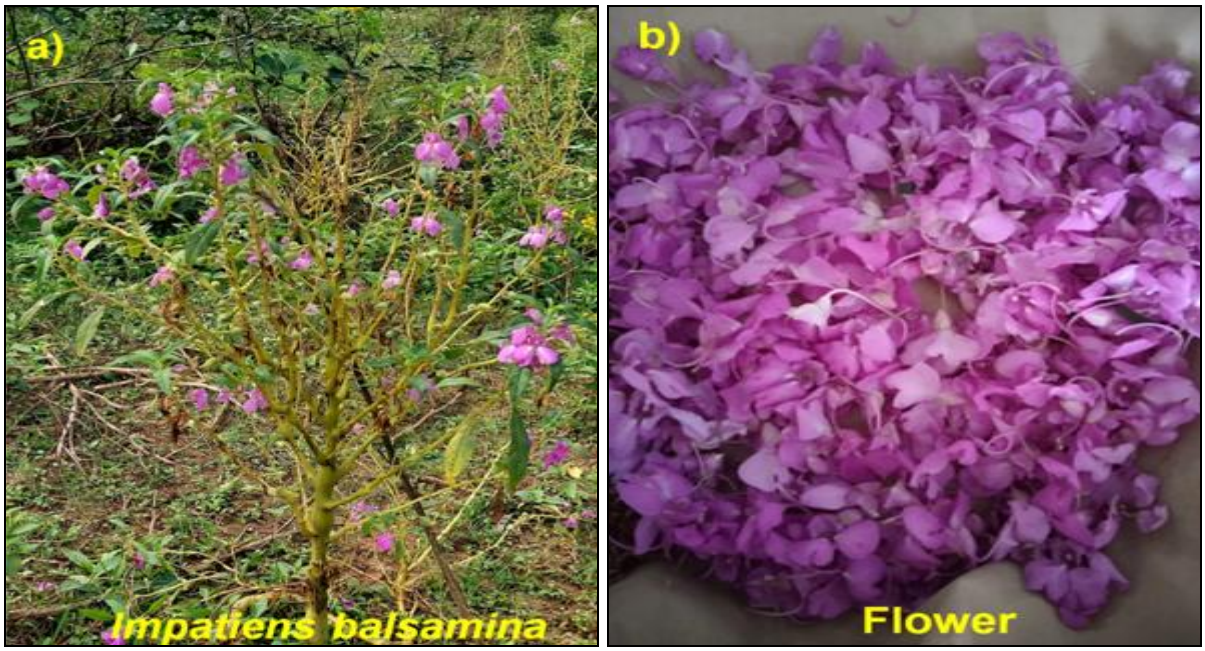

FIG. 1: (A) *IMPATIENS BALSAMINA* PLANT (B) FLOWER

Extraction Techniques: The *Impatiens balsamina* flowers were cleaned with fresh water and allowed to dry in a shaded area. Following the process of shade drying, the material is finely powdered via an electronic grinder and preserved in an airtight glass container for additional examination. To obtain a crude extract, a series of solvent extraction techniques were employed. A Soxhlet apparatus was used to separate the crude extract according to the polarity of the different solvents [15]. The extractor ran for eighteen hours or until the extract in the siphon tube lost its color. For later use, the crude extract was extracted and stored in sealed glass vials.

Physicochemical Analysis: The physicochemical analysis of *Impatiens balsamina* flowers was performed via conventional methods and our previously reported procedure [16, 17]. Many characteristics, including ash values, extractive values, loss on drying, organic foreign matter, dry matter, and bulk density, were used to make this determination. In the discussion that follows, the procedural technique that was employed is further discussed.

Total Ash: For the determination of the total ash content in *Impatiens balsamina* flowers, 2 g of finely powdered flower material was taken in a preweighed, heat-resistant silicate crucible. The sample was incinerated at a controlled temperature of 500 °C to ensure the complete removal of organic and carbonaceous matter. This incineration process was carried out until the residue became free from any black carbon particles, indicating that only inorganic components remained. After incineration, the crucible was allowed to cool to room temperature in a desiccator to prevent moisture absorption. The final weight of the crucible containing the ash was recorded. The percentage of total ash was then calculated via Equation (1).

$$\text{Total ash\%} = Wa/Ws \times 100 \quad \ldots\ldots\ldots (1)$$

Where, Wa represents the ash weight and Ws represents the sample weight.

