

TAXONOMIC SURVEY OF OCCURRENCE, DIVERSITY AND ETHNOBOTANY OF PTERIDOPHYTES IN SOME PARTS OF NASARAWA STATE, NIGERIA

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ABSTRACT

The study was carried out to investigate the taxonomic occurrence of Pteridophytes in Lafia and Doma Metropolis of Nasarawa State, Nigeria. A total of 16 locations were sampled in Lafia and Doma respectively. These locations include wetlands, swamps, forest shade and trees. From these locations, ferns were collected, pressed and identified. Their relative abundances in each location were calculated and their ethnobotanical uses by the local dwellers were documented using structured questionnaires. Ferns were observed only in 12 locations in Lafia and nine locations in Doma. Seven species of ferns were identified namely, *Pneumatopteris afra*, *Nephrolepis biserrata*, *N. undulata*, *N. cordifolia*, *Adiantum capillus-veneris*, *Adiantum* sp. and *Pityrogramma calomelanos*. *Pneumatopteris afra* was found to be the most widely distributed fern. Of the ferns observed, terrestrial ferns had the highest occurrence (85.7%) in Lafia with only 50% in Doma. *Pneumatopteris afra* was found to have the highest relative frequency while *Nephrolepis biserrata* and *N. undulata* had the lowest relative frequency in Lafia and Doma. All these species have been reported by the local dwellers to have ethnobotanical uses such as in the treatment of ulcer, fever, typhoid, chest pain, stomach pain and diabetes. Also, *Pityrogramma calomelanos* had the highest percentage awareness by the local dwellers. It is concluded that Lafia is more rich and diverse in fern species than Doma. Locations where ferns were absent are due to the long-term alterations in the microclimatic conditions by various human activities in those places.

INTRODUCTION

In most parts of Africa ferns are more diverse in the eastern than in the western mountains (Moran & Smith, 2001). Ecological and physiological factors such as habitat, seasonality, elevation, soils, rainfall, cloud cover and temperature have been identified as the determinants for the diversity, richness and distribution of ferns in most parts of the world (Kornas, 1993).

Nigerian's first biodiversity report stated that ferns and fern allies have been observed to grow in most ecological zones but different habitats (Akinsoji *et al.*, 2016). Although, ferns have wide coverage in Nigeria, due to habitat change by factors such as unplanned urbanization, over-exploitation of minerals and farming, many species have been reduced, endangered or are on the verge of extinction (Dixit, 2000).

Pteridophytes are often restricted to specific micro-habitats. However, as a result of serious threats faced by these plants coupled with the fact that they are underutilized

and overlooked in this part of the world because of their relatively small size and cryptogamic nature, there is need for adequate survey and documentation of their occurrences, locations and economic values. Therefore, this research aimed to investigate the occurrence, diversity and ethnobotany of ferns in Lafia and Doma metropolis, Nasarawa State, Nigeria.

MATERIALS AND METHODS

This study was carried out at Lafia and Doma Local Government areas of Nasarawa State, Nigeria. Habitats assessed for the various diversities of pteridophytes include river banks, streams, forest (under shade), arboreal (top of trees), swamps and some other wet lands. The study was conducted towards the end of rainy season in 2016 and early dry season of 2017. Plants specimens were collected using Random sampling method. Various fern species parts were collected which included leaflet, fronds and roots. The samples collected were all recorded in the field. Representative of all collected fern species or specimens, were also photographed. These specimens were later used for identification and to provide permanent records for future use. The geographical coordinates of each sampling location were taken by using a GPS device.

Mature fern species were collected in each location and pressed, dried, poisoned then mounted on standard herbarium sheets and classified according to standard procedures. Identifications were made with the aid of taxonomic literature (Oloyede & Odu, 2011). In the field proper care was taken in selecting the plant materials to enable correct identification. Specimens were collected in a good condition, free of insect damage or diseases. Voucher specimens are preserved in the Department of Botany Herbarium, Federal University, Lafia.

