



# A SURVEY OF VASCULAR EPIPHYTES OF OIL PALMS (*Elaeis guineensis* JACQ.) IN LEKKI CONSERVATION CENTRE, LAGOS, NIGERIA



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**Abstract:** A survey of vascular epiphytes of *Elaeis guineensis* was carried out at the Lekki Conservation Centre, Lagos. A total number of nine species of epiphytes were collected and identified. Their locations on the phorophytes such as base, trunk and canopy were also noted. Seven epiphytic species were found at the base, five epiphytic species were found on the trunk and six epiphytic species were found at the crown of the oil palms. Four Pteridophytes and five flowering plants species were found. Pteridophytes found were *Nephrolepis biserrata*, *Elaphoglossum* sp, *Polypodium* sp, *Phymatodes scolopendria* and the flowering plants include *Ficus* sp, *Ficus lepriouri*, *Ficus conraui*, *Commelina africana* and palm seedlings. This study documents the occurrence of vascular epiphytes on various locations on the *Elaeis guineensis*, in relation to light and shaded portions of the *Elaeis guineensis* and the study area at large.

**Keywords:** *Elaeis guineensis*, Ferns, Lagos, Lekki conservation centre, Pteridophytes, vascular epiphytes,

## Introduction

An epiphyte is any plant that does not live in the soil, but has true root system and frequently lives on another plant causing no harm (Madison, 1977) sometimes they may grow upon some other objects such as buildings. An epiphyte derives its moisture and nutrients from the air, rain and sometimes debris, which accumulates on the phorophyte (Killick, 1971) and it also photosynthesize to manufacture its food. Plants on which an epiphyte grows and derives support are called phorophytes (Barkman, 1958). Epiphytes are commonly referred to as higher plants but there are also epiphytic bacteria, fungi and algae (Akinsoji, 1991). They account for about 40% of the biomass of all plants, trees and shrubs in some Neotropical forests (Nadkarni, 1984), serving as food for some certain insects and bird species (Nadkarni and Matelson, 1984; Joanne, 1978). Some species such as orchids and bromeliads are also used in the beautification of homes and offices (Pittendrih, 1948).

Epiphytes usually derive only physical support and not nutrition from their host, although some might damage their host. Such are not referred to as true epiphytes but still possess epiphytic habit. Some epiphytes begin their lives on the tree and soon over years they send down true roots into the soil (Madison, 1977) and then damage and replace the original plant. For example, *Ficus lepriouri* and *Ficus conraui* are stranglers. Epiphytes that end up as free standing tree are called hemi-epiphytes (Francis, 1986). They may also develop roots primarily for attachment and some other specialized structure such as cups, scales, succulent leaves and stems to collect or hold moisture (Akinsoji, 1990). Assemblages of large epiphytes occur most abundantly in the forest regions, they grow on tree branches, soil particles on tree trunks and also in rotten holes on the trees. However, epiphytes can also be used to characterize vegetation (Sanford, 1974)

Major works on the documentation of vascular epiphytic flora in Nigeria has only been carried out in Olokemeji and Gambari forest reserves and Gashaka-Gumti National Park by Akinsoji (1990, 1991 and 2005). Some of the epiphytic taxa documented in these areas include Moraceae, Asteraceae, Polypodiaceae, Acanthaceae, *Utricaca* sp, Portulacaceae, Arecaceae, Orchidaceae and Commelinaceae. The epiphytes were recorded based on their location on the phorophytes such as canopy, bark and base. It was also recorded that *Elaeis guineensis* especially the ones with very rough barks accumulated dusts and moisture, which supported enormous number of vascular epiphytic growth compared to the ones with little roughness. Therefore, the *Elaeis guineensis* in these reserves had almost all the plant families listed above growing

on them. Some of the recorded vascular epiphytic floras on *Elaeis guineensis* according to Akinsoji (1990, 1991 and 2004) include *Nephrolepis* spp, palm seedlings, *Phymatodes scolopendria*, *Polypodium* and *Commelina* spp. Also important work is that of Sanford (1974), in his study in the use of epiphytic orchids to characterize vegetation in Nigeria. However, this work was limited to orchids only.

