

# Comparative Morphological and Anatomical Studies on the Leaf and Stem of some Medicinal Plants: *Jatropha curcas* L. and *Jatropha tanjorensis* J.L. Ellis and Saroja (Euphorbiaceae)

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## Abstract

Morphological and anatomical investigations were carried out on two species of *Jatropha*: *J. curcas* and *J. tanjorensis*. These studies were carried out on the leaf and stem of these plants using the light microscope fitted with a Nikon digital camera. Trichomes were observed in the leaf section of *J. tanjorensis* whereas these were lacking in *J. curcas*. The lower palisade parenchyma of *J. tanjorensis* consists of fewer layers but is thicker compared to that of *J. curcas*, which possessed more but thinner palisade layer.

**Key words:** Morphological, anatomical, medicinal plants, *Jatropha curcas*, *J. tanjorensis*.

## Introduction

The family Euphorbiaceae contains 290 genera and 750 species. They may be shrubs, trees and herbs, but rarely lianas. Many are xerophytes and cactoid and produce milky latex (Gill, 1988). The representatives *Jatropha curcas* and *J. tanjorensis* are of considerable economic importance as they provide food, drugs and may be cultivated as ornamentals. They are predominant in the tropics and subtropics.

*J. curcas* is a shrub or tree dispersed and naturalized through the tropics, propagated by cuttings and seeds (Okujagu *et al.*, 2005). The latex of *J. curcas* obtained directly from the stem of the plant can be applied directly to cuts, wounds and may be mixed with salt to clean the teeth.

*J. tanjorensis* is a common weed of field crops, bush re-growth, roadside and disturbed places in the higher rainfall forest zones of West Africa including Nigeria. It is useful in herbal medicine, prepared locally in most parts

of Southern Nigeria by collecting the leaves and squeezing out the juice. This is taken to reduce hypertension and also as malaria therapy.

Anatomical study of medicinal plants is significant in pharmacognosy and to prevent adulteration as well as evolve the specific parameters for authenticity and quality control of raw drugs (Bernerjee and Mukherjee, 2001; Gupta *et al.*, 2001). Earlier contributors to similar studies include Edeoga (1991), Ugborogho *et al.* (1992), Obute and Omotayo (1999), Edeoga and Eboka (2000), Idu *et al.* (2000), Gill and Mensah (2001).

There is however a general dearth of information on *J. tanjorensis*, and no documented report about its anatomical features. Also, the physiognomic similarities between the two species under investigation require that further parameters be investigated in order to adequately separate them. The present study seeks to address some of these needs.

## **Materials and Methods**

A sample of *J. curcas* was collected from the botanical garden in University of Benin while *J. tanjorensis* was collected from a home garden in BDPA, Ugbowo, Benin City, Edo State, Nigeria. The corresponding author properly identified both species.

Morphological study was by physical observation and measurement of their fresh leaf and stem specimens. For the anatomical studies, the fresh samples were fixed in Booying fixative and cross sections obtained using a microtome (Johansen, 1940). The slide preparations were independently stained with heamatoxyline and safranin. A light microscope was used to view the slides and adjusted to finest resolution. Microphotographs were obtained using a Nikon digital camera focused through the microscope eyepiece. The terminology of Metcalfe and Chalk (1950) was used in this report.

## **Results and Discussion**

The anatomical features among the *Jatropha* species investigated were summarized in Table 1. While Figure 1 illustrates the transverse and abaxial microscopic views of *J. tanjorensis* and *J. curcas* leaves, while Figure 2 represents the microscopic anatomy of their stems.

Morphologically, *J. curcas* are biennial or perennial herbs, woody at the base. Stem is erect, 1.80-7.0m, branched at the top. Leaves 10.0-15.0 cm x 9.0-12.5 cm, digitately veined and serrate to palmately lobed. While *J. tanjorensis* is an erect perennial herb 90-120m woody and branched at the base. Leaves 4.0-11.0 cm x 2.0-5.5 cm, palmately veined, palmately lobed, hastate and pubescent.