Ethnobotanical Uses

A total of ninety (90) structured questionnaires were administered to local dwellers of all the locations visited to gather information on the knowledge of the plants by the people, the uses of the plants and the part of the plant that had been used. The relative frequency of occurrence of each fern species was determined to assess the distribution of the species.

$$RF = \frac{\text{No of occurrences of individual fern species}}{\text{No of occurrences of all ferns}} \times 100$$

Sørensen Similarity Coefficient was calculated to indicate their floristic similarities between the two towns (Lafia and Doma) as follows:

$$Sc = \frac{2W}{a + b} \times 100$$

where Sc is the similarity coefficient, W is the species occurring in both communities under consideration, a is the number of species occurred in Lafia and b is the number of species occurred in Doma.

The relative abundance of the ferns at each site was determined according to Bongers *et al.* (1988) and Kayode (1999): less than five individuals as Rare; 5 to 10 as Occasional; 11 to 30 as Frequent; 31 to 100 as Abundant and over 100 individuals as Very Abundant.

RESULTS

Ferns occurrence and distribution in Lafia

A total of 16 locations were sampled in Lafia, of which ferns were observed in only 12

Table 1: Sampling Locations In Lafia L.G.A

S/ N	DESCRIPTION OF LOCATION	LOCATION CODE	LATI- TUDE	LONDI- TUDE	PRESENCE / ABSENCE OF FERNS
1	Akurba osanya	AKB	8.47104N	8.58747E	Present
2	Opposite triple Z farm	OTF	8.45695N	8.57489E	Present
3	Gandu	GAN	8.45116N	8.57304E	Absent
4	Agudu	AGD	8.51771N	8.52483E	Absent
5	Akunzan tabori	AKTR	8.4105N	8.56368E	Present
6	Beside college of Agric	BCA	8.55723N	8.54292E	Present
7	Opposite college of Agric	OCA	8.51061N	8.52016E	Absent
8	Inside college of Agric	ICA	8.53292N	8.53659E	Present
9	Between lafia and shabu river	B/W L\$SR	8.58883N	8.5559E	Present
10	Between lafia shabu river	B/W L\$SR2	8.56688N	8.54802E	Present
11	Shabu one	SHBI	8.57557N	8.55119E	Present
12	Shabu two	SHB2	8.56688N	8.54802E	Present
13	Shabu three	SHB3	8.57405N	8.55062	Present
14	Akunzan tabo well	AKTW	8.49018N	8.53358E	Present
15	FUL Auditorium	FUL AUD	8.47066N	8.58688E	Present
16	Tudun amba	TUA	8.49216N	8.50355E	Absent

Table 2: The locations occupied by the ferns and the respective abundance status in Lafia

S / N	Species	Location / Abundance status															
		AKB	OTF	GA	AGD	AKTR	BCA	OCA	ICA	B/WL&SR	B/WL&SR2	SHB1	SHB2	SHB3	AKTW	FULAUD	TUA
1	<i>Adiantum sp.</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	√A	X	X
2	<i>Adiantum capillus-veneris</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	√A	X	X
3	<i>Pneumatopteris afra</i>	√VA	√F	X	X	X	√VA	X	X	√VA	√F	X	√A	√A	X	X	X
4	<i>Nephrolepis bisserata</i>	X	X	X	X	X	X	X	X	X	X	X	X	√R	X	X	X
5	<i>Nephrolepis cordifolia</i>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√F	X
6	<i>Nephrolepis undulata</i>	X	X	X	X	√F	X	X	√VA	X	√A	√O	X	√O	X	X	X
7	<i>Pityrogramma calomelanos</i>	X	X	X	X	√VA	X	X	X	X	X	X	X	X	√A	X	X