Another similar work on vascular epiphytes in Nigeria is the work of Enuofu, (1994), who documented the pteridophytes in the Lekki Conservation Centre, Lagos Nigeria. The pteridophytes make up about 50 % of the epiphytic species in this area thereby leaving the non-pteridophytic vascular epiphytes untouched. Similar work is that of Oloyede *et al.* (2014) who were able to document the composition and distribution of epiphytes in relation to climatic factor in Obafemi Awolowo University, Ile Ife, Nigeria. Oloyede *et al.* (2014) reported that the distribution of epiphytes and environmental factors were lowest in the secondary forest while open areas had the highest number of epiphytes. He reported that *Elaeis guineensis* had just one epiphytic species in the forest patches and secondary forest and three epiphytic species in the open habitat. He also reported that *Ficus vogelii* and *Nephrolepis biserrata* were mostly found on *Elaeis guineensis*. However, he observed only three palm trees in this work and therefore made the overall representation of epiphytes growing on palm trees poor.

The Lekki Conservation Centre consists majorly of two distinct vegetation types, which include grassland and freshwater swamp forest (Fig. 2). The dominant species in the grassland are *Pennisetum* spp. and *Hyparrhenia* spp. The freshwater forest zone possesses a cooler atmosphere compared to the outer portion of this area, which is hot. Plants present here include