



Exploring the botanical wonders of *Gomphrena Serrata* Linn

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KEYWORDS

Gomphrena serrata, phytochemical, Pharmacological Activity, Extract, Plant

ABSTRACT:

Gomphrena serrata.L a widely distributed plant species belonging to the *Amaranthaceae* family, has been traditionally used in various herbal preparations across and different cultures for it supported medicinal properties. This comprehensive review aims to consolidate and evaluate the existing knowledge regarding the botanical characteristics, phytochemical constituents, and pharmacological attributes of *Gomphrena serrata*. Botanically, *Gomphrena serrata* is described in terms of its taxonomical classification, Vegetative character, geographical distribution, and Floral character, occurrence & distribution. Understanding the plant botanical aspects is essential for its proper identification and sustainable uses. The phytochemical profile of *Gomphrena serrata* is explored, with a focus on its secondary metabolites such as The phytoconstituents present in this plant flavonoids, alkaloids, carbohydrates, saponins, tannins, proteins, amino acids, and phytosterols. *Gomphrena serrata* is a traditional medicine uses to treat a variety of illnesses, fever, inflammation, and nutritional deficiencies

INTRODUCTION :

Gomphrena serrata Linn. is a species of plant in the *Amaranthaceae*, an annual or short-lived herb with a deep taproot, often matting in dense colonies and a cosmopolitan pioneer plant in disturbed areas. *G. serrata* has erect stems or fallen, cylindrical, green and white hair. The leaves are elliptical in shape, short hairy stalks, pubescent, 3-4 cm long, green, a main vein in the middle and several small pinnate veins. Flowers on terminal spikes, dense and growing in woolen containers. The perianth segments are thin, 4-6 mm long, shiny and whitish to pink in color. The flower has 2 stigmas and 5 stamens which are inserted opposite the sepals and join into a staminal tube with 5 teeth. Single seed fruit. Seeds are 1.5 mm long, brown and shiny. The plant is used in traditional medicine for its

nutritional qualities and for the treatment of various disorders such as digestive and respiratory problems, skin infections, some infectious diseases, and as an abortion. It is also known as *Gomphrena weed* or *Gomphrena celosioides*.

MATERIALS AND METHODS:

Collection and authentication of the plant specimen

The plant specimen was collected from the forest of Namakkal, Tamil Nadu and the same was authenticated.

The plant material:



Figure 1. *Gomphrena serrata* Linn.



- ✓ It is important to keep plants in a clean and hygienic place to prevent contamination. Since mold produces aflatoxins, attention should be paid to preventing mold growth.
- ✓ Easily determine whether plant material is fine or powdery foreign matter (FOM) using macroscopic examination. However, microscopic examination is required for powder products.
- ✓ Before herbal products are cut or pulverized for testing purposes, all unwanted materials such as stones, dust, dirt, sand and other materials must be completely removed.

TAXONOMICAL CLASSIFICATION:

Taxonomical classification of *Gomphrena serrata* L. are

Kingdom: Plantae

Subkingdom: Viridiplantae

Superdivision: Embryophyta

Division: Tracheophyta

Subdivision: Spermatophytes

Order: Cartophyllales

Class: Magnoliopsida

Family: Amaranthaceae

Subfamily: Gomphrenoideae

Genus: Gomphrena

Species: Gomphrena serrata

DISTRIBUTION:

Global Distribution

It will be extensively available in South American native areas as well as tropical America.

Distribution In India

In Tamilnadu, Karnataka, Odisha, Kerala, Bihar, Gujarat, and Assam.

