A Survey of Occurrence and Distribution of *Phyllanthus* Species in Nigeria

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Abstract: The genus *Phyllanthus* has a diversity of growth forms which are distributed in all tropical and subtropical regions of both hemispheres. As West African species of *Phyllanthus* have not been studied adequately and problems of identification as well as taxonomic confusion still persist, there is the need to provide basic information on the species. Therefore the present study carried out a floristic search of the taxa of *Phyllanthus* in Nigeria with a view to ascertaining how many species there are and determine the species boundaries. One hundred and forty two specimens comprising 55 field collections covering major Nigerian ecological zones and 87 representative herbaria materials from Forest Herbarium Ibadan, University of Ibadan herbarium and Obafemi Awolowo University herbarium were assessed. The most commonly distributed *Phyllanthus* species in Nigeria is *P. amarus* occurring in the far northern to the southern states. Although *P. niruri* and *P. muellerianus* had no record of collection in the far northern states, they are also well distributed over the central or middle-belt of Nigeria to the southern states. *P. pentandrus* is the fourth most distributed species, records being from the far northern states through the central and extending to few southern states. Most of the species under study occur in the Guinea savanna, lowland rainforest and the mangrove forest with *P. amarus* occurring in all the ecological zones. The species that have narrow distributional ranges are *P. maderaspatensis* confined to the Sudan savanna and *P. urinaria* restricted to the mangrove forest. Herbarium samples: *P. fraternus, P. floribundus* and *P. physocarpus* which do not occur in Nigeria were cases of misidentification; they are species of *P. amarus, P. muellerianus* and *P. acidus* respectively. The present study did not also document the misidentified species from the field.
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Keywords: *Phyllanthus* species; field and herbarium study; distribution; Nigeria

1. Introduction

Plant distribution studies are carried out because they provide valuable information in several ways. The facts that distribution may be significant in the context of conservation of vegetation especially in the face of increasing destruction of plants in many parts of the world. Distribution patterns of species may yield information on the mechanism of speciation and dispersal as well as the determination of the relationship of floras.

The genus *Phyllanthus* has a diversity of growth forms including terrestrial or floating aquatics, pachycaulous succulents, trees, shrubs, climbers, annual and perennial herbs. Some species have flattened leaf-like stems or modified branchlets called phylloclades. All these growth forms are distributed in all tropical and subtropical regions of both hemispheres (Webster, 1994). They are found in open and shaded conditions in rocky areas, waste grounds, roadsides, on termitaria, cultivated fields and swamps in different vegetational zones including the grassland, derived savanna and rainforest. According to Webster (1994) and Silva (2009), despite the variety of growth forms, almost all *Phyllanthus* species express a specific type of growth called "phyllanthoid branching" in which the leaves on the main (vertical) plant axes are reduced to cataphylls while leaves on the plagiotropic (horizontal) axes are deciduous and floriferous. Indeed, leaf flower is the common name for all *Phyllanthus* species and '*Phyllanthus'* means 'leaf and flower' because the flowers as well as the fruits are associated with the leaf (Cabieses 1993).

Some *Phyllanthus* species provide food, fruit, fuel, fodder, timber, dyes pharmaceutical and industrial products while others are extensively used in ethnomedicine (Rao, 2012). A survey of 300 ethnobotanical references of *Phyllanthus* species arranged taxonomically suggested some uses were clustered by subgenus (Holm-Nielsen, 1979). The genus forms one of the most important non-timber forest products in Southern India where a large number of forest dwelling and forest fringe communities depend on *P. embelica* L. and *P. indofischeri* Bennet (Ravikanth *et al*., 2012). As revealed by Sinha and Bawa (2002), unsustainable and destructive harvesting adversely affects regeneration of *Phyllanthus* species. To remedy the situation, domestication of the species and maintenance of *in-situ* gardens were suggested for long term conservation of the genetic resources. On the

cultivation of *Phyllanthus* species, Kangsu Medical Institute (1975) recommended fertile, well-drained soil for growing *P. urinaria* L. To produce sufficient quantities for large scale extraction, a system was developed at the University of Florida Tropical Research and Education Center at Homestead, USA using black plastic mulch and trickle irrigation. Webster (1970) was of the opinion that the relative ease of growing herbaceous species of *Phyllanthus* in the greenhouse makes them to be attractive experimental objects for studying specialization in branching patterns. *Phyllanthus acidus* (L.) Skeel and *P. embelica* (*Emblica officinalis* Gaertner) are regionally cultivated for their fleshy edible fruits (Calixto *et al*., 1998). According to Murthy and Joshi (2007), *P. emblica* (Indian gooseberry) is grown in India, China, Taiwan, Indonesia, Malaysia, Thailand, Sri Lanka, Honduras and Costa Rica in orchards, home gardens, wastelands and forests. In these countries, *P. emblica* fruits are consumed and the plant parts utilized in local medicine systems. Tiwari *et al*., (2007) reported that well-drained deep fertile sandy loams are ideal for cultivation. *P. acidus* (Malay gooseberry) raised in many parts of the world including Australia, Brazil and Venezuela prefers moist soil (Murthy and Joshi, 2007). Probably the most economic importance of *Phyllanthus* species is their being used medicinally in various parts of the world.

