

# THE IMPORTANCE OF PTERIDOPHYTES IN THE EPIPHYTIC FLORA OF SOME PHOROPHYTES OF THE CAMEROONIAN SEMI-DECIDUOUS RAIN FOREST

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**ABSTRACT.** Epiphyte diversity and abundance were surveyed in trees that were felled by a logging operation in the Cameroonian semi-deciduous rain forest to determine the importance of pteridophytes. Six host tree species were surveyed, including 150 individual phorophytes. *Triplochiton scleroxylon* hosted the greatest number of pteridophytes while *Canarium schweinfurthii* and *Terminalia superba* hosted the fewest. Of the 78 epiphytic species recorded, the largest groups were the monocotyledons (51 species) and the pteridophytes (20 species), while the dicotyledons (7 species) were the smallest. Regardless of the host, pteridophytes represented over 25% of the epiphytic flora. More than 5 pteridophytes were always hosted by each of the individual host trees. Within the pteridophytes, Polypodiaceae (8 species) was the most diversified family, followed by Davalliaceae (5 species) and Aspleniaceae (4 species). Factor analysis showed no strict specificity between tree species and pteridophytes.

## INTRODUCTION

Pteridophytes are a characteristic feature of forest in tropical regions. They are used as a bio-indicator of different types of forests. In the flora of Cameroon, Tardieu-Blot (1964) recorded 256 species belonging to 6 orders, 25 families and 69 genera. In the semi-deciduous rain forest, more than 40 epiphytic pteridophytes were recorded (Zapfack 1993).

In this paper, we studied the importance of pteridophytic flora in the canopy of 6 host species: *Gossweilerodendron joveri*, *Triplochiton scleroxylon*, *Detarium macrocarpum*, *Canarium schweinfurthii*, *Terminalia superba* and *Erythrophloeum suaveolens*. The tree trunks of most individuals had low numbers of epiphytes. The few species observed belonged to the families of Hymenophyllaceae (genera *Hymenophyllum* and *Trichomanes*), Lomariopsidaceae (genera *Lomariopsis*) and Aspleniaceae (genera *Asplenium*). We documented the pteridophyte species on each of the six host tree species; determined the percentage of pteridophytes in the epiphytic flora of these host species; and assessed the relationship, if any, between pteridophytes and phorophytes, and between pteridophytes and tree species.

## METHODS

This study was conducted in the semi-deciduous rain forest located in the southern part of Cameroon, between longitudes 11°E and 12°15'W, and latitudes 4°15'N and 2°30'S. This site was situated between Biafran and Congolian forests and the grass land of the northern region (Letouzey 1968). Six tree species were selected in 8 timberyards. They were the most abundant species within this region, and subsequently also the most exploited by timber companies. Epiphytes were surveyed in timber camps for two reasons: access to the canopy was easy, and errors in the determination of species were very low.

Epiphytes were collected from 25 individuals of each tree species that had been felled. The number of pteridophytes in the epiphytic flora was then determined. On the 25 individuals of each timber species, the presence or absence of the different pteridophytes was noted. Only phorophytes with D.B.H. (Diameter at Breast Height) > 60 cm were considered.

Frequencies were determined for all pteridophyte species observed, first by tree species and then on all 150 individuals. The percentages of each epiphytic group and family were calculated.

The mean number of epiphytes per tree was also determined. In this way, we determined the number of the most common species and of pteridophytes that were related to a specific tree species. Data were subjected to factor analysis in order to determine the affinity between pteridophytes and host species.

