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# STANDARDIZATION OF THE STEMS OF *PSEUDARTHRIA VISCIDA* (L.) WIGHT AND ARNOTT (PAPILIONACEAE)

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**ABSTRACT**

*Pseudarthria viscida* (L.) Wight and Arnott, commonly known as *Salaparni* in Sanskrit, is a perennial viscid pubescent semi erect diffuse under shrub, belonging to the family Papilionaceae. The plant is traditionally used as astringent, sweet, bitter, emollient, digestive, antidiabetic, antidiarrhoeal, anthelmintic, antiinflammatory, diuretic, cardiotonic, aphrodisiac, antirheumatic, antiasthmatic, febrifuge, rejuvenating and tonic. In the present study, the pharmacognostic standardization of fresh, powdered and anatomical sections of the stems of *Pseudarthria viscida* (L.) was carried out to determine its macro and microscopical characters and also some of its quantitative standards. Physico-chemical evaluation includes ash values, extractive values, moisture content was evaluated. Preliminary phytochemical screening of the different extracts of *P. viscida* stem powder was carried out. These findings will be useful towards establishing pharmacognostic standards on identification, purity, quality and classification of the plant, which is gaining relevance in plant drug research.

**Key words:** *Pseudarthria viscida* (L.), Papilionaceae, Standardization, Stem, Phytochemical screening.

## INTRODUCTION

The plant *Pseudarthria viscida* (L.) Wight and Arnott (Papilionaceae) is a perennial viscid pubescent semi erect diffuse under shrub, distributed throughout all districts of South India, also reported from Srilanka and Timor [1]. It is commonly known as *Salaparni* in Sanskrit. It is also an key ingredient of many popular Ayurvedic preparations like Dashamoola and Mahanarayana taila [2]. The plant is used as anthelmintic, antiinflammatory, diuretic, cardiotonic, aphrodisiac, febrifuge, astringent, sweet, bitter, emollient, digestive, rejuvenating and tonic. It is also used in treating cough, bronchitis, asthma, tuberculosis, dyspepsia, diarrhea and alternate fever. The roots are found to be effective in treating rheumatism, asthma, heart diseases, headache, hemicranias and piles [3]. The phytoconstituents reported from root of the plant are leucopelargonidin, flavonoids and proteins [2,4].

The objective of the present study is to carry out pharmacognostic evaluation of stems of *P.viscida*, in order to prevent or detect any kind adulteration and contamination, which obviously occurs when the particular herbal drug starts gaining popularity. The study includes morphological and anatomical evaluation, determination of physico-chemical constants and preliminary phytochemical screening of the different extracts of stem powder of *P. viscida*.

## MATERIALS AND METHODS

### Plant material

The plant *Pseudarthria viscida* (L.) Wight and Arnott was collected from Tirumala hills, Tirupati, India in the month of September 2010**.** The taxonomical identification and authentication of the plant was done by Prof. P Jayaraman, Ph.D., Director, Plant Anatomy Research Centre, Chennai, Tamil Nadu [Reg.No: (PARC/2010/662)]. The voucher specimen was deposited at the department for future reference. The stems were dried under shade, powdered and passed through 40-mesh sieve.

### Macroscopic and microscopic analysis

The macroscopy and microscopy of the stem were studied according to the standard methods [5]. For the microscopical studies, cross sections were prepared and stained as per the procedure of Johansen [6]. The microscopic powder analysis was done according to the method of Brain and Turner [7] and Kokate [8].

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**Physico-chemical analysis**

Physico-chemical analysis i.e. percentage of ash values, extractive values, Fluorescence analysis and moisture content of powder sample of stem of *P.viscida* was performed according to the official methods prescribed [9] and the WHO guidelines on quality control methods for medicinal plant materials [10, 11, 12].

**Successive solvent extraction**

About 500 g of dried stem powder was extracted with solvents of different polarity in succession, starting with a highly non-polar solvent [Petroleum Ether (40-60°C)], followed by comparatively less non-polar solvents (Benzene, Diethyl Ether), then with intermediate polar solvents (Chloroform, Ethyl acetate, Acetone) and finally with a more polar solvent (Methanol and Water). Aqueous extract was prepared by macerating the dried drug powder in double distilled water. The extract was concentrated in water bath and then used for phytochemical screening.

