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Pharmacognostical standardisation of *Jatropha integerrima* Jacq. (Euphorbiaceae) roots

Surendra Kr. Sharma* and Harneet Singh

Faculty of Pharmacognosy, Department of Pharmaceutical Sciences, Guru Jambheshwar
University of Science & Technology, Hisar - 125001, Haryana, India

ABSTRACT

Jatropha integerrima Jacq. (Euphorbiaceae) is an erect ornamental shrub, native to West Indies. The plant has numerous applications in traditional medicine but there is a lack of data related to the standards of roots of the plant. So pharmacognostical study and parameters related to physico-chemical properties have been assessed. Macroscopy and microscopy of transverse section were performed. Extractive values, ash values, foreign matter, loss on drying, volatile oil content, bitterness value, swelling index, foaming index, crude fibre content, microbial contamination, aflatoxin content, heavy metal profile and pH values of drug solutions were analysed as per WHO guidelines. The roots of *Jatropha integerrima* Jacq. are light brown in colour with characteristic odour and slight bitter taste. Transverse section of *Jatropha integerrima* Jacq. root shows the presence of cork consisting of 6-8 cell layers, cortex, lignified protoxylem and metaxylem vessels intervened by medullary rays. Physicochemical parameters and quantitative standards were also estimated and the data thus generated may be used as an analytical feature to ascertain the authenticity and quality of the crude drug.

Keywords: *Jatropha integerrima*, Euphorbiaceae, pharmacognosy, standardisation

INTRODUCTION

Jatropha (Euphorbiaceae) is a genus comprising of approximately 175 succulent plants, shrubs and trees. Irrespective of the species, extracts from different parts such as leaves, stem, bark and roots of the *Jatropha* plant have been used in ethno-medicines for a long time [1]. *Jatropha integerrima* Jacq. (Euphorbiaceae) is an erect ornamental shrub, native to West Indies that grows commonly in South parts of India [2]. Various parts of *Jatropha integerrima* Jacq. are traditionally used as purgative, styptic, emetic, in treatment of warts, tumors, rheumatism, herpes, pruritis, toothaches, scabies, eczema and ringworm [3]. The leaves and branches of the plant have been shown to hold cholinesterase activity while latex of the plant has demonstrated anti cancer activity [4, 5, 6].

It is important to interpret morphological and anatomical descriptions of crude drugs as well as characteristic features of drugs and adulterants of commercial significance. In order to establish the pharmacognostical, morphological and microscopical characters of roots of the plant, the present study was undertaken, which would assist in standardization and guarantee quality, purity and identification of crude drug sample.

MATERIALS AND METHODS

Plant collection and authentication

Roots were collected from healthy plants of *Jatropha integerrima* Jacq. from the campus of Guru Jambheshwar University of Science & Technology, Hisar, Haryana, in the month of October, 2011. Herbarium so prepared was authenticated by Dr. H. B. Singh (Scientist F and Head, Raw Materials Herbarium and Museum, NISCAIR, New Delhi) under voucher specimen no. NISCAIR/RHMD/Consult/-2011-12/1887/187 dated 16-11-2011 and a specimen was deposited in the department. The plant material was dried under shade and then coarsely powdered.

Macroscopy

Untreated sample was examined under diffused day light and the colour of sample was recorded. The powder was rubbed slowly between fingers and odour was examined. Taste of the powder was also checked. Surface material was touched to determine whether it was soft or hard. It was ruptured to obtain information of brittleness and the appearance of the fracture plane [7].

Microscopy

Roots were fixed in formalin (5ml), acetic acid (5ml) and ethyl alcohol (90ml) mixture for 24 hours and dehydrated with graded series of tertiary butyl alcohol (TBA). Infiltration of the specimens was achieved by gradual addition of paraffin wax until TBA solution attained supersaturation and the specimen was cast into paraffin blocks. The blocks were used to prepare sections with the help of rotary microtome (WES WOX Model, MT-1090 A). Sections were stained with phloroglucinol and hydrochloric acid and then observed under compound microscope (Motic) and photographed [8, 9].

Physico-chemical parameters

Extractive values and successive extractive values of *Jatropha integerrima* Jacq. root powder were determined according to standard procedures using petroleum ether (60-80°C), chloroform, methanol and water. Total ash, water soluble ash, sulphated ash and acid insoluble ash values were studied according to standard procedures [10-13].

Quantitative studies

Foreign organic matter, loss on drying, foaming index, swelling index, volatile oil content, bitterness value, crude fibre content, aflatoxin content, microbial contamination, heavy metal analysis of root powder and pH values of 1% w/w and 10% w/w powder in water were determined as per WHO guidelines [14-16].

RESULTS AND DISCUSSION

Macroscopy

The roots are light brown in colour as shown in Figure 1. The roots have characteristic odour, slight bitter taste, rough, hard texture with fibrous fracture.

Microscopy

The transverse section of *Jatropha integerrima* Jacq. root shows the presence of cork layer, 6-8 cell thick, with a black mass. Cortex consists of brown coloured parenchymatous cells. Central portion consists of lignified protoxylem and metaxylem vessels intervened by medullary rays as shown in Figure 2.