Acid-soluble and Insoluble Ash: The crucible holding the total ash was filled with 5 mL of diluted hydrochloric acid. After the mixture was stirred, filter paper was used to gather the fine particles that had not yet dissolved. Following a thorough water rinse, the residue was repeatedly washed until the filtrate showed no signs of acidity or basicity, indicating that no acid was present. Once a steady weight was reached, the filter paper containing the insoluble particles was moved to another crucible, dried on a hot plate, and lit. The residue was then weighed to determine the amount of insoluble ash after being allowed to cool in a desiccator for 30 minutes. By deducting the weight of the insoluble ash from the total ash, the acid soluble ash content was computed. Equation (2) provides the formula for calculating acid-soluble and acid-insoluble ash.

$$\text{\% Acid soluble ash} = (\text{weight of soluble ash}) / (\text{weight of Total ash}) \times 100 \quad \ldots\ldots\ldots (2)$$

The amount of ash that can dissolve in acidic media is referred to as acid soluble ash. Conversely, acid insoluble ash is the remaining part of the total ash that does not dissolve in acidic environments. The acid-insoluble ash content was calculated via Equation (3).

$$\text{\%Acid Insoluble Ash} = \text{Total Ash} - \text{Soluble Ash} \quad \ldots\ldots (3)$$

Water-soluble and Insoluble Ash: 50 mL of distilled water was used to boil the total amount of ash. Whatman filter paper or a clean beaker was used to collect the resulting immiscible material. The collected material was then cleaned with warm water and heated to 500 °C for ten minutes. The water-soluble ash content was expressed as the difference in the total weight of the immiscible residue and ash. To determine the water-soluble ash content, the formula in Equation (4) was used.

$$\text{\% Water soluble ash} = (\text{Weight of soluble ash}) / (\text{Total ash weight}) \times 100 \quad \ldots\ldots\ldots\ldots (4)$$

Ash that dissolves in water, as a percentage of the total ash, is called water-soluble ash. Ash that is insoluble in water after it has been boiled is referred to as water-insoluble ash. The amount of water-insoluble ash was calculated via Equation (5).

$$\text{Water insoluble ash} = \text{Total Ash} - \text{Soluble Ash} \quad \ldots\ldots\ldots (5)$$

Sulfate Ash: A silicate crucible was heated to a red-hot temperature and left for fifteen minutes. The mixture was then allowed to sit in a desiccator

for a while and its weight was determined. Two grams of the finely ground plant material was carefully added to the crucible. To ensure that the powder burnt all the way through, the ignition process was started gradually. The residual substance was cooled and then moistened with 1 mL of sulfuric acid. Ignition was performed at a high temperature until all black particles were completely gone, after which gentle heating was applied until the white vapors stopped.

The crucible was allowed to cool, a small amount of sulfuric acid was added, and the crucible was heated after that. After that, the material was ignited once more and allowed to cool, and its weight was subsequently calculated. When there was a disparity between two successive measurements of no more than 0.5 mg, the process was repeated. Equation (6) was used to compute the amount of sulphated ash via the following formula.

$$\text{Sulfated ash \%} = W1/W2 \times 100 \quad \ldots\ldots\ldots\ldots (6)$$

where W1 is the weight of the sulphated ash and W2 is the original weight of the plant sample.

Extractive Values: Water-soluble extraction (WSE): In a closed flask, 50 mL of distilled water was combined with 2 g of precisely weighed powdered *Impatiens balsamina* flower fine powder and left for a whole day. To guarantee complete extraction, the flask was shaken for 12 hours before being allowed to stand for another 12 hours.

The clear supernatant was then extracted from the mixture by filtering through filter paper. In a preweighed crucible, 25 mL of the filtrate was evaporated to dryness at a regulated temperature until a consistent weight was reached. A reduced extractive value could indicate that the floral material has degraded because of factors such as aging, moisture loss, handling, or insufficient extraction techniques. Equation (7) uses the following formula to determine the water soluble extractive value of Impatiens balsamina:

$$\text{\% Extractive Value Soluble in Water \%} = Wr / Wd \times 100 \quad \ldots\ldots\ldots (7)$$

Wr represents the weight of the residue following drying, and Wd denotes the weight of the crude drug (a powdered flower sample).

