Investigation of the Phytochemical Constituents of diverse Epiphytes in the Federal Capital Territory, Nigeria

Abstract

A study on the diversity and classification of epiphytes in the Federal Capital Territory (FCT) was conducted on thirty (30) species of epiphytes. As an extension of the research work, fifteen (15) epiphytic plants were selected on the basis of data collected by administering semi-structured questionnaires to 90 respondents. The interest of this work is to investigate the phytochemical constituents of *Ficus platyphylla, Senna mimosifolia, Platycerium stemaria, Nephrolepsis bisserata, Calyptrochilum emerginatum, Frullania dilatata, Perperomia pellucida, Plagiothecium undulatum, Pitrogramma calomelanos, Caprinus lagopides, Auricularia polytrichia, Formitopsis* sp, *Lycopodium clavatum and Entodon seductrix* in the FCT, to determine their ethnobotanical uses. A qualitative and quantitative phytochemical study procedures were carried out using flavoniods, saponins, alkaloids and tannins. The result of the qualitative analysis on the diverse epiphytes showed that flavonoids, saponins, alkaloids and tanins were either present or moderately present in each of the epiphytes while that of quantitative indicated that the flavonoid content varied between 4.29 mg/100 and 52.61

mg/100. *Calyptechium emerginatum* has the highest flavonoid content of 52.61 while the lowest was *Entodontpsis nitens* with 4.29.

Keywords: phytochemicals, epiphytes, constituents, medicinal, biological

Introduction:

The classes of compounds found in epiphytes often trigger and encourage the diverse use of epiphytes in the medicinal treatment of diseases such as cancer (Katta *et al.*, 2019). Modern researchers seek to explore the basis of plant use in various areas of human activity. In many habitats, epiphytes have been used as antibiotics, decorations, dyes, natural remedies, stabilizers for fragrance and food for thousands of years (Alamgir, 2017). It is a centuries-old culture and tradition in most African communities to use epiphytes as vegetables, ornamental plants and for the treatment of diseases. FCT, Nigeria is not to be outdone in this regard. The need to develop baseline data on the phytochemical constituents and ethnobotany of diverse epiphytes in the FCT cannot be overemphasized; hence the basis of this study.

Epiphytes are sources of food and habitat for other organisms (Migiro 2019). They are also good bio-indicators due to their low tolerance to changes in their environment (Akhaltatsi *et al.*, 2014).

In Brazil, the leaves of *Loranthus rotundifolius* Engl. cooked in milk have been used to treat chest diseases (Subhashini *et al.*, 2019). An ointment prepared from the young shoots and leaves of *L. citrocolus* is a well-known remedy for edematous tumours (Shanavaskhan *et al.*, 2012). *Cypripedium parviflora* is widely used as an aphrodisiac and nerve tonic (Singh *et al.*, 2012).

In the mid-eighteenth century, regular crops were severely affected in Europe by frosts and droughts causing famine, and as a result, lichens were used for food due to their easy availability, cheapness, and nutritional value (Luczaj and Pieroni, 2016).

Most lichens are poisonous, although there are some exceptions. *Letharia vulpine* (L.) has been traditionally used to poison predators and treat stomach disorders; more recently, *extracts of L. vulpine* have demonstrated promising antimicrobial properties (Shrestha *et al.*, 2016). According to Gray in GBIF Secretariat (2023), *Cetraria pinastri* (Scop.) Gray is used as a poison for wolves**.** *Bryoria fremontii* is edible whereas other *Bryoria* species are mildly toxic (Chandler *et al.* 2020). *B. tortuosa* is a well-known toxic lichen rich in vulpinic acid or pinastrinic acid (Spribille *et al.* 2016). They have also been used in traditional foods for millennia and play a critical role in ecosystem functioning and human well-being (Crawford, 2015).

Bryophytes can contribute significantly to total stream metabolism, nutrient cycling, interactions with food webs in streams, and as a direct food source for some invertebrates (Tessler *et al.* 2014). Some species are a great source for herbal medicine (Sabovljevic *et al.*, 2016). However, to date, there has been no attempt to document FCT bryophytes as to their medicinal properties, ethnic and other uses.

Traditional communities depend on wild plants for food, healing, and building materials, firewood, and almost all other material crops (Vira *et al.*, 2015).

