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Pharmacognostic characterisation of flowers *Woodfordia fruiticosa* Kurz. (Dhataki Pushpa) used as fermentation initiators

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ABSTRACT

Background: *Woodfordia fruiticosa* Kurz. flowers are highly valued medicinal material used in Indian System of Medicine. They are used as fermentation initiators in medicated alcoholic preparations like asavas and arishtas. In addition to this, flowers are recommended in acute diarrhoea, haemorrhages, ulceration and erysipelas. Authentication of herbal drug by macro-microscopic and chemical characterization should be the primary criteria prior to its usage. **Materials and Methods:** In the current study flowers of *W. fruiticosa* are collected and subjected for macro-microscopic and physico-chemical analysis aiding standard methodology. **Results:** Macro-microscopic features of different parts of a flower are documented along with their photographs. Physico-chemical values like total ash, acid insoluble ash, water soluble ash, ethanol soluble extractive and water soluble extractive are recorded. **Conclusion:** Macro-microscopic atlas; along with physico-chemical value serve as reference standard for identification and distinguishing the sample from its substitutes and adulterants.

Keywords: *Sandhana dravya*, Macro-microscopic atlas, Physico-chemical standards.

INTRODUCTION

Woodfordia fruiticosa Kurz. of Lythraceae is commonly found beautiful shrub, the flowers of which are used in different Indian medicinal preparations in the name of *Dhataki Kusuma*[1]. The commercial drug consists of dried fruits, flowers, buds and broken pieces of inflorescence[2,3]. Dried flowers are credited with stimulant and astringent properties[4]. Therapeutically these are used in bowel complaints, haemorrhages, menorrhagia and seminal weakness[5]. Flowers appear to be a promising indigenous tanning material with a fairly high content of tannin. Red dyes extracted from flowers are employed throughout India for dyeing fabrics[1]. Apart from this flowers are used extensively in the preparation of asava and arishta containing self generated alchohol[4]. According to texts *W. fruiticosa* flowers contain wild yeasts, which can tolerate high sugar concentration and are clearly able to bring about the fermentation process[6].

Documenting pharmacognostic standards is an essential step in any research related herbal medicine. Photodocumentation of herbal materials through macro-microscopic recordings forms an illustrative data in identification of drug[7]. The quality of a drug is determined by its nature, identification, purity, physical and chemical properties. Physico-chemical evaluation is a necessary step in detecting adulteration and there by assessing strength of herbal drug[8].

Hence this particular task was undertaken to provide macro-microscopic atlas of *W. fruiticosa* flowers along with its physico-chemical standardisation.

MATERIALS & METHODS

Plant material

Fresh flowers of *W. fruiticosa* were collected in the month of March, 2014 from Dakshina Kannada district of Karnataka, India. It was authenticated through botanist and sample deposited at SDM centre for research in Ayurveda and Allied sciences, Udupi (Voucher specimen number 14032502).

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Detailed morphological features are noted and documented.

Macroscopic evaluation

The sample was cleaned and macroscopic evaluation of the whole plant was carried out. Macroscopic characters like size, shape, texture, colour were noted in detail[9].

Microscopic evaluation

The sample collected was left in FAA for more than 48 hours. The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with saffranine[10]. Transverse sections were photographed using Zeiss AXIO trinocular microscope attached with Zeiss AxioCam camera under bright field light. Magnifications of the figures are indicated by the scale-bars.

Analytical parameters

Physico-chemical constants of test drug Dhataki, like moisture content, total ash, water soluble ash and acid insoluble ash were calculated following the procedures recommended by standard text books[11]. Aqueous and ethanol soluble extractive was also determined.

