

Studies on Pharmacognostical, Preliminary Phytochemistry of Stem of *Justicia gendarussa* Burn

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DOI: <http://doi.org/10.5281/zenodo.2585379>

Abstract

Objective: To study the detailed pharmacognostical, preliminary phytochemical evaluation of the stem of *Justicia gendarussa* Burm, belonging to the family Acanthaceae, commonly known as “vatham kolli”. Traditionally this plant was used in treatment of bronchitis, inflammation, eye diseases, ear ache, vaginal discharges, rheumatism, dysentery, eczema and jaundice. **Methods:** Stem of *Justicia gendarussa* was studied by its Macroscopical, Microscopical, Preliminary phytochemical, Physiochemical analysis and other methods for standardization recommended by WHO. **Results:** Macroscopically, the stem is gray to brown, has a characteristic odour, is 10-60 cm long and 0.5-2 cm wide, thick, multi-branched, glabrous and bitter in taste. The young stem is circular in transverse sectional view with dense matter of epidermal trichomes which are two types, glandular and non-glandular. The vascular bundle consists of prominent discontinuous masses of bundle cap fibers, thin layer of phloem and several short parallel lines of xylem elements. The pith is wide and parenchymatous. The thick stem exhibits well developed secondary growth having closed vascular bundle with secondary xylem and phloem. These were the anatomical study's diagnostic characteristics. Physiochemical parameters have also been determined, such as loss of drying, extractive values and ash values. In the preliminary phytochemical screening revealed that the presence of sterols, carbohydrates, flavanoids, tannins, alkaloids, glycosides and saponin. **Conclusion:** The result of study can serve as a valuable source of information and provide adequate standards in future investigations and applications to identify this plant material.

Keywords: *Justicia gendarussa*, Microscopy, Macroscopy, Antimicrobial activity

INTRODUCTION

Herbal medicines derived from plant extracts are being increasingly utilized to treat a variety of clinical diseases, though relatively little knowledge about their mode of action is available. To explore the possibility of using the traditional medicine with proper chemical and pharmacological profiles, there has been a large volume of work aimed at scientific validation of efficacy of herbal drugs used in the traditional medicine [1]. The use of plants to promote health care and treatment of various diseases has become

accepted rapidly. Currently plant based drugs are researched and formulated in modern framework in new ways of medicine. Thousands of plant species growing throughout the world have medicinal uses, containing active constituents that have a direct pharmacological action on the body. This article provides an overview of key concepts regarding the pharmacognostical and preliminary phytochemical screening of stem of *Justicia gendarussa*, *Justicia gendarussa* Burm, belonging to the family Acanthaceae, commonly known as

“vatham kolli”. Traditionally this plant was used in treatment of bronchitis, inflammation, eye diseases, ear ache, vaginal discharges, rheumatism, dysentery, eczema and jaundice [2].

Materials and Methods

Collection and authentication

Justicia gendarussa Burm was collected from Vellapara, Palakkad, Kerala, India. The plant was identified and authenticated by the taxonomist Dr Kanakamany. M.T professor and Head Office of AICRP on Medicinal and Aromatic Plants, Thrissur, Kerala. The authenticated specimen was deposited in the Department of Pharmacognosy, Sanjo College of pharmaceutical studies, Palakkad, the authentication specimen number is SCPS/P.CO/004/2019. The Plant parts were separated. The stem was broken into small pieces and was dried in room temperature for 2 months. Dried specimen was powdered using mechanical grinder and passed through 60 mesh sieve to get the powder of desired coarseness. Powdered material was preserved in an air tight container.

Pharmacognostic standardization

Organoleptic characters such as shape, size, colour, odour, taste of were determined. Microscopic studies was carried out by preparing thin stem sections, stained with Phloroglucinol-hydrochloric acid (1:1) and mounted in glycerine³. Histochemical studies and powder microscopy were carried out to know about the inclusions and detailed anatomical characters of the material [4].

Physico-chemical evaluations:

The parameters were done to evaluate the proceedings of total ash; water soluble ash and acid insoluble ash were calculated as per Indian Pharmacopoeia. Extracts of the powdered stem was prepared with different solvents for the study of extractive value [5].

Preliminary phytochemical screening

The n-hexane and aqueous extract of *Justicia gendarussa* stem was subjected to tests for the presence or absence of the major class of compounds by standard methods [6].