**Preliminary phytochemical screening**

Preliminary phytochemical screening of the above extracts was carried out by using standard procedures described by Kokate [13] and Harborne [14].

**Results and Discussion**

***Macroscopic characters*** (Fig. 1) - The plant is perennial, diffuse and prostrate; stems are 60 - 120 cm long, slender, more or less clothed with soft whitish hairs. Leaves are pinnately trifoliate, alternate, and stipulate. Stipules are free and hairy. The leaves are lanceolate, subulate or cuspidate. They are 4.5-6mm long deciduous. Flowers are many, small, deep purple, red or pink color. They are arranged in distantly placed fascicles of 2 to 4 or comparatively long spreading, filiform pedicels jointed or articulated close beneath the calyx; bracts are lanceolate-subulate, shorter than the pedicels; Seeds are varying from four to six. They are brownish black in color, compressed and reniform in structure; root is subcylindrical, slightly tapering, branched, posseses longitudinal wrinkles and the inner wood is brown in colour. It has a fibrous fracture and is 3 - 7 cm long and 4 - 7 mm in thickness.

***Microscopic characters of stem*** - Mature Stem with secondary growth, measuring 2.1 mm diameter was studied. The stem is circular in sectional view. It consists of a thin epidermal layer, narrow cortex with Sclerenchyma cylinder, wide and thick vascular cylinder and incomplete pith (Fig 2a). The epidermis includes thin cylindrical layer of thin walled cells. At certain locations, a short arc-shaped region appears a narrow periderm (Fig. 3b). In other regions, the epidermis remains intact and no peridermis is formed. Unique type of glandular trichomes is occasionally seen on the epidermis. The glandular trichomes are flask shaped multicellular bodies; it bulged into elliptical body and a narrow cylindrical neck with apical pore. The gland is 120 µm in height and 50 µm thick along the basal part. Inner to the epidermal layer is a narrow cortical zone. it indicates one or two layers of parenchyma cells, a thick layer of Sclerenchyma cells and two or three layers of parenchyma cells. The middle Sclerenchyma layer consists of alternate clusters of gelatinous fibres and sclereids. The gelatinous fibres are narrow cells with gelatinous (mucilaginous inner secondary walls). The Sclereids are larger cells with thick lignified walls and wide lumen. Phloem zone is narrow comprising both crushed and collapsed elements and intact, non collapsed elements. Secondary xylem is a thick and dense cylinder of 900 µm radius. There is no growth ring. The vessels are diffuse in distribution. They are either solitary or in short radial multiples (Fig. 2b, 3c). The vessels are 20-50 µm in diameter. Xylem fibres are thick walled and lignified. The fibre lumen is narrow. Pith is wide and major portion of the pith is hollow cavity. Only a few peripheral layers of cells are visible (Fig 2a).

***Powder characters of stem*** (Fig. 4) - The Stem powder consists of the following elements when viewed under the microscope;

i. Fibres: Xylem fibres are abundant in the powder. Some of these are wide and others are narrow.

a. Wide fibres have thin walls, wide lumen and are less in length. They are 340 - 540 µm long and 20 µm wide. No pits are seen on their walls (Fig. 4a).

b. Narrow fibres have thicker walls and narrow lumen. They are usually longer than the wider fibres. The narrow fibres are up to 600 µm long (Fig. 4b).

ii. Vessel Elements: Vessel elements of different sizes are frequently seen in the powder. They are short, wide and barrel shaped or drum shaped or long, narrow and cylindrical (Fig. 4). The vessel elements are 40 µm long and more commonly 150 µm long (Fig. 4d). Rarely they are 250 µm long. The perforation plate is simple, wide and circular. In wide short vessel elements, the perforation is horizontal; in long narrow elements they are oblique (Fig. 4c). The pits on the lateral walls of the vessels are either circular or elliptic (Fig. 4e). The pits are multiseriate and alternate.

***Physico-chemical parameters***

The physico-chemical evaluation of a crude drug involves the determination of identity, purity and quality. Extractive values (Table 1) are useful for determination of crude drugs & it gives an idea about the nature of the chemical constituents present. Since the water soluble extractive value was found to be higher, this indicates that the concentration of polar compounds (eg., Flavonoids) may be high in *P. viscida*. Ash value is a criterion to judge the identity and purity of crude drug. The ash values (Table 2) of the powdered *P. viscida* stem shows a high concentration of sulphated ash. The results of fluorescence analysis, which is a standardizing

parameter of the drug powder are presented in Table 3. The percentage moisture content in the stem powder was found to be 7.0 %w/w.