Alcohol Soluble Extractive Value (ASE): In a sealed container with 50 mL of ethanol, 2 g of finely powdered *Impatiens balsamina* flowers were macerated for 18 hours. For the first six hours, the container was shaken gently at regular intervals to encourage extraction; for the next twelve hours, it was left alone. The mixture was quickly filtered to reduce solvent loss and maximize extract recovery. In a shallow dish that was previously weighed, 25 mL of the filtrate was evaporated until it was completely dry at a regulated temperature of 100 degrees Celsius. This process was repeated until a consistent weight was achieved. A reduced extractive value could be a sign of possible active ingredient loss or degradation caused by poor extraction techniques or storage. Equation (8) was used to determine the alcohol soluble extractive value of *I. balsamina* flowers.

$$\text{Value of alcohol soluble extractive \%} = Wr / Wc \times 100 \quad \ldots\ldots\ldots\ldots (8)$$

Where, Wr = the weight of the residue (after drying) and Wc = the weight of the crude drug (powdered flower sample).

Loss on Drying (LOD): After precisely weighing 10 g of finely ground *Impatiens balsamina* flowers, they were placed in an evaporating dish that had been tarred but had not been dried beforehand. The sample was dried for five hours at 100 °C, after which its weight was recorded. This drying process was repeated every hour until the weight remained stable. When two consecutive weights, taken after a 30-minute drying period and a subsequent 30-minute cooling period in a desiccator, fluctuated by no more than 0.1 g, the weight was considered constant. The following formula in Equation (9) was used to obtain the percentage of loss on drying (LOD).

$$\text{Loss on Drying \%} = (Wbd-Wad) / Wad \times 100 \quad \ldots\ldots\ldots\ldots (9)$$

Where, Wbd = weight before drying, Wad = weight after drying Organic Foreign Matter: Extraneous substances such as insects, mildew, animal contamination, and other plant detritus that might be present in the sample are referred to as organic foreign matter. One hundred grams of *Impatiens balsamina* flowers that had been shade-dried were carefully laid out on a spotless white tile surface.

Under visible light, the sample was inspected, and any foreign objects were physically eliminated. The remaining sample was weighed once it had been carefully examined, and any unnecessary materials had been removed. This final weight is noted as the organic foreign matter weight. The following formula in Equation (10) is used to determine the percentage of biological foreign matter:

$$\% \text{ Organic Foreign Matter} = (Wa-Wb) / Wa \times 100 \ldots\ldots (10)$$

Where, Wa = initial weight of the plant material, Wb = weight after removal of foreign matter Dry matter:

With the exception of moisture content, dry matter is the term used to describe the fully dried components of plant material. A 100 g sample of finely ground *Impatiens balsamina* flowers was placed in a dry, clean tray that had been previously weighed. To guarantee total moisture removal, the tray containing the sample was subsequently dried for 24 hours at 105 °C.

The sample was dried and then allowed to cool in a desiccator before being weighed once more. The dry matter weight was the final weight that was measured. Equation (11) can be used to obtain the proportion of dry matter.

$$\% \text{ Dry Matter} = (Wa-Wb) / Wa \times 100 \ldots\ldots\ldots (11)$$

Where, Wa denotes the sample's weight prior to drying and Wb is the sample's weight following drying.

Bulk Density: *I. balsamina* leaf powder was finely ground and placed within a cube of 1 cm × 1 cm × 1 cm to determine the bulk density. The excess powder was removed to maintain uniformity, and the remaining powder was removed and weighed. The bulk density was calculated via Equation (12):

$$\% \text{ Bulk Density (mg/cm3)} = Ws / Vs \times 100\ldots\ldots\ldots (12)$$

Where, Ws = weight of the powdered sample, and Vs = volume of the powdered sample in cm^3.

Organoleptic Analysis: The organoleptic analysis of *I. balsamina* flowers was completed *via* previously described methods [16, 18]. A fine powder was used to examine the form, size, color, taste, smell, and surface area of *I. balsamina* flowers to assess their organoleptic qualities.

Phytochemical Screening: Phytochemical screening of *I. balsamina* flowers was conducted via protocols previously described in standard phytochemical guidelines [19-21]. Various reagents have been employed to detect specific phytochemical classes. Shinoda reagent (Mg powder) was used for flavonoids, Wagner reagent was used for alkaloids, and a combination of trichloromethane (TCM), acetic anhydride, and concentrated sulfuric acid was used for both terpenoids and sterols. Ferric chloride was used for phenols, whereas acetic anhydride and sulfuric acid were employed for steroids.