Extraction of plant materials

For the preliminary phytochemical analysis, extract was prepared by weighing 50 gm of the dried powdered stem was subjected to hot successive continuous extraction with 250 ml n-hexane. The extraction process was carried out for 72 hrs and then the extract was collected. It was evaporated in a hot plate and residue was collected, kept in desiccators. The aqueous extract was prepared using 50 gm stem powder and 1000 ml chloroform water. Kept aside for 24 hrs and extract was concentrated under vacuum to get a brown residue.

Results

Macroscopical characters

The stem is gray to brown, has a characteristic odour, is 10-60 cm long and 0.5-2 cm wide, thick, multi-branched, glabrous and bitter in taste.



Figure 1: Habitat profile of *Justicia gendarussa*



Figure 2: Macroscopy of stem

Microscopic features of the stem

Young stem

The young stem is circular in sectional view with dense matter of epidermal trichomes. Stem consist of wide outer collenchymatous cortex, measuring 150µm thick. The inner cortex is also equally wide and parenchymatous; the cells are circular and compact (Fig 3-1, 2). These are 9 or 10 discrete triangular collateral vascular bundles with wide medullary rays. The vascular bundle consists of prominent discontinuous masses of bundle cap fibres, thin layer of phloem and several short parallel lines of xylem elements (Fig 3.2). The pith is wide and parenchymatous. A fairly mature stem is circular in outline with wavy contous (Fig.3:1, 2). It exhibits a structure similar to young stem. It consists of collenchymatous outer cortex and narrow parenchymatous inner cortex. The pith is wide and it possesses two or more wide circular secretory canals (Fig 3.1). The vascular bundles have small nests of bundle cap sclerenchyma fibres, narrow phloem band short rows of xylem (Fig 4.2).

Thick and old stem

The thick stem exhibits well developed secondary growth. The vascular cylinder is closed, thicken include secondary xylem and phloem. The outer border of the phloem is surrounded by closely arranged thick masses of sclerenchyma (Fig 5.2). Xylem cylinder comprises radial rows of

vessels and thick walled xylem fibers. The pith remains wide and parenchymatous. The pith cells are heavily loaded with starch grains. These are also dilated and wide cells filled with mucilage (Fig 5.2).

Epidermal trichomes

The epidermis of young stem bears dense trichomes. The trichomes are of two types:-

Nonglandular trichomes: These trichomes are dead cells and occurring clusters several trichomes originates from a common point and spread in the form of a star; these trichomes are called stellate trichomes (Fig 6.1)

Glandular trichomes

These trichomes are less common and are glandular type. They have short narrow basal stalk, dilated spindle shaped middle part and gradually tapering terminal part. The middle part is two or three seviate and densely stained (Fig 6.2). The gland is 140 µm in height; the mid part is 20 µm thick.

Crystal distribution

Calcium oxalate druses are abundant in the stem, especially in the phloem zone. The druses occur in close radial rows in the phloem and the crystals are located in the phloem rays. The druses are also seen sparingly in the cortical region. The druses are 20 m wide.