## RESULTS

### *Gossweilerodendron joveri*

Forty-nine epiphytes were recorded on 25 individuals, of which 14 epiphytes were pteridophytes. Some individuals hosted as many as 20 epiphytes, while some as few as 3 (mean 11). Of the 11 most common species, 6 were pteridophytes: *Arthropteris orientalis*, *Asplenium laurentii*, *Drynaria laurentii*, *Microgramma owariense*, *Phymatosorus scolopendria* and *Platynerium angolense*. The pteridophytic flora of *Gossweilerodendron joveri* represented 28.6% of the epiphytic flora (TABLE 1A). In order of decreasing abundance, the most common species found on this host tree were *Arthropteris orientalis*, *Asplenium africanum*, *A. laurentii*, *Davallia chaerophylloides*, *Drynaria laurentii*, *Loxogramme lanceolata*, *Microgramma owariense*, *Microsorium punctatum*, *Oleandra distenta*, *Phymatosorus scolopendria*, *Platynerium angolense*, *Pyrrhosia mechowii*, *Vittaria guineense* and *V. schaeferi*.

### *Triplochiton scleroxylon*

Forty two epiphytes were collected on 25 individuals, and 17 species (among the 42) were pteridophytes. Epiphyte abundance ranged from 3–24 individuals with a mean of 10. There were 10 common species on this host tree. Among them, 5 were pteridophytes: *Phymatosorus scolopendria*, *Arthropteris orientalis*, *Microsorium punctatum*, *Platynerium angolense* and *P. stemaria*. The pteridophytes on *Triplochiton scleroxylon* represented 40.5% (TABLE 1B) of the epiphytic flora. The most common species included: *Arthropteris orientalis*, *Asplenium africanum*, *A. laurentii*, *Davallia chaerophylloides*, *Drynaria laurentii*, *Lycopodium ophioglossoides*, *Microgramma owariense*, *Microsorium punctatum*, *Nephrolepis biserrata*, *Oleandra distenta*, *Phymatosorus scolopendria*, *Platynerium angolense*, *P. stemaria*, *Pyrrhosia mechowii*, and *Vittaria guineense*.

### *Detarium macrocarpum*

Of 43 epiphytes counted on 25 individuals of this tree species, 12 were pteridophytes. Abundance ranged from 7–29 epiphytes per tree. Of the 13 commonest species, five were pterido-

phytes: *Phymatosorus scolopendria*, *Asplenium laurentii*, *Arthropteris orientalis*, *Drynaria laurentii*, and *Asplenium africanum*. The pteridophytes represent 27.9% of the flora.

The following species were collected: *Arthropteris orientalis*, *Asplenium africanum*, *A. laurentii*, *Drynaria laurentii*, *Microgramma owariense*, *Microsorium punctatum*, *Phymatosorus scolopendria*, *Platynerium angolense*, *P. stemaria*, *Pyrrhosia mechowii* and *Vittaria guineense*. Pteridophytes were the second commonest group of epiphytic flora of this host species (TABLE 1C).

### *Canarium schweinfurthii*

Of 34 epiphytes counted on 25 trees of this species, ten were pteridophytes. Individuals hosted between 6 and 13 of the commonest epiphyte species; but only one, *Drynaria laurentii*, was a pteridophyte. The entire checklist of ferns collected on this host tree was: *Arthropteris orientalis*, *Asplenium laurentii*, *Davallia chaerophylloides*, *Drynaria laurentii*, *Loxogramme lanceolata*, *Microsorium punctatum*, *Phymatosorus scolopendria*, *Platynerium angolense*, *P. stemaria* and *Vittaria guineense*. Pteridophytes represented 29.4% of the epiphytic flora of *Canarium schweinfurthii* (TABLE 1D and 2).

### *Terminalia superba*

On 25 phorophytes, 38 epiphytes were recorded of which 12 were pteridophytes. Epiphyte abundance ranged from 4–15, with a mean of 7. There were seven common species, and two were pteridophytes: *Phymatosorus scolopendria* and *Platynerium stemaria*.