A foaming test was used to determine saponins, alcoholic ferric chloride was used to identify tannins, and Molisch reagent was used to confirm carbohydrates. For glycosides, Salkowski reagent (glacial acetic acid and ferric chloride) was applied, whereas hydrochloric acid resulted in a red precipitate for phlobatannins and quinones. Finally, acetic acid was used to determine the oxalates. The specific procedures for the screening are outlined below.

Flavonoids: 5 mL of clean water was used as the solvent to treat 2 mL of *I. balsamina* flower extract. After 2 mL of filtrate was mixed with pure hydrochloric acid, 1 mg of magnesium powder (Shinoda reagent) was added. After some time, a bright pink color starts to develop.

Alkaloids: 5 mL of methanol filtrate was mixed with 2 mL of diluted hydrochloric acid solution. Wagner's reagent was added to small drops after the mixture had been warmed with a water bath. The formation of a crimson residue has allowed for the detection of alkaloids.

Terpenoids: 5 mL of trichloromethane (TCM), 3 mL of acetic anhydride, and pure H_2SO_4 were combined with 2 mL of *I. balsamina* flower extract. Layers were observed as a result. The thick, deep, crimson coloring of the junction confirmed that terpenoids were present.

Steroids: 2 mL of *I. balsamina* flower extract were heated and then refrigerated after a few drops of acetic anhydride were added. The solution was then diluted by adding 2 ml of pure H_2SO_4 along the walls of the glass beaker. The presence of steroids was verified by the color shift of the top layer and

the development of a brownish ring at the junction of the two layers.

Phenols: 2 mL of *I. balsamina* flower extract were combined with one mL of a fresh $FeCl_3$ solution at 5%. Indigo or dark greenish color is indicative of the blend.

Sterols: One drop of concentrated H_2SO_4 was added to two mL of TCM, 2 mL of acetic anhydride, and 2 mL of *I. balsamina* flower extract. The emergence of a violet color confirms the existence of sterol.

Saponins: First, 10 mL of distilled water was quickly combined with one gram of finely powdered *I. balsamina* flowers. The presence of a solid, continuous foam was then examined in the final solution. After the foam was mixed with a tiny amount of oil and vigorously stirred, it was checked to determine whether emulsification had occurred.

Tannins: A pale brown or golden-brown deposit, which indicates the presence of tannins, was identified in combination with 2 mL of *I. balsamina* flower extract mixed with 2 mL of a 5% fresh ferric chloride solution.

Amino Acids: 2 mL of *I. balsamina* flower extract were heated in a water bath after being treated with several drops of a 2% alcoholic ninhydrin solution. Amino acids (proteins) were present because a deep blue or violet precipitate appeared.

Carbohydrates: Molisch reagent (alcoholic α-naphthol) was applied to 2 mL of *I. balsamina* flower extract. The walls of the tilted beaker were then slowly poured with concentrated H_2SO_4. A positive reaction is considered when the interface turns from red to purple.

Glycosides: 1 mL of pure sulfuric acid was added after 2 mL of *I. balsamina* flower extract, 1 mL ofglacial acetic acid solution, and an equivalent quantity of fresh ferric chloride were combined.

The visual identification of a brownish circle at the contact point suggested the presence of glycosides. The appearance of a purple ring beneath the brown circle, which verifies the presence of cardiac glycoside, is one possible outcome.

Phlobatannins: 5 mL of purified water, 1 mL of pure HCl, and 2 mL of *I. balsamina* flower extract were combined. The presence of phlobatannis is indicated by the presence of a maroon-colored residue.

Quinones: 2 mL of *I. balsamina* flower extract were heated to a high temperature, boiled and filtered in the presence of 10 mL of pure sulfuric acid. 5 mL of chloroform were added to the filtrate to stir it. The chloroform layer was moved to a separate test tube, and then 1 mL of diluted NH_3 was added. We looked for color changes in the resulting combination.

Oxalates: Multiple drops of acetic acid were added to a volume of 2 mL of *I. balsamina* flower extract. The development of a brownish or charcoal color may be a sign that oxalates are present. The emergence of a brownish or charcoal hue could be a sign that oxalates are present.