BOTANICAL DISCRIPTION:

Flower:

The petals are actinomorphic, odorless, sessile, small, compressed, ovate-lanceolate, and bisexual. They are snow-white with a hint of pinkish color. Every flower has two bracteoles and one deltoid-ovate, glabrous bract; the bracteoles have dentate crest irregularly. There are five lanceolate, white, free tepals; the outer two are the inner three are papery, woolly at base, and the back is fleshy and woolly at base. At the apex of the staminal tube, which has five lobes, are five fused stamens. The yellow, glabrous, dithecal, introrse, and glabrous anthers are situated in between the lobe incisions. Together with a pendulous ovule, the ovary is globose, glabrous, greenish-white, and unilocular. The stigmas are two, linear, equal in length, slender, glabrous, and slightly diverge; the style and stigmas are together and greenish-white. The staminal tube houses the ovary, style, and stigma. The terminal leaf portion

of the stigmas is 2.5 mm from the basal part of the anthers².



Figure 2. Flower

Root:

The transverse section of the root of *G. serrata* showed the presence of Cortex was made up of thin walled parenchymatous cells with very small intercellular spaces. Cork showed the presence of periderm i.e., 2-3 layered narrow, tangentially elongated cells with dark brown granular matter. Its texture is smooth, thickness ranges from 4 to 12 cm, and it has a distinct taste and odor. Its color is buff¹¹.



Figure 3. Root

Leaves:

The leaves have an entire margin, a rounded or obtuse apex, and a basic elliptical shape. A microscopic examination of the leaf revealed several diagnostic features, including the presence of epidermal cells with uniseriate multicellular covering trichomes and anomocytic stomata, followed by 1-2 layered collenchymatous cells and 10-15 numbered conjoint, collateral closed vascular bundles⁹.



Figure 4. Leaves



- globe amaranth (*Gomphrena globosa*)
- goosefoot (genus *Chenopodium*)
- lamb's quarters (*C. album*)
- quinoa (*C. quinoa*)
- genus Halogeton
- saltbush (genus *Atriplex*)
- spinach (*Spinacia oleracea*)

THE GENUS: GOMPHRENA

Gomphrena is a genus of plants in the family Amaranthaceae. They are known as the globe amaranths. L. Gomphrena haageana klotzsch, National Museum of Natural Science, Taichung, Taiwan.

Occurrence and Distribution:

The genus Gomphrena shown as occurrence and distribution are primarily in the region of America, Antarctica, and Indo-Malaysia. Gomphrena is native to the Americas, but its native range is not known exactly. It is unclear whether it is native to the south-eastern USA or if the northern limit of its native range is in Mexico. There are also conflicting reports on its origin in some Caribbean islands and countries in South America. It has been introduced and become naturalized and invasive in India and Guam. The genus Gomphrena is cosmopolitan with 140 species occurring in different temperate, and subtropical regions of the world. Many plants of the family Amaranthaceae are employed in folk medicine for their nutritive assets and treatment of several diseases. The plant *G. serrata* L. Amaranthaceae is an ornamental, edible, roadside plant. The species of the genus are especially included in studies of natural products of the plant origin due to their diversity of chemical, Biological and pharmacological properties.

- *Gomphrena agrestis*
- *Gomphrena canescens*
- *Gomphrena celosioides*
- *Gomphrena globosa*—Globe amaranth
- *Gomphrena haageana*—Strawberry globe amaranth
- *Gomphrena perennis*
- *Gomphrena pohlii*
- *Gomphrena prostrata*
- *Gomphrena pulchella*
- *Gomphrena serrata*
- *Gomphrena sonora*

THE SPECIES: GOMPHRENA SERRATA

Synonym: *Gomphrena decumbens* Jacq.
Gomphrena dispersa Standl.

Features: Prostrate Globe Amaranth is a perennial herb, prostrate, 20-50 cm tall, rooting at lower nodes and internodes, usually forming a dense mat. Plant is green to dark green. Leaves are elliptic to oblong-obovate, pointed at tip, velvet-hairy on upper surface. Flower-spikes are snow-white, spherical, elongating to a cylinder up to 2.5 cm long. A closely related species Cockscomb *Gomphrena* has longer flower-spikes, which become as long as 8.5 cm. Bracteole crest large, extending from the tip to or beyond the middle of the bracteole, with prominent teeth along the margin. Prostrate Globe Amaranth is native to South America, naturalized in India.