Webster (1994) divided *Phyllanthus* into 10 subgenera, 68 sections and sub-sections. The subgenera are: *Isocladus* Webster, *Kirganelia* (Juss.) Webster, *Cicca* Linnaeus, *Emblica* Gaertner, *Gomphidium* (Baill.) Webster, *Phyllanthodendron*, Webster & Carpenter, *Xylophylla* Webster, *Botryanthus* Webster, *Eriococcus* (Hassk) Croiz & Metc. and *Phyllanthus* L. Of these, only *Isocladus, Kirganelia* and *Phyllanthus* are represented in Nigeria. *Isocladus* differs from *Kirganelia* and *Phyllanthus* by having no phyllanthoid branching. Although *Isocladus* and *Kirganelia* are made up of herbs, shrubs or trees, *Phyllanthus* consists of only herbs or low woody shrubs (Botanical Survey of India, 2014). *Isocladus* is represented by *Phyllanthus maderaspatensis* which belongs to the section *Paraphyllanthus* and is regarded as sister to all other species of *Phyllanthus sensu lato* (Kathriarachichi *et al.,* 2006). Trees and shrub species, *P. reticulatus, P. acidus, P. muellerianus* and the herbaceous *P. pentandrus* Schum & Thonn belong to *Kirganelia*. The subgenus *Phyllanthus* comprises the herbaceous species. *P. amarus, P. niruri, P. odontadenius* and *P. urinaria*. According to Kathriachichi *et al.,* (2006) subgenera *Isocladus, Kirganelia* and *Phyllanthus* are paraphyletic whereas other subgenera appear to be monophyletic.

Unlike other parts of the world, the West African species of *Phyllanthus* have not been studied adequately, problems of identification and taxonomic confusion still persist. There is therefore the need to provide basic information on these *Phyllanthus* species. Thus it is expedient to carry out a floristic search of the taxa of *Phyllanthus* in Nigeria with a view to ascertaining how many species there are and determine the species boundaries.

2. Materials and Methods

Field work and sampling

Fifty-five specimens were collected during field trips undertaken to different parts of the country for the collection and study of *Phyllanthus* species. Fresh samples of these species were collected from seventeen states and these are Oyo, Osun, Ondo, Lagos, Kwara, Niger, Benue, Adamawa, Kaduna, Sokoto, Plateau, Edo, Abia, Akwa Ibom, Enugu, Rivers and Cross River in Nigeria covering major ecological zones. Characters such as flower colour, fruit colour, number of perianth lobes as well as the colour of the leaf on both the adaxial and abaxial surfaces were recorded in the field notes as these might have changed or not available again after the specimens had been processed. Identification of the species was based on the characters used by Hutchinson and Dalziel (1954). Voucher specimens were prepared for all collections and deposited in the Herbarium of the Department of Botany, University of Ibadan, Ibadan, Nigeria (UIH). Photographs of the specimens were taken during the field trips with Digital camera (Sony Steady Shot DSC W530) for the picture database.

Herbarium studies

Eighty-seven representative herbarium materials presently deposited at Forest Herbarium Ibadan (FHI) of Forestry Research Institute of Nigeria, University of Ibadan Herbarium (UIH), Obafemi Awolowo University Herbarium (IFE) were studied. Three specimens were taken on loan from Nigerian Institute of Pharmaceutical Research and Development Herbarium (NIPRDH) while one specimen each was taken from University of Ilorin Herbarium (ILH) and Ahmadu Bello University Herbarium (ABUH) respectively for assessment. The list of the specimens studied is presented in Table 1.

3. Results

Field collections

A total of 55 fresh specimens were collected from different locations across seventeen states in Nigeria during field studies. These specimens represent nine species in the genus *Phyllanthus*: *Phyllanthus acidus* (L.) Skeels*, Phyllanthus amarus* Schum. & Thonn.*, Phyllanthus capillaris* Schum. &

Thonn., *Phyllanthus muellerianus* (O. Ktze) Exell, *Phyllanthus niruri* Linn., *Phyllanthus odontadenius* Mull. Arg., *Phyllanthus pentandrus* Schum. & Thonn., *Phyllanthus reticulatus* Poir. and *Phyllanthus urinaria* Linn. Figure 1 shows the collection sites of specimens of the genus *Phyllanthus* in Nigeria. Photographs of the specimens collected during the field studies are provided (Plates 1–9).

Herbarium studies

A list of taxa studied is presented in Table 1. Eighty-seven specimens representing nineteen species in the genus *Phyllanthus*: *Phyllanthus acidus*, *Phyllanthus amarus*, *Phyllanthus beillei*, *Phyllanthus capillaris*, *Phyllanthus floribundus*, *Phyllanthus fraternus*, *Phyllanthus maderaspatensis*, *Phyllanthus mannianus*, *Phyllanthus muellerianus*, *Phyllanthus nigericus*, *Phyllanthus niruri*, *Phyllanthus niruroides*, *Phyllanthus odontadenius*, *Phyllanthus pentandrus*, *Phyllanthus physocarpus*, *Phyllanthus reticulatus*, *Phyllanthus rotundifolius*, *Phyllanthus sublanatus* and *Phyllanthus urinaria.* Table 2 shows the distribution of members of the genus and the states where they occur in Nigeria.