RESULTS

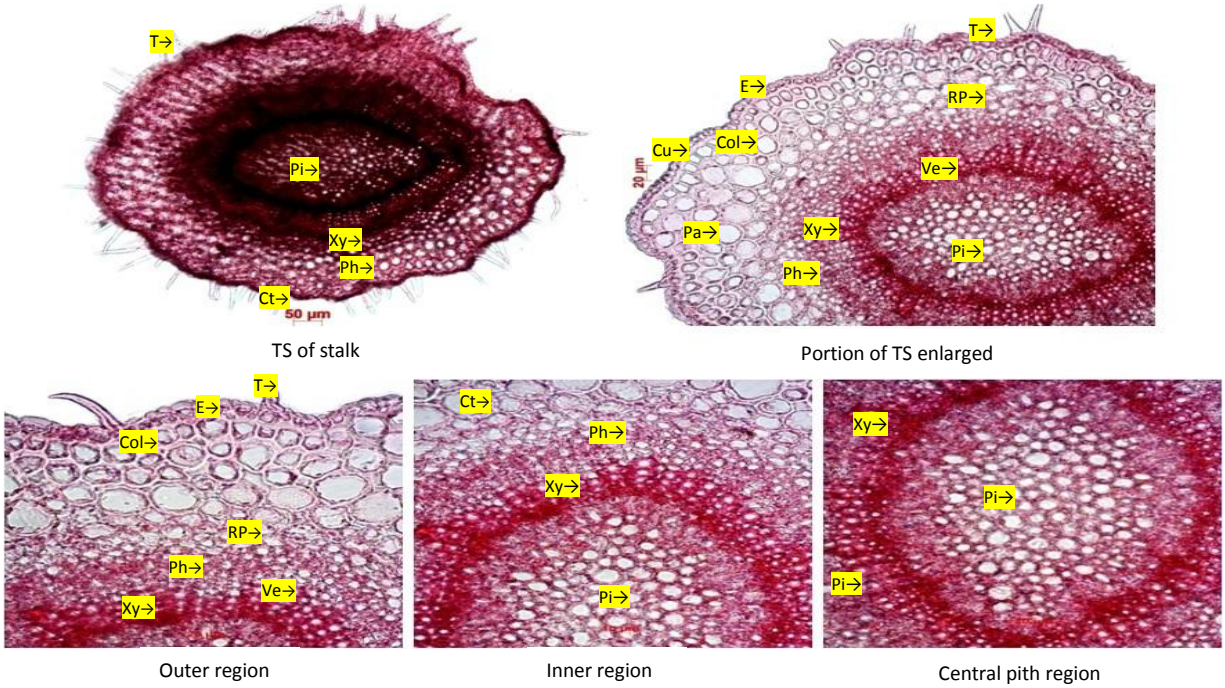
Macroscopy

Flowers are 1.2 cm long; occurs as single or in bunches. Calyx of a flower is 1 to 1.6 cm long, ridged, glabrous, bright red when fresh and fades on drying. Elongated calyx with campanulate base and oblique apex are characteristic of *Woodfordia* flowers. Apex of a calyx is having 6 traingular and acute teeth. Calyx tooth is attached with very minute accessory seplas which are deep in colour. Pale rose or whitish, thin and papery petals are attached inside the mouth of calyx tube. Stamens 12, united at the base. Anthers are dorsifixed; brown almost rounded or broadly ovate. Ovary is superior, with filiform style (Figure 1).

Figure 1: Macroscopy of flower

Microscopy

Stalk of flower: TS is elliptical in outline, shows an epidermis formed by thick walled cells with cuticle; 2 to 3 layers of collenchymas follows the epidermis; cortex formed by characteristically reticulate parenchyma in about 4 to 5 layers; inner to cortex continuous ring of phloem followed by xylem with usual elements are seen; the centre of TS is occupied by pith formed by pitted parenchyma (Figure 2).



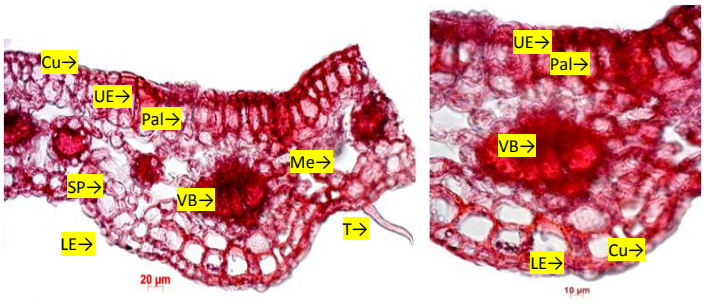
Col – collenchymas; **Ct** – cortex; **Cu** – cuticle; **Ep** – epidermis; **Pa** – parenchyma; **Ph** – phloem; **Pi** – pith; **RP** – reticulated parenchyma; **T** – trichome; **Ve** – vessels; **Xy** – xylem.

Figure 2: Microscopy of stalk

Corolla: TS is dorsiventral in outline, shows upper and lower epidermii with few conical unicellular covering trichome having sharp tip.

TS passing through mid vein shown slightly conical projections either side having a vascular bundle formed by patch of xylem with fibres at lower side and phloem at the upper side.

TS passing through lamina shows single layer of palisade formed by elongate broad columnar cells beneath the uppers epidermis; there is well differentiated sub-epidermal cell under the lower epidermis having spongy parenchyma cells in between palisade and sub-epidermis; the loosely arranged mesophyll tissue embeds few tiny vascular bundles at regular intervals (Figure 3).