Pteridophytes formed 31.6% of the epiphytic flora of this host species (TABLE 1E). Species collected were *Arthropteris orientalis*, *Asplenium africanum*, *A. laurentii*, *Davallia chaerophylloides*, *Drynaria laurentii*, *Microgramma owariense*, *Microsorium punctatum*, *Nephrolepis biserrata*, *Oleandra distenta*, *Phymatosorus scolopendria*, *Platynerium angolense*, *P. stemaria*, *Pyrrhosia mechowii*, and *Vittaria guineense*.

### *Erythrophloeum suaveolens*

Thirty-eight epiphytes were collected on this host tree. Of these, 16 were pteridophytes. Trees averaged 5–12 epiphytes. Of the commonest species, seven were ferns: *Drynaria laurentii*, *Microgramma owariense*, *Microsorium punctatum*, *Platynerium angolense*, *Oleandra distenta*, and *Arthropteris orientalis*. Pteridophytes formed 42.1% of the flora (TABLE 1F), including *Arthropteris orientalis*, *Asplenium africanum*, *A. hemmitomum*, *A. laurentii*, *Davallia chaerophylloides*, *Drynaria laurentii*, *Microgramma owariense*, *Microsorium punctatum*, *Nephrolepis undulata*, *Platynerium angolense*, *P. stemaria*,

TABLE 1. Systematic partitioning of species of epiphytes in groups, families and genera: A: *Gossweilerodendron joveri*, B: *Triplochiton scleroxylon*, C: *Detarium macrocarpum*, D: *Canarium schweinfurthii*, E: *Terminalia superba*, F: *Erythrophloeum suaveolens*.

	Groups	%	Families	Number of genera	Number of species	% species
A	Pteridophytes	28.6	Polypodiaceae	7	7	14.2
			Davalliaceae	3	3	6.2
			Aspleniaceae	1	2	4.1
			Vittariaceae	1	2	4.1
	Monocotyledons	63.2	Orchidaceae	16	31	63.2
Dicotyledons	8.2	Begoniaceae	1	3	6.2	
		Cactaceae	1	1	2.0	
B	Pteridophytes	40.5	Polypodiaceae	6	7	16.7
			Davalliaceae	4	4	9.5
			Aspleniaceae	1	3	7.1
			Vittariaceae	1	2	4.8
			Lycopodiaceae	1	1	2.4
	Monocotyledons	47.6	Orchidaceae	9	20	47.6
	Dicotyledons	11.9	Begoniaceae	1	3	7.1
			Cactaceae	1	1	2.4
			Piperaceae	1	1	2.4
C	Pteridophytes	27.9	Polypodiaceae	6	7	16.3
			Davalliaceae	1	2	4.6
			Aspleniaceae	2	2	4.6
			Vittariaceae	1	1	2.3
	Monocotyledons	67.4	Orchidaceae	15	29	67.4
	Dicotyledons	4.7	Begoniaceae	1	1	2.3
			Cactaceae	1	1	2.3
D	Pteridophytes	29.4	Polypodiaceae	5	6	17.7
			Davalliaceae	2	2	6
			Aspleniaceae	1	1	2.9
			Vittariaceae	1	1	2.9
	Monocotyledons	61.8	Orchidaceae	10	21	61.8
	Dicotyledons	8.8	Begoniaceae	1	1	2.9
			Cactaceae	1	1	2.9
			Moraceae	1	1	2.9
E	Pteridophytes	31.6	Polypodiaceae	5	6	15.9
			Davalliaceae	3	3	7.9
			Aspleniaceae	1	2	5.3
			Vittariaceae	1	1	2.6
	Monocotyledons	60.5	Orchidaceae	12	23	60.5
	Dicotyledons	7.9	Begoniaceae	1	1	2.6
			Cactaceae	1	1	2.6
			Urticaceae	1	1	2.6
F	Pteridophytes	42.1	Polypodiaceae	6	7	18.5
			Davalliaceae	4	4	10.5
			Aspleniaceae	1	3	7.9
			Vittariaceae	1	2	5.3
			Orchidaceae	11	19	50
	Dicotyledons	7.9	Begoniaceae	1	1	2.6
			Cactaceae	1	1	2.6
			Urticaceae	1	1	2.6
			Moraceae	1	1	2.6

*Pyrrosia mechowii*, *Vittaria guineense* and *V. schaeferi*.

