Annual Review & Research in Biology
1(3): 68-78, 2011

SCIENCEDOMAIN *international*
www.sciencedomain.org

Study of Host-Parasite Relationship among Loranthaceae Flowering Shrubs-Myrmecophytic Fruit Trees-Ants in Logbessou District, Cameroon

R. Mony[1,2], S. D. Dibong[2,3,4*], J. M. Ondoua[3] and C. F. Bilong Bilong[5]

[1]Department of Animal Biology, Faculty of Science, University of Douala, P.O. Box 24157, Douala Cameroon.
[2]Department of Pharmaceutical Sciences, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, P.O. Box 2701, Douala Cameroon.
[3]Department of Plant Biology, Faculty of Science, University of Douala, P.O. Box 24157, Douala, Cameroon.
[4]Institute of Fishery Sciences, University of Douala, P.O. Box 2701, Cameroon.
[5]Department of Animal Biology and Physiology, Faculty of Science, University of Yaoundé I, P.O. Box 812, Yaoundé, Cameroon.

Research Article

Received 2nd May 2011
Accepted 2nd June 2011
Online Ready 25th June 2011

ABSTRACT

The objective of this study is host-parasite relationship among Loranthaceae flowering shrubs, Myrmecophytic fruit trees and ants. The study was conducted in 2009 in the garden plots and orchards of houses in the Logbessou district of Douala, Cameroon. We inventoried a total of 141 myrmecophytic fruit trees (diameter ≤ 45 cm) of which 95 (67.3%) were parasitized by flowering-shrub epiphytes (Loranthaceae). These trees belong to 14 species, 11 genera and 8 families. Among the eight species of ants inventoried on the trees, two were arboreal-dwelling and six were ground-dwelling, arboreal-foraging species. They belonged to two sub-families: the Formicinae, which were mostly represented by two genera, *Camponotus* and *Paratrechina*; and the Myrmicinae, which were more abundant (87.5%). The ants nested in the domatia of myrmecophyte hosts or hollow branches, trunks and dead suckers of Loranthaceae. *Crematogaster* was the most frequent genus and dominant ant on all of the parasitized host trees.

**Corresponding author: Email: didierdibong@yahoo.fr;*

Keywords: Host fruit trees; myrmecophyte; Loranthaceae; ant species; garden plots; orchards;

1. INTRODUCTION

The Loranthaceae is the family of flowering trees that live as epiphytic, hemi-parasites on the branches of both wild and cultivated trees and shrubs. (Dibong et al. 2009c,d). They are able to achieve photosynthesis by tapping into the mineral matter of their host by their haustoria or 'suckers', a structural and physiological bridge that enables them to absorb nutrients and water (Kuijt, 1969; Dibong et al., 2010d,e). Despite having chlorophyll, some species have a very low rate of photosynthesis compared to that of their host (Sallé et al., 1998). Others, however, produce sufficient carbohydrates and do not depend on the organic matter from their host (Hull and Leonard, 1964; Schulze et al., 1992). The Loranthaceae produce berries that are eaten by birds, which, in this way, disperse the plant's seeds (Priya, 1983; Boussim, 2002). The wind plays a role in the pollination of flowers, but ants and other insects may also help to transfer pollen (Frochot and Sallé, 1980; Boussim et al., 1993; Mony et al., 2010b).

The family of plants belonging to the Loranthaceae is distributed worldwide, and is composed of 77 genera and 950 species (Polhill and Wiens, 1998). In Cameroon, Balle, S. (1986) reported seven genera encompassing nearly 26 species. Among them, *Phragmanthera capitata* (Sprengel) S. Balle mainly attacks cultivated trees such as cacao, avocado and citrus causing extensive damage to the host (Sallé et al., 1998). In home garden plots and orchards, another Loranthaceae, *Tapinanthus ogowensis* (Engler) Danser was also recorded (Dibong et al., 2009a); it can be competitor of *P. capitata*, affecting its fitness (Overfield et al., 1998; Sonké et al., 2000).

On the African continent and in Cameroon in particular, few studies have focused on hemi-parasitic epiphytes. Moreover, the study of plant-ant relationships often concerns the host plant species (Dejean, 1991; Ngnegneu and Dejean, 1992; Kenné et al., 1999). The objective of this study is to identify the host species which are associated with the Loranthaceae, and to identify and also list the myrmecofauna involved in these interactions.