RESULTS AND DISCUSSION:

Physicochemical Analysis: The physicochemical properties of the *Impatiens balsamina* flowers were analyzed, and the results are presented in **Table 1.** This analysis provides insight into the composition and quality of flowers, which can be crucial for their application in various fields, such as herbal medicine and food science. The total ash content of *Impatiens balsamina* was determined to be 7.45 g/100 g, indicating a moderate level of mineral content.

The breakdown of the ash values revealed that the acid soluble ash (ASA) content was 1.32 g/100 g, whereas the acid insoluble ash (AIA) content was 2.67 g/100 g. The water soluble ash (WSA) content was 3.28 g/100 g, and the water insoluble ash (WIA) content was 2.50 g/100 g. Notably, the sulphated ash content was 6.15 g/100 g, reflecting the presence of sulphate minerals. The extractive values, which indicate the solubilities of the constituents in different solvents, were 12.45 g/100g for alcohol and 18.32 g/100g for water. The higher water extraction value suggests that a significant portion of the bioactive compounds in the flowers are soluble in water, which is relevant for herbal extraction processes. The loss during drying, which provides an estimate of moisture content, was found to be 8.67 g/100 g.

This relatively low moisture content is advantageous for increasing storage stability and prolonging shelf-life. Additional parameters included organic foreign matter (OFM) at 9.12 g/100 g and dry matter (DM) content, which was measured at 81.33 g/100 g. The bulk density of the flowers was recorded at 9.42 g/100 g, a parameter that can influence processing and formulation.

TABLE 1: PHYSICOCHEMICAL ANALYSIS OF *IMPATIENS BALSAMINA* FLOWERS

S. no.	Parameter	Values (g/100 g)
1	**Ash Values**	
	Total ash (TA)	7.45
	Acid soluble ash (ASA)	1.32
	Acid insoluble ash (AIA)	2.67
	Water soluble ash (WSA)	3.28
	Water insoluble ash (WIA)	2.50
	Sulphated ash	6.15
2	**Extractive Values**	
	Alcohol extractive	12.45
	Water extractive	18.32
3	**Moisture Content**	
	Loss on drying	8.67
4	**Other Parameters**	
	Organic Foreign Matter (OFM)	9.12
	Dry Matter (DM)	81.33
	Bulk Density (BD)	9.42

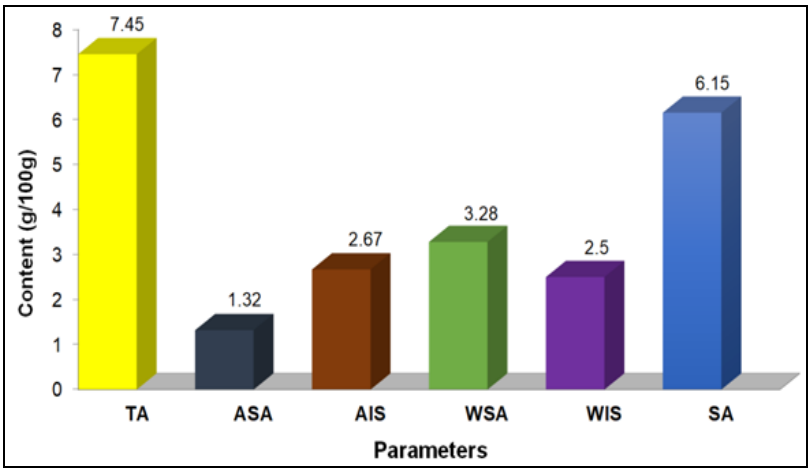

FIG. 2: ASH VALUES OF *I. BALSAMINA* FLOWERS. TA= Total ash, ASA= Acid soluble ash, AIA= Acid insoluble ash, WSA= Water soluble ash, WIA= Water insoluble ash, SA= Sulfated ash.