KEY: √ means present, X means absent

A – abundant, VA – very abundant, F – frequent, O – occasional, R – rare

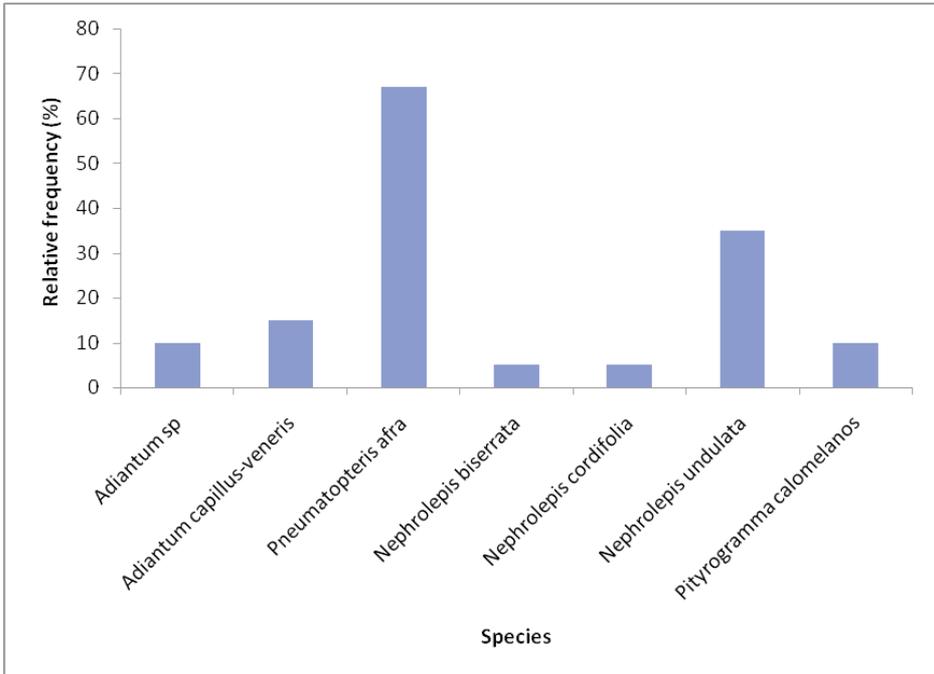


Figure 1: Relative frequency of Fern species in Lafia town

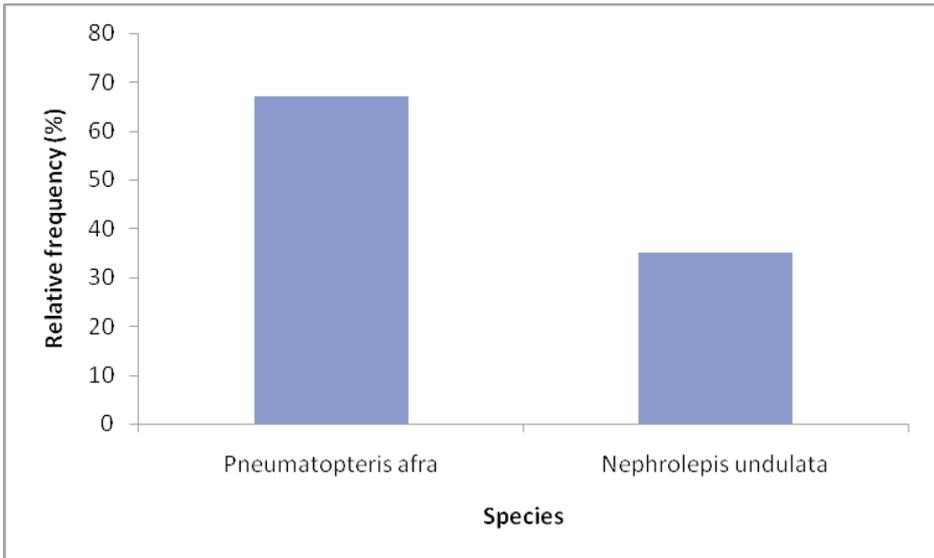


Figure 2: Relative frequency of Fern species in Doma town

Table 3: Sampling Locations in Doma LGA

S/ N	DESCRIPTION	LOCATION CODE	LATITUDE	LONGITUDE	PRESENCE / ABSENCE OF FERNS
1	Omenza 1	Omz1	8.39514N	8.35005E	Present
2	Omenz2	Omz2	8.39017N	8.34801E	Present
3	Osota1	OST1	8.39013N	8.3481E	Absent
4	Osota 2	OST2	8.39278N	8.35039E	Absent
5	GSS Doma	GSSD	8.39188N	8.35039E	Present
6	Govt. college Doma	GCD	8.39024N	8.35762E	Absent
7	Arumangye	ARG	8.39004N	8.35762E	Absent
8	Federal Science and Technical College	FSTC	8.39131N	8.34863E	Absent
9	Ogbobula1	OGB1	8.39695N	8.34863E	Present
10	Ogbobula2	OGB2	8.39074N	8.34881E	Absent
11	Okpuripu	OKPU	8.39145N	8.3498E	Absent
12	Okussupa	OKSP	8.3906N	8.34861E	Present
13	Ipugigu	IPG	8.39102N	8.3492E	Present
14	GGSSD formal hostel	GGDFH	8.4043N	8.36809E	Present
15	Campo 1	CMP1	8.46461n	8.43512E	Present
16	Campo 2	CMP2	8.44435N	8.41107E	Present

Table 4: The locations occupied by the ferns and the respective abundance status in Doma

S/ N	Species	Location / Abundance status															
		OMZ1	OMZ2	OST1	OST2	GSSD	GCD	ARG	FSTC	OGB1	OGB2	OKPU	OKSP	IPG	GGFH	CMP1	CMP2
1	<i>Pneumatopteris afra</i>	√ VA	√ A	X	X	√ F	X	X	X	√ A	X	X	X	X	X	√ VA	√ A
2	<i>Nephrolepis undulata</i>	X	X	X	X	X	X	X	X	X	X	X	√ VA	√ VA	√ O	X	X

KEY: √ means present, X means absent

A – abundant, VA – very abundant, F – frequent, O – occasional, R - rare

Table 5: Ethnobotanical uses of the fern species in Lafia

