

Pharmacognostic and Phytochemical Studies on Flowers of *Aerva lanata* [L.] Juss. ex. Schult

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ABSTRACT

Background: *Aerva lanata* is an interesting plant used in traditional medicine for many years and used for the treatment of bladder and kidney stones. **Objective:** The aim was to study detailed pharmacognostic profile of an important medicinal plant in the Indian system of medicine, *A. lanata* (amaranthaceae). **Materials and Methods:** Flower samples of *A. lanata* were studied by macroscopical, microscopical characters. Physicochemical, phytochemical, and fluorescence analysis of powder of the plant was performed according to the methods of standardization recommended by World Health Organization. **Results:** Macroscopically flowers are small, actinomorphic, and solitary or aggregated in cymes. Microscopically ovary was found to be bicarpellary, syncarpous, unilocular, superior; ovules one to many and campylotropous type. Powder microscopy of flower revealed the presence of epidermis with stomata and covering trichomes, calcium oxalate crystals, starch grains, and oil globules. The investigations also included fluorescence analysis. Physicochemical parameters such as total ash, acid insoluble ash sulfated ash and water soluble ash; moisture content values were found to be 12.66%, 1.64%, 9.12%, 4.52%, 12%, respectively. Preliminary phytochemical screening showed the presence of carbohydrates, triterpenoids, flavonoids, glycosides, and phenolic compounds. **Conclusion:** The results of the present study can serve as a valuable source of information and provide suitable standards for identification of this plant material in future investigations and applications.

Keywords: *Aerva lanata*, fluorescence, microscopic, physicochemical, phytochemical

INTRODUCTION

Medicinal plants are used by nearly all cultures to prevent or treat illness. Many of most common medicines of today are developed from the components of medicinal plants. *Aerva lanata* (amaranthaceae) is an interesting plant used in traditional medicine for many years and described as one of the best known remedies for the treatment of bladder and kidney stones. It is a common weed grows wild everywhere in the plains of India, commonly known as "Mountain knot grass."¹ It has been ethno medicinally used as a therapeutic agent for a variety of diseases.²⁻⁵ Flowers are used in dysentery, diarrhea and bronchitis.⁶ However, it is important to conduct thorough

investigation of many traditionally used medicinal plants with reference to modern system of medicine.⁷ A regular and wide spread use of herbs throughout the world has increased serious concerns over their quality, safety and efficacy.⁸ Hence, pharmacognostical study gives the scientific information regarding the purity and quality of the plant drugs.⁹ The objective of the present study is to evaluate various pharmacognostical parameters such as macroscopic, microscopic, physicochemical, fluorescence, and phytochemical studies of the plant.

MATERIALS AND METHODS

Plant material

A. lanata plants were collected from Bhimavaram, East Godavari District, Andhra Pradesh. Botanical identification of the plants was done by Dr. P. Bangara Raju, Department of Botany, DNR College, Bhimavaram. Specimens of *A. lanata* (Voucher number: SVCP/Cognosy/1) was conserved in Shri Vishnu College of Pharmacy, Bhimavaram.

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Pharmacognostic study

Macroscopy

Fresh flowers were taken for morphological and histological studies. Coarse powder (60#) was used to study microscopical characters, physicochemical parameters and for phytochemical investigation. Microscopical studies were performed as per standard procedure.¹⁰⁻¹² The powder microscopy was performed according to the method of Khandelwal.¹¹

Extraction of plant material

The flowers were dried under shade for 15 days. The material was pulverized and powder was extracted with methanol. The extract was evaporated to dryness under reduced pressure at 45°C to give a solid residue. The residue was weighed and stored in refrigerator for further phytochemical study.¹³

Physicochemical and phytochemical analysis

Physicochemical values such as ash values and extractive values were determined according to the well-established official method and procedure.¹⁴⁻¹⁷ Preliminary screening was carried out using the standard procedure described by Khandelwal.^{12,16}

Florescence analysis

Powdered leaf material was treated with various chemical reagents and exposed to visible, ultraviolet (UV) light (short and long UV) to study their fluorescence behaviour.^{18,19}

RESULT AND DISCUSSION

Taxonomic classification

Kingdom: Plantae, Subkingdom: Viridiaeplantae, Phylum: Tracheophyta, Subphylum: Euphyllophytina, Class: Spermatopsida, Subclass: Caryophyllidae, Superorder: Caryophyllanae, Order: Caryophyllales, Suborder: Chenopodiineae, Family: Amaranthaceae, Subfamily: Amaranthoideae, Tribe: Amarantheae, Genus: *Aerva*, Specific epithet: *lanata*, Botanical name: *A. lanata* (L.) Juss.ex Schult.