The chief phytochemicals present in the different extracts of *Pseudarthria viscida* (L.) Wight and Arnott (Papilionaceae) were carbohydrates, proteins, steroids, flavonoids, terpenoids, tannins & phenolic compounds and fixed oils and the results are tabulated ( Table 4).

**Table 1. Extractive values of powdered stems of *P.viscida***

| Extractive values | Stem powder (%w/w) |
|---|---|
| Alcohol soluble extractive | 3.20 |
| Ether soluble extractive | 0.80 |
| Water soluble extractive | 4.00 |

**Table 2. Ash values of powdered stems of *P.viscida***

| Ash values | Stem powder (%w/w) |
|---|---|
| Total Ash value | 7.00 |
| Acid insoluble ash value | 1.00 |
| Water soluble ash value | 2.00 |
| Sulphated ash value | 8.00 |

**Table 3. Fluorescence analysis of powdered stems of *P.viscida***

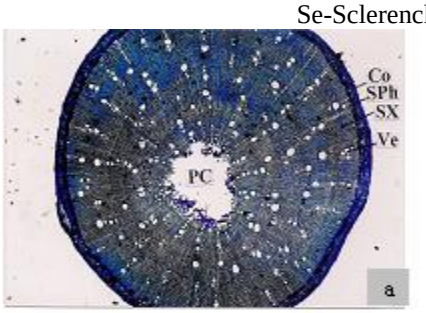
| Treatments (Stem powder) | Observations | | |
|---|---|---|---|
| | Day light | Short UV (254 nm) | Long UV (365 nm) |
| Powder | Greenish yellow | Yellow | Light green |
| Powder + 1N $H_2SO_4$ | Brown | Dark brown | Brown |
| Powder + 1N $HNO_3$ | Slightly Brown | Brown | Fluorescent green |
| Powder + 1N HCl | Slightly Brown | Fluorescent green | Fluorescent green |
| Powder + 1N NaOH (aqueous) | Yellow | Green | Pale Yellow |
| Powder + 1N NaOH (alcoholic) | Yellow | Green | Pale Yellow |
| Powder + Ammonia | Yellowish green | Green | Dark green |
| Powder + Iodine | Brown | Dark green | Brown |

**Table 4. Preliminary Phytochemical Analysis of various extracts of *Pseudarthria viscida* (L.) Wight and Arnott (Papilionaceae)**

| Phytoconstituents | Extract of Stem powder of *Pseudarthria viscida* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pet.Ether | Benzene | Diethyl Ether | $CHCl_3$ | Ethyl Acetate | Acetone | Methanol | Water |
| Carbohydrates | - | - | - | + | - | - | + | + |
| Proteins | - | - | - | - | - | - | + | + |
| Steroids | + | + | + | - | - | - | - | - |
| Glycosides | - | - | - | - | - | - | - | - |
| Flavonoids | - | - | - | + | + | + | + | - |
| Alkaloids | - | - | - | - | - | - | - | - |
| Terpenoids | + | + | - | - | - | - | - | - |
| Phenolic compounds & Tannins | - | - | - | - | - | + | + | + |
| Fixed oils & Fats | + | + | - | - | - | - | - | - |
| Saponins | - | - | - | - | - | - | - | - |

**Fig 1**. Twig of *P.viscida*

**Fig 2:** (a) T.S of stem - Entire view, (b) T.S of stem - A sector enlarged
(Co-Cortex; Ep-Epidermis; Pe-Pith cavity; SPh-Secondary phloem; SX-Secondary xylem; Se-Sclerenchyma; Ve-Vessels)