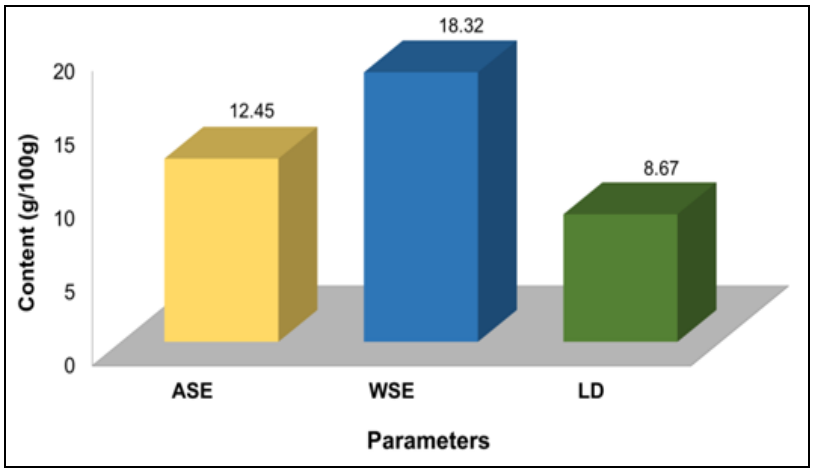

FIG. 3: EXTRACTIVE VALUES AND LOD OF *I. BALSAMINA* FLOWERS. ASE = alcohol soluble extract value, WSE = water soluble extract value, LOD = loss on drying.

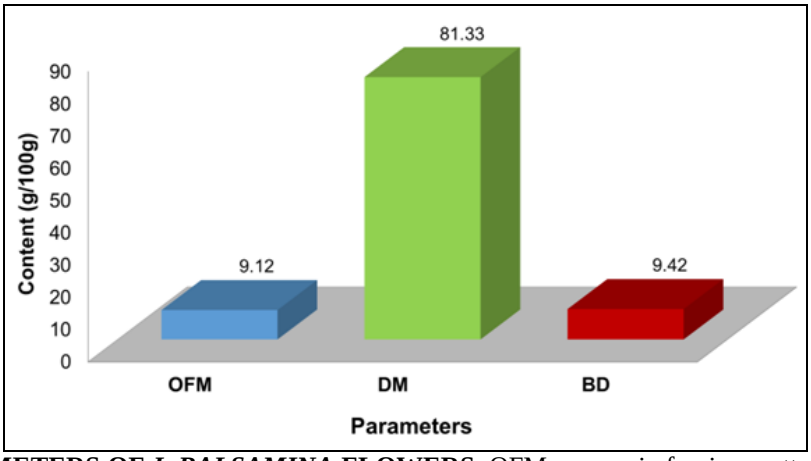

FIG. 4: OTHER PARAMETERS OF *I. BALSAMINA* FLOWERS. OFM = organic foreign matter, DM = dry matter, BD = bulk density

Organoleptic Analysis: The organoleptic analysis of *Impatiens balsamina* flowers, presented in **Table 2**, revealed distinct sensory characteristics in the fine powdered form of the sample. The powdered sample exhibited a pale pink hue, indicative of the flower's natural coloration, suggesting a potential appeal in applications where visual aspects are relevant. The texture is described as a fine and soft powder, which may facilitate ease of incorporation in various formulations, enhancing its usability in both culinary and medicinal contexts. The taste is characterized as slightly astringent. This property could influence the potential applications of flowers, particularly in herbal remedies where the flavor profile is essential.

The sample emits a floral aroma with mild sweetness, contributing to its sensory appeal. This olfactory characteristic could enhance its attractiveness in perfumery or cosmetic applications. The analysis revealed that the particles are uniformly fine, which suggests a consistent quality and may be advantageous for product formulation, ensuring uniformity in dosage and efficacy [22]. Overall, the organoleptic properties of the *Impatiens balsamina* flower indicate its potential for various applications, leveraging its appealing color, texture, taste, and fragrance.

TABLE 2: ORGANOLEPTIC ANALYSIS RESULTS FOR *IMPATIENS BALSAMINA* FLOWERS

S. no.	Character	Observation
	Sample form Fine powder	
1	Color	Pale Pink
2	Texture	Fine, Soft Powder
3	Taste	Slightly Astringent
4	Odor	Floral with Mild Sweetness
5	Shape	Uniform Fine Particles

Phytochemical Screening: Preliminary phytochemical analysis of *Impatiens balsamina* flowers, as summarized in **Table 3**, revealed a diverse array of phytochemicals across various solvent extracts. Flavonoids are detected predominantly in ethanol and methanol extracts, with the highest presence noted in water (++) and a consistent presence across other polar solvents. Flavonoids are known for their antioxidant properties [23]. Alkaloids are found in significant amounts in ethanol (++) and methanol (++) extracts, with moderate presence in acetone and ethyl acetate. Alkaloids are recognized for their potential pharmacological effects. Terpenoids present at high concentrations in pet. Ether (++) and dichloromethane (++) extracts, terpenoids contribute to the aromatic qualities of the flower and possess various biological activities [24].