Table 1: Herbarium specimens of *Phyllanthus* species examined

Taxa	Reference/ Herbarium number	Locality	Collector (s)/Collectors' number (where indicated from herbarium study)	Date of Collection
Phyllanthus acidus (L.) Skeels	IFE 518	Biological garden, OAU, Ife.	B. O. Daramola/ B08	17.09.2000
	FHI 25674	Forestry hills, Ibadan	R. W. J. Keay	February, 1950
Phyllanthus amarus Schum. & Thonn.	UIH 12922	Jericho reservation, Ibadan	J. Lowe/2212	20.05.71
	UIH 22022	Zoology Department, U.I, Ibadan	Kuteyi R. R/2	13.11.91
	UIH 11063	Old farmland, Ibadan	98	16.11.56
	UIH 14260	Bodija Cattleyard, Ibadan	G. Jackson	24.11.70
	UIH 19784	University of Portharcourt, Rivers state	R. A. Freemann/11A	January, 1982
	FHI 70064	Ankpa, Igala, Kwara	Olorunfemi & Ibhanesebor	21.05.73
	FHI 73377	Ajassor bridge, Nfum, S.E	Okeke, Ekwuno & others/ E & O 757	16.08.74
	FHI 27564	Quarters 680, Jericho, Ibadan	P. Wit/ PW 6	17.08.71
	FHI 103399 FHI 89889 FHI 97140	Wadata area, Makurdi Along farmland, Gashaka, Gongola Sapele, Bendel	Daramola/Emwiogbon/Oguntayo/DEO 595 Fagbemi F. A/326 Ariwaodo & Adesina / AA8	07.07.78 12.08.77 11.09.81
	IFE 13856 NIPRDH 5884	Borgu game reserve, Niger	B.O. Daramola	27.09.01 29.08.06
Phyllanthus beillei Hutch.	FHI 5636	Little Osse river, Owo, Ondo	A. C. Hoyle & J. P. M. Brenna	24.08.43
	FHI 61825	Iseyin, Oyo	D. P. Stanfield	02.05.65
Phyllanthus capillaris Schum. & Thonn.	FHI 84523	Jauro-Umar camp area, Gembu, Gongola	B. O. Daramola / D 233	26.08.77
	FHI 86495	Akoko south, Oka, Ondo	Daramola & Ihe /BO 550	30.05.78
	FHI 86973 FHI 78618	Ogoja-Ikom road, Cross-river Akapabuyo beach, Calabar	Emwiogbon & Daramola/608 Daramola, Macaulay & Oguntayo/C345	05.05.78 30.09.75
	UIH 17453	SHF hill, Yaounde, Cameroon	J. Lowe/3269	27.02.77
	UIH 12270	Umudike	Tuley & Redhead/705	17.08.64
	IFE 2779	CRIN station, Bende road, Umuahia	J. Medler/764	09.04.73
	IFE 2781	Roadside to Mayo-Ndaga, Mambilla Plateau	J. Medler/913	22.08.73
Phyllanthus floribundus Mull. Arg *Phyllanthus fraternus Webster* *Phyllanthus maderaspatensis L.*	FHI 104911 FHI 32082 FHI 6284 NIPRDH 4096 FHI 62771	Iseyin-Oyo road, Oyo Forestry hill, Ibadan Benin Sokoto-Illela motor road, Gwadabawa, Sokoto	B.O. Daramola/96 C.F.A. Onochie A.P.D. Jones M.G. Latilo	24.03.93 March 1953 08.03.42 06.11.97 03.08.69
	FHI 93997	Kauwa F.R, Kukawa, Borno	Ekwuno & Fagbemi/EF 222	29.09.80
Phyllanthus mannianus Muell.	FHI 77250	Ngeliyaki, Mambilla North-East	Ekwuno P. O/311	26.11.75