2. MATERIALS AND METHODS

2.1 Study Site

This study was carried out in home garden plots in the Logbessou district in the northeastern section of Douala (03° 40'-04° 11'N and 09° 16'-09°52'E, altitude 13 m). The climate can be qualified as equatorial. It is characterized by two seasons: the long rainy season (9 months) and the shorter dry season (Din et al., 2008). Rainfall is abundant with an annual average of 3562.29 mm. The average annual temperature is 27.59 °C with a temperature range of 3.7 °C. The relative humidity remains high throughout the year. The home garden plots visited were located on both sides of the road at a distance of 50 m from kilometric point (KP) 14. The site is fairly urbanized with home gardens and orchards interspersed with fallow farmlands. The fruit trees are mostly infested with Loranthaceae, hence the choice of this study site.

2.2 Methodology

The flora and myrmecofauna found in the home gardens and orchards visited were identified and inventoried.

2.2.1 Inventory and identification of the flora

The inventory was conducted from January to June 2009. We identified the host tree species, and then counted the number of trees infested by Loranthaceae and measured their diameter at 1.30 m above the ground or diameter breast height (DBH).

The percentages were calculated to highlight the diversity of the flora in home garden plots and orchards.

2.2.2 Inventory and identification of the Myrmecofauna

From June to December 2009, we sampled ants whose workers foraged on host trees and/or on the trees' parasites. We used a machete to lift up the haustoria, and captured workers with the aid of an aspirator or a pair of smooth forceps. The samples were transferred to plastic boxes and preserved in alcohol at 70°C in the Plant Biology Laboratory, Faculty of Science, University of Douala.

To study the species diversity of the ants in the home gardens, we used the identification keys contained in the basic systematic data on African ants (www.antbase.org). Thus, our specimens were identified at least to genus. To confirm the identifications of the species, the ants captured were presented to experts from the Animal Biology Laboratory, Faculty of Science, University of Douala.

2.2.3 Statistical analysis

To estimate ant diversity, we used the Alpha diversity index, which corresponds to the diversity of ants in one particular area (e.g., a stand of trees). This index is based on the proportion of specific abundance. In our study, we compared two habitats (i.e., infested trees and uninfested trees). Data are expressed as the number of individuals caught from each species or genus. They allowed us to determine: (1) species richness (S) or the total number of species in a habitat (i.e., infested trees or uninfested trees); and (2) the percentage (P) or ratio of the number of individual (Ni) species where (i) is the total number of individuals harvested (all ant species pooled), multiplied by 100 to get the result as a percentage.

$$N=\sum_{i=1}^{s} \mathrm{Ni}$$

To compare the specific diversity of both habitats (i.e., infested trees or uninfested trees) we calculated the following indices.

(1) The Berger and Parker dominance index (d): in most cases, this index expresses the frequency of the most dominant species. A low value for (d) reflects a high diversity, and is determined by the formula:

$$d = Nmax/N$$

where Nmax is the number of individuals from the most common species in the community, and N is the total number of individuals collected from one habitat.

(2) The Shannon-Weaver (H') diversity index: this index is commonly used by ecologists. If one assumes that all of the individuals are randomly sampled, the population is considered infinitely large, and all of the species in the community are thought to be represented in the samples. It depends largely on the abundance of the most common species that should naturally evolve each year. This index is determined by the following relationship.

$$H' = \sum_{i=1}^{s} Pi \ln Pi \text{ with } Pi = Ni/N$$

where Pi is number of species individuals (Ni) for one species i over total number of all individuals of species harvested (N) and S is the total number of species within the community or species richness.

(3) Student's *t*-test (t): This test is used to examine the differences in average population sizes when the available quantitative data for each monthly sample is less than 25.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 The flora

3.1.1.1 The Loranthaceae

Of the 26 species of Loranthaceae belonging to seven genera found in Cameroon, two are present at the study site: *Phragmanthera capitata* and *Tapinanthus ogowensis*. The former is ubiquitous and abundant in the Littoral region, and is a generalist parasite on most of the fruit trees, while the latter is a specialist parasite of *Dacryodes edulis*, at least at the scale of our observations. Mango is the only tree species not infested by Loranthaceae. These hemi-parasites attain a level of parasitism that varies between 25% (for *T. ogowensis*) and 85.20% to 100% (for *P. capitata*).

3.1.1.2 Host fruit trees

We examined a total of 141 host fruit trees of which 95 are infested by Loranthaceae. These trees can be divided into 14 species, 11 genera, and eight families (Table 1), namely the: Annonaceae, Anacardiaceae, Burseraceae, Fabaceae, Lauraceae, Myrtaceae, Rutaceae and Sterculiaceae. The Rutaceae is the most diversified family with four infested host species. The genus *Citrus* is the only representative of this family. Most of the infested individuals were recruited in classes three (03) and four (04) with rates of parasitism of 23.40% and 21.28%, respectively.

