



***Laguncularia racemosa* (L.) Gaertner f. (Family Combretaceae): gross morphology, phytochemistry, ecology and distribution in the Niger Delta.**

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ABSTRACT: The morphology, phytochemistry, ecology and distribution of *Laguncularia racemosa* (L.) Gaertner f., (basionym: *Conocarpus racemosa* L.), in the Niger Delta area was investigated in this study. The data showed that *Laguncularia racemosa* is a small tree or shrub 30 cm in diameter and about 6 m in height, growing on peaty chikoko soil. The bark of this plant is smooth, greyish brown in colour whereas the inner bark is light brown. Phyllotaxy is opposite. Leaves are ever-green, leathery-textured, petiolate rounded at their bases with pairs of lateral nerves; subsidiary cells surrounding the stomata on the abaxial surfaces are anomocytic whereas those on the adaxial are cyclocytic. The leaf stalk is provided with a pair of glands at the top. Leaves and stems contain flavonoids: apigenin, kaempferol, tricetin, iso-orientin and quercetin. Inflorescence is a panicle. The plant fruits all the year round; fruits are greenish yellow, leathery velvety, ribbed longitudinally, crowned by persistent calyx teeth and contains an elongated seed. The plant is well endowed with pneumatophores. @ JASEM

Laguncularia Gaertner f. is a dicotyledonous genus in the Family Combretaceae that occurs in mangrove swamps on the Atlantic coasts of the Americas and West Africa (Nyananyo, 2006). The number of species in this genus is problematic as some authors led by Airy-Shaw (1985) are of the opinion that the genus is ditypic i.e. has two species whereas others led by Keay (1989) are of the opinion that it is monotypic i.e. has only one species. The present investigation is on the plant occurring in the Niger Delta area of Nigeria on the West African coast of the Atlantic Ocean. This plant species is a relatively small tree or shrub 30 cm in diameter and about 6 m in height, superb for stabilizing tropical and subtropical shorelines and for providing habitat for wild life like other mangrove species: the black (*Avicennia germinans* L.) and red mangroves (*Rhizophora racemosa* G. F. W. Meyer, *R. mangle* L., and *R. harrisonii* Leechmann) in Nigeria's Niger Delta region. The Niger Delta is the oil rich region in Nigeria. It is a triangular Delta and one of only five in Africa. The others are the Nile in Egypt, North Africa, Okavango in Botswana, Southern Africa which flows into the Kalahari Desert and Zambesi in the Congo. *Avicennia* L., *Laguncularia* and *Rhizophora* L. are the three mangrove genera occurring in the Niger Delta. It is worthy of note that whereas species of *Avicennia* and *Laguncularia* have pneumatophores i.e. breathing roots, species of *Rhizophora* do not have breathing roots but have stilt roots with lenticels that serve the same purpose as the pneumatophores. Flavonoids are secondary metabolites i.e. secondary plant products which are relatively less widespread and perform non-vital functions in the plant. It is this restricted occurrence amongst plant species that renders flavonoids valuable as taxonomic markers. Flavonols and flavones are the two most important classes of flavonoids for phytochemical investigations. Flavonoids play an

important role in plants by protecting them against external pathogens, ultra violet light or heat. They are also responsible for the red, purple, and blue colours of fruits, petals of flowers and play a role in the pollination process by attracting insects. The literature on the gross morphology, ecology and chemistry of tropical plant species is lacking especially those from the Niger Delta area of Nigeria. It is as a consequence of the dearth of information in this regard and to contribute to its flora that this work was carried out.

MATERIALS AND METHODS

Leaves of fresh and dry specimens were used in this study. Twenty five (25) plant samples were collected from the Niger Delta area of Nigeria. Voucher specimens duly authenticated were deposited in the University of Port Harcourt Herbarium. Leaf specimens were stored in FAA (Formaldehyde, 40%: Glacial Acetic acid and Alcohol, 70% ethanol: 1:1:18) solution, washed twice in water, boiled in 70% alcohol for 5 – 10 minutes to further revive the herbarium specimens and kill the chlorophyll in the fresh specimens. Specimens were then transferred into 5% NaOCl (sodium hypochlorite) solution until they were colourless and transferred into chlorohydrate solution until specimens were translucent. The epidermal surface of the specimens were peeled off in 50 % glycerol on a glass slide and stained with safranin solution. Leaf extracts were run through Whatman No. 1 chromatographic paper in various solvents, BAW (n-butanol-acetic acid-water, 4:1:5), distilled water, 50 % Acetic acid, and Forestal (concentrated Hydrochloric acid-Acetic Acid-water, 3:30:10) using standard procedures (Harborne, 1973). The chromatogram was sprayed after drying with ammonia solution for flavonoids and observed in UV light at 366nm and the colours emitted were recorded. Identification of the various flavonoids was achieved using the colours and Rf

values (the retardation factor, which is the ratio of the solute front to the solvent front multiplied by 100) on the chromatogram values.

