

A Comprehensive Review of *Sesbania grandiflora* Flower: Pharmacognostic, Phytochemical and Green Hydrogel Film

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Abstract: Medicinal plants are very important for making medicines because they have a lot of different bioactive compounds and pharmacological effects. *Sesbania grandiflora* (L.) Pers., a member of the Fabaceae family, is a well-known medicinal plant that is commonly used in traditional medicine. The plant's flowers have important pharmacological effects, such as being an antioxidant, antimicrobial, anti-inflammatory, and wound healer. For quality control and authentication of medicinal plants, pharmacognostic evaluation is very important. Phytochemical investigations, on the other hand, help find the biologically active compounds that give plants their healing properties. Flavonoids, tannins, saponins, alkaloids, and phenolic compounds are just a few of the phytochemicals that have been found in the flowers and other parts of *Sesbania grandiflora*. These compounds have different biological effects, such as killing germs and protecting cells from damage. Recent progress in green chemistry and green metrics has made it clear how important it is to use eco-friendly extraction methods in herbal drug research. Hydrogel-based biomaterials have also gotten a lot of attention for wound healing because they can keep the area moist and control the release of drugs. Adding plant extracts to hydrogel matrices has been shown to help wounds heal faster. This review gives a lot of information about the pharmacognostic properties, phytochemical components, pharmacological effects, and possible uses of *Sesbania grandiflora* flower extracts in wound healing systems that are based on hydrogels and are good for the environment.

Keywords: Sesbania Grandiflora , Pharmacognostic, Phytochemical, wound Healing

I. INTRODUCTION

Sesbania grandiflora is among the most potent medicinal plants known. It belongs to the family of Fabaceae and is commonly known as Agathi or hummingbird tree. They have been used since ancient times for the treatment of different diseases. Due to their natural origin and fewer side effects in compared with synthetic drugs herbal medicines are widely accepted. Medicinal plant represent an important tool for new drug discovery as many of contemporary drug isolated from plant source. It is widely found in tropical and subtropical regions, including India, Sri Lanka, Thailand, and Indonesia. The plant has been traditionally employed for wound healing fever inflammation, and respiratory problems [1,2]. Leaves flowers bark, and roots of the plant have been found to contain several bioactive phytochemicals which are deciding factors for various pharmacological effects. Research carried out on the phytochemical analysis showed the presence of flavonoids, phenolic compounds tannins saponins, and glycosides in the plant which are mainly responsible for antioxidant, antimicrobial, and anti-inflammatory properties [3,4]. A pharmacognostic study is a very significant step in the identification and standardization of herbal drugs. To verify the genuineness and purity of raw plant materials, the determination of the scope of the drug (macroscopic), the study of the drug at the tissue level (microscopic), and the evaluation of the physical and chemical properties of the drug (physicochemical) are indispensable [5].



In the last few years, pharmaceutical research has used the principles of green chemistry more and more to lessen their impact on the environment. Green metrics are ways to measure how sustainable chemical processes are by cutting down on the amount of energy, solvents, and waste they produce. Plant-based hydrogels are another way to deliver herbal medicines. Hydrogels, which are polymeric networks that can hold a lot of water, have been used a lot as dressings for wounds because they keep the area moist and help tissue grow back. This review paper seeks to examine the pharmacognostic characteristics, phytochemical constituents, pharmacological attributes, and the application of *Sesbania grandiflora* flower extracts in sustainable hydrogel-based wound healing systems.

II. HISTORY OF SSBANIA GRANDIFLORA FLOWER



(Fig: 1)

2.1 Botanical Information

Sesbania grandiflora is a fast-growing, small deciduous tree that belongs to the Fabaceae (Leguminosae) family. It is widely valued for its medicinal, nutritional, and ecological benefits. The plant is commonly found in tropical and subtropical regions, where it is cultivated for its edible flowers as well as its therapeutic properties.

Scientific Name: *Sesbania grandiflora*

Family: Fabaceae (Leguminosae)

2.2 Common Names

This plant is known by different names in various regions, reflecting its widespread use in traditional practices:

Hindi: Agati

Marathi: Agase / Agathi

English: Vegetable Hummingbird, Scarlet Wisteria Tree

Bengali: Basna



The name “*Vegetable Hummingbird*” comes from the unique shape of its flowers, which resemble the beak of a hummingbird. In traditional medicinal systems such as Ayurveda, *Sesbania grandiflora* holds an important place, especially for its wound healing and anti-inflammatory properties.

2.3 Taxonomical Classification

Sesbania grandiflora is classified under the legume family, which is well known for plants that improve soil fertility and possess significant medicinal value.

Taxonomic Rank	Classification	Description
Kingdom	Plantae	Multicellular plants capable of photosynthesis
Subkingdom	Tracheobionta	Vascular plants with specialized transport tissues
Division	Magnoliophyta	Flowering plants (angiosperms)
Class	Magnoliopsida	Dicotyledonous plants
Order	Fabales	A group that includes leguminous species
Family	Fabaceae (Leguminosae)	A large and economically important plant family
Genus	Sesbania	Known for fast-growing

Table 1. taxonomical classification of sesbania grandiflora flower

Plants belonging to the Fabaceae family are especially important because they can fix atmospheric nitrogen through symbiotic bacteria in their roots. This ability enhances soil fertility and supports sustainable agricultural practices.