lianas, stranglers, climbing palms and epiphytic plants, which add to the growth and development of the forest. Plant species noticeable in this forested zone are *Pterocarpus santalinoides*, *Alstonia boonei*, *Campylospermum*, and *Elaeis guineensis*. The authors are not aware of any survey or documentation of the epiphytes of *Elaeis guineensis* in this centre. This work was therefore aimed at surveying and documenting the vascular epiphytes on the oil palms (*Elaeis guineensis*) in the Lekki Conservation Centre (LCC), Lagos in view of the recent urbanization impact on the Lekki-Ajah area of Lagos.

## Materials and Methods

### Study area

Lekki Conservation Centre is one of Nigeria Conservation Foundation's foremost conservation project site located on the

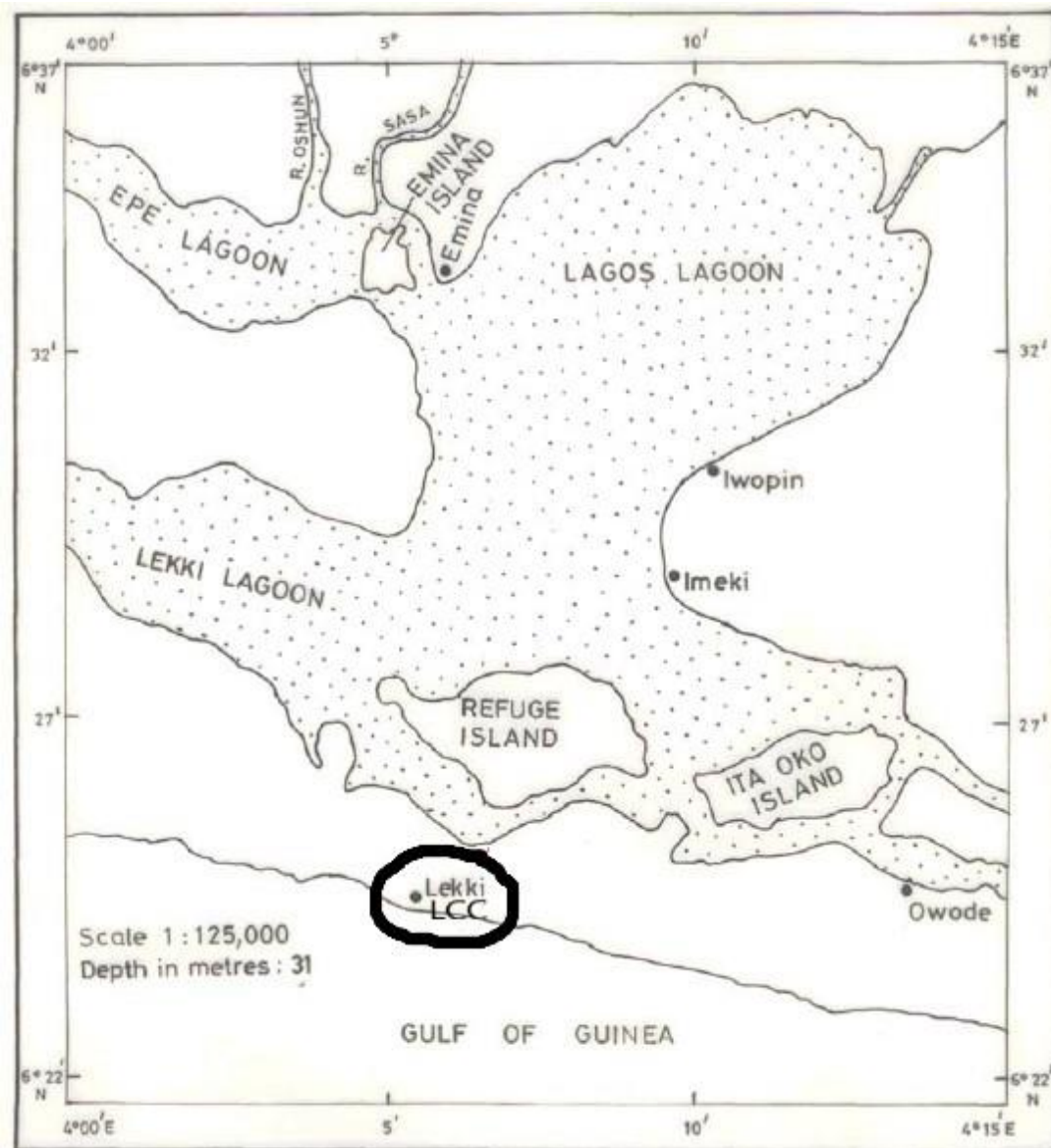
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Lekki Peninsula, which covers a land area of 78 hectares. It is located on the eastern part of Lagos state between 6.4417°N and 3.5355°E, extending from kilometer 19 along Lagos-Epe expressway opposite Chevron Oil Company Nigeria Limited (Fig. 1). It ends up at a very close distance to the Atlantic Ocean near Okun Ibeju village in Eti-osa Local Government Area of Lagos State. The Lekki Conservation Centre lies on the margin of the lowland rainforest zones and it receives a mean annual rainfall of about 1532 mm. It is seasonally flooded, which allows for the pattern of precipitation (Enuofu, 1994).