S/N	SPECIES	% AWARENESS	ETHNOBOTANICAL USES	PARTS USED	MODE OF PREPARATION
1	<i>Pneumatopteris afra</i>	90	Typhoid, fever, headache, ulcer	Leaflets, fronds	boiling,
			piles, stomach pain	roots & fronds	Drying
			strengthening of bones	whole plants	drying & boiling
			healing of wounds caused by guinea worm	root	Drying
2	<i>Pityrogramma calomelanos</i>	100	enhancement of male sexual cells	root	boiling
			treatment of chest pain,	leaflets	air drying
			healing of stomach pain, fever	fronds	boiling
			treating shortage of blood	leaflets	boiling
			reducing prolonged labour	whole plants	boiling
breast cancer	root	boiling			
3	<i>Nephrolepis undulata</i>	30	Snake bite, convulsion, high blood pressure, poisoning, goitre, bone fracture, sickle cell anemia	Whole plants	drying, freshly pounded, boiling
			diabetes	roots	boiling
4	<i>Adiantum capillus-veneris</i>	40	Convulsion, diabetes, headache, pile, Gonorrhoea, scorpion bite, dysentery	whole parts, roots & fronds	air drying, freshly pounded, boiling
			Measles	leaflets only	Boiling
5	<i>Adiantum sp</i>	33.3	fibroid, shortage of blood, diabetes, abnormal menstruation, stomach pain	whole parts	Boiling & air drying
			piles, back pain, waist pain & joint cases	leaf	Boiling & air drying
6	<i>Nephrolepis cordifolia</i>	20	sickler cases, high blood pressure, bone fracture, goiter, snake/scorpion bite, skin rashes & diabetes	whole parts & roots	Boiling, freshly pounded, air drying
			headache & rheumatism	leaf	air drying
7	<i>Nephrolepis biserrata</i>	30	Eyesight issues, bone fracture, goitre, high blood pressure, snake / scorpion bite & diabetes	Whole parts & roots	Boiling, freshly pounded & drying