Different parts of the world have greatly helped the modern world to benefit from the traditional knowledge systems (Kumar *et al.*, 2021). This has been recognized, mainly in the areas of developing promising life-saving drugs, including plant-based psychotomimetics (Crawford, 2015), by gaining knowledge about the traditional land and plant use model (Bradai *et al.*, 2015), evolving strategies for the conservation of biological diversity and environmental management policies (Santamaria and Mendaz, 2012) and the search for promising new economic plants and land races (Shah, 2014). Tribals living in the area are known to have a great knowledge of the medicinal uses of many of these plants (Mahomoodally, 2013). Because of the difficulty of obtaining the plants from other higher plants, information on these groups is very scarce. No one has so far attempted to record this information. Therefore, the present study is a new endeavor to establish the epiphytes of FCT, and record ethnobotanical information from this group of plants.

Materials and Methods

Auricularia polytricha

Caprinus lagopides

Platycerium stemaria

Nephrolepis bisserata

Frullania dilatata

Formitopsis sp

Lycoperdon clavatum

Entodon sedutrix

Plagiothecium undulatum

Peperomia pelucida

Nephrolepis undulata **and** ***Ageratum conyzoides***

Ficus platyphylla

Plates: Photos of epiphytes phytochemical analysis was carried out on in the Federal Capital Territory

The Federal Capital Territory (FCT) is situated in the Middle Belt region of Nigeria. It was formed in 1976 from parts of the states of old kwara, Niger, Kaduna and Plateau states (Federal Capital Territory Administration - Facts, 2008).

The FCT is made up of six area councils namely: Abaji, Bwari, Gwagwalada, Kuje, Kwali and Municipal area councils (Figure 1).

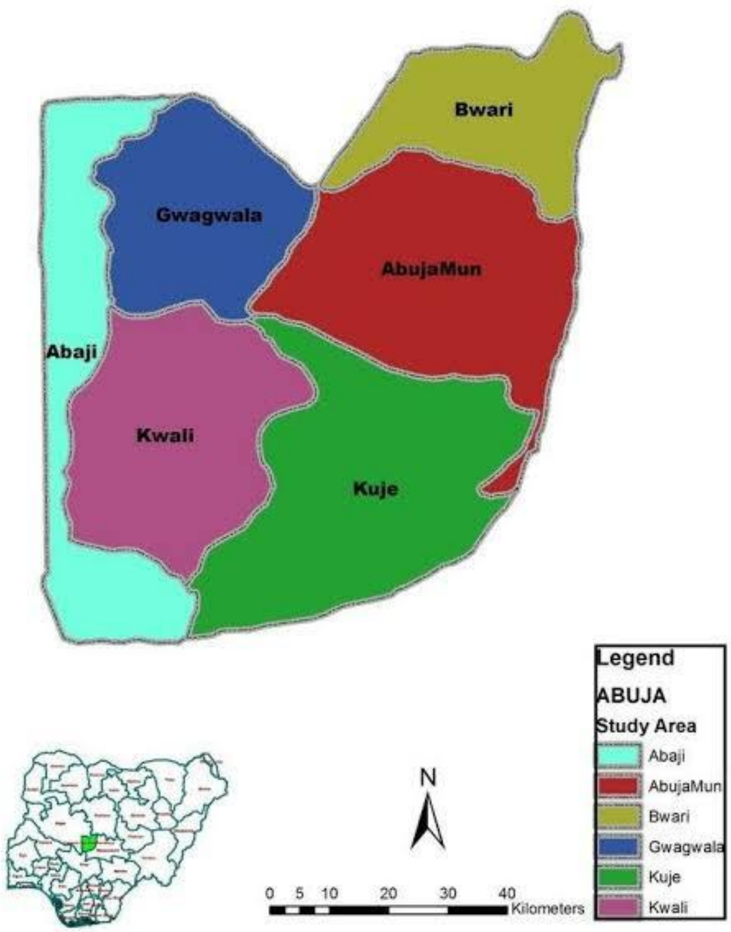

Figure 1: Modified from the Administrative Map of Nigeria: Map of the Federal Capital Territory

Source: Adeiza *et al.*, 2023

According to Ezejiofor *et al.,* (2024), a reconnaissance survey of the study area was carried out from November to December, 2021. The study sites were selected randomly, considering the dry and riparian nature of the region, altitudinal ranges, notable presence of epiphytes diversity and recommendation from respondents.

Data was collected by administering semi-structured questionnaires to 90 respondents for a single purpose face-to-face interview (Ezejiofor *et al.*, 2024).

All the epiphytes were collated and analyzed using ethnobotany and diversity information. This data comprised of the species name, plant family, areas of the ethnobotany (Ezejiofor *et al.*, 2024).