Geographical Source

Sesbania grandiflora is native to Southeast Asia and grows best in warm and humid climates. Due to its adaptability and multiple uses, it is now widely cultivated in many tropical and subtropical regions.

Widely Cultivated In

India: Commonly grown in both rural and urban areas; widely used in traditional medicine and cuisine

Sri Lanka: Cultivated for edible flowers and medicinal uses

Indonesia: Used in traditional herbal remedies

Philippines: Frequently grown and included in local diets

Habitat and Growth Conditions

Thrives in tropical and subtropical climates

Prefers well-drained, loamy soils

Can tolerate waterlogged and saline conditions

It is commonly found along:

- Roadsides
- Agricultural fields
- Home gardens
- Coastal regions

Because of its rapid growth and ability to improve soil fertility, *Sesbania grandiflora* plays an important role in agroforestry and sustainable farming systems.

Pharmacognostic Evaluation

Macroscopic Characteristics

The flowers of *Sesbania grandiflora* are big, fleshy, and hang down in a curved shape. They are usually white or red and smell faintly. The petals are smooth and soft to the touch.



Microscopic Features

Microscopic analysis shows that there are epidermal cells, vascular bundles, and parenchymatous tissues. When you look at dried plant material under a microscope, you can see pieces of epidermal hairs, mucilage cells, oil globules, and spiral vessels. These are helpful for identifying plants [5].

Physical and chemical factors

Some of the most common quality control parameters that are looked at are:

- Total amount of ash
- Ash that doesn't dissolve in acid
- Value of extractive substances that dissolve in water
- Value of extractive that dissolves in alcohol
- Loss when drying

Phytochemical Constituents

Research on phytochemicals has shown that *Sesbania grandiflora* has a number of biologically active compounds, including

- Flavonoids
- Alkaloids
- Tannins
- Saponins
- Glycosides
- Compounds with phenols

Flavonoids like quercetin and rutin are known for their antioxidant properties and are important for protecting cells from oxidative damage and neutralizing free radicals [6].

Phenolic compounds and tannins also help fight germs by stopping the growth of harmful microorganisms [7].

The plant has been found to have a number of triterpenoids and isoflavonoids, such as oleanolic acid and medicarpin, which help fight inflammation and germ

Pharmacological Activities

Antioxidant Activity

Crude extracts of *Sesbania grandiflora* have exhibited antioxidant activity owing to the presence of phenolic and flavonoid compounds, which scavenge free radicals [9].

Antimicrobial Activity

Several studies have documented the antibacterial activity of the plant extracts, which are effective against several pathogenic microorganisms including *Staphylococcus aureus* and *Escherichia coli* [10].

Anti-Inflammatory Activity

The anti-inflammatory activity of the plant is attributed to the inhibition of inflammatory pathways and oxidative stress [11].

Wound Healing Activity

The wound healing activity of *Sesbania grandiflora* was demonstrated in experimental studies, in which the plant extracts were observed to increase the rate of wound contraction and collagen synthesis [12].

Green Metrics in Herbal Drug Development

Green metrics help to determine the environmental sustainability of pharmaceutical processes. Green metrics take into account various parameters, such as:

- Energy use



- Waste production
- Atom economy
- Use of solvents

Use of green extraction techniques, such as ultrasonic-assisted extraction and microwave-assisted extraction, help to reduce environmental impact while increasing extraction efficiency. [15].

Hydrogel-Based Wound Healing Applications

Hydrogel is a three-dimensional polymer network that is capable of absorbing a high amount of water while maintaining its structural integrity. Due to their high biocompatibility, hydrogels have found wide application as wound healing agents.

Use of plant extracts in hydrogel formulations provides various benefits, such as:

- Delivery of therapeutic agents
- Antimicrobial activity
- Tissue regeneration
- Reduction of infection risk

Sesbania grandiflora, with its high antioxidant activity, is a potential candidate for use in hydrogel-based wound healing agents.

III. CONCLUSION

Sesbania grandiflora is an important medicinal plant with considerable potential in the field of therapy. Various pharmacognostical and phytochemical investigations have established the presence of different bioactive compounds in the plant, which exhibit antioxidant, antimicrobial, anti-inflammatory, and wound healing properties. The incorporation of green chemistry principles in the development of herbal drugs may prove advantageous in terms of sustainability. In addition, the incorporation of plant extracts in hydrogel-based wound care products may prove advantageous in the development of eco-friendly wound healing products.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to our guide for his invaluable guidance, constant encouragement, and continuous support throughout the preparation of this review paper. His insights and suggestions greatly contributed to the quality of our work. We are also thankful to the faculty and staff of Samarth Institute of Pharmacy, Bethe, Pure, for providing the necessary resources and a motivating academic environment that helped us complete this work successfully. Finally, we extend our heartfelt appreciation to our peers, friends, and family members for their constant encouragement and moral support. Their support played an important role in the successful completion of this work.

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