The factor analysis revealed two groups (FIGURE 1): one located on the negative side of

axis 1 and the other on the positive side of axis 1. The following epiphytes have higher frequencies and therefore influenced the disposition of species into two groups: *Arthropteris orien-*

TABLE 2. Number of epiphytes in the different groups and families.

Epiphyte groups	Families	Number of Epiphytes
Pteridophytes	Aspleniaceae	4
	Davalliaceae	5
	Lycopodiaceae	1
	Polypodiaceae	8
	Vittariaceae	2
Monocotyledons	Orchidaceae	51
	Begoniaceae	3
	Cactaceae	1
Dicotyledons	Moraceae	1
	Piperaceae	1
	Urticaceae	1
Total		78

*alis*, *Phymatosorus scolopendria*, *Drynaria laurentii*, *Davallia chaerophylloides* and *Loxogramme lanceolata*.

The group located at the negative side of axis 1 were *Canarium schweinfurthii*, *Terminalia superba* and *Erythrophloeum suaveolens*. Around these host species, 3 pteridophytes were correlated with them. In the second group located at the positive side of axis 1, *Arthropteris orientalis* and *Phymatosorus scolopendria* have the higher frequencies. This group showed two poles with respect to axis 2: the first pole at the positive side of the axis 2, with species related to *Triplochiton scleroxylon*; and the second pole, located at the negative side of the axis regroups *Gossweilerodendron joveri* and *Detarium macrocarpum*.

In all the phorophytes surveyed, the percentage of pteridophytes collected was always > 25%. *Erythrophloeum suaveolens* was the richest host for pteridophytes (42.1%) while *Detarium macrocarpum* was the poorest (27.9%). The pteridophytes represented 28.6% of the epiphytic flora, distributed into 5 families. Among them, Polypodiaceae was the most diverse family (TABLE 1E and FIGURE 2).

#### DISCUSSION AND CONCLUSION

This study illustrated the variability of pteridophytes between host canopies (TABLE 3). Johanson (1974) made similar studies in the Nimba area, and found 15 pteridophytes on *Canarium schweinfurthii*, 19 on *Triplochiton scleroxylon*, and 5 on *Terminalia superba*. In the Cameroonian semi-deciduous rain forest, we counted 10, 17 and 12 pteridophytes, respectively, on these host species of Mt. Nimba. In these two cases, it was noted that *Triplochiton scleroxylon* hosted the greatest number of pteridophytes.

Both Wee (1978) and Handerson (1935) noted that certain species of epiphytes were found on specific host trees, while Piers (1968), Rupp (1969) and Moris (1970) demonstrated a specificity between tree species and orchids. In this study, no clear relationship between pteridophytes and tree species was found. We noted in this tropical rain forest that certain pteridophytes had affinity for certain hosts. For instance, *Drynaria laurentii* grew on 16 of 25 individuals of *Gossweilerodendron joveri*, *Detarium macrocarpum*, *Canarium schweinfurthii* and *Erythro-*