Qualitative and quantitative phytochemical survey procedure of epiphytes were done as described by Yadav and Agarwala (2011).

The Kolmogorov-Smirnov test was used to test if data were normally distributed before any parametric statistics such as the ANOVA, Correlation analysis was deployed.

Test for alkaloids

a. Mayer's test

To a few ml of plant sample extract, two drops of Mayer's reagent were added along the sides of the tube. The appearance of a creamy white precipitate indicated the presence of alkaloids.

b. Wagner's test

A few drops of Wagner's reagent were added to a few ml of plant extract along the sides of the test tube. A reddish-brown precipitate confirmed that the test was positive.

Test for saponins

The extract (100 mg) was dissolved in 10 ml of distilled water and composed of 20 ml.

The suspension was shaken in a graduated cylinder for 15 minutes. A two-cm layer of foam indicated the presence of saponins. (no picture taken).

Test for phenolic compounds and tannins

a. Ferric Chloride Test

The extract (50 mg) was dissolved in 5 mil of distilled water. To this, a few drops of neutral 5% ferric chloride solution were added. A dark green colour indicated the presence of a phenolic compound. (no picture taken).

b. Lead Acetate Testing

The extract (50 mg) was dissolved in distilled and to which 3 ml of 10% lead acetate solution was added. A large white precipitate indicated the presence of phenolic compounds. (no picture taken).

c. Magnesium and hydrochloric acid reduction

The extract (50 mg) was dissolved in 5 ml of alcohol and a few fragments of magnesium tape and concentrated hydrochloric acid (drip) were added. A pink to crimson color developed, the presence of flavonol glucosides was inferred. (no picture taken).

Quantitative Phytochemical Investigation Procedure

Test for saponins:

The extract (1 g) was macerated with 10 ml of petroleum ether and transferred to a beaker. Another 10 ml of petroleum ether was added to the beaker and the filtrate evaporated until it became dry. The residue was dissolved in 6 ml of ethanol. The solution (2 ml) was put into a test tube and 2 ml of chromagen solution was added. It was left to rest for 30 minutes and the absorbance was read at 550 nm. (no picture taken).

Test for alkaloids

The extract (1g) was macerated with 20ml of ethanol and 20% hydrogen sulphate (H_2SO_4), (1:1 V/V). The filtrate (1 mL) was added to 5 mL of 60% H_2SO_4. After 5 minutes, 5 mL of 0.5% formaldehyde in 60% H_2SO_4 was mixed into the mixture and allowed to sit for 3 hours. The absorbance was read at 565 nm. (no picture taken).

Test for phenolic compounds and tannins

To test for phenolic compounds, the extract (1 g) was macerated with 20 ml of 80% ethanol and then filtered. The filtrate (5 mL) was added to 0.5 mL of folinciocalteus reagent and allowed to sit for 30 minutes, and absorbance was measured at 650 nm. (no picture taken).

To test the tannins, the extract (1g) was macerated with 50ml of methanol and filtered. To the filtrate (5 mL), add 0.3 mL of 0.1N ferric chloride in 0.1N hydrogen chloride (HCl) and 0.3 mL of 0.0008M potassium ferricyanide, and the absorbance was read at 720 nm. (no picture taken)

A qualitative analysis was carried out on the diverse epiphytes and it showed that flavonoids, saponins, alkaloids and tanins were either present or moderately present in each of the epiphytes as indicated in table 1 below.

Table 1: Qualitative Phytochemical Analysis of the Selected Epiphytes (mg/100g)

Epiphytes	Flavonoids	Saponins	Alkaloids	Tannins
Ageratum conyzoides	++	+	++	++
Ficus platyphylla	++	++	++	++
Senna mimosifolia	++	++	++	+
Platycerium stemaria	+	++	++	+
Nephrolepsis sp	++	++	++	++
Calyptechium emerginatum	++	++	++	+
Frullaria dilatata	+	++	++	++
Perperomia pelucida	++	++	++	+
Plagiothecium undulatum	+	++	+	++
Pitrogramma sp	++	++	++	++
Caprinus lagopides	+	++	++	+
Auricularia polytrichia	+	++	++	++
Formitopsis sp	+	++	++	++
Lycopodon spadiceus	+	++	++	++
Entodontpsis nitens	+	+	++	+

KEY:

+ = Present

++ = Moderately Present

Table 2: Replicates Quantitative Phytochemical Analysis of Diverse Epiphytes (mg/100g)