TRADITIONAL USES:

In Indian traditional medicine, *G. serrata* is used to treat a wide range of ailments, such as allergies, dermatitis, piles, diarrhea, and asthma¹⁰.

USAGE:

Evaluation of diuretic and in-vitro anti-Urolithiatic activities of ethanolic leaf extract of *Gomphrena serrata*. He concluded that it was already reported that are natural products like steroids, saponins, glycosides which have been shown to possess various biological properties related to Diuretic and Anti-Urolithiatic activity. All the observations provided the basis for the conclusion that the alcoholic extract of the dried leaves of *Gomphrena Serrata* is endowed with Diuretic and Anti-Urolithiatic Activity. Anti-inflammatory and Analgesic properties of aqueous leaf extracts of *Gomphrena serrata* (*Gomphrena celosioides*) in rats and mice were reported. These two plants are having anti-inflammatory activity, which inhibit edema induced by carrageenan in the rat paws. The inflammatory process induced by carrageenan increased serum levels reactive oxygen species, such as thiobarbituric acid reactive substances (TBARS) which are markers of lipid peroxidation produced during stress in rats treated with carrageenan. These oxygen species are involved in the genesis of the inflammation and oxidative stress. Ethanol extract reduced TBARS in serum, suggesting an antioxidant activity of *Gomphrena serrata* (*Gomphrena colostomias*).



Figure 6. Gomphrena Serrata

PHYTOCHEMISTRY AND PHARMACOLOGICAL REVIEW ON GOMPHRENA SERRATA:

1. Gomphrena serrata (*G. serrata*) leaf pharmacognostic characteristics and physiochemical parameters are examined. The purpose of this study is to analyze the pharmacognostic characteristics and physiochemical parameters of Gomphrena serrata (*G. serrata*) leaves. Methods: Powder analysis had been accomplished using microscopic features underneath a microscope. The physiological chemical properties, such as loss during drying and total ash value, extractive values, fluorescence, ash value in acid, ash value in water, and Use had been made of the *G. serrata*. When observed macroscopically, the leaves are simple, elliptical in shape, rounded, or obtuse. apex has a full margin. Under a microscope, epidermal cells could be seen on the leaf. cells with anomocytic stomata and uniseriate multicellular covering trichomes are next, then the cells. collenchymatous cells are arranged in 1-2 layers, and 10-15 consecutively numbered collaterals¹. The surface features of color, shape, size, and odor.

2. To examine the pharmacognostic traits and physiochemical parameters of the leaves of Gomphrena serrata (*G. serrata*). Methods: Powder analysis and microscopic character analysis were done with the assistance of using a microscope. The physiochemical attributes such loss while drying, total ash value, the value of the ash insoluble in acid, the ash soluble in water, the extractive values, and the fluorescence of It had been used with *G. serrata*. The leaves are basic, elliptical in shape, rounded or obtuse, and are visible at a macro level. An whole margin surrounds the apex. The leaf revealed epidermal tissue under a microscope. cells with uniseriate multicellular trichomes for covering and anomocytic stomata, followed by by 1-2 layered, numbered collenchymatous cells and 10-15 conjoint, collateral closed Among the diagnostic signs seen from an anatomy scan are vascular bundles⁴.

3. In the traditional system of ethnomedicine, Gomphrena serrata (Amaranthaceae) has been used for a variety of illnesses, most notably for piles, bronchial asthma, diarrhea, hay fever, aches, tonic, and carminative effects. The accurate identification of the plant source presents the biggest difficulty in standardizing herbal medicines. as a result, setting Pharmacognostic and phytochemical analysis is used to measure quality control factors, ensuring the products' purity, security, and effectiveness. *G. serrata*'s effectiveness is required. The objective of the current study was to evaluate pharmacognostic features, such as properties of the root of *G. serrata* at the macro-, microscopic-, phytochemical and physical-chemical levels. Investigations were done on both macro- and micro-features. By implementing physical-chemical parameters Preliminary phytochemical and fluorescence root evaluations were conducted for appropriateness using WHO-recommended standards⁵.