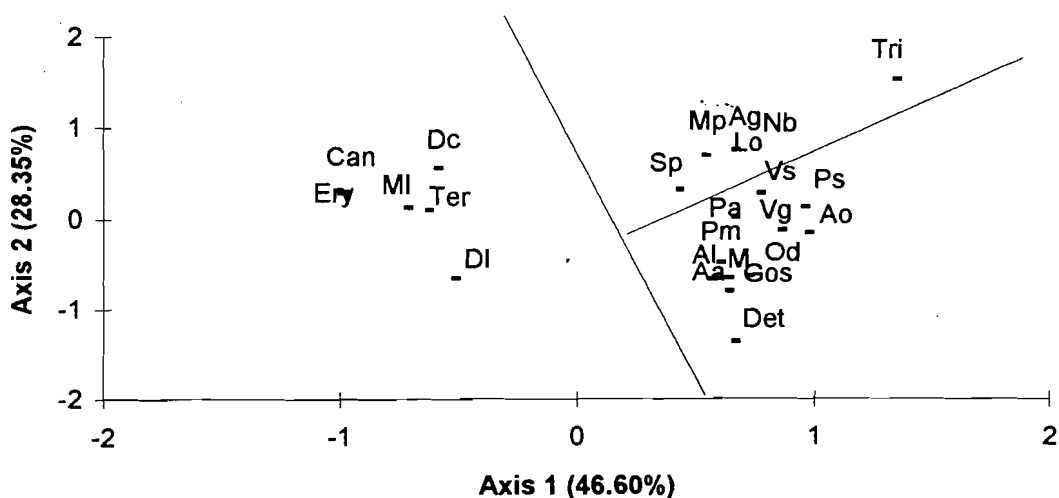


FIGURE 1. Factor analysis of the distribution of pteridophytes and their hosts. Projection on the plane formed by Axis 1 and 2.

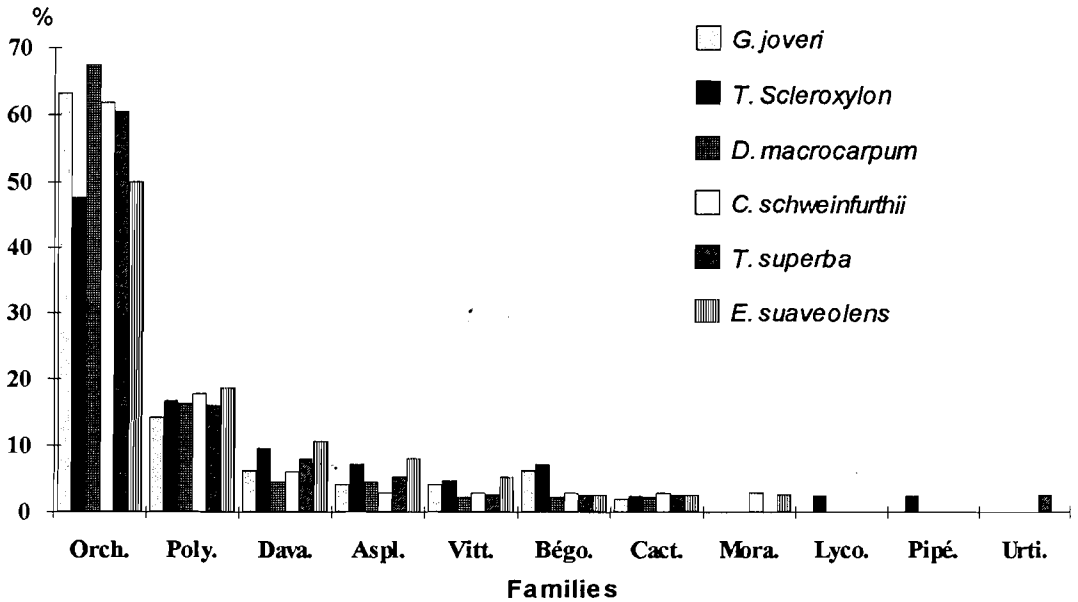


FIGURE 2. Proportion of epiphytes in each family encountered on the six host species. Orch. = Orchidaceae; Poly. = Polypodiaceae; Dava. = Davalliaceae; Aspl. = Aspleniaceae; Vitt. = Vittariaceae; Bégo. = Begoniaceae; Cact. = Cactaceae; Mora. = Moraceae; Lyco. = Lycopodiaceae; Pipe. = Piperaceae; Urti. = Urticaceae.

TABLE 3. Occurrence of pteridophytes on the six host trees. The arabic number represents the pteridophyte frequencies on 25 individuals of each host species.

