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Pharmacognostical studies on the endemic medicinal plant – *Jatropha maheswarii* Subr. & Nayar (Euphorbiaceae)

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Abstract: *Jatropha* species are known for many biological activities like anticancer, hepatoprotective and pesticidal activity. *Jatropha maheswarii* Subr. & Nayar is an endemic medicinal taxon distributed in Southern east coast of Tamil Nadu, India. The stem and leaf of this plant are used by the rural folk similar to other *Jatropha* species in curing skin diseases, hemorrhage and tooth infections but it is unexplored. The present investigation intended to evaluate the pharmacognostical features of stem and leaf of this species. The pharmacognostical parameters were carried out by complete botanical evaluation which includes macroscopic, microscopic, physicochemical and phytochemical analysis. Pharmacognostical standard serve as an reference piece and helps in the further identification and authentication of this taxon.

Key words : *Jatropha maheswarii, pharmacognosy, physicochemical, phytochemical analysis.*

Introduction

People are becoming more aware of medicinal plant resources and many of them utilize these therapeutic interventions and their products in maintaining health and preventing diseases with an ecofriendly touch. They also provide raw materials for pharmaceutical industries and represent a substantial proportion in global drug market. It is pertinent on the part of the researcher to testify the crude drug for its purify and authenticity before proceed with future research, on the drug. The pharmagnostical studies gives helping hand to the researcher in resolving the identity enigmas of the crude drug. *Jatropha maheswari* Subr. & Nayar is an endemic plant commonly called as Athalai[1]. It is distributed in the red clayey soils of southern east coast of Tamil Nadu India and it is related to the petroplant *Jatropha curcas L.* It is an erect shrub to 200cm with thick stem and underground root stock. The aerial part of the stem has a light green viscid fluid (latex) and it is used by the rural folk for curing various ailments like skin diseases, tooth infections and hemorrhages. Perusal of the previous literature revealed that this medicinal plant is unexplored, so a detailed systematic pharmacognostic study was carried out.

Materials and methods

Plant collection and authentication

The aerial parts of the plant with reproductive parts were collected from the coastal areas of Thoothukudi. The specimens were preserved identified and authenticated by the Botanical survey of India – Southern circle (Coimbatore) as *Jatropha maheswarii* Subr.&Nayar. (Euphorbiaceae) Voucher specimens SMCH 2681, and 2682 were preserved in

Department of Botany, St. Mary's College (Autonomous) Herbarium, Thoothukudi, Tamilnadu, India. The stem and leaves were collected, shade dried, powdered in mechanical pulverizer and stored in air tight containers for future use.

Macroscopic and microscopic studies

Macroscopic studies were carried out by simple determination, technique like the shape, size, colour, odour, margin and apex. The stem and leaf specimens were fixed in FAA and microtome slides were prepared and stained[2, 3]. Photomicrographs of with different magnifications were taken with Nikon Labphot 2 microscopic unit.

Determination of Physicochemical Parameters

Total ash value, water and acid, soluble and insoluble ash value, and moisture content were determined as per Indian pharmacopoeia[4,5].

Fluorescence analysis

The fine powders of the samples were examined under visible light and UV light (365mm). These powders were also treated with acid, alkali and alcohol and changes in colour were recorded under visible and uv-light[6].

Determination of extractive value

The powdered stem and leaves were successively extracted with petroleum ether, benzene, chloroform methanol and water in a soxhlet apparatus. The extracts were evaporated using a rotary evaporator and water extract with a freeze dryer. The residues were weighed.

Preliminary phytochemical analysis

The preliminary phytochemical analysis of the methanol extract was carried out using standard methods. The presence and absence of the secondary phytoconstituents were noted[7, 8].

Result and discussion

To ensure the quality of herbal products, proper control of starting material is utmost essential. Various techniques are used for the standardization of medicinal plants of therapeutic potential. But identification and evaluation of plant drugs by pharmacognostical studies is still more reliable, accurate and inexpensive. Standardization plays an important role in the production of phytopharmaceuticals of standard quality and purity[9, 10].

