

TAXONOMIC VALUES OF MORPHOLOGICAL FEATURES OF THREE *Ficus* spp. L. (MORACEAE) USE AS VEGETABLE AND MEDICINE IN EBONYI STATE, SOUTHEASTERN NIGERIA

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Abstract: Taxonomic studies were carried out on *F. capensis*, *F. thonningii* and *F. umbellata* based on macro-morphology and foliar epidermis to specifically state the diagnostic features of the three species used as vegetable. The young leaves of the species are very delicious vegetables. Standard methods were used for the studies. The results of the studies showed that the leaf shape was elliptic in *F. thonningii* and *F. capensis* and ovate in *F. umbellata*. Results of the studies showed considerable variations of leaf size among the three species studied. The leaf length of the *F. capensis* ranged from 7.0-11.0 cm with the mean of 10.5, the width ranges from 4.9-9.0 cm with the mean of 7.0 while the leaf length of *F. thonningii* ranged from 6.0-10.7 cm with the mean 9.8, leaf width ranged from 4.7-8.2 cm with the mean 5.0. The length of the *F. umbellata* ranged from 7.6-13.4 cm with the mean 9.0, the width ranged from 5.9-11.2 cm with the mean 8.0. The three species studied were hypostomatic as anomocytic stomata were common on the abaxial surfaces of *F. capensis* and *F. thonningii* while pericytic stomata were present in *F. umbellata*. Oblong-elliptic leaf shape with crenate margin, leaf apex: acute, leaf and fruit size, pentagonal epidermal cell shape are unique to *F. capensis*. *Ficus thonningii* possesses elliptic leaf shape, apiculate leaf apex and hexagonal epidermal cell shape while *F. umbellata* has ovate leaf shape with cordate base, cuspidate leaf apex, irregular cell shapes and multicellular trichomes on the adaxial surface. Proper identification of plant species is the first step to achieving credible and rewardable results of research on plants.

Key words: *Ficus*; macromorphology; foliar epidermis; vegetables; Ebonyi State; Nigeria.

INTRODUCTION

Species of the genus *Ficus* Linn. in the family moraceae are distributed mostly in the tropical and subtropical regions of the world [12]. In African floristic region, 105 species of the genus were recorded by Berg [7]. The genus is valuable due to its high economic and nutritional values. In Nigeria, and other regions of the world, *Ficus* species are ethnobotanically useful for the treatment of various diseases [2]. Diseases like tuberculosis, diarrhoea, dysentery, leprosy, convulsion and anaemia can be treated with the extracts of most *Ficus* species [2, 24] among many others. Sonibare *et al.* [27] broadly grouped the species of *Ficus* they studied into two based on glabrous and pubescent nature of leaf surfaces. Among the pubescent group was *F. thonningii* Blume with hairs on the adaxial surfaces of the leaves. Stalked hairs with flat plates were observed on the abaxial surfaces of *F. ingens* and *F. capensis* Thumb formerly, known as *Ficus sur* Forssk and also on the adaxial surfaces of *F. ovata*, *F. polita*, *F. thonningii*, and *F. trichopoda*.

The leaf shape of *F. capensis* was described by Keay [14] to be ovate-elliptic. The leaf apex and base were acute and lightly cordate, sometimes rounded or cuneate. The margin could be dentate, wavy or at times, entire [5]. *Ficus thonningii* is a deciduous, evergreen and multistemmed tree, distributed in tropical and subtropical Africa [8]. According to Schmidt *et al.* [25], the leaf arrangement of the *F. thonningii* is alternate or whorled with mid-dark green colour. The leaf surfaces could be glabrous with a prominent midrib [8]. *Ficus umbellata* Vahl. is a plant species found in subtropical regions of the world,

growing up to 6–10 m in height [26] with the leaf arrangement and surface, alternate and grabrous respectively.