Table 6: Ethnobotanical uses of the fern species in Doma

S/N	SPECIES	% AWARENESS	ETHNOBOTANICAL USES	PARTS USED	MODE OF PREPARATION
1	<i>Pneumatopteris afra</i>	50	increases male sexual stamina	Leaf, stem & whole parts	Boiling
			rheumatism, stomach pains, tuberculosis, fever	Leaf, stem & whole parts	Boiling
2	<i>Nephrolepis undulata</i>	50	Healing of wounds, asthma, pneumonia, cough & ulcer	Leaf, whole parts	Drying, boiling & freshly pounded

locations (Table 1). Seven species of ferns were identified from the sampled locations in Lafia: *Pneumatopteris afra* (Christ) Holttum, *Nephrolepis undulata* (Afzel.) J.Sm., *Nephrolepis cordifolia* (L.) K.Presl, *Nephrolepis biserrata* (Sw.) Schott, *Adiantum sp.*, *Adiantum capillus-veneris* L. and *Pityrogramma calomelanos* (L.) Link (Table 2). *Pneumatopteris afra* was found to be the most widely distributed fern in Lafia where it was found in seven locations. Of the ferns observed, terrestrial ferns were most frequent with 85.7% occurrence while epiphytes were least frequent at 14.3%. *Pneumatopteris afra* was found to have the highest relative frequency at 65% while *Nephrolepis biserrata* and *N. undulata* had the lowest (5%) (Figure 1). The similarity coefficient between the two towns is 22.2%.

Ferns occurrence and distribution in Doma

In Doma, from a total of 16 locations sampled ferns were observed in only nine locations (Table 3). However, in Doma, only two species of ferns were recorded, one terrestrial and the other epiphytic, namely *Pneumatopteris afra* and *Nephrolepis undulata* (Table 4). *Pneumatopteris afra* was found to be the most widespread fern in Doma where it was found in six locations. The relative frequency of *Pneumatopteris afra* was greater (66.67%) than that of *N. undulata* (33.34%) (Figure 2).

Ethnobotanical Uses of Ferns in Lafia

The results of the survey of ethnobotanical uses and awareness of the ferns in Lafia are presented in Table 5. Every species was discovered to have ethnobotanical uses among the local population. *Pneumatopteris afra* had 90% percentage awareness and it was used for treating ulcer, fever, typhoid and piles. *Pityrogramma calomelanos* had the highest percentage awareness (100%) and was used for enhancement of male sexual performance and treating chest pain. The lowest percentage awareness (20%) was recorded for *Nephrolepis cordifolia* which was used for treating high blood pressure and skin rashes.

Ethnobotanical Uses of Ferns in Doma

In Doma, *Pneumatopteris afra* had 50% percentage awareness and was used for treating rheumatism, stomach pains and tuberculosis (Table 6). *Nephrolepis undulata* also had 50% percentage awareness and was used for treating wounds, asthma and pneumonia.

DISCUSSION AND CONCLUSION

The occurrence of ferns in the two towns studied had only two species in common. As reported by Jones *et al.*, (2011), some fern species are highly flexible and are found in nearly all habitats and also have various life forms. High species occurrence in areas with suitable environmental conditions showed that such species have adapted to the environment (Richard *et al.*, 2000). Consequently, the relatively high number of ferns species found in Lafia compared with Doma might be the result from more favourable microclimatic conditions than in Doma, where conditions have been affected by human activities such as deforestation and farming. This is supported by Sumesh *et al.* (2014) who stated that human activities usually increase pressures on plants.

The occurrence of some species in Lafia such as *Pneumatopteris afra*, *Nephrolepis undulata* and *Adiantum capillus-veneris* with high relative frequencies suggests that these species will persist in this area if the environmental conditions remain favourable. But species like *Adiantum sp.*, *Nephrolepis cordifolia*, *Nephrolepis biserrata* and *Pityrogramma calomelanos* with low relative frequencies are more likely to become

threatened in the future. Also in Doma town, only two ferns were recorded, and *Pneumatopteris afra* was more frequent than *Nephrolepis undulata*. The paucity and often total absence of ferns in some locations sampled in Lafia (four sites) and Doma (seven sites) is a clear indication of the accumulated long-term anthropogenic activities in the areas resulting in loss of ferns species at these sites.

It is concluded that, in comparison, Lafia has a more rich and diverse ferns flora than Doma, and that despite the presence of relatively few species, all have been used by the local dwellers for various economic purposes. Therefore, conservative measures should be put in place by the Government to avoid future extinction of these ferns.

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