**Table 1: Comparison of Anatomical Characteristics between *J. curcas* and *J. tanjorensis*.**

<b>Plant Part</b>	<b>Anatomical measurements</b>	<b><i>J. curcas</i></b>	<b><i>J. tanjorensis</i></b>
STEM	Thickness of upper epidermis ( $\mu\text{m}$ )	60-80	40-60
	Thickness of collenchyma ( $\mu\text{m}$ )	88-100	95-105
	Thickness of parenchyma ( $\mu\text{m}$ )	260-270	250-270
	Thickness of phloem ( $\mu\text{m}$ )	96-98	40-60
	Thickness of xylem ( $\mu\text{m}$ )	32-38	80-100
LEAF	Thickness of upper epidermis ( $\mu\text{m}$ )	40-44	48-55
	The layer No. & thickness of upper palisade parenchyma ( $\mu\text{m}$ )	4 layered 24-30	5 layered 60-66
	Thickness of spongy parenchyma ( $\mu\text{m}$ )	80-90	120-128
	The layer No. & thickness of lower palisade parenchyma ( $\mu\text{m}$ )	4 layered 16-20	2 layered 40-44
	Thickness of lower epidermis ( $\mu\text{m}$ )	16-20	16-22
	Stoma length ( $\mu\text{m}$ )	28-32	44-60
	Stoma width ( $\mu\text{m}$ )	24-26	36-38
	No. of stomata on upper epidermis	2 $\pm$ 1	5 $\pm$ 1
	No. of stomata on lower epidermis	5 $\pm$ 1	18 $\pm$ 1
	Length of Trichome ( $\mu\text{m}$ )	-	60

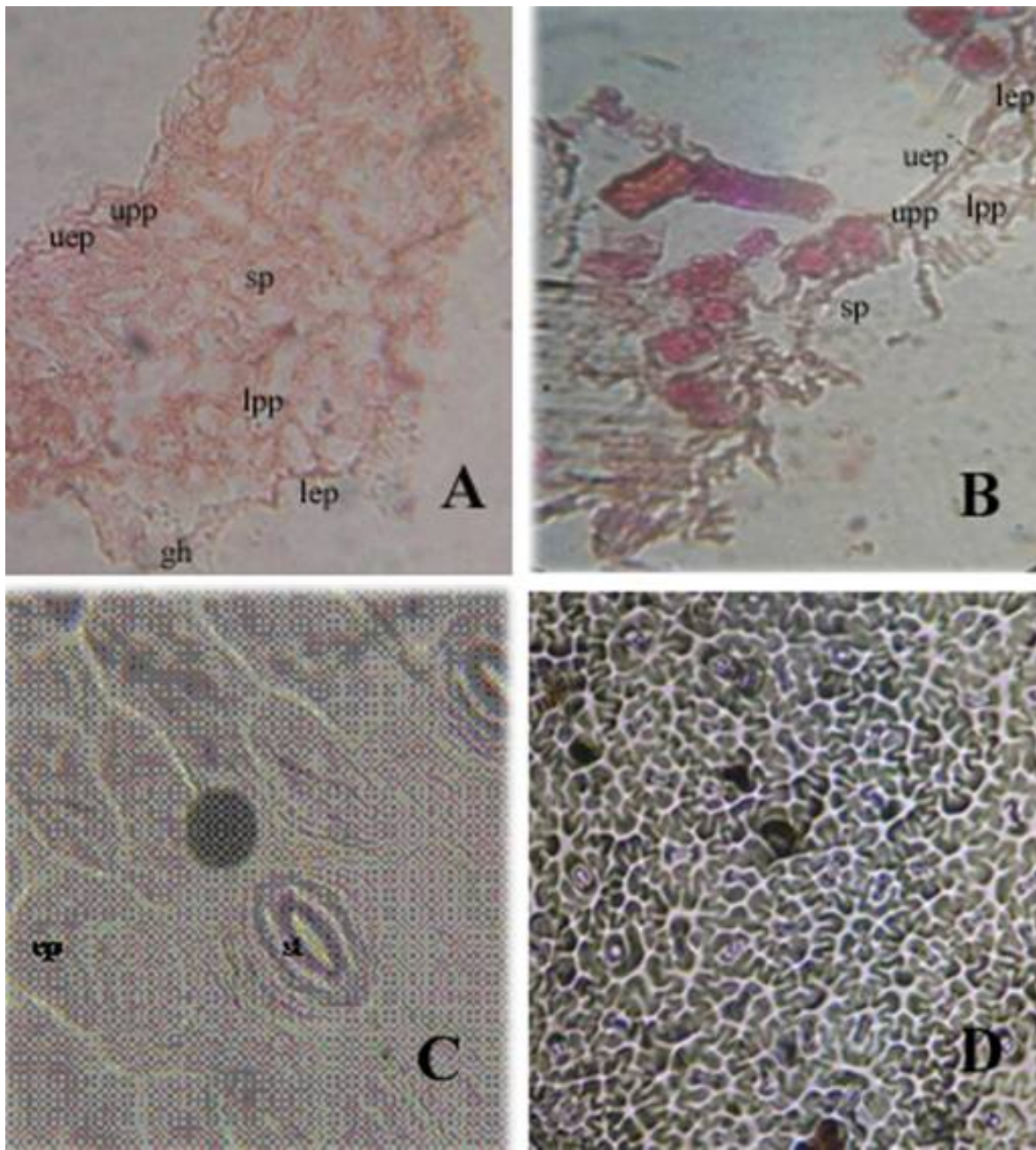
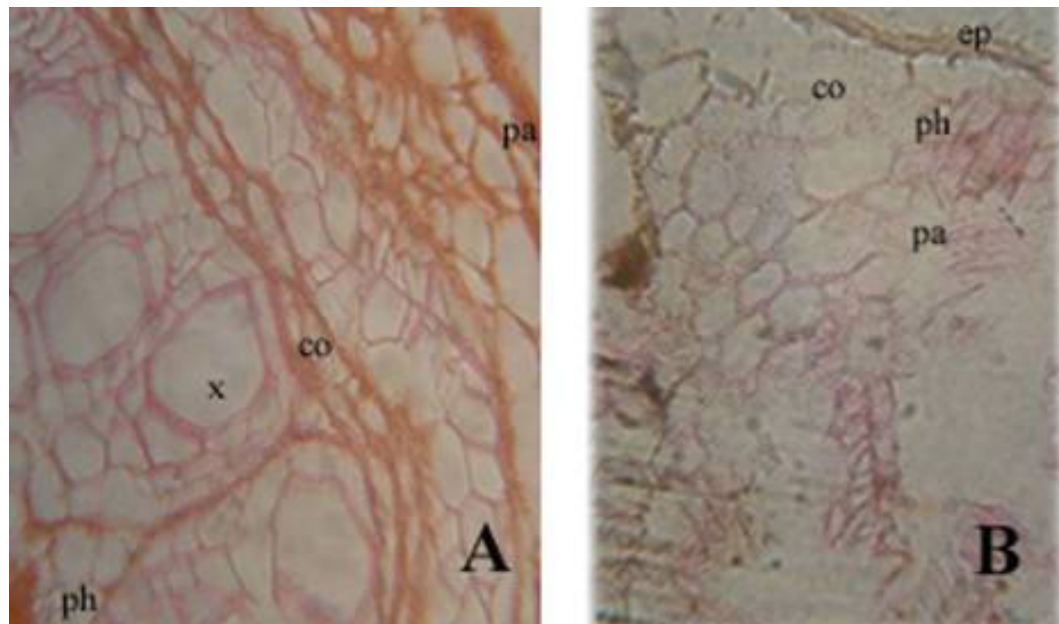