Macroscopic Characters

Jatropha maheswarii Subr. & Nayar is an erect branched shrub to 200 cm, with thick stem and root stock. Leaves simple, alternate, 10-15 cm long, ovate-lanceolate, penninered with entire margin and acute tip; petioles 3-5 cm long. Inflorescence axillary dischasial cyme, 5-10cm long. Flowers unisexual, greenish yellow. Fruit capsule, 1.2-2cm long. Seed brown, 0.4 – 0.8 cm long. The meat of the seed is white and oily in texture and with agreeable tastes. (fig.1a)

Microscopic characters

Stem

The stem consists of distinct periderm, cortex, and hollow cylinder of xylem, phloem and wide pith. Pesiderm is 100µm large with 6-5 layers of suberised cells. The inner cortex is parenchymatous and outer cortex is collenchymatous. Circular thick walled laticifers with dark inclusion are abundant in the cortex. Secondary phloem consists of narrow rays and radical rows of sieve tube members. Secondary xylem consists of solitary or radial multiple of thin walled angular vessels and xylem rays are narrow. The vessels are about 75µm in diameter. The pith cells are circular with minute intercellular space. Crystals and articulated and nonarticulated laticifers are seen in abundance. (fig.1b)

Leaf

The leaf is dorsiventral, mesomorphic, amphistomatic, smooth. The mid rib is planocovex with flat adaxial side and broadly convex on the abaxial side. (fig.1d)

Mid rib

The epidermal cells are narrow, thick walled, outer wall is papilli. The ground tissue is parenchymatous with small patch of adaxial collenchyma. The palisade tissue extends upto collenchymatous border on abaxial side. The vascular tissues occur as arc with several radial files of xylem and small nest of phloem.

Lamina

350µm thick. Epidermal cells are tubular with thick cuticle. The mesophyll is with palisade and spongy parenchyma. Crystals are distributed in the spongy parenchyma region.

Petiole

It is circular in cross section. The epidermis is thin and less conspicuous. Outer ground tissue is collenchymatous and inner is parenchymatous. The vascular system consists of several (more than 15)

discrete vascular bundles forming a medullated ring. The vascular bundles are collateral, with separate rows of xylem and small patches of phloem. Circular, thick walled laticifers are distributed in the outer cortex. (fig.1c)

The petiole anatomy of *Jatropha* showed infrageneric relationship. It also corresponds to south – North distribution of species. In *J.maheswari* 11 -15 discrete bundles were observed and several vascular bundles in *J.maheswarii* were considered to be primitive and reduction in number of bundles during advancement[11].

Vein islet and veinlet termination number

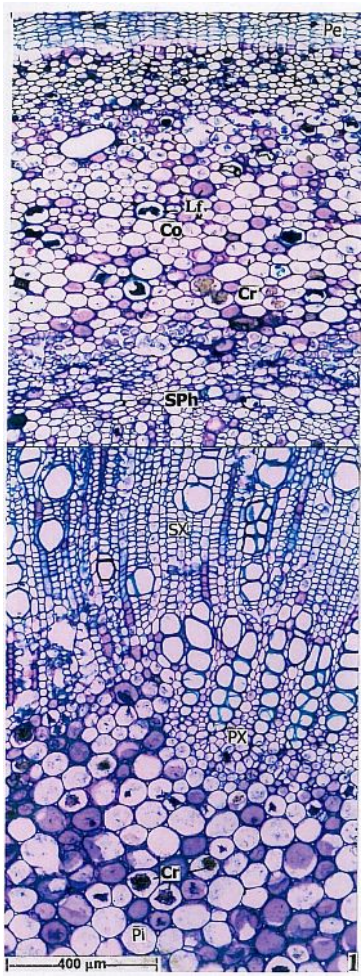
Vein islets ranges from 0.75 -4.25 and the veinlet termination number ranges from 3.25 – 10.5. The mean value of vein-islet is 2.5 and the mean value of veinlet termination is 6.8. (fig.1e)

Stomatal characteristics

The leaf is amphistomatic while all other *Jatropha* are hypostomatic. The stomata are of paracytic[12]. Stomatal frequency in the lower and upper epidermis is 28.5 and 13.5 respectively. The epidermal cells are polygonal in shape. (fig.1f)