Specie	Replicates	Flavonoid mg/100g	Saponin mg/100g	Alkaloid mg/100g	Tannin mg/100g
Ageratum conyzoides		44.40	19.75	25.32	17.20
		45.71	20.15	26.57	18.47
		44.89	19.21	25.21	17.65
Ficus		33.18	24.85	21.23	26.28
platyphylla		34.59	25.63	20.16	26.74
		31.74	25.82	21.98	26.00
Senna		16.58	15.48	18.26	19.18
mimosifolia		17.95	15.11	19.47	19.03
		16.20	16.74	18.12	20.15
Platycerium		9.68	13.29	20.15	20.23
stemaria		10.63	14.58	22.37	22.17
		10.87	13.01	20.87	21.10
Nephrolepsis		27.48	26.17	20.41	21.11
bisserata		26.58	26.99	23.17	20.98
		28.17	27.65	22.64	22.31
Calytrochilum		52.31	15.33	20.38	20.30
emerginatum		52.04	16.43	21.65	20.87
		53.49	15.10	21.10	21.37
Frullania		6.87	18.27	16.73	26.36
dilatata		6.15	20.18	17.70	28.65
		7.13	19.43	16.34	27.15
Perperomia		49.84	10.75	21.61	22.95
pellucida		51.73	11.32	20.74	23.46
		50.32	10.56	22.15	23.87
Plagiothecium		10.20	23.28	15.73	24.03
undulatum		10.98	24.36	16.34	24.95
		10.04	24.87	17.47	23.87
Pitrgroma		45.86	21.91	21.69	18.59
cameloanos		45.21	22.34	20.98	19.46
		47.27	21.67	21.51	18.43
Caprinus		4.61	14.36	18.79	27.84
lagopides		4.72	14.12	19.74	28.47
		4.24	14.98	18.33	27.54

Auricula polytrichia	24.27	17.27	20.73	19.83
	24.93	18.45	21.42	20.34
	25.16	18.84	20.56	19.31
Formitopsis sp	16.78	20.18	14.82	26.27
	18.47	20.44	14.45	26.23
	17.33	21.31	15.32	27.65
Lycopodon clavatum	11.42	16.71	16.73	20.76
	12.38	17.36	17.84	22.10
	11.87	17.88	16.21	21.27
Entodon seductrix	4.02	9.78	19.60	15.88
	4.64	10.21	20.13	16.48
	4.21	11.32	19.87	15.42

Table 3: Quantitative Phytochemical Analysis of diverse Epiphytes (mg/100g)

Epiphytes	Flavonoids	Saponins	Alkaloids	Tannins
Ageratum conyzoides	45.00	19.07	25.67	17.77
Ficus platyfylla	33.17	25.43	31.68	26.34
Senna mimofolia	16.91	15.77	18.68	19.45
Platycerium stemaria	10.39	13.62	21.13	21.16
Nephrolepsis sp	27.41	26.93	22.07	21.46
Calyptechium emerginatum	52.61	15.62	21.04	20.84
Frullaria dilatata	6.71	19.29	16.92	27.38
Perperomia pelucida	50.63	10.87	21.50	23.42
Plagiothecium	10.40	24.17	16.51	24.28

undulatum				
Pitogramma sp	46.11	52.00	21.39	18.82
Caprinus lagopides	4.52	14.48	18.95	27.95
Auricularia polytrichia	24.78	18.18	20.90	19.82
Formitopsis sp	17.52	20.64	14.86	26.95
Lycopodon spadiceus	11.89	17.31	16.92	21.37
Entodontpsis nitens	4.29	10.43	19.86	15.92

Quantitative analysis for **Flavonoids**

Method

Null hypothesis All means are equal
Alternative hypothesis At least one mean is different
Significance level $\alpha = 0.05$

Equal variances were assumed for the analysis.

Factor Information

Factor Levels Values

Factor	15	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	14	1049.17	74.9406	160.12	0.000
Error	30	14.04	0.4680		
Total	44	1063.21			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.684131	98.68%	98.06%	97.03%

Means

Factor	N	Mean	StDev	95% CI
C1	3	19.703	0.472	(18.897, 20.510)
C2	3	25.433	0.514	(24.627, 26.240)
C3	3	15.777	0.855	(14.970, 16.583)
C4	3	13.627	0.837	(12.820, 14.433)
C5	3	26.937	0.741	(26.130, 27.743)
C6	3	15.620	0.711	(14.813, 16.427)
C7	3	19.293	0.962	(18.487, 20.100)
C8	3	10.877	0.396	(10.070, 11.683)
C9	3	24.170	0.812	(23.363, 24.977)
C10	3	21.973	0.339	(21.167, 22.780)
C11	3	14.487	0.444	(13.680, 15.293)
C12	3	18.187	0.817	(17.380, 18.993)
C13	3	20.643	0.592	(19.837, 21.450)
C14	3	17.317	0.586	(16.510, 18.123)
C15	3	10.437	0.795	(9.630, 11.243)