Taxa	Reference/ Herbarium number	Locality	Collector (s)/Collectors' number (where indicated from herbarium study)	Date of Collection
Arg.				
	IFE 2782	Obudu Cattle ranch, Ogoja	J. Medler	13.04.73
Phyllanthus muellerianus (O. Ktze) Exell	FHI 97072 FHI 46275 FHI 65767 FHI 88505 FHI 92098 UIH 21638 UIH 10235	Okorshie, Obudu, C.R.S Mambilla Plateau, N.E, Nigeria Zoo garden, Enugu Isanlu, Kwara state Makurdi, Benue state Okomu F.R Biological garden, University of Ife	Ekwuno & Others/E & O1001 J.D. Chapman J.A. Emwiogbon Olorunfemi/Oguntayo/Ihe.284 Daramola/Emwiogbon/Oguntayo DEO 658 J. Lowe/4937 D. Gledhill	19.09.81 07.07.72 17.08.72 04.10.78 03.01.80 10.03.91 10.01.68
	UIH 10892	Botanical garden, U.I, Ibadan	K.K. Agwu	21.08.62
	UIH 16816	10, Laird place, U.I, Ibadan	J. Lowe	23.10.75
	UIH 1927	South of Kishi, Oyo	J. F. Redhead	27.07.64
	IFE 2747	Igbetti rock, Oyo	J. Medler/577	06.02.71
	IFE 2746B	O A U Campus, Ife	D. P. M. Guide/597	January, 1967
	IFE 2745A NIPRDH 5559	I A. R & T Agricultural crop research station, Ilora	J. Medler/1059	17.07.74 08.04.04
Phyllanthus nigericus Brenan. *Phyllanthus niruri Linn.*	FHI 36162A FHI 70470 FHI 97017 FHI 56177 FHI 40000 FHI 89081 FHI 95587 FHI 60497 FHI 103424 UIH 21438	Akure, Ondo Enugu Obudu, C. R. S Adamawa division, Mambilla district, Plateau Owo, Ondo Duji F.R, Minna, Niger state Bende F.R, Imo Jalingo, N.E Odoba,Otupko road, Benue Nursery, Botany Dept, U.I, Ibadan	J.P.M. Brennan & R. W.J. Keay Ekwuno P.O - - - - - - - - J. Lowe/4866	03.01.48 16.10.73 11.02.82 29.01.58 04.05.57 19.02.77 06.09.81 08.05.72 17.06.78 23.11.89
	UIH 1928	Ibadan	A. J. C/598	10.08.33
	UIH 1930	Lagos	A. J. C/832	December, 1934
	IFE 16428	Ibadan road, Ile-Ife, Osun	Akinwande O.	27.06.11
	ILH 185			09.04.84
	ABUH 2522			02.08.88
Phyllanthus niruroides Mull. Arg.	FHI 42341 UIH 15562	Igarra Kolokuma area, Yenagoa Division, Rivers state	- K. R. M. Williamson/339	22.09.58 06.11.73
Phyllanthus odontadenius Mull. Arg.	FHI 6217 UIH 14259	Awka bathing pool, Awka, Onitsha Borgu	A. P. D. Jones/1800 G. Jackson	14.06.42 03.10.72
	UIH 13797	Kiama, Yenagoa area, Rivers state	Dr Williamson's Assistant/A 13	March, 1970
	UIH 19713	Calabar	-	December, 1981
	UIH 21320	Sapoba, Benin	J. Lowe/4812	03.04.88
Phyllanthus pentandrus Schum. & Thonn.	IFE 2785B FHI 83311 UIH 14257	Idanre hills, Ondo Ohumbe F.R Argungu road	J. B. Hall/1258 - G. Jackson	20.04.69 13.06.77 13.10.70
	UIH 12482	Igbetti, Oyo	Z.O. Gbile & J. Olorunfemi	22.10.68
	IFE 2794	Panyan, Plateau	J. B. Hall/2002	13.07.70
Phyllanthus physocarpus Mull. Arg	IFE 2792 IFE 2795B	Borgu game reserve, near Kanji Dam, Ilorin Road 7, OAU, Ile-Ife	I.B. Faremi I. B. Faremi/1262	15.10.76 21.03.77
Phyllanthus reticulatus	FHI 40876 FHI 43451	Owena Akure F. R, Ondo Ife - Kano town Forest	E. O. Bamgbala M. G. Latilo	07.05.60 10.07.59

Taxa	Reference/ Herbarium number	Locality	Collector (s)/Collectors' number (where indicated from herbarium study)	Date of Collection
Poir.	FHI 19180 UIH 10866	Nursery, Kano Ikorodu	R. W. J. Keay G. Jackson/2544A	26.08.47 09.05.62
Phyllanthus rotundifolius *Phyllanthus sublanatus* Schum. *& Thonn.*	IFE 2796 IFE 2798B FHI 96993 UIH 2105 IFE 2800	Shagumu, near new village, Ilorin Shere Mountain, Bauchi Okitipupa, Ondo Oyo Shagumu, near new village, Ilorin-	J. B. Hall J. B. Hall/2133 Ibhanesebor & Osanyinlusi A. J. C/580 J. B. Hall/1304	11.06.69 18.07.70 15.07.82 08.08.37 11.06.69
Phyllanthus urinaria Linn.	UIH 21823 IFE 2802B	Odimodi, near Forcados, Delta state Sha falls, Plateau	A. Egunyomi/8 J. B. Hall/2034	08.06.92 15.07.70

UIH – University of Ibadan Herbarium
FHI - Forest Herbarium Ibadan
IFE – Obafemi Awolowo University Herbarium
ABUH – Ahmadu Bello University Herbarium
ILH – University of Ilorin Herbarium
NIPRDH – Nigerian Institute of Pharmaceutical Research and Development Herbarium

Figure 1: Collection sites of *Phyllanthus* species in Nigeria

Table 2: List of *Phyllanthus* species and the states where they occur in Nigeria

Zones	States in Nigeria	Pac	Pam	Pbe	Pca	Pfl	Pfr	Pma1	Pma2	Pmu	Pni1	Pni2	Pni3	Pod	Ppe	Pph	Pre	Pro	Psu	Pur
North west	Sokoto							X							X					
	Kebbi																			
	Zamfara																			
	Katsina		X												X					
	Kano																			
	Jigawa																			
North east	Taraba		X		X				X			X					X			
	Yobe																			
	Bauchi			X														X		
	Gombe		X																	
	Bornu		X					X												
	Adamawa				X															
North central	Nassarawa																			
	Niger		X				X					X		X	X					
	Abuja									X										
	Kaduna			X						X		X								
	Plateau			X	X				X	X	X	X			X			X	X	
	Kogi		X							X		X	X	X	X					
	Benue		X							X		X								
	Kwara		X			X				X		X					X		X	
South west	Oyo	X	X	X		X				X		X	X		X				X	
	Ogun		X							X		X					X		X	
	Osun	X	X		X					X		X		X		X				
	Ekiti				X					X										
	Ondo		X	X	X					X	X	X		X	X	X			X	
	Lagos		X							X		X			X		X			
South east	Enugu		X							X	X				X					
	Anambra									X					X				X	
	Ebonyi																			
	Imo		X									X								
	Abia				X		X					X		X						
South south	Edo		X			X				X		X		X						
	Delta																			X
	Bayelsa												X	X						
	Rivers		X										X	X						
	Akwa-Ibom																			
	Cross River		X		X				X	X	X	X		X						

