



Scholars Research Library

Der Pharmacia Lettre, 2012, 4 (1): 256-262
(<http://scholarsresearchlibrary.com/archive.html>)



Morpho-anatomical and physicochemical studies of *Jatropha gossypifolia* (L.)

V. Siva parvathi, B. Sri Jyothi, T. Lakshmi, P. Srinivasa Babu, R. Karthikeyan*

Department of Pharmacognosy, Vignan Pharmacy College, Vadlamudi, Andhra Pradesh, India

ABSTRACT

The plant *Jatropha gossypifolia* (Euphorbiaceae) is known as belly ache bush. The plant originated from Brazil and it is now cultivated in Tropical countries throughout the world. The roots, stems, leaves, seeds and fruits of the plant have been widely used in traditional folk medicine in many parts of West Africa. The young stem of the plant is used as tooth brush as well as to clean tongue in the treatment thrush. The tuber of the plant grinded into a paste is also locally used in the treatment of hemorrhoids. The literature survey claims that there is a lack of taxonomical features of the species. Hence we aimed to study the morphology, microscopy and physicochemical constants of *Jatropha gossypifolia* leaves. The present study revealed different taxonomical characters and physicochemical constants, the resultant features could be used to identify and to know the adulterants if any for routine qualitative measures.

Key Words; *Jatropha gossypifolia*, Microscopy, Powder characters.

INTRODUCTION

Jatropha gossypifolia belongs to the family Euphorbiaceae. The common name for *J. gossypifolia* is pignut or fignut, and in Yoruba land it is commonly known as "Lapalapa" [1]. The leaf decoction of *J. gossypifolia* is used for bathing wounds [2]. It was reported that the leaf bath used for sores, sprains, rash and bewitchment in Latin America and the Caribbean; the poultices are used for sores and pain in Trinidad [3-4]. The stem sap stops bleeding and itching of cuts and scratches. In Southern Nigeria, the extract from fresh leaf applied with crushed leaf is routinely used by herbalists and local people to stop bleeding from the skin and nose. The coagulant activity of the leaf extract of *J. gossypifolia* was detected while trying to examine its coagulant properties; hence the aim of our present study was to establish the morpho-anatomical and physicochemical constant of leaf part of the species *Jatropha gossypifolia* for identification of the drug to ensure the quality in routine basis.

MATERIALS AND METHODS

Plant collection and Authentication

The plant species was collected during the month of December at Potharlanka near Repalle, Guntur (Dist) of Andhra Pradesh. Then it was authenticated by Dr SM.Khasim, professor, Department of Botany and Microbiology, Acharya Nagarjuna University, Nagarjuna nagar, Guntur. The specimen was deposited in the department for further reference.

MORPHOLOGY OF LEAF

Study of morphology of leaf

As per standard procedure matured 25 leaves were taken for the evaluation of morphology of leaves and studied various parameters such as length, width, margin, apex, surface, colour, odour, taste, base, midrib and size.

MICROSCOPICAL CHARECTERS OF LEAF

Collection of specimens

Care was taken to select healthy plants and for normal organs. The required samples of different organs were cut and removed from the plant and fixed in FAA [Formalin-5ml+Acetic acid - 5ml+70%ethyl alcohol 90ml]. After 24hrs of fixing the specimens were dehydrated with graded series of tertiary-butyl alcohol as per the schedule given by Sass [5]. In filtration of the specimens was carried by gradual addition of paraffin wax (melting point 58-60°C) until TBA solution attained super saturation. The specimens were cast into paraffin blocks.

Sectioning

The paraffin embedded specimens were the help of rotany microtome. The thickness of the sections was 10-12 micro-meters. Dewaxing of the sections was by customary procedure [6] The sections were at stained with toluidine blue is a poly chromatic strain, the stationary results were remarkably good and some cytochemical reactions were also stained with saffranin and fast green and iodine [for starch] For studying the stomata morphology, venation pattern and trachoma distribution, par dermal [sections taken parallel to the surface of leaf] as well as clearing of leaf with 5% sodium hydroxide or experimental peeling by partial maceration employing Jeffery's maceration fluid were prepared. Glycerin mounted temporary preparations were made for macerated cleared materials

Photomicrographs

Microscopic description of tissues of tissues or supplemented with micrographs were necessary photographs of different magnifications were taken with Projection microscope (Elite, India). For normal observations bright field was used for the study of crystals, starch grains and lignified cells, polarized light was employed.

Powder Microscopy

Powder characters of leaf of *Jatropha gossypifolia* were studied with standard protocol.