Pooled StDev = 0.684131

Quantitative analysis for Saponnins

Method

Null hypothesis	All means are equal
Alternative hypothesis	At least one mean is different
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Factor	15	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	14	1049.17	74.9406	160.12	0.000
Error	30	14.04	0.4680		
Total	44	1063.21			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
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C2	3	25.433	0.514	(24.627, 26.240)
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C4	3	13.627	0.837	(12.820, 14.433)
C5	3	26.937	0.741	(26.130, 27.743)

C6	3	15.620	0.711	(14.813, 16.427)
C7	3	19.293	0.962	(18.487, 20.100)
C8	3	10.877	0.396	(10.070, 11.683)
C9	3	24.170	0.812	(23.363, 24.977)
C10	3	21.973	0.339	(21.167, 22.780)
C11	3	14.487	0.444	(13.680, 15.293)
C12	3	18.187	0.817	(17.380, 18.993)
C13	3	20.643	0.592	(19.837, 21.450)
C14	3	17.317	0.586	(16.510, 18.123)
C15	3	10.437	0.795	(9.630, 11.243)

Pooled StDev = 0.684131

Quantitative analysis for alkaloids

Method

Null hypothesis All means are equal

Alternative hypothesis At least one mean is different

Significance level $\alpha = 0.05$

Equal variances were assumed for the analysis.

Factor Information

Factor Levels Values

Factor 25.23, 21.23, 18.46, 20.15, 20.41, 20.38, 16.73, 21.61, 15.73, 21.69, 18.79, 20.75, 14.82, 16.72, 19.60

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	14	218.53	15.6090	21.86	0.000

Error	15	10.71	0.7141
Total	29	229.24	

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.845035	95.33%	90.97%	81.31%

Means

Factor	N	Mean	StDev	95% CI
25.23	2	25.890	0.962	(24.616, 27.164)
21.23	2	21.070	1.287	(19.796, 22.344)
18.46	2	18.795	0.955	(17.521, 20.069)
20.15	2	21.620	1.061	(20.346, 22.894)
20.41	2	22.905	0.375	(21.631, 24.179)
20.38	2	21.375	0.389	(20.101, 22.649)
16.73	2	17.020	0.962	(15.746, 18.294)
21.61	2	21.445	0.997	(20.171, 22.719)
15.73	2	16.905	0.799	(15.631, 18.179)
21.69	2	21.245	0.375	(19.971, 22.519)
18.79	2	19.035	0.997	(17.761, 20.309)
20.75	2	20.990	0.608	(19.716, 22.264)

14.82	2	14.885	0.615	(13.611, 16.159)
16.72	2	17.025	1.153	(15.751, 18.299)
19.60	2	20.000	0.184	(18.726, 21.274)

Pooled StDev = 0.845035

Quantitative analysis for Tannins

Method

Null hypothesis	All means are equal
Alternative hypothesis	At least one mean is different
Significance level	α = 0.05

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
Factor	13	3, 4, 5, 6, 7, 8, 9, 12, 30, 32, unk1, unk2, unk3

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	12	469.17	39.0978	83.52	0.000
Error	26	12.17	0.4681		
Total	38	481.34			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.684188	97.47%	96.30%	94.31%

Means

Factor	N	Mean	StDev	95% CI
3	3	19.453	0.608	(18.641, 20.265)
4	3	21.167	0.972	(20.355, 21.979)
5	3	21.467	0.733	(20.655, 22.279)
6	3	20.847	0.535	(20.035, 21.659)
7	3	27.387	1.163	(26.575, 28.199)
8	3	23.427	0.461	(22.615, 24.239)
9	3	24.283	0.583	(23.471, 25.095)
12	3	18.827	0.554	(18.015, 19.639)
30	3	27.950	0.475	(27.138, 28.762)
32	3	19.827	0.515	(19.015, 20.639)
unk1	3	26.950	0.710	(26.138, 27.762)
unk2	3	21.377	0.676	(20.565, 22.189)
unk3	3	15.927	0.532	(15.115, 16.739)

Pooled StDev = 0.684188

A quantitative analysis of the flavonoid components of diverse epiphytes of the FCT was carried out in replicates. The result showed that the flavonoid content of the studied epiphytes ranged between 4.29 mg/100 to 52.61 mg/100. *Calyptechium emerginatum* has the highest flavonoid content of

52.61 while the lowest was *Entodontpsis nitens* with 4.29 as earlier shown in table 3.