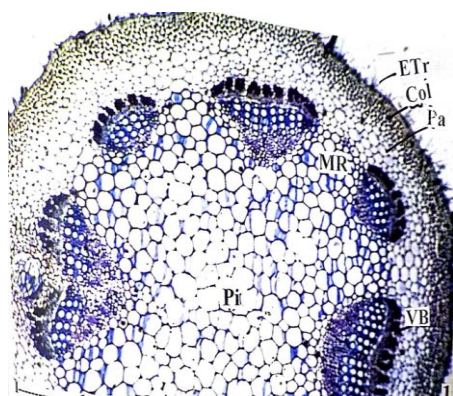


Figure 3.1: T.S of young stem

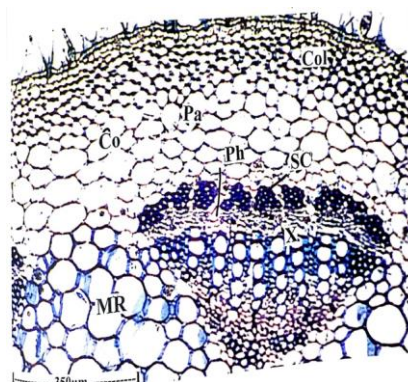


Figure 3.2: A sector enlarged

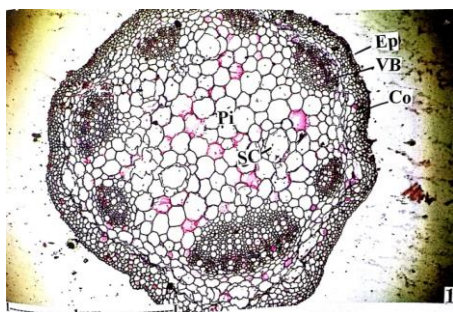


Figure 4.1: T.S of old stem

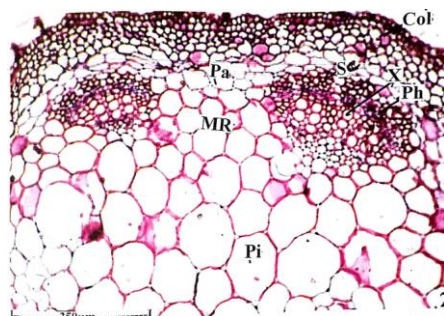


Figure 4.2: A sector enlarged

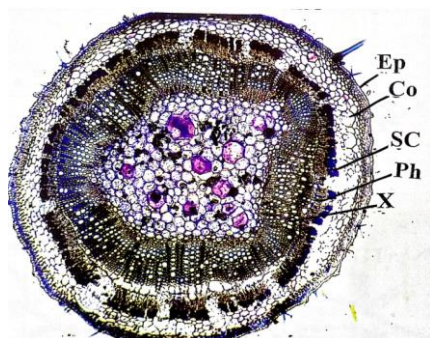


Figure 5.1: T.S of thick old stem

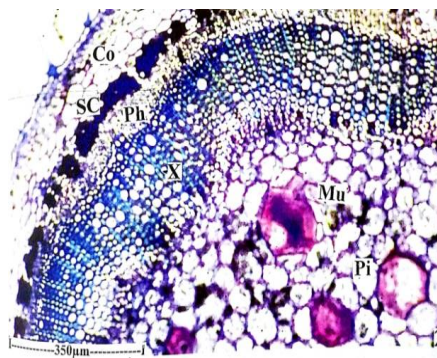


Figure 5.2: A sector enlarged

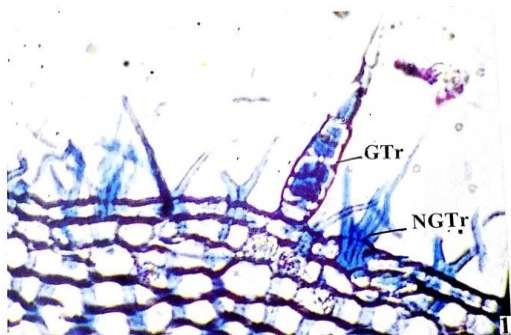


Figure 6.1: Epidermal trichomes of the stem

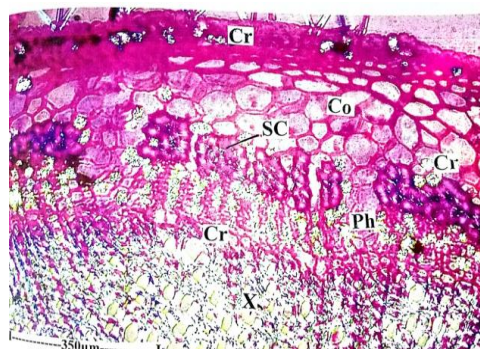


Figure 6.2: Crystal in the stem

Powder Microscopy

The study showed the presence of parenchyma cells, vascular bundles, phloem fibres, xylem fibres, epidermis and medullary rays.

Physiochemical parameters

The physico-chemical parameters of powder like total ash values, acid insoluble ash, water soluble ash and loss on drying were evaluated and the results were tabulated (Table 1).

Table 1: Physico chemical evaluation of *Justicia gendarussa*

Standardization parameters	W/W
Total ash	14.1±0.705
Acid insoluble ash	0.74±0.037
Water soluble ash	4.84±0.242
Loss on drying	9.7% ±0.34

Extractive values

The extracts were prepared according to the polarity, concentrated and their

values were calculated based on the air-dried drug and the results were tabulated (Table 2).

Table 2: Extractive values of stem extracts of *Justicia gendarussa* with different solvents

S.No	Extracts	Extractability (%)
1	Petroleum ether	01.60±0.08
2	Acetone	03.48±0.174
3	Chloroform	00.98±0.049
4	Ethanol	12.42±0.821
5	Aqueous	16.52±0.626

Preliminary phytochemical analysis

The powdered drug and various extracts such as hexane extract and aqueous extract were subjected to

preliminary phytochemical screening of their presence or absence of the constituents and the results were tabulated (Table 3).