TS through mid vein of corolla | Portion of mid vein enlarged

Cu – cuticle; **LE** – lower epidermis; **Me** – mesophyll; **Pal** – palisade cells; **SP** – spongy parenchyma; **T** –trichome; **UE** – upper epidermis; **VB** – vascular bundle.

Figure 3: Macroscopy of corolla

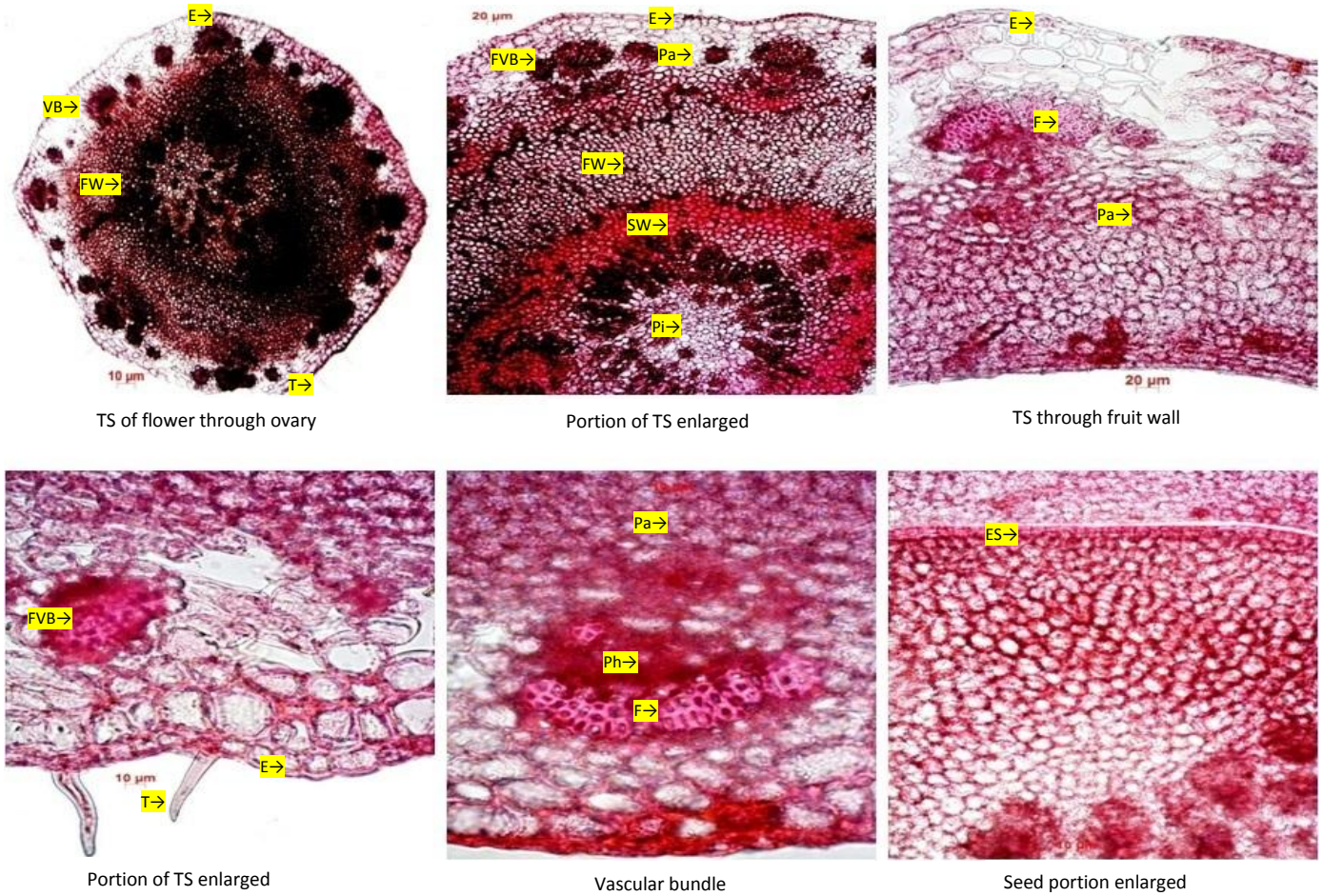
Anther: TS of anther shows an epidermis having papillose epidermal cells with covering of cuticle; the sclerified parenchyma underneath the epidermis shows pollen grains of different types (Figure 4).