Key:
Pac: *Phyllanthus acidus*; **Pam:** *Phyllanthus amarus*; **Pbe:** *Phyllanthus beillei*; **Pca:** *Phyllanthus capillaris*; **Pfl:** *Phyllanthus floribundus*; **Pfr:** *Phyllanthus fraternus*; **Pma1:** *Phyllanthus maderaspatensis*; **Pma2:** *Phyllanthus mannianus*; **Pmu:** *Phyllanthus muellerianus*; **Pni1:** *Phyllanthus nigericus*; **Pni2:** *Phyllanthus niruri*; **Pni3:** *Phyllanthus niruroides*; **Pod:** *Phyllanthus odontadenius*; **Ppe:** *Phyllanthus pentandrus*; **Pph:** *Phyllanthus physocarpus*; **Pre:** *Phyllanthus reticulatus*; **Pro:** *Phyllanthus rotundifolius*; **Psu:** *Phyllanthus sublanatus*; **Pur:** *Phyllanthus urinaria*

As shown in Table 2, the most commonly distributed *Phyllanthus* species in Nigeria is *P. amarus* occurring in the far northern to the southern states. Although *P. niruri* and *P. muellerianus* had no record of collection in the far northern states, they are also well distributed over the central or middle-belt of Nigeria to the southern states. *P. pentandrus* is the fourth most distributed species, records being from the far northern states through the central and extending to few southern states.

The species collected from the southern states only are *P. acidus, P. physocarcus* and *P. urinaria*. In contrast, *P. maderaspatensis* and *P. mannianus* are restricted to a few northern states. Records of collection revealed that certain species were found in the middle belt area and some southern states of Nigeria. The species are *P. floribundus, P. fraternus, P. niruroides, P. odontadenius* and *P. sublanatus.*

Phyllanthus species collected from states characterized by highland and montane areas (Plateau, Taraba and Adamawa) are *P. beillei, P. capillaris, P. nigericus, P. rotundifolius* and *P. reticulatus*. The distribution of *Phyllanthus* species based on the ecological zones of Nigeria shows that fourteen of the nineteen species under study occur in the Guinea savanna, lowland rainforest and the Mangrove forest. *P. amarus* occurs in all the ecological zones hence have the widest ecological distributional range. The species that have narrow distributional ranges are *P. maderaspatensis* confined to the Sudan savanna, *P. physocarpus* restricted to the lowland rainforest and *P. urinaria* to the mangrove forest.

Plate 1: Photographs of *Phyllanthus amarus* showing
a: growth habit;
b: the flowers (arrowed) on the abaxial surface;
c: fruits (arrowed)

Plate 2: Photographs of *Phyllanthus odontadenius* showing
a: growth habit;
b: alternate leaf arrangement and the flowers (arrowed) on the abaxial surface;