Using analysis of variance, the quantitative analysis of the flavonoid contents of the selected epiphytes showed a significant difference among the epiphytes (P< 0.000). The F – Value (160.12) and P – Value (0.000) communicating the significance difference.

A quantitative analysis of the saponins components of selected epiphytes of the FCT was carried out in replicates. The result showed that the saponins content of the studied epiphytes ranged between 52.00 to 10.43. *Pitrogramma sp* has the highest saponins content of 52.00 while the lowest was *Entodontpsis nitens* with 10.43 as initially indicated in table 3 above.

Using analysis of variance, the quantitative analysis of the saponins contents of the selected epiphytes showed a significant difference among the epiphytes (P< 0.000). The F – Value (160.12) and P – Value (0.000) communicating the significance difference.

A quantitative analysis of the alkaloid components of selected epiphytes of the FCT was carried out in replicates. The result indicated that the alkaloid content of the studied epiphytes ranged between 14.86 to 31.68. *Ficus* *platyphylla* has the highest alkaloid content of 31.68 while the lowest was *Formitopsis sp* with 14.86 as shown in table 3 above.

Using analysis of variance, the quantitative comparative analysis of the alkaloid contents of the selected epiphytes showed a significant difference among the epiphytes (P< 0.000). The F – Value (21.86) and P – Value (0.000) communicating the significance difference.

A quantitative analysis of the tannins components of diverse epiphytes of the FCT was carried out in replicates. The result indicated that the tannins content of the studied epiphytes ranged between 15.92 to 27.38. *Frullaria dilatata* has the highest tannins content of 27.38 while the lowest was *Entodonpsis nitens* with 15.92 as represented in table 3 above.

Using analysis of variance, the quantitative comparative analysis of the tannins contents of the selected epiphytes showed a significant difference among the epiphytes (P< 0.000). The F – Value (83.52) and P – Value (0.000) communicating the significance difference.

Test for alkaloids

a. Mayer's test

To a few ml of plant sample extract, two drops of Mayer's reagent were added along the sides of the tube. The appearance of a creamy white precipitate indicated the presence of alkaloids.

b. Wagner's test

A few drops of Wagner's reagent were added to a few ml of plant extract along the sides of the test tube. A reddish-brown precipitate confirmed that the test was positive.

Test for saponins

The extract (100 mg) was dissolved in 10 ml of distilled water and composed of 20 ml.

The suspension was shaken in a graduated cylinder for 15 minutes. A two-cm layer of foam indicated the presence of saponins. (no picture taken)

Test for phenolic compounds and tannins

has. Ferric Chloride Test

The extract (50 mg) was dissolved in 5 mil of distilled water. To this, a few drops of neutral 5% ferric chloride solution were added. A dark green colour indicated the presence of a phenolic compound. (no picture taken)

b. Lead Acetate Testing

The extract (50 mg) was dissolved in distilled and to which 3 ml of 10% lead acetate solution was added. A large white precipitate indicated the presence of phenolic compounds. (no picture taken)

c. Magnesium and hydrochloric acid reduction

The extract (50 mg) was dissolved in 5 ml of alcohol and a few fragments of magnesium tape and concentrated hydrochloric acid (drip) were added. A pink to crimson color developed, the presence of flavonol glucosides was inferred. (no picture taken)

Quantitative Phytochemical Investigation Procedure

Test for saponins:

The extract (1 g) was macerated with 10 ml of petroleum ether and transferred to a beaker. Another 10 ml of petroleum ether was added to the beaker and the filtrate evaporated until it became dry. The residue was dissolved in 6 ml of ethanol. The solution (2 ml) was put into a test tube and 2 ml of chromagen solution was added. It was left to rest for 30 minutes and the absorbance was read at 550 nm. (no picture taken)

Test for alkaloids

The extract (1g) was macerated with 20ml of ethanol and 20% hydrogen sulphate (H2SO4), (1:1 V/V). The filtrate (1 mL) was added to 5 mL of 60% H2SO4. After 5 minutes, 5 mL of 0.5% formaldehyde in 60% H2SO4 was mixed into the mixture and allowed to sit for 3 hours. The absorbance was read at 565 nm. (no picture taken)