Synonyms: *Achyranthes lanata* L., *Achyranthes villosa* Forssk, *Aerva sansibarica* Suess, *Aerva incana* Suess.^{20,21}

Common names

Bengali: Chaya. Hindi: Gorakhbuti or Kapuri jadi, Kannada: Bilesuli, Malayalam: Cherula, Marathi: Kapuri-madhura,

Punjabi: Bui-kaltan (flowers as sold in bazaars), Rajasthani: Bhui, Sanskrit: Astmabayda, Sindhi: Bhui, Jari, Tamil: Sirru -pulay-vayr, Telugu: Pindi-kura, Pindi-chettu.²²

Macroscopic characteristics

Flowers are greenish white, very small. The tiny clusters of two or three flowers grow in the leaf axils, 1.4-1.5 cm long and 3-4 mm wide. Flowers spikes are stalk less, solitary or usually in clusters, divergent, cylindrical, silky white to creamy, forming a long inflorescence leafy to the ultimate spikes. Flowers are about 0.1 inches (2.5 mm) long, sessile, often bisexual, in small dense sub sessile axillary heads or spikes 6-13 mm long, often closely crowded and forming globose clusters; bracteoles 1.25 mm, long, membranous, broadly ovate, concave, apiculate. Tepals 3-5, stamens as many as tepals and opposite to perianth members, rarely fewer than tepals; filaments free, connate into a cup at base or entirely into a tube, pseudostaminodes present or absent; anthers uni or bilocular, dorsifixed, introrsely dehiscent. Ovary bicarpellary, syncarpous, unilocular, superior; ovules one to many campylotropous; style persistent, short and indistinct or long and slender; stigma capitate, penicillate, bilobed or forming two filiform branches. Perianth 1.5-1.25 mm long; sepals oblong, obtuse, sometimes apiculate, silky-hairy on the back.^{1,22-25} Utricle broadly ovoid, acute; stigmas two (Figure 1). Inflorescences are elongated or condensed spikes (heads), racemes, or thyrsoid structures of varying complexity. The dried flowers which look like soft spikes are sold under the commercial names as buikallan or boor. It is one of the plants included in dasapushpam, the 10 sacred flowers of Kerala. The flowers are normally self-pollinated. Flowering time is from May to October.

Microscopy

The powder microscopy of flower shows trichomes, pollen grains, starch grains, calcium oxalate crystals,



Figure 1: Morphology of *Aerva lanata* (a) plant (b) flowers.

epidermal cells and stomata. Trichomes are multicellular, uniseriate with spinulated surface, tapered at the end and multiarticulate. Pollen grains are spherical in shape and are about 17-20 μm in diameter. Starch grains are oval to ellipsoidal, mostly simple, without any striations. Calcium oxalate crystals are rosette shaped. Epidermal cells are with almost straight walls and contain anomocytic stomata (Figure 2).

Physicochemical and phytochemical analysis

The yield of the methanolic extract was 2.1 g/Kg. Phytochemical studies revealed the presence of carbohydrates, triterpenoids, flavonoids, glycosides and phenolic compounds. The total ash, acid insoluble ash sulfated ash and water soluble ash; moisture content

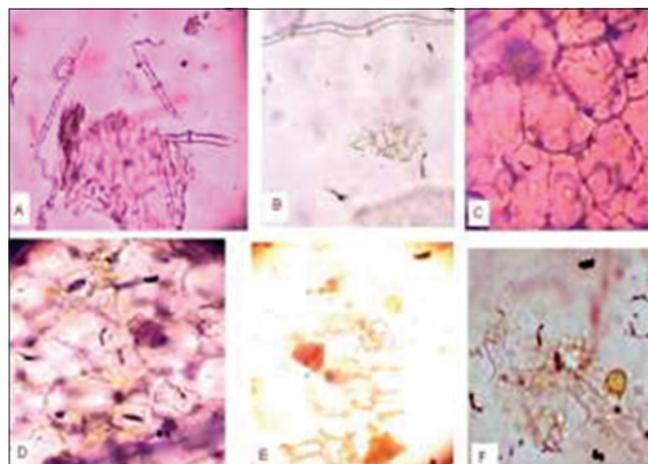


Figure 2: Powder microscopy of flowers (a) trichome (b) trichome and epidermis (c) epidermal cell (d) stomata (e) starch grains (f) pollen grain.

Table 1: Fluorescence characteristics of <i>Aerva lanata</i> flower powder			
Reagent	Normal light	Under UV light	
		254 nm	365 nm
Dry powder	Whitish green	Whitish green	Whitish green
Powder+Dil./Conc. HCl	Whitish green	Brownish green	Brownish green
Powder+Dil. H_2SO_4	Whitish green	Green	Green
Powder+Conc. H_2SO_4	Brownish green	Blue fluorescence	Blue fluorescence
Powder+Dil. Ammonia	Pale green	Blue fluorescence	Blue fluorescence
Powder+ FeCl_3	Yellow	Blue fluorescence	Blue fluorescence
Powder+Iodine solution	Brown	Brown	Blue fluorescence
Powder+Bromine water	Pale brown	Brown	Blue fluorescence

UV: Ultraviolet, Dil.: Dilute, Conc.: Concentrated

values were found to be 12.66%, 1.64%, 9.12%, 4.52%, 12% respectively. Results of florescence analysis were summarized in Table 1.

CONCLUSION

It is concluded that the above pharmacognostic and phytochemical parameters are very useful for the identification and authentication of the species. The results of the present study will also be helpful in preparation of monograph. The reported phytochemical and pharmacological studies on the species support and proved its traditional uses. Further research will help in the isolation of active compounds for therapeutic importance.

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