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Investigation of Fluorescence Characteristics and Physicochemical Properties of Different Parts of *Sesamum Triphyllum* Welw. Ex Asch.

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A B S T R A C T

Natural medications have the advantages of being easily accessible, affordable, and having few or no adverse effects; nevertheless, they are also prone to adulteration. The herbal drugs may quickly tampered with inferior ingredients to satisfy the increasing demand. Pharmacognostic investigations provide standardization parameters and assure plant identity, which will aid in preventing adulterations. The present study provides a detailed fluorescence and physicochemical analysis of leaves, stems, roots, and seeds of Sesamum triphyllum in order to identify and eventually standardize. Fluorescence analysis revealed different shades of colours in various powders of the plant treated by different chemicals. The moisture content values of leaves, stems, roots, and seeds were 6.84, 5.72, 4.82, and 3.77 %, respectively. The swelling index was higher than 22 ml in vegetative parts and the foaming index was significant in leaf, root, and seed powders. The fluorescence and physicochemical features of S. triphyllum plant parts have been determined and serve as quality control parameters for their purity, identification, and standardization.

Keywords: *Sesamum triphyllum*, Pharmacognosy, Fluorescence, Physicochemical, Powder

1. Introduction

Man and his search for natural remedies have a long history together (Kumar et al., 2021). One of the earliest and most important sources of medicine is plants (Jeet et al., 2022), and medicinal plants have long played a vital part in the provision of healthcare worldwide. Many plants have shown promise in medicine in recent decades, and they are now being considered as possible lead compounds in drug discovery (Jeet et al., 2022).

Pharmacognosy is essential to drug research and discovery because it reveals natural products with medicinal potential to treat a wide range of illnesses. Pharmacognostic investigations often involve the identification, validation, and evaluation of the quality of natural products or medications derived from plants (Akula et al., 2023). The science of biogenic or naturally derived medications, pharmaceuticals, and poisons is also known as pharmacognosy. In order to authenticate and ensure the quality of crude pharmaceuticals, as well as purified active extracts, fractions, and components, as well as medicinal foods, pharmacognosy integrates a number of contemporary analytical techniques (Sarker, 2012).

Despite all obstacles, pharmacognosy's popularity and utilization are growing in nations like China, India, and Brazil, which are emerging giant economies. These countries have witnessed a surge in pharmacognosy research due to its proven potential to contribute billions of dollars to their economies (Sarker, 2012). Pharmacognosy is currently employing organoleptic, microscopic, chemical, and biological properties to evaluate herbs. Additionally, physicochemical characteristics and fluorescence analysis are quick, accurate, and responsive techniques employed in pharmacognosy to identify different components.

Sesamum L. is one of the 13 genera in the Pedaliaceae family and contains approximately 40 species. The chemical substances found in *Sesamum* species have numerous health benefits, including anti-oxidant, anti-inflammatory, anti-diabetic, hepatoprotective, anti-microbial, and anti-convulsant properties (Astalakshmi et al., 2022). *Sesamum triphyllum* Welw. ex Asch. (wild sesame) is an erect annual plant, can have simple or bushy stems, and ranges in height from 25 to 250 cm. This species is used as an aphrodisiac and to treat snakebites, epilepsy, malaria, chest pain, and stomach pain (Leffers, 2003; Oyen, 2011). However, the pharmacognostic qualities of this plant have not yet been assessed. Thus, the current study is focused on investigating the physicochemical characteristics and fluorescence analysis of *S. triphyllum*.

2. Materials and Methods

2.1 Collection of the samples

Wild sesame leaves, stems, roots, and seeds were collected from the Karamadai region in Coimbatore district. The specimen was verified by the Botanical Survey of India (BSI), Coimbatore, and the voucher specimen was preserved in our laboratory.

2.2 Sample preparation

The collected plant parts were ground into a fine powder using a mortar and pestle after being dried in a shade environment to prevent the active ingredients from breaking down; then the powders were subjected to fluorescence and physicochemical investigations. Additionally, the fluorescence analysis was also performed on extract forms of crude drugs. For this analysis, 100 g of each powder was separately extracted by using the Soxhlet apparatus by the successive extraction method (Das et al., 2010). Petroleum ether, ethyl acetate, ethanol, and distilled water solvents were used for extraction.

2.3 Fluorescence analysis

A small quantity (1 gm) of powdered plant materials was treated with freshly prepared various acids, alkaline solutions, and solvents. The powdered materials were treated with various acids (10% HCl, 10% H_2SO_4, acetic acid, and picric acid), solvents (70% methanol, 70% ethanol, and cold & hot water), and an alkaline solution (5% aqueous NaOH) under visible and UV lights (Kokoshi et al., 1958). Additionally, the crude extracts of different parts of wild sesame were also subjected to the same analysis under visible and UV light conditions and treated without any acids/solutions/solvents (Chase & Pratt, 1949).

2.4 Physicochemical evaluation

The powdered crude drugs were analyzed quantitatively for different physicochemical parameters, *viz*., moisture content (loss on drying), foaming index, and swelling index, as per the standard procedures (World Health Organization, 1998; Trease & Evans, 2022).

2.5 Data analysis

MS office 2013 Excel software was used to calculate the foaming index and swelling index. Triplicate values were done for every experiments, and the results were expressed as mean ±standard deviation.

3. Results and Discussion

3.1 Fluorescence analysis

Fluorescence analysis of various powders and extracts of *S. triphyllum* was carried out under visible and ultraviolet light conditions. The powders were treated with various chemicals, solvents, and reagents, but the crude extracts were not treated by them. Leaf powder of *S. triphyllum* showed different shades of green and brown fluorescence in both visible and UV lights. Whereas stem powder exhibited mostly brown and rarely yellow fluorescence in visible light, meanwhile it produced a mix of green, brown, and yellow fluorescence in UV light. On the other hand, brown, red, orange, and yellow shade fluorescence was observed in root powder under visible light; the same powder exhibited mostly green and brown fluorescence under UV light conditions. Seed powder illuminated different shades of green and brown fluorescence in visible light, and it also showed yellow, green, and brown fluorescence in UV light (table 1).