Code	Epiphytes	Host species						Total	%
		Gos	Tri	Det	Can	Ter	Ery		
Ps	<i>Phymatosorus scolopendria</i>	16	22	18	11	9	11	87	58
Dl	<i>Drynaria laurentii</i>	17	1	16	18	8	18	78	52
Ao	<i>Arthropteris orientalis</i>	19	19	17	7	7	7	76	50.6
Pa	<i>Platynerium angolense</i>	18	14	9	9	8	9	67	44.6
Al	<i>Asplenium laurentii</i>	22	6	16	5	1	4	54	36
Sp	<i>Platynerium stemaria</i>	0	14	10	2	13	2	41	27.3
Mp	<i>Microsorium punctatum</i>	8	14	1	6	1	5	35	23.3
Mo	<i>Microgramma owariense</i>	14	3	9	0	1	2	29	19.3
Vg	<i>Vittaria guineense</i>	5	6	6	3	1	3	24	16
Aa	<i>Asplenium africanum</i>	4	3	13	0	1	1	21	14
Od	<i>Oleandra distenta</i>	5	3	7	0	3	1	19	12.6
Dc	<i>Davallia chaerophylloides</i>	1	3	0	6	1	6	17	11.3
Pm	<i>Pyrrosia mechowii</i>	1	3	9	0	0	1	13	8.6
Ml	<i>Loxogramme lanceolata</i>	1	0	0	3	0	3	7	4.6
Vs	<i>Vittaria schaeferi</i>	1	1	0	0	0	0	2	1.3
Ah	<i>Asplenium hemmitomum</i>	0	0	0	0	0	1	1	0.6
Ag	<i>Asplenium geppii</i>	0	1	0	0	0	0	1	0.6
Lo	<i>Lycopodium ophioglossoides</i>	0	1	0	0	0	0	1	0.6
Nb	<i>Nephrolepis biserrata</i>	0	1	0	0	0	0	1	0.6
Nu	<i>Nephrolepis undulata</i>	0	0	0	0	0	1	1	0.6
	Total	132	115	131	70	54	71	573	
	Percentage	23.0	20.02	22.8	1.2	9.4	12.5	100	
	Total number of pteridophytes/ host species	14	17	12	10	12	16		

Gos: *Gossweilerodendron joveri*, Tri: *Triplochiton scleroxylon*, Det: *Detarium macrocarpa*, Can: *Canarium schweinfurthii*, Ter: *Terminalia superba*, Ery: *Erythrophloeum suaveolens*.

*phloeum suaveolens*. In contrast, this fern was seen only once on 25 phorophytes of *Triplochiton scleroxylon* (TABLE 3).

The percentage of pteridophytes in the epiphytic flora has been calculated by some authors: 18.9% in the Nimba region (Johanson 1974), 27.4% by Kiew and Anthonyamy (1987), and 23% in the epiphytic flora of *Dipterocarpus oblongifolius* (Henderson 1935).

In the semi-deciduous rain forest, pteridophytes comprised an average of 28.6% in the epiphytic flora (Zapfack 1993). They always represented more than 25%, regardless of host species. Catling and Lefkovitch (1989) recorded 20 pteridophytes belonging to 3 families on 327 tree trunks in the Guatemalan cloud forest (Hymenophyllaceae, Lycopodiaceae and Polypodiaceae). Within the semi-deciduous rain forest canopy of South Cameroon, we recorded 20 pteridophytes on 6 tree species belonging to 5 families: Aspleniaceae, Davalliaceae, Lycopodiaceae, Polypodiaceae and Vittariaceae. On their trunks, we found only 3 families: Aspleniaceae, Hymenophyllaceae and Lomariopsidaceae. As in Guatemalan cloud forest, Polypodiaceae was also the most diversified family in the tropical rain forest. It has been noted that the percentages of these families do not vary regardless of the phorophytes.

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