TS of anther | Pollen grains

Ep – epidermis; **Po** – pollen sac with pollen grains; **SC** – sclerified layer

Figure 4: Microscopy of anther

Ovary: TS is quadrangular in outline, shows an epidermis formed by cells of varying sizes embedding few stomata and unicellular conical thick-walled covering trichomes; multi layers of parenchyma without any intercellular spaces forming the cortex follows the epidermis; cortex shows group of thin-walled fibres in groups; rudimentary cells which would form fruit wall and seed wall are seen in the transverse section; there are fibro-vascular bundles in the parenchyma cells; the central portion is formed by thin-walled parenchyma which shows pith like tissue of the axis of the ovary (Figure 5).



TS of flower through ovary | Portion of TS enlarged | TS through fruit wall

Portion of TS enlarged | Vascular bundle | Seed portion enlarged

E – epidermis; **F** – fibres; **FVB** – fibro vascular bundles; **FW** – fruit wall; **Pa** – parenchyma; **RP** – reticulated parenchyma; **SW** – seed wall; **T** – trichomes. **ES** – epidermis of seed; **Ph** – phloem;

Figure 5: Microscopy of ovary

Analytical parameters

The flowers are subjected to examination of physicochemical parameters like total ash, acid insoluble ash, water soluble extractive and ethanol soluble extractive. The total ash indicating total inorganic content was found to be 1.7289%. Acid insoluble part of total ash, which indicates silica, was found to be 0.099%. Water soluble ash is the water soluble part of total ash indicating inorganic content without water insoluble inorganic salts like silica, 1.2322 % was water soluble. Ethanol and water soluble secondary metabolites were found to be 7.9803 and 11.8926 % w/w respectively. Yield to water was comparatively higher than ethanol (Table 1).

Table 1: Analytical parameters Woodfordia fruticosa Kurz. Flowers

Parameter	Results n=3 %w/w
Total ash	1.7289
Acid insoluble ash	0.099
Water soluble ash	1.2322
Ethanol soluble extractive	7.9803
Water soluble extractive	11.8926

DISCUSSION

Woodfordia fruiticosa Kurz. is a straggling woody shrub flowering annually, with short petioled deep orange red cymes. Flowers are an important ingredient in asava and arishta (medicated alchoholic dosage forms) as they aid in fermentation. Apart from this they possess highly valued therapeutic benefits. Documenting pharmacognostic standards of popular medicinal plants is need of the hour[12].

Elongated calyx with campanulate base and oblique apex are characteristic macroscopic features of *Woodfordia* flowers. Attachment of calyx tooth; with very minute accessory seplas are found on naked eye observation. Each part of flower studied under microscope to make standard pharmacognostic atlas. Transverse section of stalk is elliptical in outline. Corolla revealed upper and lower epidermii with few conical unicellular covering trichome having sharp tip. Transverse section of anther has an epidermis having papillose epidermal cells with covering of cuticle, along with different types of pollen grain underneath the epidermis. Ovary was quadrangular in outline with fibro-vascular bundles in the parenchyma cells. Few stomata and unicellular conical thick walled covering trichomes are characteristic findings on epidermal layer of ovary. These findings will help in authenticating dhataki flower samples under naked eye or microscope[13].

Physico-chemical constants of a drug are indicative of its quality, purity and simultaneously give a picture about other admixture. Total ash reveals the inorganic residue that remains after incineration. Whereas acid insoluble ash will decide the percentage amount of silicaceous matter present along with the drug. If total ash is treated with dilute hydrochloric acid the percentage of acid-insoluble ash can be determined; minimum acid insoluble ash value percentage (0.099) will reveal its less contamination with siliceous matter. Extraction of plant material with suitable solvent (water/ alchohol) forms a basic step for finding concentration of secondary metabolites in a plant species intended for medicine[14].

CONCLUSION

Adulteration is a major problem while assessing the identity and quality of herbal drugs. Study carried out on *Woodfordia fruiticosa* Kurz. not only established the data that may be utilized for identification, but also established the purity and standard of the flower sample. Pharmacognostic monograph prepared may be used as reference standard in future studies on this herbal medicine.

CONFLICTS OF INTEREST

No conflicts of interest.

SOURCE OF FUNDING

Nil.

AUTHORS CONTRIBUTION

Actual practical work, procurement of test drug, pharmocognostic work was carried out by first author Dr. Admani Mallikarjun, a PG Scholar from Department of Dravyaguna. Dr. Sunikumar KN, second author is responsible for complete guidance towards pharmacognostic study, which was carried out under his supervision. He analyzed the data and framed the outline of the paper. Corresponding author Dr. Suma V. Mallya is responsible for concept designing, correction and paper submission.

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