Various extracts of *S. triphyllum* leaf exhibited green, brown, and yellow fluorescence in visible light; the same extracts of the material produced mostly green and rarely yellow colour in ultraviolet light. Stem extracts showed green, red, and yellow shades of fluorescence in the visible light region, but the same extracts invariably exhibited green-shaded fluorescence under UV light. Particularly red fluorescence was observed in organic solvent extracts of root, but brownish-yellow fluorescence was observed in aqueous extract of root in visible light. The same plant material illuminated green, brown, and red fluorescence under UV light. Organic solvent extracts of seed emitted different green shade fluorescence under both visible and UV lights. The aqueous extract of root showed yellow and green fluorescence in visible and UV light, respectively (table 2). In fluorescence analysis, the colour of the drug is mostly determined by the phytochemicals found in the tissue concerned (Shah & Seth, 2010). According to Chakravarthy et al. (1980), the fluorescence evaluation is used for the identification of plant and powdered drugs; therefore, it is an important parameter in pharmacognostic studies.

3.2 Determination of Physiochemical properties

The physicochemical characteristics of *S. triphyllum* were displayed in table 3. The moisture content of leaf, stem, root, and root was 6.84 ±0.25, 5.72 ±0.22, 4.82 ±0.26, and 3.77 ±0.12 %, respectively. The seed has a little bit lower moisture content than other parts. Stem powder showed a higher swelling index (26.33 ±0.57 ml) than other powders. The foaming index was significant (less than 100) in leaf, root, and seed powders but it is insignificant in stem powder. Physicochemical property estimation is a crucial parameter in order to detect adulterants and inappropriate drug handling (Regupathi & Chitra, 2015). Consequently, notable differences in the physicochemical characteristics of *S. triphyllum* may be helpful in confirming the identity of the species.

Table 1 - Fluorescence analysis of powders.

Reagents with powder	Leaf		Stem		Root		Seed	
	Visible light	UV light	Visible light	UV light	Visible light	UV light	Visible light	UV light
Powder alone	Dark green	Green	Pale brown	Pale brown	Brown	Pale brown	Green	Green
Powder + Cold water	Light green	Brownish green	Pale brown	Light green	Light brown	Light green	Brownish green	Pale green
Powder + Hot water	Light green	Light green	Light brown	Yellowish green	Reddish brown	Brown	Light green	Yellowish green
Powder + 70% Ethanol	Yellowish green	Light green	Light brown	Pale green	Yellowish red	Brown	Brownish green	Dark brown
Powder + 70% Methanol	Light green	Light green	Light brown	Light green	Light orange	Brown	Brownish green	Golden yellow
Powder + 5% NaOH	Yellowish brown	Brown	Brownish yellow	Light brown	Dark brown	Brownish green	Dark brown	Dark brown
Powder + 10% HCl	Pale brown	Light brown	Light brown	Light brown	Light brown	Light brown	Pale brown	Light brown
Powder + 10% H_2SO_4	Green	Light green	Light brown	Green	Reddish orange	Pale green	Brown	Brown
Powder + Saturated Picric acid	Yellow	Golden yellow	Yellow	Yellow	Yellow	Yellowish green	Yellowish brown	Yellowish green
Powder + Acetic acid	Light green	Brownish green	Light brown	Light yellow	Orange-red	Yellowish brown	Light brown	Brown

Table 2 - Fluorescence analysis of extracts.

Extracts	Leaf		Stem		Root		Seed	
	Visible light	UV light	Visible light	UV light	Visible light	UV light	Visible light	UV light
Petroleum ether	Brownish yellow	Yellowish green	Pale green	Light green	Yellowish red	Yellowish red	Dark green	Dark green
Ethyl acetate	Dark green	Greenish yellow	Brownish green	Light green	Red	Reddish brown	Green	Dark green
Ethanol	Dark green	Dark green	Brownish red	Yellowish green	Greenish red	Brownish green	Yellowish green	Brownish green
Water	Reddish brown	Yellowish green	Greenish yellow	Green	Brownish yellow	Light green	Pale yellow	Light green

Table 3 - Determination of Physiochemical properties.

Physicochemical parameters	Leaf	Stem	Root	Seed
Moisture content (% w/w)	6.84 ±0.25	5.72 ±0.22	4.82 ±0.26	3.77 ±0.12
Swelling index (ml)	23.8 ±0.76	26.33 ±0.57	22 ±0.5	4.25 ±0.25
Foaming index	Significant	Not significant	Significant	Significant

Values are mean of triplicate determination (n=3) ± standard deviation.

4. Conclusion

Based on ethnomedicinal surveys, numerous studies have been conducted on medicinal plants to either explore or validate their traditional therapeutic usage or biological activities. Many therapeutic plants have been effectively extracted and fractionated, and their constituents have been successfully separated. Further, the obtained compounds were examined for pharmacological action, and they were generally determined to be active. However, plant specimen identification was unable to achieve its level of accuracy, especially while it was in its primitive form. The current study provided powdered characteristics of different parts of *S. triphyllum*. It can be concluded that different parts of *S. triphyllum* ensure the presence of various bioactive compounds via fluorescence and physicochemical analysis. This could be ideal for standardizing the materials that are being investigated. Future research on *S. triphyllum* should concentrate on more pharmacognostic analysis. Such research will provide more precise and significant information on the plant, which will be helpful for generating a monograph of the species.

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