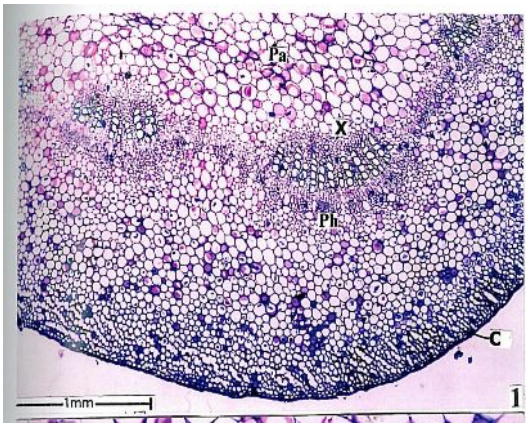
Crystal and starch grains

Calcium oxalate crystals are spiny, spheroid and of druses type and abundant in stem and leaf. Starch grains are oval and spheroid. They are mostly of simple concentric type and found abundant in pith and secondary phloem of stem. The laticifer and crystal characters are important in delimiting the sections and alleviating the sections and the taxonomic ditermma of the family Euphorbiaceae [13].



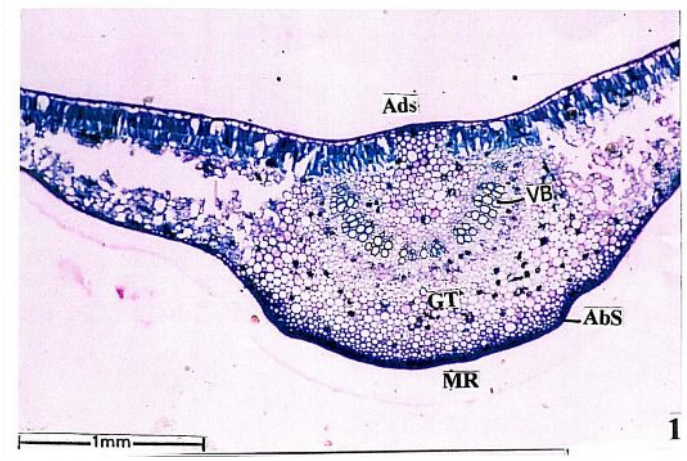
1b. T.S. of a portion of stem

Fig.1.a. *Jatropha maheswarii* Subr. & Nayar. Plant.