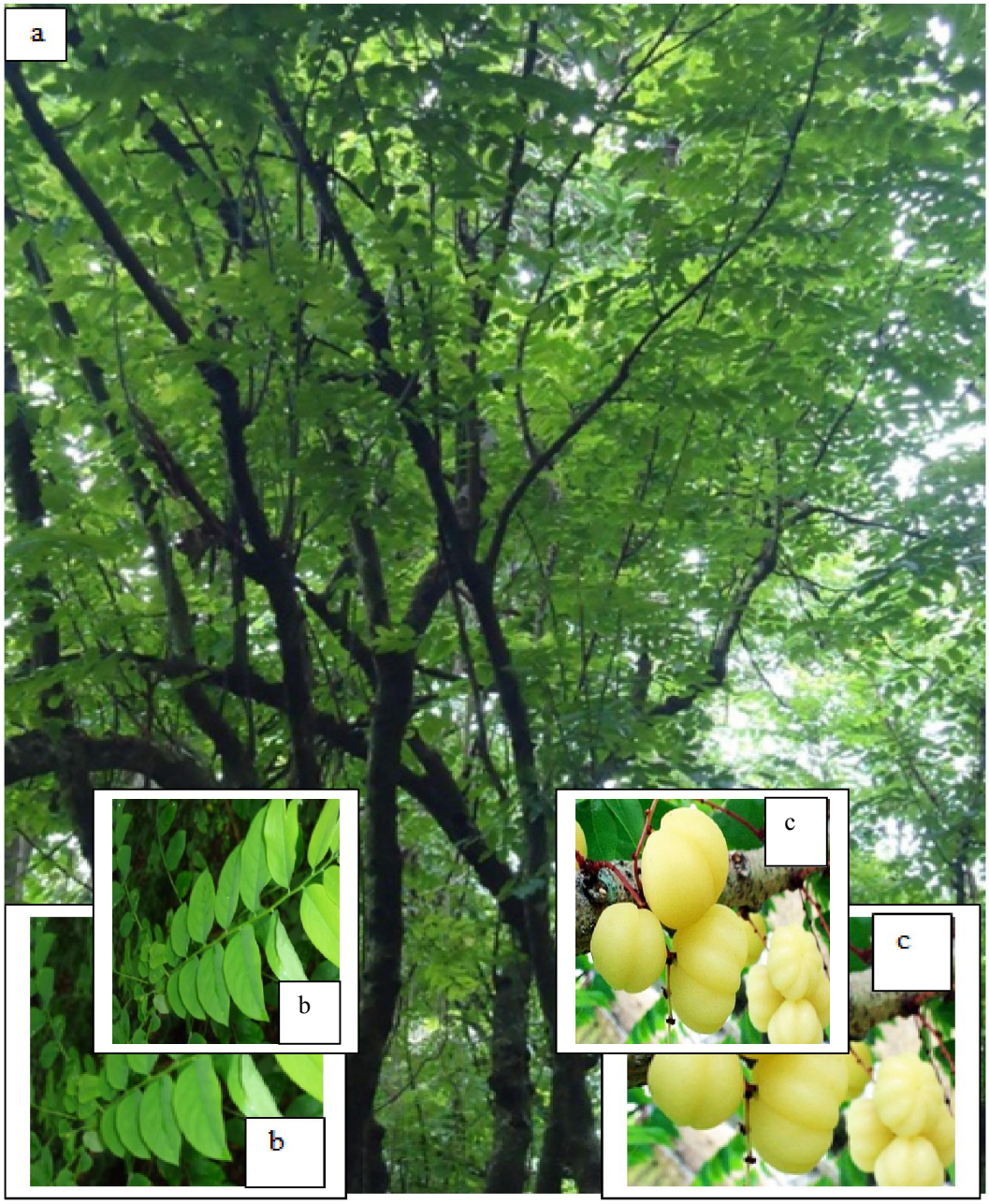

Plate 3: Photographs of *Phyllanthus acidus* showing
a: growth habit;
b: alternate leaf arrangement;
c: fruits

Plate 4: Photographs of *Phyllanthus capillaris* showing
a: growth habit;
b: fruits and flowers (arrowed) on the abaxial surface

Plate 5: Photographs of *Phyllanthus muellerianus* showing
a: growth habit;
b: alternate leaf arrangement;
c: flowers (arrowed);
d: fruits (arrowed)