Physico-chemical parameters

The ethanol soluble and water soluble extractive values were found to be 6.79% and 13.65% w/w respectively. The roots yielded successive extractive values of 2.74%, 4.11%, 4.21% and 13.15% w/w with petroleum ether (60-80°C), chloroform, methanol and water respectively. The total ash value of the crude drug was revealed to be 5.40% w/w while water soluble ash, acid insoluble ash and sulphated ash values were determined as 1.37%, 1.22% and 7.13% w/w, respectively.



Figure 1: *Jatropha integerrima* Jacq. root

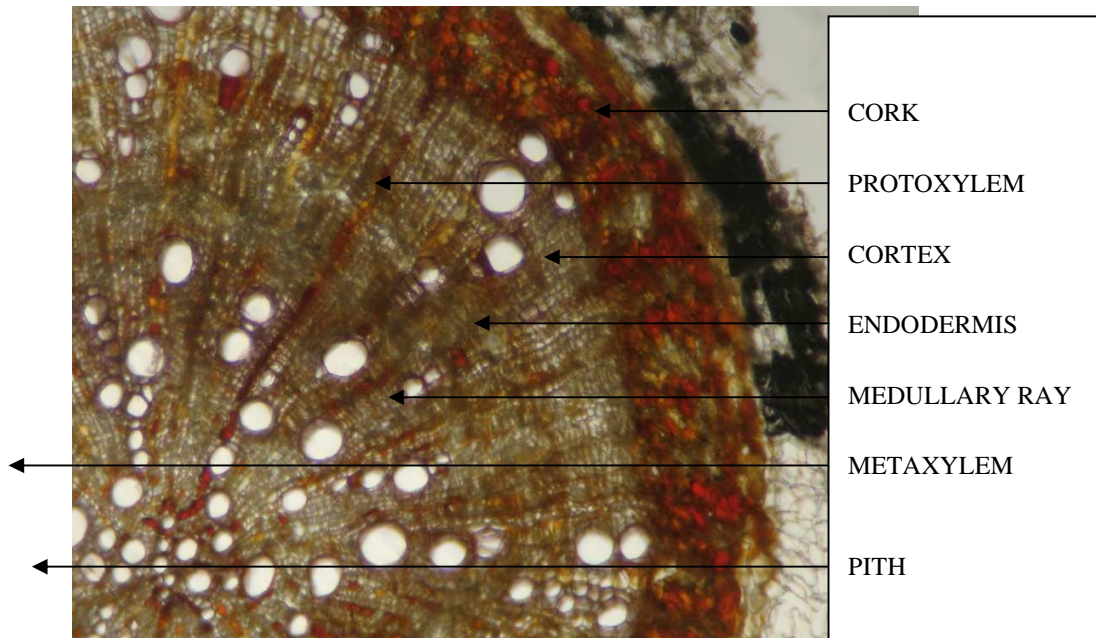


Figure 2: T.S. of *Jatropha integerrima* Jacq. root (100X)

Quantitative Studies

Foreign organic matter and loss on drying content was determined to be 0.2% and 8.75% w/w respectively. The drug was devoid of volatile oil content and foaming index was found to be less than 100. The crude drug revealed a swelling index of 1.5. The drug was slightly bitter with bitterness value of 145 units/ g and crude fibre content was found to be 22.58% w/w. Aflatoxin content and microbial contamination of root powder were confirmed to be within limits as shown in Table 1. Heavy metal analysis revealed that each element was present within specified limits as per Ayurvedic Pharmacopoeia of India as shown in Table 2. The pH values of 1% and 10% w/w drug solutions were found to be 7.4 and 6.7, respectively.

Table 1: Aflatoxin and microbial contamination test

Parameter	Specified limit	Value
Total bacterial count	1×10^5 c.f.u./g	40×10^2 c.f.u./g
Total yeast/mould count	1×10^3 c.f.u./g	560 c.f.u./g
<i>E. coli</i>	Nil	Nil
<i>Salmonella</i> sp.	Nil	Nil
<i>S. aureus</i>	Nil	Nil
<i>P. aeruginosa</i>	Nil	Nil
Aflatoxin B ₁	0.5 ppm	Absent
Aflatoxin B ₂	0.1 ppm	Absent
Aflatoxin G ₁	0.5 ppm	Absent
Aflatoxin G ₂	0.1 ppm	Absent

Table 2: Heavy metal content

Heavy metal	Result (ppm)	Specified limit (ppm)
Arsenic	0.18	3.00
Cadmium	0.02	0.30
Lead	2.45	10.0
Mercury	0.02	1.00

CONCLUSION

Standardization is an essential measure of identity, quality and purity of crude drugs. Microscopic study is one of the cheapest and simplest techniques to ascertain the genuineness of source material. Extractive values are useful to assess chemical constituents of crude drugs and the limit tests for microbial contamination and heavy metal analysis reveal the safety of herbal drugs. Quantitative determination of pharmacognostical parameters is efficient to institute standards for crude drugs. The present work was carried out on *Jatropha integerrima* Jacq. roots to lay down the standards which could be useful for establishing its authenticity and maintaining quality, safety and reproducibility.

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