Physicochemical Study [7]

Determination of Moisture content (loss on drying)

Place about 10g of drug (without preliminary drying) after accurately weighing (accurately weighed within 0.01g) it in a tared evaporating dish. For example, for underground or un powdered drug, prepare about 10g of the sample by cutting shredding so that the parts are about 3mm in thickness.

Seeds and fruits, smaller than 3mm should be cracked. Avoid the use of high speed mills in preparing the samples, and exercise care that no appreciable amount of moisture is lost during preparation and that the portion taken is representative of the official sample. After placing the above said amount of the drug in the tared evaporating dish dry at 105°C for 5 hours, and weigh. Continue the drying and weighing at one hour interval until difference between two successive weighings corresponds to not more than 0.25 per cent. Constant weight is reached when two consecutive weighings after drying for 30 minutes and cooling for 30 minutes in a desiccators, show not more than 0.01 g difference

Determination of Foreign matter

Weigh 100 – 500 g of the drug sample to be examined or the minimum quantity prescribed in the monograph, and spread it out in a thin layer. The foreign matter should be detected by inspection with the unaided eye or by the use of lens (6 xs). Separate and weigh it and calculate the percentage present

$$\% \text{ of foreign matter} = \frac{\text{Amount of foreign matter}}{\text{Amount of drug taken}} \times 100$$

Determination of Alcohol Soluble Extractive

Macerate 5g of the air dried drug, coarsely powdered, with 100ml of *Alcohol* of the specified strength in a closed flask for twenty four hours, shaking frequently during six hours and allowing standing for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105°C to constant weight and weigh. Calculate the percentage of alcohol soluble extractive with reference to the air dried drug.

Determination of Water soluble extractive

Macerate 5g of the air dried drug, coarsely powdered, with 100ml of *chloroform water* of the specified strength in a closed flask for twenty four hours, shaking frequently during six hours and allowing to stand for eighteen hours. Filter rapidly, taking precautions against loss of solvent, evaporate 25 ml of the filtrate to dryness in a tared flat bottomed shallow dish, and dry at 105⁰ to constant weight and weigh. Calculate the percentage of *chloroform water* soluble extractive with reference to the air dried drug.

Determination of Ether soluble extractive

Transfer a suitably weighed quantity (depending on the fixed oil content) of the air dried, crushed drug to an extraction thimble, extract with solvent ether (petroleum ether boiling point 40⁰- 60⁰) in a continuous extraction apparatus (Soxhlet apparatus, Elite, India) for 6 hours. Filter the extract quantitatively into a tared evaporating dish and evaporate off the solvent on a water bath. Dry the residue at 105⁰ C to constant weight. Calculate the percentage of ether soluble extractive with reference to the air dried drug.

Determination of Total Ash

Incinerate about 2 to 3 gm accurately weighed, of the ground drug in a tared platinum or silica dish at a temperature not exceeding 450⁰ until free from carbon, cool and weigh. If a carbon free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450⁰C . Calculate the percentage of ash with reference to the air dried drug.

Determination of Acid Insoluble Ash

Boil the ash obtained in total ash for 5 minutes with 25 ml of *dilute hydrochloric acid*, collect the insoluble matter in a Gooch crucible or on an ash less filter paper, wash with hot water and ignite to constant weight. Calculate the percentage of acid- insoluble ash with reference to the air dried drug.

Determination of Water Soluble Ash

Boil the ash for 5 minutes with 25ml of water, collect insoluble matter in a Gooch crucible, or an ash less filter paper, wash with hot water, and ignite for 15 minutes at a temperature not exceeding 450⁰. Subtract the weight of the insoluble matter from the weight of the ash. Calculate the percentage of water – soluble ash with reference the air dried drug.

RESULTS AND DISCUSSIONS

Morphological Characters

Size: length- 8.5 to 10.5 cm; Width- 10 to 12 cm; Colour: dark green- pale green ; Odour: characteristic; Taste: tasteless to slightly bitter ; Surface: reddish brown to greenish with less pubescent on upper surface than the lower surface. Margin: dentate; Apex: sharp; Midrib: Upper surface- midrib is not prominent; Lower surface- midrib is prominent

Microscopical Characters

In cross sectional view, the leaf has thick and prominent midrib and thin uneven densely hairy lamina. The midribs has broad, pyramidal shaped ad axial part and transverse hemispherical wide abaxial body. The different characters are observed and shown in (Figure 1.)

DERMAL LAYER**Upper epidermis**

Colorless, rectangular type of cells arranged in vertical position.

Lower epidermis

Colorless, rectangular type of cells arranged in vertical position.

Stomata

Stomata occur mostly on the lower surface of the leaf. They are of anamocytic type. Lacking subsidiary cells. The epidermal cells are polygonal with this, waxy anticlinal walls.

Trichomes

Lignified, uniseriate seen above the upper epidermis.