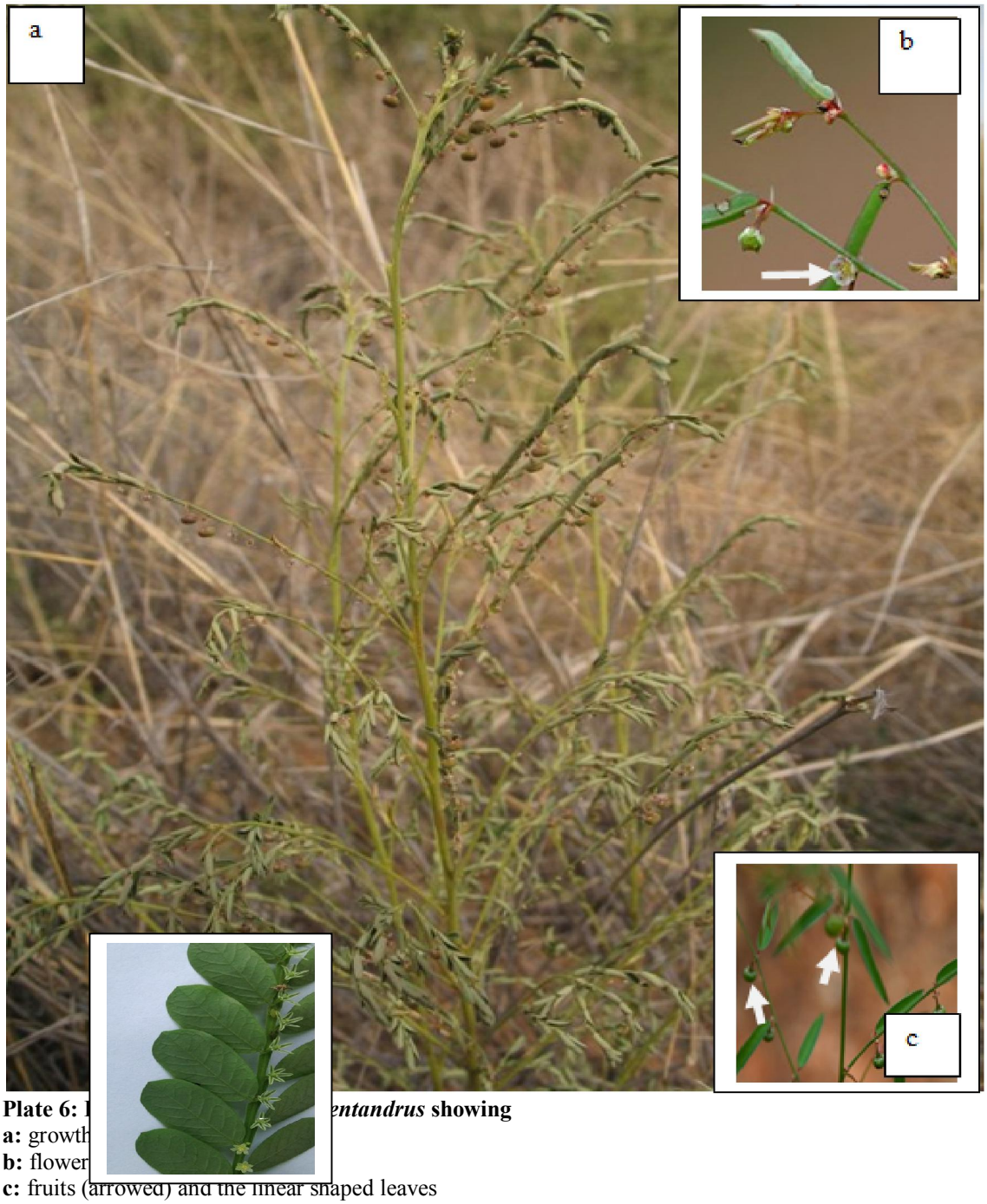

Plate 6: I ***ntandrus*** **showing**
a: growth
b: flower
c: fruits (arrowed) and the linear shaped leaves

Plate 7: Photographs of *Phyllanthus niruri* showing
a: growth habit;
b: flowers (arrowed);
c: fruits (arrowed)

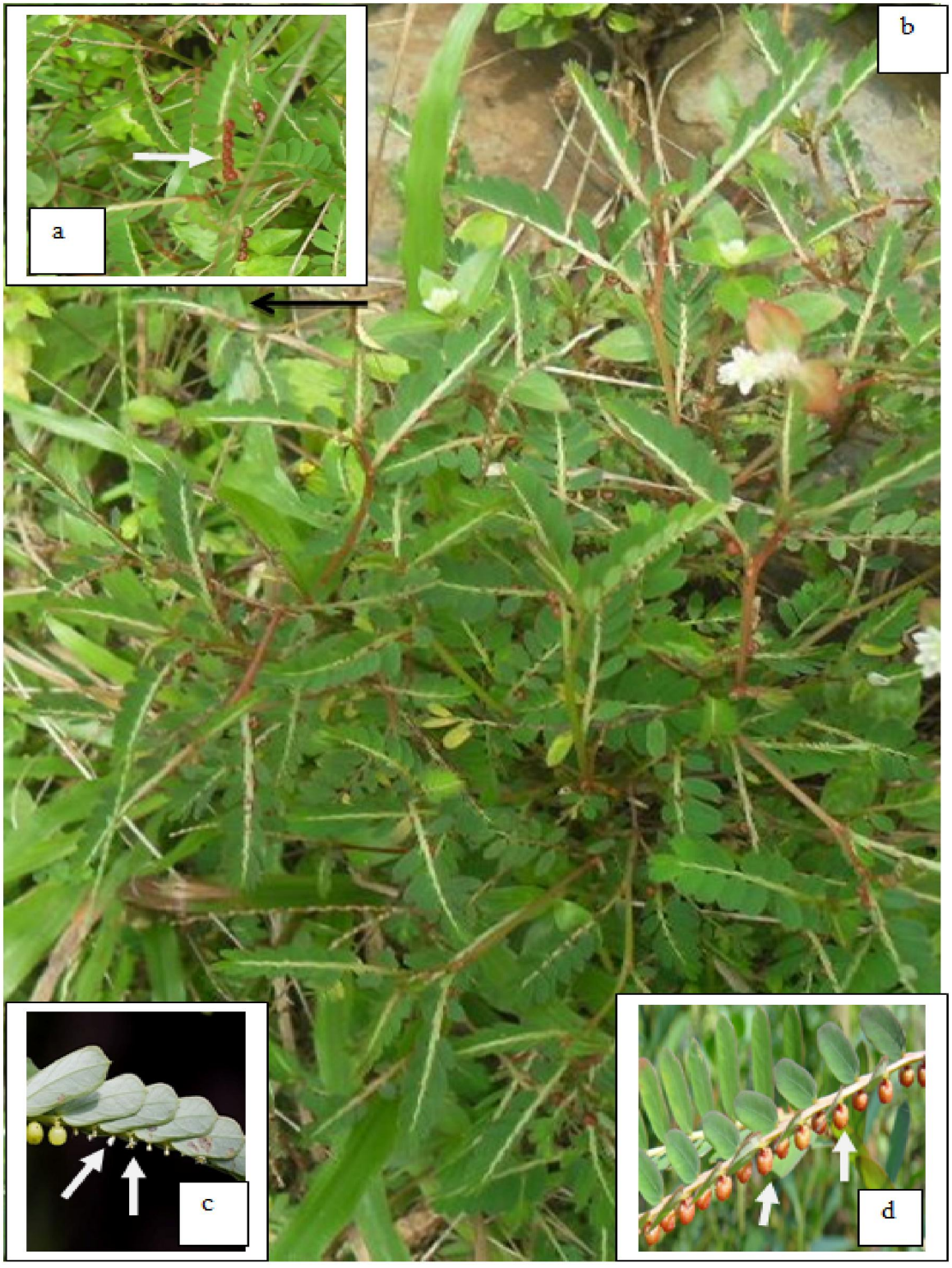

Plate 8: Photographs of *Phyllanthus urinaria* showing
a: alternate leaf arrangement and the reddish brown fruits (arrowed) on the abaxial surface;
b: growth habit;
c: flowers (arrowed);
d: fruits (arrowed)