Uses of *F. capensis*, *F. thonningii* and *F. umbellata*

According to Igoli *et al.* [13], Igede people of Benue State in Nigeria use the leaves of *F. capensis*, traditionally, to treat diarrhea. Gill [11] also reported the use of the leaves of the taxon in treating dysentery, oedema, epilepsy and rickets in children among some tribes in Edo-Delta areas. Leaves of *F. capensis* have antimalarial, antibacterial and antiulcer properties [4, 9]. Decoction of the bark of *F. capensis* is used in Ghana and Nigeria to treat dysentery [10]. The leaves of *F. thonningii* are good sources of protein [28] and its ripe fruits used to make jam and alcoholic beverages [24]. In Angola, Sudan, Kenya, Ethiopia and Senegal, the leaves of *F. thonningii* are used as vegetable [8, 17]. Igede and Fulani people of Nigeria also use the leaves as vegetable [16]. *Ficus thonningii* is extensively used in African traditional medicine to treat disease conditions like diabetes, respiratory infections and psychosis [19, 28]. Malians use leaf decoction of *F. thonningii* to treat urinary schistosomiasis [6]. In Nigeria, leaf extract of *F. thonningii* is used to handle stomach pains, gastric ulcers and liver disorders [3, 21]. *Ficus thonningii* is commonly used in homesteads for fencing, firewood and construction and stem-bark ethanolic extract reduces blood glucose in non-diabetic and diabetic rats after five weeks exposure [18, 23]. *Ficus umbellata* Vahl. is a plant species found in subtropical regions, growing up to 6–10 m in height [26] with the leaf arrangement and surface, alternate and grabrous respectively. *Ficus umbellata* stem barks are used in

Cameroonian in traditional medicine system for treatment of various gynecological conditions, such as amenorrhoea, dysmenorrhoea as well as for menopausal complaints. It could be used to treat cancer [26].

Although, the three species serve important purposes as vegetables and medicine, less attention has been given to taxonomic studies using various aspects. Besides, most of previous researchers on some species of the genus *Ficus*, complicated their studies as the diagnostic features of the species were not properly stated, hence, these present studies are important to specifically state the diagnostic features of the three species and to make it known to the world that *F. capensis*, *F. thonningii* and *F. umbellata* are good vegetables and medicines for various ailments. The studies are based on macro-morphology and foliar epidermis of the three species.

MATERIALS AND METHODS

Fresh specimens of *F. capensis* (synonym: *F. sur*), *F. thonningii* and *F. umbellata* were collected from Abakaliki metropolis in Ebonyi State, identified at Ebonyi State University Herbarium (EBSU-H) and authenticated at Forest Research Institute of Nigeria (FRIN) Jerico Ibadan, Oyo State, Nigeria. The voucher specimens of *F. capensis*, *F. thonningii* and *F. umbellata* with the numbers EBSU-H-5433, EBSU-H-5434 and EBSU-H-5435, respectively, were deposited in Ebonyi State University Herbarium.

Macro-morphological study. Leaf length and width were measured following the method used by Nwankwo and Ayodele [20]. From each specimen, a total of 10 leaves were randomly selected and measured. The qualitative and quantitative characters of the taxa were obtained by visual observation and measuring with metre rule.

Foliar epidermal study. Epidermal preparation methods also followed the method used by Nwankwo and Ayodele [20]. The standard median portions of the leaves obtained by cutting with razor blade were soaked in concentrated trioxonitrate (v) acid for about 10 to 15 minutes to soften the mesophyll layers for separation. The appearance of air bubbles on the surfaces of the leaves indicated their readiness for separation. They were transferred into some water in the Petri dish with a pair of forceps. Both epidermises were carefully separated by teasing them apart and pulling the epidermis back on itself using camel hair brush. The camel hair brush was also used to remove the adhering tissue debris. The separated surfaces were rinsed in distilled water and then transferred into 50% ethanol for about two to three minutes to harden. They were rinsed again in distilled water and stained with safranin for about five minutes and excess stains were washed off in water. They were mounted in 25% glycerol on slides with the edge of the cover slips sealed with nail varnish to prevent dehydration. The slides were labelled appropriately and examined under the light microscope while photomicrographs of each

slide was taken at a magnification (x400), using Canon digital camera fixed to Premiere light microscope and connected to personal computer.