Glandular trichomes

Multi headed with central stalk glandular trichomes are seen in the lower epidermis on the mid rib portion



Figure 1. Transverse section of *Jatropha gossypifolia* L. (T.S)

TRICHOMES



Figure 2.

SCALARIFORM

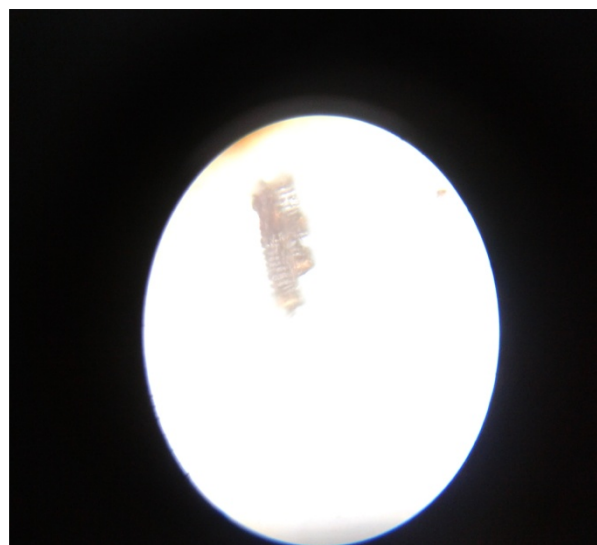


Figure 3.

ENDOPLASMIC RETICULUM



Figure 4.

PERICYCLIC FIBRES



Figure 5.

PHLOEM FIBRES



Figure 6.

CALCIUMOXALATE CRYSTAL



Figure 7

Table 1. Extractive Values of Different Solvents

EXTRACTIVE VALUE	In grams
Alcohol soluble extraction	0.16
Water soluble extraction	0.05
Ether soluble extraction	0.04

Table 2. Different ash values

ASH VALUES	In grams
Total ash value	1.76
Acid insoluble ash value(dil.Hcl)	1.67
Sulphated ash value (H ₂ SO ₄)	1.65
Water soluble ash value(H ₂ O)	1.70

LAMINA**Palisade cells**

Rectangular shape of palisade cells arranged completely towards middle portion from the margin

Collenchymas

Lower portion of upper epidermis and upper portion of lower epidermis are arranged with polygonal shape of collenchymas with thin walled cells.

Spongy parenchyma

Spongy parenchyma are seen below the palisade cells in the lamina portion, they are polygonal, spongy like structure rarely filled with sandy crystals of calcium oxalate.

Vascular Bundles

Central part of mid rib is occupied with convex shape of vascular bundles in which non lignified phloem and lignified xylem are prominent

Calcium oxalate crystals

In the parenchyma there are prism type of sandy crystals are scattered

Powder Characters

Powder characters are seen in the leaf powder are shown in (Figure 2-7).It explores trichome with single celled, uniseriate, lignified one. Scalariform pitting are seen with coiled, tubular in shape, lignified in nature. Endoplasmic reticulums are seen with irregular, multichanneled structure. Pericyclic fibres are seen with "S" shape and it is non lignified one scattered in the powder. Bunch of phloem fibres without lignification is also observed in the powder. Calcium oxalate crystals are isolated and prism shaped, scattered or grouped.

Physicochemical constant

Determination of Physicochemical constants is performed as per the standard protocol followed in the Ayurvedic pharmacopoeia. The values are tabulated in (Table 1 and 2).The foreign matter adulterated in one gram powder was found to be 10%.

CONCLUSION

This study revealed the various morphological, microscopical and physicochemical characteristics. The powder characters of leaves of *Jatropha gossypifolia* are inevitable finding in this study. Hence these characteristics could be used to identify and to know the adulterants if any with this species.

Acknowledgement

The authors are thankful to Mr.P.Venkatesh and N. Chandrashekar for their immense encouragement to complete this research work fruitfully

REFERENCES

- [1] Odebiyi O, Sofowora EA (1998). Phytochemical screening of Nig. Medicinal plants II; Lloyd, 41,234 – 236.
- [2] Morton JF (1968). *Econ. Bot.* 22: 87 – 102.
- [3] Morton JF (1981). Atlas of medicinal plants of middle America: Bahamas to Yucatan. Charles C. Thomas, Springfield, USA; 1420
- [4] Omoregbe RE, Ikuebe OM, Ihimire IG (1996). *Afr. J. Med Med Sci*, 25: 373 –376.
- [5] Sass, J.E., Elements of botanical microtechniques, 1940,222.
- [6] Johanson, D. A, Plant micro technique, 1940,523.
- [7] The Ayurvedic pharmacopoeia of India part 1, volume 3, 233-235