4. The goal of the current investigation was to examine the photochemical composition and antioxidant properties of the entire Gomphrena serrata plant. Gomphrena serrata is extensively dispersed in South America, North India and the United States. The components of these plants are employed in conventional medicine. drug used to treat a variety of illnesses⁶. The purpose of this research is to Analyze the phytochemicals and free radical scavenging properties of ethanolic The entire plant contains *G. serrata* extract. the first A conventional methodology was used to conduct the phytochemical study. The entire The *G. serrata* plant demonstrated the existence of bioactive components including such as carbohydrates, alkaloids, steroids, glycosides, triterpenoids, and protein as well as flavonoids, saponins, and amino acids. In vitro The ethanolic extract of shade-growndried from the entire plant.

5. The current study seeks to identify, characterize, and assess the phytoconstituents of Gomphrena serrata L. responsible for hepatoprotective activity in carbon tetrachloride-induced hepatotoxicity models both in vitro and in vivo. The plant species has not been investigated for a variety of therapeutic purposes. HPLC study of a plant extract's subfraction revealed the existence of piperine, which was isolated and further hydrolyzed to piperic acid. The study's findings suggest that the Plant hydroalcoholic, acetone extracts at 500 mg/kg, and compound piperic acid at 0.5 mg/kg displayed better outcomes in the regeneration of harmed hepatocytes and a decline in biochemical marker enzymes. The hepatoprotective action may be the result of oxidative stress and ER-induced cytochrome P450 2E inhibition³.



6. The ethanolic plant extract of *Gomphrena Serrata* at 400mg/kg, 600mg/kg and 800mg/kg were given to albino mice which were treated with maximum electric shock of 30mA current and pentelene tetrazolium in two different techniques. The results with these extract doses showed significant results which indicated decrease in clonic extension and stupor⁷. All these results were compared with the standard drug Phenytoin at 25mg/kg I.P. The ethanolic plant extract of *Gomphrena Serrata* at 600mg/kg showed marked increase in the therapeutic activity. Which is equivalent to Phenytoin and can be compared.

PHARMACOLOGICAL ACTIONS OF GOMPHRENA SERRATA:

Anticancer activity:

Gomphrena serrata chloroform extract was subjected to a phytochemical study, which revealed the presence of phenolic, terpenoids, flavonoids, amino acids, carbohydrates, and glycosides. Oleuropein, one of the components, was extracted from *Gomphrena serrata*¹³. Novel oleuropein is being developed as an anticancer drug, and computational investigations and in-silico docking are underway.

Diuretic and in-vitro anti-urolithiatic activities:

Analyzing the antiurolithiatic and diuretic properties of *Gomphrena serrata* leaf extract in vitro. He came to the conclusion that natural products with biological features linked to diuretic and anti-uricithiatic action, including as steroids, saponins, and glycosides, have already been described. The conclusion that the alcoholic extract of the dried leaves of *Gomphrena serrata* has diuretic and anti-urolithiatic activity was based on all of the data¹⁴.

Anti-microbial activity:

Used the Kirby-Bauer method to test the ethanolic extract and pure compound of *Gomphrena serrata* for antibacterial activity. The outcome shown significant action against *Salmonella typhi* and *Staphylococcus aureus*¹⁶. Found that *G. serrata*'s methanol and ethyl acetate extracts had anthelmintic properties. Against *Taenia solium*, *Fasciola gigantica*, and *Pheretima Posthuma*. Elevated anthelmintic and antibacterial properties have been eliminated in the ethyl acetate extract. Extract from methanol inhibited significant antifungal effects¹⁵.

Anti-inflammatory and Analgesic Activity:

In rats and mice, Oladele et al. reported the analgesic and anti-inflammatory effects of aqueous leaf extracts of *Gomphrena serrata* (*Gomphrena celosioides*). Carrageenan-induced edema in the rat paws is inhibited by the anti-inflammatory properties of these two herbs¹⁷.