Table 3: Preliminary phytochemical tests of various extracts of *Justicia gendarussa*

Test	Petroleum ether extract	Ethanol Extract	Aqueous extract
Sterols	+	-	-
Carbohydrates	-	+	+
Flavanoids	-	+	-
Proteins	+	+	+
Alkaloids	-	+	+
Glycosides	-	-	-
Saponins	-	+	+
Tannins	-	-	-
Muclage	-	-	-

DISCUSSION

Our study has focused on examining Pharmacognostic and Preliminary phytochemical study of stem of *Justicia gendarussa*. Normalization of the macroscopic and microscopic characteristics of the *Justicia gendarussa*. Drug remains essential in other to identify and avoid falsification. Organoleptic characteristics are important in drugs because they play a role in the detection of adulterated or substituted drugs [7]. The stem is gray to brown, has a characteristic odour, is 10-60 cm long and 0.5-2 cm wide, thick, multi-branched, glabrous and bitter in taste. The young stem is circular in transverse sectional view with dense matter of epidermal trichomes which are two types, glandular and non-glandular. The vascular bundle consists of prominent discontinuous masses of bundle cap fibres, thin layer of phloem and several short parallel lines of xylem elements. The pith is wide and parenchymatous. The thick stem exhibits well developed secondary growth having closed vascular bundle with secondary xylem and phloem. These were

the anatomical study's diagnostic characteristics. Powder characteristics revealed the presence of epidermal trichomes, vascular bundle, phloem, xylem, fibres, parenchyma cells. These diagnostic elements are consistent with botanical standards and WHO guidelines [8-9]. The study of physicochemical parameters such as moisture content and ash values are useful as it determines the physiological and non-physiological state of ash, this will help to determine the possibility of microbial growth and lastly contaminant or impurities. The moisture content of the drug studied had a rate of 9.7 ± 0.1 , which is below 10%. This result comply with the standards established by the International Pharmacopoeia, because this water content rate, prevent oxidation reactions, fermentation and give less chance to microbial growth and contamination in drugs [10]. Therefore, for proper conservation of drugs made from the stems of *Justicia gendarussa* it would be desirable to use those whose water content is less than or equal to 10%.The determination of total ash gave us a rate of

14.1 ± 0.705. This value indicates the level of minerals in drugs. Insoluble ash in hydrochloric acid gave a rate of 0.74 ± 0.037. Indeed, the ash insoluble in hydrochloric acid tells us about the contamination of the drug by siliceous elements [11]. This result is in agreement with Srikanth et al. [12] who found rate of 0.97% and 0.5% respectively. The maximum extractive value was found in distilled water (16.52%) followed by Ethanol (12.42%) Acetone (3.48%), Petroleum ether (1.60%) and chloroform (0.98%). All the extracts of the drug was subjected to different tests for detecting the presence of various phytoconstituents present in the drug, which revealed that the presence of sterols, carbohydrates, flavanoids, tannins, alkaloids, glycosides and saponin. Though *Justicia gendarussa* is a weed, it is a highly reputed drug used in Ayurveda. Barring the anatomical details and preliminary phytochemical screening, rest of the pharmacognostical parameters, gives us the clue that it can be cashed economically as well to improve the standard of health in the developing countries.

CONCLUSION

World health organization has emphasized the need to ensure quality control of the raw materials used for ayurvedic medicines by using modern techniques and by applying suitable parameters and standards. In the present study various standardization parameters such as macroscopy, microscopy (histochemical and powder), physicochemical standards, preliminary phytochemical investigation, which are being reported for the first time in the stem of this plant and could be helpful in authentication and preparation of a suitable monograph for the proper identification of *Justicia gendarussa* for the future.

Acknowledgement

The authors are thankful to the Director and Principal of Sanjo College of

Pharmaceutical studies, vellapara, Palakkad, Kerala for providing facilities to carry out the present research.

Competing interests

Authors have declared that no competing interests exist

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Cite this article as:

Dr. Dhanapal Venkatachalam, Akhib Rahman, Basil Sunny, Jency Jacob, Nikhil Kuriyan, Reshma Raman, & Ria Vaniapurackal. (2019). Studies on Pharmacognostical, Preliminary Phytochemistry of Stem of Justicia gendarussa Burn. Journal of Advances in Pharmacy Practices, 1(1), 34–40. <http://doi.org/10.5281/zenodo.2585379>