### Sampling

The study was carried out by observation, counting and recording of epiphytic flora on phorophytes (*Elaeis*

*guineensis*) stands, which include their bases, trunks and canopies. The phorophyte stands were picked at random systematically at 200-meter distance. Some fell in the swampy area in the freshwater forest while some fell in the dry part of the swamp forest. Epiphytic species that could not be identified on the field were pressed and identified in the University of Lagos Herbarium (LUH). Photographs of all the epiphytic species were taken, which also aided in the identification. Close observation was possible for epiphytes on the trunk and base but for those at the canopy, they were observed and counted from a distance with the aid of a pair of high power magnification binoculars. Plates 1 and 2 show some of the recovered epiphytes.



Sources: Akinsanya *et al.* (2015)

Fig. 1: Location of Lekki Conservation Centre (LCC)

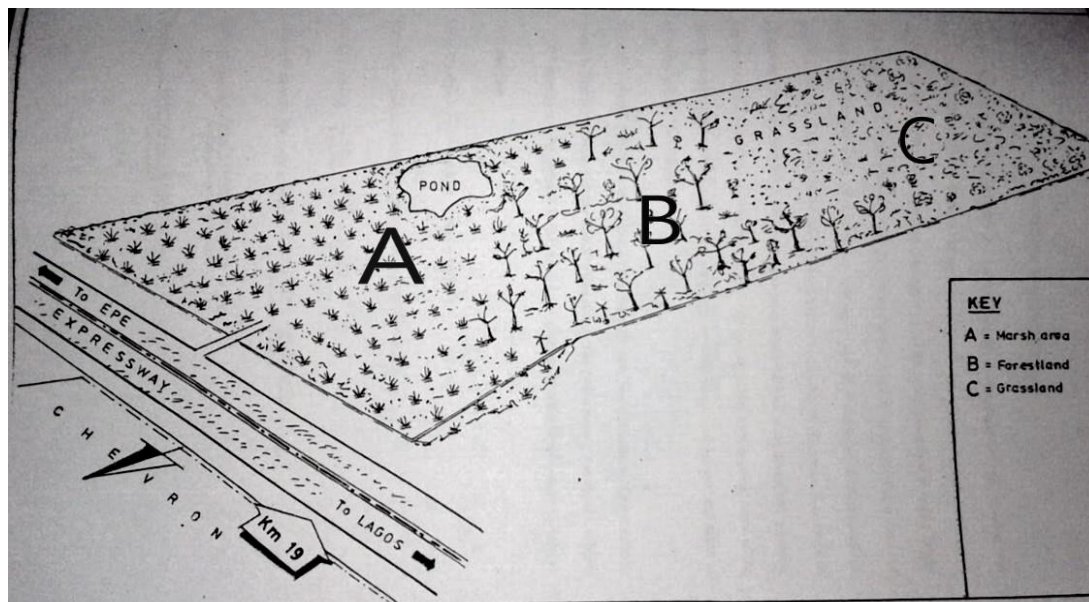


Fig. 2: The vegetation map of Lekki Conservation Centre

**Results and Discussion**

The total number of epiphytic species found on *Elaeis guineensis* in the sample area of the Lekki Conservation Centre was nine and are made up of four pteridophytes and five angiosperms species. The angiosperm families include Commelinaceae, Arecaceae, and Moraceae while the pteridophytes include Dryopteridaceae, Davalliaceae and Polypodiaceae (Table 1).

*Nephrolepis* and *Polypodium* were found on six out of the ten stands of *Elaeis guineensis* surveyed. Some areas received light regularly while others were shaded. The areas which received high amount of sunlight (grassland) had only one species of epiphytes each growing on the two palm trees surveyed while the palm trees in the area that received reduced sunlight (forest) had seven species of epiphytes growing on them.

There were almost the same species of epiphytes on *Elaeis guineensis* stands present in both areas. They only differ in number and richness. For instance, the *Ficus* plants growing on the palm tree in the area with high amount of sunlight were more than ten while the palm tree in the area with reduced sunlight had only one *Ficus* plant growing on it. *Nephrolepis* were found abundant (more than ten) on the palm trees in the forest zone and they occur mostly on the trunk and crown. *Commelina* had the least number among the epiphytes; it was found growing only on one palm tree and not up to ten in number. *Polypodium* sp and *Phymatodes scolopendria* were mostly found occurring abundantly on the trunk of the palm trees with sufficient light exposure. *Elaphoglossum* sp was

found on two stands of *Elaeis guineensis* and they appeared on the trunk, crown of the first and only at the base of the second. They were however found abundant on the trunk i.e. more than ten in number. Palm seedlings were also found on two *Elaeis guineensis* plants, growing on the crown of one and at the base of the other (Table 1).

*Elaeis guineensis* is a secondary forest species and it forms such a reservoir of epiphytes in that it possesses features which make it very convenient and conducive for epiphytic growth. Such features are retention of dust particle due to its rough bark and its retention of water after rain fall (Akinsoji, 1991). These features enable the formation of appropriate microclimate for growth of many epiphytes. These epiphytes in turn assist in sequestration and storage capacity of carbon (Diego, 2006); reduce water loss from the bark of the oil palm tree by creating a covering on it. The presence of pteridophytic epiphytes indicates a high humid condition, which can as well be said to be an environmental indicator (Goda-Sporn, 2007). Some epiphytes such as *Nephrolepis* grew well in the forest especially the swampy areas. They so flourished that they further prevent the availability of light to other epiphytes that inhabited the lower portion of the phorophytes and further affect the growth, occurrence and existence of these other epiphytes. This agrees with the work of Oloyede *et al.* (2014), as *Nephrolepis* spp are known to grow excellently on *Elaeis guineensis* and most times, they occur as the most abundance epiphytes growing on *Elaeis guineensis*.