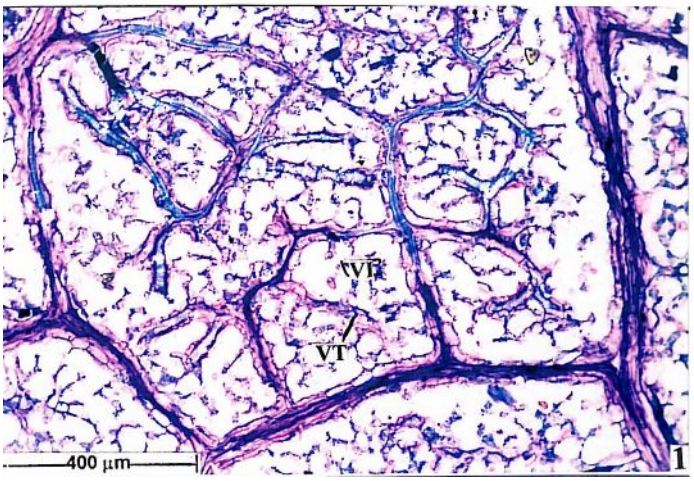


1.c. T.S. of petiole

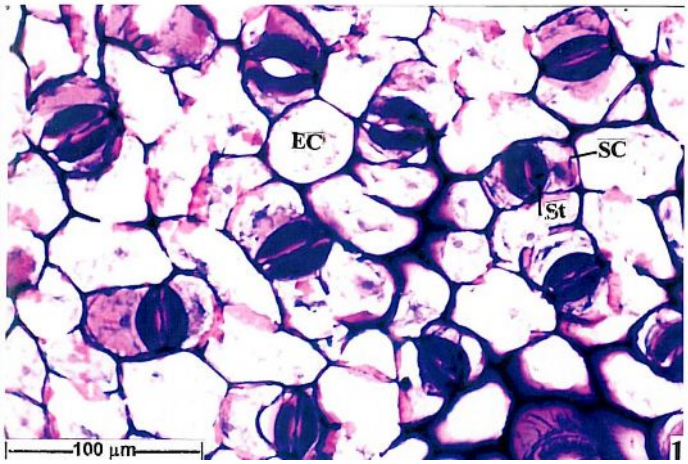
X – Xylem, Ph – Phloem, Cr – Crystal, C – Collenchyma, Co –Cortex, LF – Laticifer, P.x – Protoxylem Pe – Periderm



1. d. T.S. of leaf;



1. e. Vein islet and vein termination;



1. f. Stomatal morphology.

Ads – Adaxial Side; Abs – Abaxial side MR – mid rib; VB – Vascular bundle; VI – Vein Islet, VT – Vein Termination,

EC – Epidermal cell; St. – Stomata, SC – Subsidiary cell

Table 1: Determination of Ash Values and Moisture content

Parameters	Ash Value (% w/w)	
	Leaf Sample	Stem Sample
Total Ash value	8.2	9.8
Acid insoluble ash	3.7	4.1
Acid soluble	5.7	4.8
Water insoluble	2.8	3.2
Water soluble	3.5	4.3
Moisture content (%)	4.7	3.8

Table 2: Determination of Extractive Value

Solvent	Extractive	Value % (W/W)
	Leaf Sample	Stem sample
Petroleum ether	2.8	2.4
Benzene	3.4	3.8
Chloroform	2.8	3.1
Methanol	6.1	5.2
Water	10.5	8.8

Table 3: Fluorescence Analysis of leaf and stem powder

Sample	Leaf Powder		Stem Powder	
	Visible light	Ultra violet light (365mm)	Visible light	Ultra violate 365 mm
Powder	Greenish brown	Dark Green	Light green	Dark brown
Powder + water	Brown	Dark Green	Light Brown	Dark brown
Powder + HCl	Light green	Greenish	Dark brown	Brown
Powder + Con / H_2So_4	Brown	Dark brown	Reddish brown	Black
Powder + Con. HNo_3	Brown	Black	Yellowish brown	Yellowish green
Powder + NaoH	Black	Greenish black	Light green	Brown
Powder + Methanol	Light green	Dark green	Yellow	Greenish yellow
Powder + NHCL	Black	Dark green	Green	Brown
Powder + O.NHcl	Light green	Dark green	Brown	Brown

Table 4 : Preliminary phytochemical screening of methanol extract of leaf and stem samples.

Phytoconstituents	Sample	
	Leaf extract	Stem extract
Alkaloid	+++	++
Tannin	+++	+
Flavanoid	++	+
Steroid	+	+
Glycoside	+	++
Saponins	++	+
Coumarin	+	+

+ present. ++ deeply present , +++ very deeply present

Physicochemical Parameters and Preliminary Analysis

The residue after incineration of plant material is the ash. The ash value represents the inorganic salts naturally occurring in the crude drug. It was more for leaf (9.8%). The moisture content of the drug was more for leaf than stem (Table 1). The leaf and stem powder showed a specific and diagnostic colouration under ordinary day light and UV light (Table 3). This character is distinct for each species and can be used as a diagnostic feature in the identification of crude drug. The results showed greater extractive values in water extract followed by methanol indicated the concentration of secondary metabolites (Table 2).

The methanol extract of stem and leaf were subjected to preliminary phytochemical screening and it revealed that flavanoid, alkaloid, phenol, glycoside, tannin, steroids, and saponins were the phytoconstituents present in the taxon studied. The concentration of secondary metabolites was more in methanolic extract leaf than stem (Table 4). These secondary metabolites are known to support bioactivity in this plant.

Conclusion

The present investigation of *Jatropha maheswarii* Subr. & Nayar can be concluded that this pharmacognostic study yielded a set of parameters which could serve as an important source of information to as certain the identity and determination of quality and purity of plant material for future studies. This simple but reliable standardization will be useful to a lay person in using the drug as home remedy and also in the pharmaceutical industry for testing the raw material.

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