Steroid compounds were identified across several solvents, particularly in pet. ether, acetone, and ethanol. The presence of these compounds suggests their potential medicinal properties. Phenols are present in all polar solvents, with the strongest results in ethanol and methanol (both ++), indicating substantial antioxidant capacity, which is critical for health benefits [25]. Sterols are found in several extracts, particularly in dichloromethane and methanol, suggesting a range of biological activities, including anti-inflammatory effects. Saponins are detected prominently in acetone (++) and ethanol (++) extracts, and saponins are noted for their potential health benefits, including cholesterol-lowering effects. Tannins are present in significant quantities across most solvents, and with strong results in ethanol (++) and methanol

(++) extracts, tannins are known for their astringent properties and health benefits. Amino acids were detected primarily in ethanol and methanol extracts, indicating their nutritional value, especially for dietary applications. Carbohydrates found in ethanol and methanol contribute to the nutritional profile and energy content of the flower. Glycosides are present predominantly in acetone, ethanol, and methanol extracts, suggesting potential bioactivity. Phlobatannins are detected mainly in ethanol and methanol, and phlobatannins are known for their antinutritional factors and potential health benefits. Quinones are highly abundant in dichloromethane and trichloromethane extracts, with multiple solvents detected, indicating a broad range of biological activities. Oxalates were detected primarily in ethanol and methanol extracts, suggesting potential dietary considerations. This phytochemical screening revealed that *Impatiens balsamina* flowers are rich in bioactive compounds, supporting their potential use in various therapeutic and nutritional applications.

TABLE 3: PRELIMINARY PHYTOCHEMICAL ANALYSIS OF *IMPATIENS BALSAMINA* FLOWERS

S. no.	Phytochemicals	Pet. Ether	DCM	TCM	Acetone	EA	Ethanol	Methanol	Water
1.	Flavonoids	-	-	+	+	+	+	+	++
2.	Alkaloids	-	+	-	+	+	++	++	++
3.	Terpenoids	++	++	+	+	+	+	+	-
4.	Steroids	+	-	+	-	+	+	+	+
5.	Phenol's	-	-	+	+	++	++	+	++
6.	Sterol	+	+	-	+	-	-	+	+
7.	Saponins	-	-	+	++	++	+	++	++
8.	Tannins	-	-	+	+	+	++	++	++
9.	Amino Acids	-	-	-	-	+	+	++	++
10.	Carbohydrates	-	-	-	-	+	+	++	++
11.	Glycosides	-	-	-	+	+	++	++	++
12.	Phlobatannins	-	-	-	-	-	+	+	++
13.	Quinones	+	+	++	++	+	+	++	++
14.	Oxalates	-	-	-	-	-	+	++	++

DCM = Dichloromethane, TCM = Trichloromethane, EA = Ethyl acetate

CONCLUSION: The physicochemical and phytochemical characterization of *Impatiens balsamina* flowers revealed a rich profile of bioactive compounds and distinctive chemical properties. The physicochemical analysis demonstrated significant ash values, with both water-soluble and sulphated ash contents indicating a notable presence of mineral components. The extractive values, particularly those obtained using alcohol and water, underscore the capacity of flowers to yield high concentrations of soluble phytochemicals, which are essential for medicinal applications. The decrease in drying and bulk density further provided insights into the moisture stability and handling properties of the material, which are critical for its storage and formulation in herbal products. Phytochemically, *Impatiens balsamina* flowers are abundant in flavonoids, alkaloids, phenols, saponins, and quinones, which contributes to their pharmacological potential. These compounds, which are widely known for their antioxidant, anti-inflammatory, and antimicrobial activities, validate the traditional use of flowers in ethnomedicine. The presence of secondary metabolites such as terpenoids and tannins further supports their application in various therapeutic contexts. Overall, the detailed characterization of the *Impatiens balsamina* flower provides a foundational understanding of its chemical composition, reinforcing its potential for pharmaceutical and nutraceutical development. These findings not only highlight the medicinal value of the flower but also pave the way for future research to explore its bioactivity and therapeutic benefits on a broader scale.

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