**Table 1: Epiphytes growing on selected palm trees (*Elaeis guineensis*) at Lekki Conservation Centre, Nigeria**

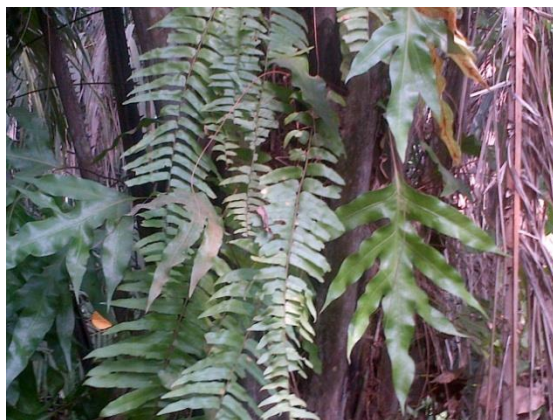
Epiphytes	Family	Pteridophytes	Angiosperm
<i>Commelina africana</i> L.	Comelinaceae		✓
<i>Elaeis guineensis</i> Jacq.	Arecaceae		✓
<i>Elaphoglossum</i> sp	Dryopteridaceae	✓	
<i>Ficus conraui</i> Warb.	Moraceae		✓
<i>Ficus leprieuri</i> Warb.	Moraceae		✓
<i>Ficus</i> sp	Moraceae		✓
<i>Nephrolepis biserrata</i> Huang	Davalliaceae	✓	
<i>Phymatodes scolopendria</i> Burm.	Polypodiaceae	✓	
<i>Polypodium</i> sp	Polypodiaceae	✓	

**Table 2: Locations of epiphytes on the phorophytes (*Elaeis guineensis*) at Lekki Conservation Centre, Nigeria**

Sample Points	Species	Crown	Trunk	Base
1	<i>Nephrolepis biserrata</i>	-	1	>10
	<i>Ficus leprieuri</i>	-	-	1
	<i>Polypodium</i> sp	3	-	-
2	<i>Nephrolepis biserrata</i>	>10	-	5
	<i>Commelina Africana</i>	-	1	3
	<i>Elaeis guineensis</i>	>10	-	-
3	<i>Nephrolepis biserrata</i>	>10	>10	5
4	<i>Elaphoglossum</i> sp	4	>10	-
	<i>Polypodium</i> sp	8	4	-
	<i>Elaeis guineensis</i>	-	-	>10
5	<i>Polypodium</i> sp	>10	5	-
	<i>Phymatodes scolopendria</i>	>10	6	-
6	<i>Polypodium</i> sp	-	>10	-
7	<i>Ficus conraui</i>	>10	-	-
8	<i>Nephrolepis biserrata</i>	>10	-	-
	<i>Polypodium</i> sp	-	>10	-
	<i>Phymatodes scolopendria</i>	-	>10	-
9	<i>Ficus</i> sp	-	-	1
	<i>Nephrolepis biserrata</i>	>10	>10	-
10	<i>Phymatodes scolopendria</i>	8	>10	>10
	<i>Nephrolepis biserrata</i>	8	>10	>10
	<i>Polypodium</i> sp	3	>10	>10
	<i>Elaphoglossum</i> sp	-	-	9

**Table 3: Classification on mode of existence of epiphytes after Oliver (1930)**

Typical epiphytes	Occasional epiphytes	Hemi-epiphytes
<i>Nephrolepis b.</i>	<i>Commelina africana</i>	<i>Ficus leprieuri</i>
<i>Phymatodes s.</i>		<i>Ficus conraui</i>
<i>Ficus</i> sp		
<i>Elaphoglossum</i> sp		
<i>Polypodium</i> sp		



**Fig. 3:** *Nephrolepis biserrata* (left) and *Polypodium* sp (right)



**Fig. 4:** *Phymatodes scolopendria*

*Commelina africana* was found in the eco-tone region (zone of transition between the forest and the grassland), which was very dry but there was light penetration. Though, they were few and found only on one palm tree as they mainly root on ground. They possess creeping and succulent stem, which is suggested to enable them survive in this area despite the dry and sandy soil nature. *Commelina* cannot really root in this sand and soon they begin to root on the palm tree due to the creeping root system which they possess.

Another factor that could be related to the unequal distribution of epiphytes is the age of some of the phorophytes sampled. An old phorophyte oil palm usually has smoother bark with few poorly developed cracks or horny stubs for the collection of nutrients for epiphytic growth compared to a young one. Corner (1966) made similar observation in his study of natural history of palms in London; and also, in the work of Akinsoji, (1990) in his study of epiphytic flora of Gambari Forest Reserve in Nigeria. Also observed in this present work was the

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fact that, *Elaeis guineensis*' trunk side facing the sun was covered with epiphytes especially at the base and crown having no epiphytes of *Polypodium*. This shows the necessity of light, no matter how small however, this is suspected to be the reason of the abundance occurrence of *Elaphoglossum* sp on the trunk of the palm tree as well. Therefore, the effect of light and moisture in determining the growth, distribution and continue existence of epiphytes on a suitable host like *Elaeis guineensis* can be seen to be important. This agrees with the work of Oloyede, (2014) in his study of composition and distribution of epiphytes in various locations in Ile Ife, Nigeria.

