



LEAF EPIDERMAL STUDIES OF *Artocarpus altilis* (J.R&G Forster) and *Artocarpus heterophyllus* Lam

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ABSTRACT

A comparative leaf epidermal studies of two species of Artocarpus was study in this work. Fresh leaf of Artocarpus altilis FHI 113556 were collected from Idi-ayunre Ibadan while Artocarpus heterophyllus FHI 113557 were collected from University of Ibadan. Fresh plant specimens were used for this study. Samples of leaves were macerated in concentrated Trioxonitrate(v) Acid for 2-4 hours. The samples were transferred into water in Petri-dishes while the abaxial and adaxial epidermis samples were carefully separated using forceps and dissecting needle. The use of light microscope revealed that stomata only occurred on the lower surface of both plants. It also revealed the presence of trichomes on the both surfaces of the leaf of Artocarpus heterophyllus

Keywords: Anatomy, leaf epidermal, breadfruit, jackfruit, artocarpus

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INTRODUCTION

Artocarpus is a genus of approximately 60 trees and shrubs of Southeast Asian and Pacific origin, belonging to the mulberry family, Moraceae. Most species of *Artocarpus* are restricted to Southeast Asia; a few cultivated species are more widely distributed, especially *A. altilis* (breadfruit) and *A. heterophyllus* (jackfruit), which are cultivated throughout the tropics (Zerega *et al.*, 2001). The genus *Artocarpus* comprises 61 species native to Asia and India, known for their much appreciated fruits (Ragone 2011, Stevens 2012). *Artocarpus heterophyllus* grows as an evergreen tree that has a relatively short trunk with a dense treetop. It easily reaches heights of 10 to 20 m (33 to 66 feet) and trunk diameters of 30 to 80 cm (12 to 31 inches). It sometimes forms buttress roots. The bark of the jackfruit tree is reddish-brown and smooth. In the event of injury to the bark, a milky juice is released. Its origin is in the region between the Western Ghats of southern India and the rainforests of Malaysia (Morton

et al., 2016, Love *et al.*, 2011; Boning *et al.*, 2006, Elevitch *et al.*, 2006). The jack tree is well-suited to tropical lowlands, and is widely cultivated throughout tropical regions of the world. It bears the largest fruit of all trees, reaching as much as 55 kg (120 pounds) in weight, 90 cm (35 inches) in length, and 50 cm (20 inches) in diameter. (Morton *et al.*, 2016, Jackfruit Fruit Facts". 2011).

A mature jack tree produces some 200 fruits per year, with older trees bearing up to 500 fruits in a year (Morton *et al.*, 2016, Love *et al.*, 2011). The jackfruit is a multiple fruit composed of hundreds to thousands of individual flowers, and the fleshy petals of the unripe fruit are eaten. (Morton *et al.*, 2016, Silver *et al.*, 2013). The ripe fruit is sweet (depending on variety) and is more often used for desserts. Canned jack fruit has a mild taste and meat-like texture that lends itself to being called a "vegetable meat" (Morton *et al.*, 2016). *Artocarpus altilis* which belongs to the family Moraceae. It is commonly referred to as breadfruit as it is similar to

freshly baked bread. Breadfruit is a tropical fruit and the breadfruit tree produces fruits from March to June and from July to September (Akanbiet *et al.*, 2009). Breadfruit is also known to be a traditional starch rich crop.

MATERIALS AND METHODS

Sample Collection

Fresh specimens of *A. Altilis* and *A. heterophyllus* were used in this study. The plants were authenticated at Forestry herbarium Ibadan. *A. altilis* with voucher number FHI 113556 was collected from Idi-ayunre Ibadan while *A. heterophylla* with voucher number FHI 113557 was collected from University of Ibadan Oyo State, Nigeria.

Micro Morphological Study

Epidermal preparation was obtained using the technique of Ugboogu *et al.*, (2016). Samples of leaves were macerated in concentrated Trioxonitrate (v) Acid for 2-4 hours. The sample was transferred to water in Petri-dish while the abaxial and adaxial epidermis were carefully separated using forceps and dissecting needles. The inner parts (mesophyll tissue) were carefully cleared with Caramel brush; isolated epidermal layers were washed in several changes of water before transferring in 50% alcohol for 1-2 minutes to harden them.