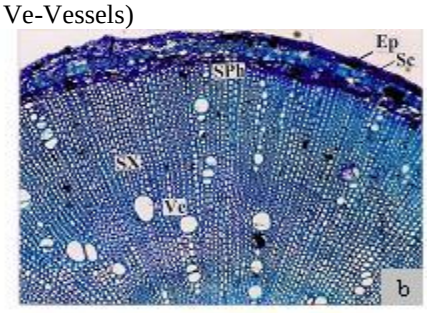



**Fig. 3:** (a) T.S of stem with flask shaped glandular trichome; (b) T.S of stem through narrow arc of periderm; (c) & (d) Secondary xylem elements-enlarged (Ep-Epidermis; GTr-Glandular Trichome; GFi-Gelatinous Fibres; Scl-Sclereids; Se-Sclerenchyma; SPh-Secondary phloem; Ve-Vessels; XF-Xylem fibres)

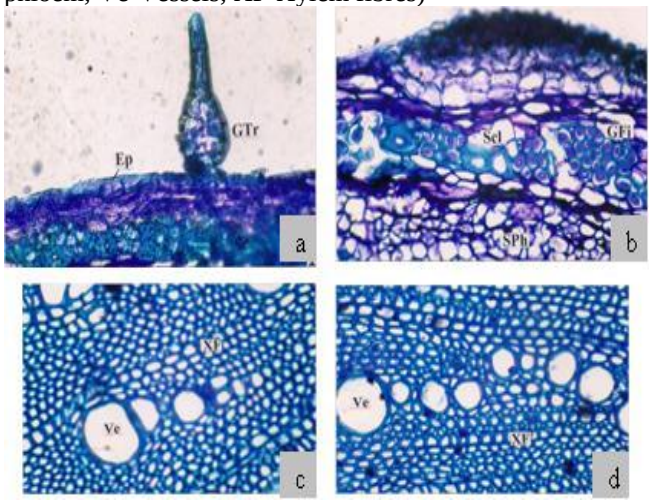
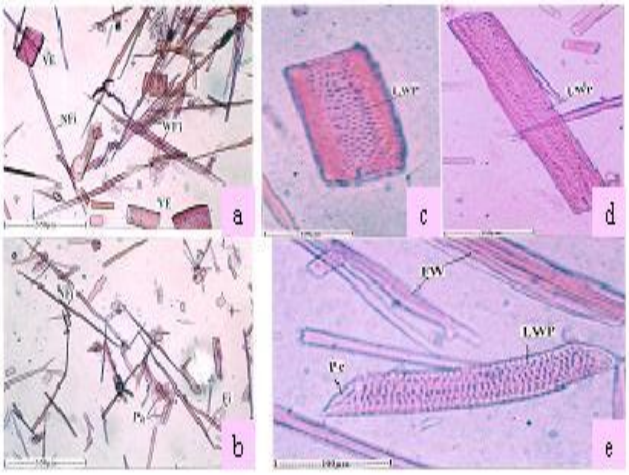



**Fig. 4:** a. Fibres and vessel elements; b. Fibres and parenchyma cells; c. Wide Vessel element; d. Narrow Vessel element; e. Narrow Vessel element with oblique perforation.(NFi-Narrow fibre; Pa-Parenchyma; VE-Vessel Elements; WFi-Wide Fibres; FW-Fibre-wall; LWP-Lateral wall pits; P-Perforation on the end wall)




## CONCLUSION

The present work was dealt with an intention to fix standards which could be useful to detect the authenticity of this medicinally useful plant. The sample of *Pseudarthria viscida* exhibits a set of diagnostic characters, which will help to identify the drug in dried condition. The taxonomical identification of plant material and pharmacognostic evaluation is important to provide the standards and to avoid adulteration of drugs. Macroscopic and Microscopic characters of the plant are used for the identification of the drug. The physicochemical evaluation helps in formulating pharmacopoeial standards, while fluorescence analysis helps in distinguishing the drug in powder form. The physico chemical constants like moisture content, ash values, extractive values and fluorescence analysis are rarely constant for crude drugs, but they may help in evaluation. Ash value is a criterion to judge the identity and purity of crude drug. The extract obtained by exhausting crude drug is indicative of approximate measure of their chemical constituents. Determination of the moisture content helps prevent degradation. The phytochemical analysis helps in chemoprofiling, which aids in determining the major therapeutically useful constituent present in the plant extracts. Standardization of a plant which has various therapeutic applications is a prerequisite; as such plants are very frequently prone to adulteration or substituted. The periodic assessment is essential for quality assurance and safer use of herbal drugs.

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