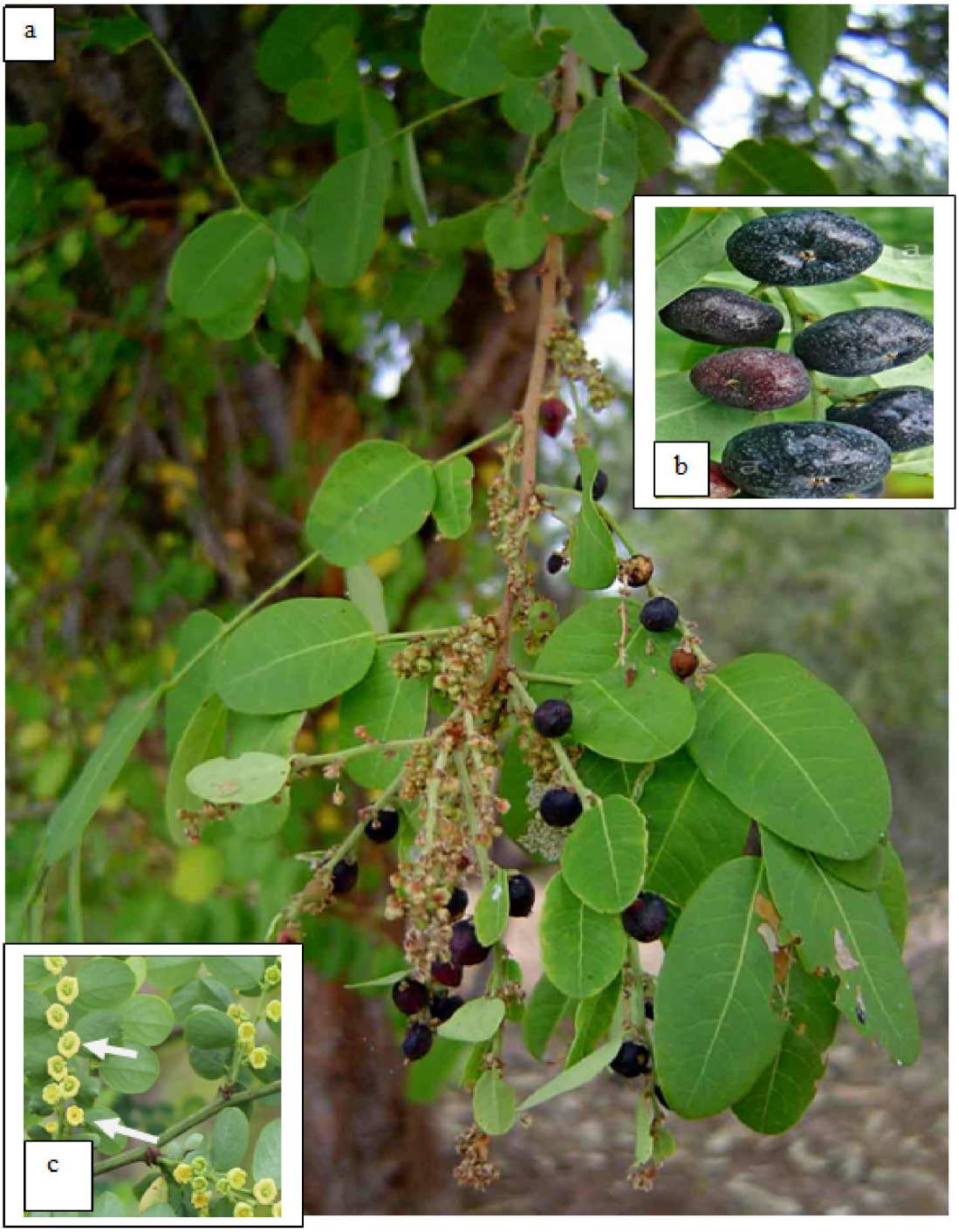

Plate 9: Photographs of *Phyllanthus reticulatus* showing
a: growth habit;
b: fruits;
c: flowers (arrowed)

4. Discussion and Conclusion

Phyllanthus is the largest genus of all the genera in the family Phyllanthaceae. The species in the genus are widely distributed in Nigeria with the herbaceous members of the genus generating a great deal of confusion among scientists regarding their identification. In many cases, misidentification of the taxa makes evaluation of the published information

difficult (Rao *et al*., 1999). The most commonly distributed species in Nigeria is *P. amarus* occurring in the far northern to the southern states closely followed by *P. pentandrus* while the species collected from the southern states only are *P. acidus, P. physocarpus* and *P. urinaria*. In contrast, *P. maderaspatensis* and *P. mannianus* are restricted to a few northern states (Figure 1, Table 2). Most of the species under study occur in the Guinea savanna, lowland rainforest and the mangrove forest with *P. amarus* occurring in all ecological zones hence have the widest ecological distributional range while the species that have narrow distributional range are *P. maderaspatensis* confined to the Sudan savanna and *P. urinaria* restricted to the mangrove forest. That *P. amarus* was encountered in all ecological zones in the study was corroborated by the work of Webster (1986) where he reported the species (*P. amarus*) among other species studied as a ubiquitous pantropical weed. Three species: *P. fraternus, P. floribundus* and *P. physocarpus* found from herbarium study are cases of misidentification as they are species of *P. amarus, P. muellerianus* and *P. acidus* respectively. As they are not found in Nigeria (Hutchinson and Dalziel, 1954), the present study did not also document them from the field in Nigeria.

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