Test for phenolic compounds and tannins

To test for phenolic compounds, the extract (1 g) was macerated with 20 ml of 80% ethanol and then filtered. The filtrate (5 mL) was added to 0.5 mL of folinciocalteus reagent and allowed to sit for 30 minutes, and absorbance was measured at 650 nm. (no picture taken)

To test the tannins, the extract (1g) was macerated with 50ml of methanol and filtered. To the filtrate (5 mL), add 0.3 mL of 0.1N ferric chloride in 0.1N hydrogen chloride (HCl) and 0.3 mL of 0.0008M potassium ferricyanide, and the absorbance was read at 720 nm. (no picture taken)

Result

The qualitative analysis on the diverse epiphytes showed that flavonoids, saponins, alkaloids and tanins were either present or moderately present in each of the epiphytes as represented in table 1 above.

Using analysis of variance, quantitative analysis of the flavonoid content of the selected epiphytes showed a significant difference between epiphytes ($P < 0.000$). The F-value (160.12) and the P-value (0.000) communicate the difference in significance.

Certains des épiphytes à savoir ; *Ageratum conyzoides*, *Ficus platyphylla*, *Senna mimosifolia*, *Platycerium stemaria*, *Nephrolepsis sp*, *Calyptechium emerginatum*, *Frullaria dilatata*, *Perperomia pelucilia*, *Plagiothecium undulatum*, *Pitrogramma sp*, *Caprinus lagopides*, *Auricularia polytrichia*, *Formitopsis sp*, *Lycopodon spadiceus* and *Entodon nitens were* subjected to qualitative and quantitative phytochemical analysis to determine their phytochemical constituents. These epiphytes were selected based on data collected by administering semi-structured questionnaires to 90 respondents for a single-purpose face-to-face interview.

A quantitative analysis of the flavonoid components of some FCT epiphytes was performed in replicates. The result showed that the flavonoid content of the epiphytes studied varied between 4.29 mg/100 and 52.61 mg/100. *Calyptechium emerginatum* has the highest flavonoid content (52.61), while the lowest was *Entodontpsis nitens* (4.29), as shown in Table 2 below.

Using analysis of variance, quantitative analysis of the flavonoid content of the selected epiphytes showed a significant difference between epiphytes ($P < 0.05$).

The F-value (160.13) and the P< value 0.05 communicate the difference in significance.

Discussion

For many years, epiphytes have been a source of medicinal agents and a whole bunch of modern medicines have been isolated from epiphytic plants. This is because plants have the ability to produce a wide variety of secondary metabolites such as saponins, tannins, phenols, alkaloids, triterpens, and phytosterols. In the current qualitative analysis of diverse epiphytes in the Federal Capital Territory, the results indicated the presence of flavonoids, saponins, alkaloids and tannins in all plants (Table: 1). It has been reported that tannins have various physiological effects such as anti-irritant, antisecretolytic, Antiphlogistics, antimicrobials and antiparasitics (Hassanpour *et al.*, 2011). In addition, there are reports showing that tannin contains plants with phytotherapeutic effect. Phytochemical analysis of some plant extracts revealed the presence of constituents known to have medicinal values as well as physiological activity. Phytochemicals such as flavonoids, saponins, alkaloids and tannins have been associated with medicinal properties (Rabizadeh *et al.*, 2022). Phytochemicals are known to be the basic source for the establishment of several pharmaceutical industries. Constituents present in plants play a crucial role in the identification of crude drug references. In addition, phytochemical screening is a very useful tool for identifying the new source of therapeutically and industrially important compounds. Epiphytes play an important role in the treatment of certain diseases, beautification and nutrition. This has undoubtedly led to other uses of *Ageratum conyzoides* L. as an analgesic, against fungal, inflammatory, anticoagulant activity, wound healing, dysentery, pesticides, and herbicides (Sivakrishnan and Kavitha, 2017). *Ficus platyphylla* Delile is used as a drug for the treatment of diarrhea, chest pain, cough, seizures, and pain (Ugwah-Oguejiofor *et al.*, 2021). *Senna mimosifolia* Mill is used to treat gastrointestinal diseases, it causes rectal cancer when used excessively (Oladeji *et al.* 2021). It is also used for weight loss by drinking tea made from its fresh leaves. Prolonged use of *Senna mimosifolia tea* can lead to liver degradation and cause bowel dysfunction (Oluwole *et al.,* 2021). According to the International Plant Names Index and the World Checklist of Vascular Plants (2024), *Platycerium stemaria* (P. Beauv.) Desv. Used in the treatment of diseases associated with blood circulation, liver disease, genital stimulation or depression, asthma and infectious diseases. The curled young leaves of *Nephrolepsis bisserata* (Sw.) Schott are used as food for humans, medicines, biofertilizers, and ornaments (Shah *et al.* 2014).