Fig. 1. Photomicrographs of leaf sections (x40).

A & B, Transverse section of *J. tanjorensis* and *J. curcas* respectively showing the structural arrangement of layers; C & D, Surface section (Abaxial) of *J. tanjorensis* and *J. curcas* respectively showing density of stomata and presence of trichomes:

uep- Upper epidermis, upp- Upper palisade parenchyma, sp- Spongy parenchyma, lpp- Lower palisade parenchyma, lep- Lower epidermis, gh- Glandular hair, st- Stomata, ep- epidermis.



pa

Fig. 2. Photomicrographs of T.S. of stem (x40).

A & B, *S. jamaicensis* and *S. cayennensis* respectively showing structural pattern:

ep- Epidermis, co- Collenchyma, pa- Parenchyma, ph- Phloem, x- Xylem.

Morphologically, the representatives were erect, branched and woody. The leaf surface of *J. tanjorensis* was pubescent while *J. curcas* was glabrous. Trichomes were present on the adaxial and abaxial surfaces of the leaf of *J. tanjorensis* being more prominent on the abaxial surface.

The stem of *J. curcas* consists of thicker epidermal layer than that of *J. tanjorensis* whereas the reverse is true in their leaf anatomy. Major differences observed in the microscopic views included the following: The lower palisade parenchyma of *J. tanjorensis* consists of fewer layers but is thicker, while that of *J. curcas* are more but thinner (Table 1). Trichomes were observed in the leaf section of *J. tanjorensis* whereas these were lacking in *J. curcas*. There was also the presence of more stomata on the abaxial surface of *J. tanjorensis*.

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