The sample was transferred to a clear glass microscopic slide and stained (after draining the excess water) with Safranin O for less than 4 minutes and excess stain was washed off using a dropping pipette to add and remove water from tissue. They were later mounted on a slide and covered with a cover-slip and lady's paint was used to seal to avoid air from entering into it. It was mounted under a light microscope and viewed with an x 10 and x 40 objective lens.

RESULTS

Leaf sections of both species revealed similar arrangements. Stomata are found on one sides of the leaf) On the occurrence of stomata on the both species they are said to be hypostomatic (i.e. stomata occurring on abaxial surface only). *A. altilis* leaf has one stomata type which is steuroscytic, qualitative foliar epidermis is shown in Table 1 below while *A. heterophyllus* leaf has one stomata type which is Anomocytic Qualitative foliar epidermis is shown in Table 2 below. Unicellular trichomes were found on *A. Altilis* while Glandular, multicellular was found on the abaxial surface of *A. heterophyllus* and Non glandular, glandular multi-cellular on the adaxial surface. Anatomical description of the leaves is shown in Plates 1-6. Qualitative and quantitative foliar epidermal features of *Artocarpus altilis* and *Artocarpus heterophyllus* in Table 1 and 2.

Table1: Foliar epidermal features of *Artocarpus altilis*

Species name	Stomata	Stomata types	Stomata length (µm)	Stomata width (µm)	Number of stomata per view	cell length (µm)	Cell width (µm)	Number of cell per view	Trichomes
<i>Artocarpus altilis</i> (abaxial)	Present	Steurocytic	9.98 1.71±0.54	8.05 1.71±0.53	14.2 3.29±1.04	15.2 3.67±1.15	12.9 5.52±4.2	10 1.34±0.42	Unicellular trichomes
<i>Artocarpus altilis</i> (Adaxial)	Absent	Absent	Absent	Absent	Absent	18.7 4.25±5.92	20.1 5.11± 6.36	13.3 3.31 ±4.21	Scarely found

Table 2: Foliar epidermal features of *Artocarpus heterophyllus*

Species name	Stomata	Stomata types	Stomata length(µm)	Stomata width(µm)	Number of stomata per view	Cell length(µm)	Cell width (µm)	Number of cell per view	Trichomes
<i>Artocarpus heterophyllus</i> (abaxial)	Present	Anomocytic	11.4 1.43±3.61	9.98 1.82±3.15	14 3.26±3.544	14.3 2.83±4.54	11.5 3.48±3.52	11.2 5.26±3.54	Present, Glandular, multicellular with five or more cells
<i>Artocarpus heterophyllus</i> (adaxial)	Absent	Absent	Absent	Absent	Absent	15.9 3.70±5.64	14.8 3.26±5.26	12.2 2.29±3.83	Present, Non glandular ,glandular multicellular with more cells