Calyptrochilum emerginatum (Afzel.ex Sw.) Schltr. is used in the treatment of cough (Mathias *et al.*, 2006), tuberculosis and malaria (Okhale et al. 2014).

According to Plant Basel (2023), *Frullania dilatata* (L.) Dumort. causes intense allergenic contact dermatitis *Perperomia pellucida* (L.) Kunth serves as a remedy for insect bites, sexually transmitted diseases, fever, cough, smallpox, measles, and kidney infections (Keat Lam *et al.*, 2022). *Plagiothecium undulatum* (Hedw.) Schimp. is used in the treatment of malaria in north-central Nigeria (Evbuomwan *et al.*, 2023). The leaves of *Pitrogramma calomelanos* (L.)Link ex Britton and Millsp. are used externally to heal wounds and stop bleeding (DeFilipps *et al.*, 2024). An infusion of the whole plant is used to strengthen the backs of men; i.e., increasing male sexual stamina and treating female bleeding (DeFilipps *et al.*, 2024). It is also used to treat asthma, coughs, colds, pneumonia, tuberculosis, and pertussis (DeFilipps *et al.*, 2024). *Caprinus lagopides* P.Karst. is not toxic (N'Douba Amako *et al.*, 2022). Its edibility is unknown, but it is considered too small to be worthwhile (Davis and Sommer 2014). *Auricularia polytrichia* (Mont.) Sacc. is used as an antioxidant, antitumor, immunomodulatory, hyperlipidemic, antidiabetic, anticoagulant, and hepatoprotectant (Miao *et al.*, 2020). *Formitopsis* sp (Sw.) P.Karst. has therapeutic effects, including anti-inflammatory, cytotoxic, and antimalarial effects (Muszynsk *et al.*, 2020). According to Plant Resources of Tropical Africa (2022), *Lycopodium clavatum* (L.) stimulates peristaltic movements of the intestine and contraction of the uterus. The whole plant is chewed to induce vomiting after poisoning or sharp stomach pains and it is applied externally on skin diseases, wounds, ulcers, and irritations. *Entodon seductrix* (Hedw.) Müll.Hal. causes skin reactions, contact dermatitis, can be used to treat liver disorders, cardiovascular disease, fever, and wounds (Bandyopadhyay and Dey, 2022).

Research indicates that *Ageratum conyzoides* L. is used as an analgesic, against fungal, inflammatory, anticoagulant activity, wound healing, dysentery, pesticides and herbicides (Sivakrishnan and Kavitha, 2017). *Ficus platyphylla* Delile is used as a drug for the treatment of diarrhea, chest pain, cough, seizures, and pain (Ugwah-Oguejiofor *et al.,* 2021). *Senna mimosifolia* Mill is used to treat gastrointestinal diseases, it causes rectal cancer when used excessively (Oladeji *et al.,* 2021). It is also used for weight loss by drinking tea made from its fresh leaves. Prolonged use of *Senna mimosifolia tea* can lead to liver degradation and cause bowel dysfunction (Oluwole *et al.,* 2021). According to the International Plant Names Index and the World Checklist of Vascular Plants (2024), *Platycerium stemaria* (P. Beauv.) Desv. Used in the treatment of diseases associated with blood circulation, liver disease, genital stimulation or depression, asthma and infectious diseases. The curled young leaves of *Nephrolepsis bisserata* (Sw.) Schott are used as food for humans, medicines, biofertilizers, and ornaments (Shah *et al.* 2014).

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Conclusion

The present research concludes that some epiphytes are important medicinal plants and contain various active phytoconstituents. Phytochemicals such as flavonoids, saponins, alkaloids and tannins have been associated with medicinal properties. Qualitatively, they are either present or moderately present in each of the epiphytes understudied. Phytochemicals are also known to be the basic source for the establishment of several pharmaceutical industries. In addition, phytochemical screening is a very useful tool for identifying the new source of therapeutically and industrially important compounds. Constituents present in plants play a crucial role in the identification of crude drug references. These constituents have made some epiphytic plants poisonous, while others serve as food, medicine, or ornaments. It is therefore necessary to develop further research on these epiphytes to determine their medicinal value.

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3.

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