RESULTS

The three species had simple leaves. The leaf shape was oblong-elliptic in *F. capensis*, elliptic in *F. thonningii* and ovate in *F. umbellata*. Leaf surfaces are glabrous in all. The leaf margin of *F. capensis* is crenate while *F. thonningii* and *F. umbellata* are entire. Results of the studies are summarized in Tables 1 and 2 while the photomicrographs of the three species are shown in figure 1.

DISCUSSION

The leaf surfaces of the three species studied are all glabrous and this disagrees with Sonibare *et al.* [27] who reported pubescent feature on the adaxial surfaces of *F. thonningii* and *F. capensis*. The disagreement of the report of Sonibare *et al.* [27] with these studies may be as a result of environmental factors of the place where the plant specimens were collected. Environmental variations affect morphological features of plants [1]. Schmidt *et al.* [25] reported the leaf arrangement of *F. thonningii* to be alternate and whorl but our studies showed that the leaf arrangement of the taxon is spiral. The three species studied are hypostomatic with stomata restricted to abaxial surfaces. Anomocytic stomata (four cells enclosing guard cells in an irregular and variable pattern) were common on the abaxial surfaces of *F. capensis* and *F. thonningii* while pericytic stomata were present in *F. umbellata* (Table 2, Figure 1). The stomatal types recorded here, disagree with Sonibare *et al.* [27] who reported paracytic stomata in the three species. Our report also disagrees with Ogunkunle and Oladele [22] who reported extensive similarities in the foliar epidermal characters of *F. umbellata* and *F. thonningii* (Tables 1 and 2). The report of Igoli *et al.* [13] that the species are edible is in line with ours. Hypostomata may be a common feature among *Ficus* species as Khan *et al.* [15] and Sonibare *et al.* [27] reported the feature mostly in all the species they studied.

The *F. capensis* can easily be recognized by oblong-elliptic leaf shape with crenate margin and acute apex, unicellular trichome on the abaxial surface and pentagonal cell shapes while *F. thonningii* possesses elliptic leaf shape, apiculate apex, hexagonal cell shapes. *Ficus umbellata* has ovate leaf shape with cordate base, cuspidate leaf apex, multicellular trichomes on the adaxial surface, irregular cell shape as its diagnostic features. Though, the data presented here are not fully novel as there have been reports on the three species, but our data have specifically stated the diagnostic features of the taxa studied which the previous data lack. Diagnostic features of the organisms are very important, especially plant species, as proper identification of the plant species is the first

Table 1. Qualitative and quantitative macro-morphological features of the *Ficus* species studied

Species	Leaf shape	Leaf surface	Leaf margin	Leaf apex	Leaf base	Leaf arrangement	Length (cm)	Width (cm)
<i>F. capensis</i>	Oblong-elliptic	Glabrous	Crenate	Acute	Acute	Spiral	7.0(10.5±0.3)11.0	4.9(7.0±0.2)9.0
<i>F. thonningii</i>	Elliptic	Glabrous	Entire	Apiculate	Acute	Spiral	6.0(9.8±0.3)10.7	4.7(5.0±0.4)8.2
<i>F. umbellata</i>	Ovate	Glabrous	Entire	Cuspidate	Cordate	Spiral	7.6(9.0±0.4)13.4	5.9(8.0±0.3)11.2

N.B. All measurements are in centimetre (cm): minimum (mean ±standard error) maximum

Table 2. Qualitative foliar epidermal features of the *Ficus* spp studied

Epidermal features	<i>F. capensis</i>		<i>F. thonningii</i>		<i>F. umbellata</i>	
	Adaxial surface	Abaxial surface	Adaxial surface	Abaxial surface	Adaxial surface	Abaxial surface
Stomatal type	Absent	Anomocytic/Anisocytic	Absent	Anomocytic	Absent	Pericytic
Cell shape	Pentagonal	Pentagonal	Hexagonal	Hexagonal	Irregular	Irregular
Anticlinal wall patterns	Straight	Undulate	Straight	Straight	Straight	Straight
Trichomes	Absent	Present	Absent	Absent	Present	Absent