RESULTS AND DISCUSSION

The results are as presented in Tables 1 & 2 and Fig. 1. *Laguncularia racemosa* is one of the components of the mangrove vegetation, the others in the Niger Delta include the species of the black (*Avicennia germinans*) and red (*Rhizophora racemosa*, *R. mangle*, *R. harrisonii*) mangroves. This species, *Laguncularia racemosa* occurs in the consistently moist, hardy portions with an underlying peaty, chikoko soil in this habitat. The bark of this plant is smooth, greyish brown in colour whereas the inner bark is light brown. The plant is well endowed with pneumatophores.

Phyllotaxy is opposite. Leaves are evergreen, leathery-textured, glabrous, entire, petiolate rounded at their bases and apices with several pairs of lateral nerves (Fig. 1).

The leaf stalk which is about 10 – 18 cm long is stout and provided with a pair of glands at the top. Subsidiary cells surrounding the stomata on the abaxial surfaces are anomocytic whereas those on the adaxial are cyclocytic. Leaves and stems contain the

flavonols: apigenin, kaempferol, triclin, iso-orientin and quercetin (Tables 1 & 2). This result indicates therefore that the stems and leaves of this plant are woody, as flavonols are usually associated with woody portions of plant species and are not dependent on the state of the plant parts used (Nyananyo, 1986). Inflorescence is a panicle. Sepals are formed into a calyx tube which is about 4 – 7 cm long increasing in the fruit with 4 – 5 shallow teeth; two which are conspicuous and persistent. There are ten stamens which are relatively inconspicuous and petals of individual flowers are green. The plant fruits at the same time as it flowers and this is all the year around. The fruits are greyish yellow, leathery, velvety, ribbed longitudinally and crowned by the persistent calyx teeth. These fruits which are about 16 – 20 cm long contain one elongated seed. The plant is well endowed with pneumatophores which are used for breathing and are usually referred to as breathing roots. These pneumatophores are negatively geotropic and thus emerge from the soil and project upwards occurring close to the plant (Fig. 1). The flowers bloom all the year round and have white petals. The fruit is a green ribbed, capsule-like structure.

Table 1: Colour reaction in BAW.

Plant Part used	Rf (x100)	Colour	Compound present	Type of Flavonoid
Leaf	92	Dull red	Apigenin	Flavone
	75	Yellow-green	Tricin	Flavone
	45	Yellow-green	Iso-orientin	Glycosylflavones
Stem	85	Bright yellow	Kaempferol	Flavonol
	60	Bright yellow	Quercetin	Flavonol

Solvent key: BAW: n-Butanol – Acetic acid – Water (4:1:5)

Table 2: Colour reaction in Forestal.

Plant P used	Rf (x10)	Colour	Compound preser	Type of Flavonoid
Leaf	80	Dull red	Apigenin	Flavone
	68	Yellow-green	Tricin	Flavone
	40	Yellow-green	Iso-orientin	Glycosylflavones
Stem	50	Bright yellow	Kaempferol	Flavonol
	38	Bright yellow	Quercetin	Flavonol

Solvent key: Forestal: Conc. HCl – Acetic acid – Water (3:30:10)

Conclusion

The problematic issue of the number of species in the genus *Laguncularia* could be as a result of the allopatric distribution of the ‘component species’ which has arisen as a result of geographical isolation due in this case to the Atlantic ocean. Inter-sterility of different species is one of the attributes of distinct species (Davis & Heywood, 1973; Okeke, 2004). Also, a species is a group of interbreeding (or potentially interbreeding) populations that is reproductively isolated from such other groups (Mayr, 1963; Templeton, 1989;

Coyne, 1992; Thompson & Lumaret, 1992; Schemske, 2000; Soltis *et al.*, 2007). It is therefore suggested that breeding experiments involving crossings of these allopatric putative species should be embarked upon to put to rest the problematic issue of the number of species in this genus. It will as a consequence repay investigations.

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