### Conclusion

In conclusion, it can be suggested from this work that *Nephrolepis* spp do not require much sunlight to grow excellently on *Elaeis guineensis* while *Polypodium* sp and *Phymatodes scolopendria* require sufficient sunlight to grow excellently on *Elaeis guineensis*. However, humidity appears to be responsible for the abundance in growth of *Nephrolepis* spp on palm trees. This can be confirmed by carrying out further work on seasonal survey in the area of vascular epiphytes; nevertheless this study has successfully revealed and documented the major epiphytes in this area.

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### References

- Akinsoji A 1990. Studies on epiphytic flora of a tropical rainforest in southwestern Nigeria I. The vascular epiphytes. *Vegetatio*, 88: 87-92.
- Akinsoji A 1991. Studies on epiphytic flora of a tropical rainforest in southwestern Nigeria II. Bark micro-flora. *Vegetatio*, 92: 181-185.
- Akinsoji A 2005. A survey of montane epiphytes in Gashaka-Gumti national park, Nigeria. *Nigeria J. Botany*, 18: 35-45.
- Akinsanya B, Kuton MP, Saliu JK, Oyebola L & Ukwa UD 2015. Conditional factor and gastrointestinal parasitic fauna of three fish species as stress indicators in Lekki lagoon, Lagos, Nigeria. *Egyptian Acad. J. Bio. Sci.*, 7(1):1-13.
- Barkman JJ 1958. Phytosociology and Ecology of Cryptogrammic epiphytes. Assen, the Netherlands, *Van Gorcum and Comp. N.V.* p. 628.
- Corner EHJ 1966. The Natural History of Palms. Widenfeld and Nicolson, London. P1.
- Diego H & Eliana M 2006. Sequestration and storage capacity of carbon in the canopy oak trees and their epiphytes in a Neotropic Cloud Forest, Colombia. *Journal of Ecology and Application*, 11(1):17-23.
- Enufu, BO 1994. A preliminary survey of pteridophytes in Lekki Conservation Center, Lagos. 44pp. (B.Sc. dissertation)
- Francis EP and Holbrook NM 1986. Notes on the natural history of hemiepiphytes. *Selbyana*, 9: 61-69.
- Goda-Sporn S, Merijn MB & Robbert SG 2007. Is productivity of cacao impeded by epiphytes? *Agriculture, Ecosystems and Environment*, 122: 490-493
- Joanne M, Sharpe KM & Lawrence RW 2010. Ecological importance of ferns. *Fern Ecology*, Cambridge University Press, UK, p. 460.
- Killick HJ 1971. Beginning Ecology. Ibadan University Press, Ibadan, Nigeria, p. 121.
- Lekki Conservation Centre, Lagos Nigeria 1988. Treasure on the Peninsula (Ed. Adeleke AA & Adebayo A), p 24.
- Madison M 1977. Vascular epiphytes: the systematic occurrence and salient features. *Selbyana*, 2: 1-13.
- Nadkarni NM 1984. The Biomass and nutrient capital of epiphytes in Neotropical cloud forest, Monteverdi. *Biotropica*, 15: 1-9.
- Nadkarni NM & Matelson T 1984. Bird use of epiphyte resources in Neotropical trees. *The Condor*, 69: 891-907.
- Oliver WRB 1930. New Zealand Epiphytes. *Journal of Ecology*, 18:50.
- Oloyede FA, Odiwe AI & Olujiyan AS 2014. Composition and distribution of Vascular Epiphytes in Different Areas in Obafemi Awolowo University, Nigeria. *Notulae Scientia Biologicae*, 6(3):316-320.
- Sanford WW 1974. The use of epiphytic orchids to characterize vegetation in Nigeria. *Botanical Journal of Linnean Society*, 86(4): 291-301.
- Pittendrigh CS 1948. The Bromeliad Flora. *Journal of Ecology*, 2: 58-59.
- Yanoviak S, Nadkani N & Gering JC 2003. Arthropods in epiphytes: A diversity component that is not effectively sampled by canopy fogging. *Biodiversity and Conservation*, 12: 731-741.