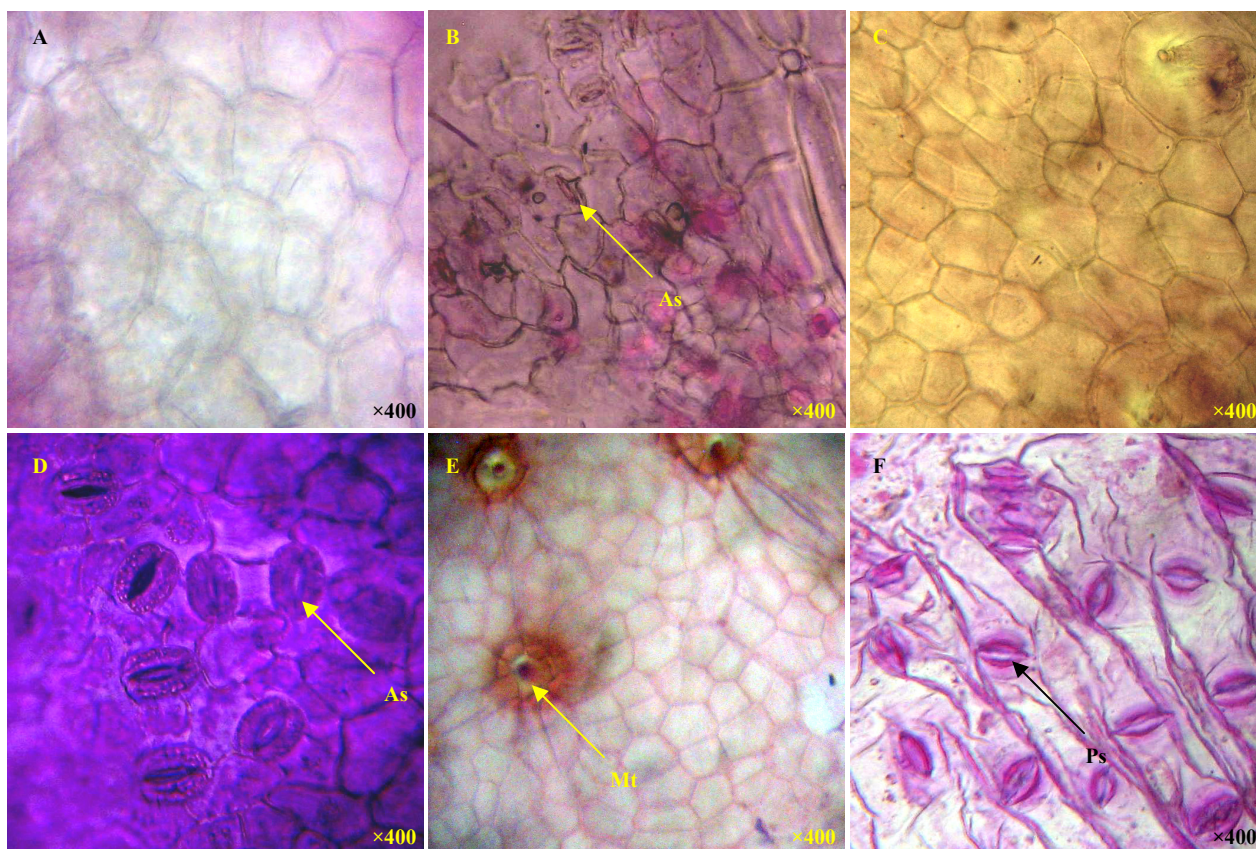


Figure 1. Photomicrographs of the foliar epidermal surfaces of the *Ficus* spp. studied where: **A** - Adaxial surface of *F. capensis*; **B** - Abaxial surface of *F. capensis*; **C** - Adaxial surface of *F. thonningii*; **D** - Abaxial surface of *F. thonningii*; **E** - Adaxial surface of *F. umbellata*; **F** - Abaxial surface of *F. umbellata*; **As** - Anomocytic stomata; **Ps** - Pericytic stomata; **Mt** - Multicellular trichome.

step to achieving credible and rewardable results of research on plants.

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