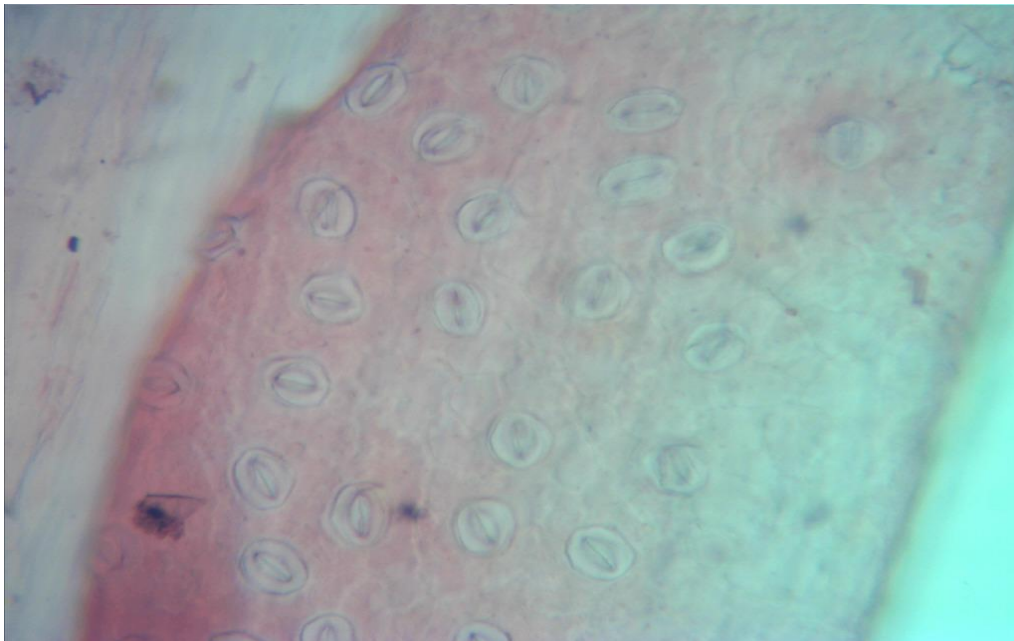


Plate1: Abaxial of Leaf surface of *Artocarpus altilis*

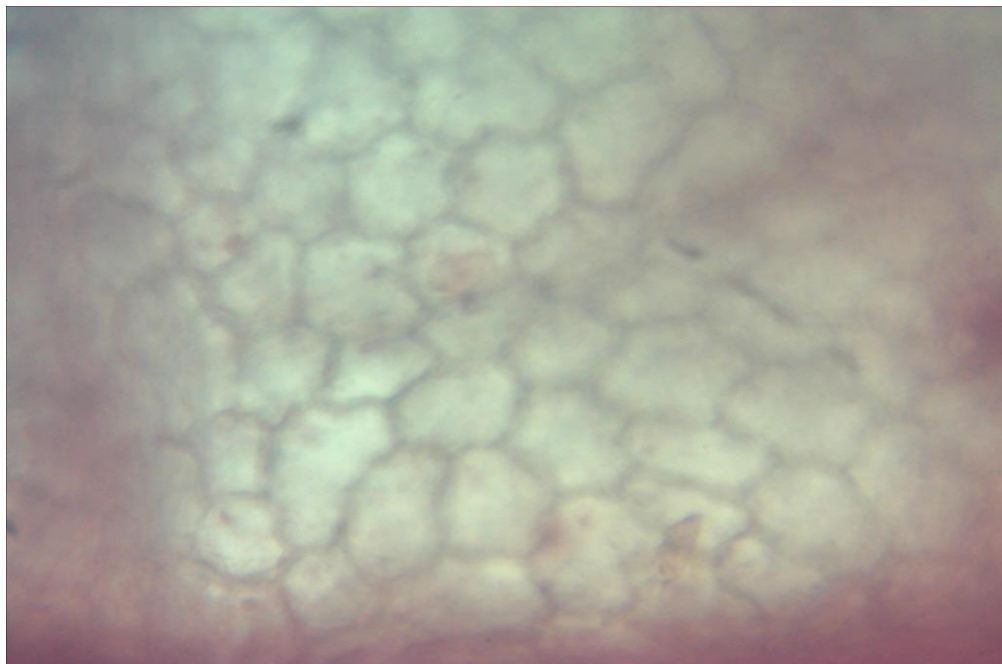


Plate 2: Adaxial surface of *Artocarpus altilis*



Plate3 Trichomes in *Artocarpus altilis*

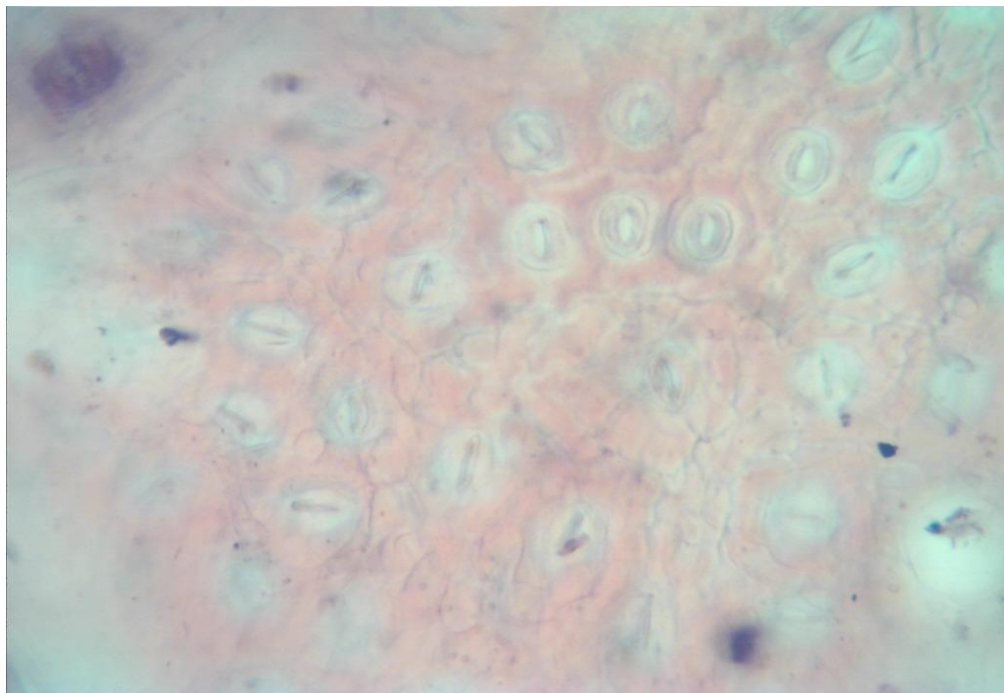


Plate 4: Abaxial surface of *Artocarpus heterophyllus*

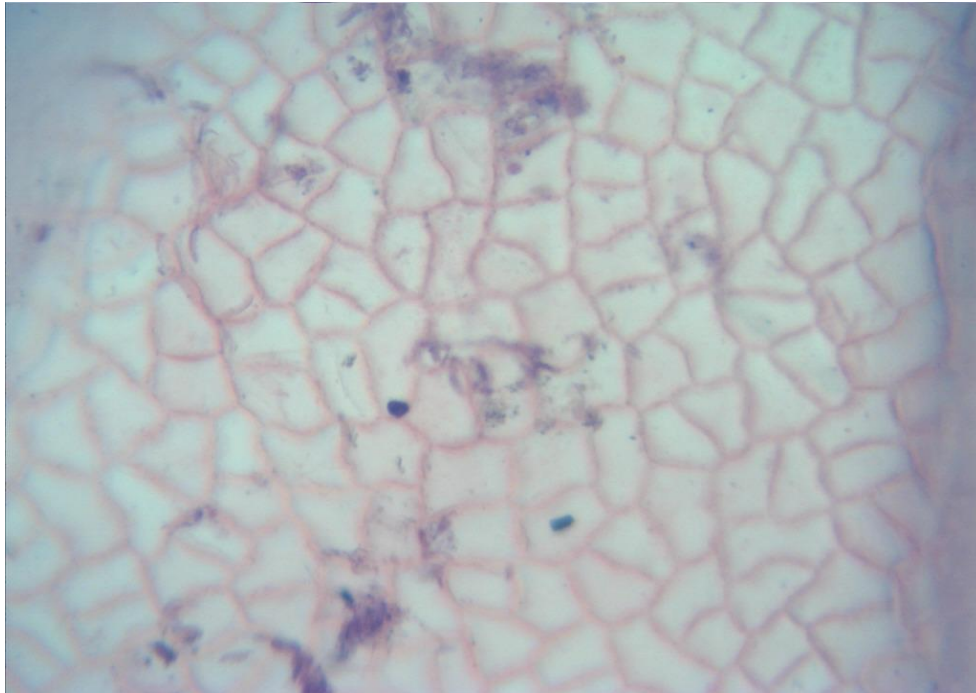


Plate 5: Adaxial of *Artocarpus heterophyllus*



Plate 6 Trichomes in *Artocarpus heterophyllus*

DISCUSSION

There are controversies in the literature regarding the types of trichomes found in the two studies. Martinez (2008) stated that the leaf blade of *A. heterophyllus* is glabrous on the

adaxial side. However, in this present study the epidermis on both surfaces of *A. altilis* are uniseriate short rectangular, oval or circular shaped sizes while *A. heterophyllus* are uniseriate, cells with sinuous walls on both

sides. In this present study it was also found that glandular trichomes in this face of leaf blade of *A. heterophyllus* was also found by Gangadhara and Inamdar (1977), Schnetzler *et al.*, 2017 and Rafaela *et al.*, 2019. Trichome features are now considered important in taxonomic studies (Leelavathi and Ramayya, 1983). According to Metcalfe and Chalk (1950), in the family moraceae can be found anomocytic and anisocytic stomata.

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CONCLUSION

This study revealed that both *Artocarpus altilis* and *Artocarpus heterophyllus* have more character than delimiting specific character. The characters observed in this study are diagnostic enough to separate the species and identify them while sterile.