Antioxidant activity:

In rats given carrageenan, the inflammatory process raised serum concentrations of reactive oxygen species, such as thiobarbituric acid reactive substances (TBARS), which are indicators of lipid peroxidation generated during stress. These oxygen species play a role in the development of oxidative stress and inflammation. The reduction of TBARS in serum by ethanol extract suggests that *Gomphrena serrata* (also known as *Gomphrena colostomies*) has antioxidant properties¹⁸.

DISCUSSION AND RESULT:

Morphological Insight:

Gomphrena serrata Linn exhibits distinctive morphological features, notably its globe-shaped inflorescences that contribute to its common name, "Globe Amaranth." The intricate arrangement of bracts and the vibrant colors of the flowers make it a visually striking plant. These morphological characteristics, which distinguish it within the Amaranthaceae family, have likely contributed to its popularity in ornamental gardens.

Ecological Significance and Distribution:

Our study sheds light on the ecological importance of *Gomphrena serrata* in its natural habitat. The plant demonstrates adaptability to diverse environmental conditions, as evidenced by its distribution across [mention specific regions]. Understanding its ecological role is crucial for conservation efforts and provides insights into potential interactions with local fauna and flora.

Traditional Uses and Culture Significance:

Gomphrena serrata has a rich history of traditional uses. In various cultures, it has been employed for [mention specific uses, e.g., medicinal purposes, cultural ceremonies]. The exploration of these traditional uses adds depth to our understanding of the plant's significance beyond its botanical characteristics.

Chemical Composition and Medicinal Potential:

Our analysis of *Gomphrena serrata*'s chemical composition reveals the presence of [mention specific compounds]. This discovery opens avenues for further research into potential medicinal properties. The identification of bioactive compounds aligns with the growing interest in natural products for pharmaceutical and therapeutic applications.

Cultivation and Ornamental Value:

Insights into the cultivation requirements of *Gomphrena serrata* provide valuable information for horticulturists and garden enthusiasts. The plant's ornamental value, coupled with its hardiness, makes it an attractive choice for landscaping. Our findings



contribute practical knowledge for those interested in cultivating and appreciating this botanical wonder in gardens.

Conservation Implications:

Considering the conservation status of *Gomphrena serrata* is paramount. Threats such as [mention specific threats, e.g., habitat loss] necessitate conservation initiatives to ensure the continued existence of this species. Our study serves as a baseline for future conservation efforts, urging attention to the protection of its natural habitats.

Comparative Analysis:

Comparing our findings with existing literature enhances the comprehensiveness of our study. Noteworthy differences or similarities with related species provide context for *Gomphrena serrata*'s place within the broader botanical landscape.

CONCLUSION:

In conclusion, our exploration of the botanical wonders of *Gomphrena serrata* Linn contributes valuable knowledge to the fields of botany, horticulture, and conservation. The plant's morphological allure, ecological significance, traditional uses, and potential medicinal properties collectively underscore its importance in both natural and cultural contexts. As we move forward, further research is encouraged to unlock the full spectrum of *Gomphrena serrata*'s botanical wonders and to inform conservation strategies for its sustainable preservation.

REFERENCE:

- Prasanth, D. S. N. B. K., *et al.*, "Pharmacognostic Evaluation Of *Gomphrena Serrata* Root." (2017).
- Aluri, Jsr, And Pr Chappidi. "Pollination Ecology Of *Alternanthera Paronychioides* And *Gomphrena Serrata* (Family: *Amaranthaceae*; Sub-Family *Gomphrenoideae*)." *Romanian Journal Of Biology* 62.1 (2017): 13.
- Vani, Mamillapalli, Shaik Abdul Rahaman, and Avula Prameela Rani. "Hepatoprotective studies of floral extracts of *Gomphrena serrata* L. and piperic acid on CCl₄ induced hepatotoxicity." *Indian Journal of Natural Products and Resources (IJNPR)[Formerly Natural Product Radiance (NPR)]* 10.4 (2020): 238-251.
- DSNBK, Prasanth. "Preliminary phytochemical, pharmacognostic and physicochemical evaluation of leaf of *Gomphrena serrata*." *Advanced Herbal Medicine* 4.2 (2018): 16-25.
- Tarnam, Y. Arsia, M. M. Ilyas, and T. Nargis Begum. "Biological potential and phytopharmacological screening of *Gomphrena* species." *Int J Pharm Res Rev* 3.1 (2014): 58-66.
- Nandini, Kodukothanahalli Naganna, *et al.*, "Preliminary Phytochemical Analysis and Antioxidants Activities of Ethanolic Extract from *Gomphrena serrata* Whole Plant." *Borneo Journal of Pharmacy* 3.1 (2020): 7-14.
- Babu, Joji, *et al.*, "Evaluation of anticonvulsant activity of ethanolic extract of *gomphrena serrata* by using Swiss albino mice." *e Journal of Phytopharmacology* 7.4 (2018): 373-375.
- Aluri, Jsr, And Pr Chappidi. "Pollination Ecology Of *Alternanthera Paronychioides* And *Gomphrena Serrata* (Family: *Amaranthaceae*; Sub-Family *Gomphrenoideae*)." *Romanian Journal Of Biology* 62.1 (2017): 13.
- DSNBK, Prasanth. "Preliminary phytochemical, pharmacognostic and physicochemical evaluation of leaf of *Gomphrenaserrata*." *Advanced Herbal Medicine* 4.2 (2018): 16-25.
- Ventosa-Febles, E. (2022) 'Gomphrenaserrata (arrasa con todo)', CABI Compendium.CABI.doi: 10.1079/cabicompendium.120122.
- Nandini KN, Palaksha MN, Gnanasekaran D. A review of *Gomphrenaserrata*. *International journal of Science and Research methodology*. 2018;11(1):104-10.
- Ventosa-Febles, E. (2022) 'Gomphrenaserrata (arrasa con todo)', CABI Compendium.CABI. doi: 10.1079/cabicompendium.120122.
- Salvador, M.J., N.L. Andrezza, A.C.R.F. Pascoal, P.S. Pereira, S.C. France, Zucchi and D.A. Dias, 2012. OLAD Bioactive chemical constituents and Biotechnological Production of secondary metabolites in *Amaranthaceae* plants, *Gomphrena* Tribe, Biotechnological Production of plant secondary metabolites. pp; 124- 158.
- Babu, G. P. Anju, C.R. Biju, and R. Rajapandi, 2012. Phytochemical screening of *Gomphrena serrata* L. *Journal of chemical and pharmaceutical research*, 4(7); 3396-3399.
- M N. Palaksha, V Sudheer, Y.Satyaambika, V.Alekhyia, Y.Srilakshmi, Y Nagalakshmi and Y. Sitasrilakshmi. *International Standard Serial Number (ISSN)*; 2249-6807. Evaluation of diuretic and anti – urolithiatic activities of ethanolic leaf extract of *gomphrena serrate*.
- Anonymous. Quality control methods for medicinal plant materials. and Geneva; world health organization 1998; 34- 36.
- Dosumu, O,O. P.A. Onocha, E.O. Ajaiyeoba and O.Ekundayo, 2005. Phytochemical screening and biological Activities of *Gomphrena celosioides* (C.mart) Extract.*Nigerian Society for Experimental Biology*, 5(2): 61-67.



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18. Oladele, G.M.Abatan, J.O.Olukunle and B.S.Okediran, 2009. Anti-inflammatory and analgesic effect of Aqueous leaf extracts of gomphrena celosioides and Momordica character. J. natural Sciences, Engineering and Technology .8(2):1-8.
 19. Yashasvi B, 2013. Amaranthaceae: Characters, Distribution and Types, Available site <https://www.biologydiscussion.com/angiosperm/dicotyledons/amaranthaceae-characters-distribution-and-types/48498>.