Table 1. Floristic inventory in home gardens and orchards parasitized by Loranthaceae in Logbessou (Period: January-June 2009)

Host species		Class diameter of tree										Total	Percentage (%) parasitism
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10		
Annona miricata	UI												
(Annonaceae)	PI			1								1	100
Citrus limon (Rutaceae)	UI												
	PI		1									1	100
C. maxima (Rutaceae)	UI												
	PI			10								10	100
C. reticulata (Rutaceae)	UI												
	PI			1	2	1		1				5	100
C. sinensis (Rutaceae)	UI												
	PI	4	10	11	8	2						35	100
Cola acuminata	UI												
(Sterculiaceae)	PI				1							1	100
Dacryodes edulis	UI		1				2					3	
(Burseraceae)	PI										1	1	25
Manilkara zapota	UI												
(Sapotaceae)	PI			3								3	100
Manniophyton fulvum	UI												
(Euphorbiaceae)	PI									1		1	100
Mangifera indica	UI			1	5		6	2	1		18	33	
(Anacardiaceae)	PI												0
Persea americana	UI		2				3					5	
(Lauraceae)	PI				1			3				4	44.4
Psidium guajava	UI												
(Myrtaceae)	PI		3		4	2	1						100
Spondias mangifera	UI												
(Anacardiaceae)	PI										1	1	100
Theobroma cacao	UI		4									4	
(Sterculiaceae)	PI			6	9	8						23	85.2
Total of individuals		4	21	33	30	13	12	6	1	1	20	141	

Legend: C1: Class diameter <5 cm, C2: Class diameter 5-10 cm; C3: Class diameter 10-15 cm; C4: Class diameter 15-20 cm; C5: Class diameter 20-25 cm; C6: Class diameter 25-30 cm; C7: Class diameter 30-35 cm; C8: Class diameter 35-40 cm; C9: Class diameter 40-45 cm; C10: Class Diameter >45 cm; UI: Unparasitized Individual; PI: Parasitized Individual.

Table 2. Myrmecofauna inventoried on host species parasitized and parasites in houses' gardens and orchards Logbessou (period: June-December, 2009)

Host species	Supports	*Ca* sp.	*Cr* sp.1	*Cr* sp.2	*My* sp.	*Pa lo*	*Ph me*	*Te ac*	*Te be*	Total	Percentage (%) of individuals
Citrus maxima	Host		11	11		5				27	10.43
	Parasite		10	11						21	10
C. reticulata	Host	2	28			2	2			34	13.13
	Parasite		28							28	13.34
C. sinensis	Host		42							42	16.22
	Parasite	2	16	5		1				24	11.43
Dacryodes edulis	Host	2	4							6	2.32
	Parasite		7							7	3.33
Manilkara zapota	Host		43	3						46	21.90
	Parasite		25	1		3				29	11.20
Persea americana	Host		10	29			5	3		47	18.15
	Parasite		7	12						19	9.05
Psidium guajava	Host		19			6				25	9.65
	Parasite		18	5						23	10.95
Spondias mangifera	Host	2	5	18		1				26	10.04
	Parasite		19							19	9.05
Theobroma cacao	Host		25	1		3				29	11.20
	Parasite		20				1		2	23	10.95
Total	Host	6	160	59	4	18	7	5	0	259	
	Parasite	2	168	36	0	1	1	0	2	210	
Percentage (%)	Host	2.4	61.8	22.8	1.5	6.9	2.7	1.9	0		
	Parasite	0.9	80	17.2	0	0.5	0.5	0	0.9		
Diversity index of	Host	0.1	0.3	0.3	0.1	0.2	0.1	0.1	0		
Shannon-Weaver (H')	Parasite	0.04	0.2	0.3	0	0.03	0.03	0	0.04		
Becker and Parker	0.02	0.6	0.2	0	0,1	0,03	0,02	0	0		
dominance (d)	0.01	0.8	0.2	0.02	0.01	0.01	0	0.01			

Legend: *Ca* sp. *: Camponotus* sp. ; *Cr* sp.1 *: Crematogaster* sp.1 *; Cr* sp.2 *: C*rematogaster sp.2 *; My sp : Myrmicaria* sp. *; Pa lo : Paratrechina longicornis ; Ph me : Pheidole megacephala ; Te ac : Tetramorium aculeatum ; Te ba : Tetramorium bellicosum.*

3.1.2 The myrmecofauna

A total of 580 worker ants were collected, including 469 on infested host trees (210 on Loranthaceae and 259 on their hosts) and 111 on uninfested host trees. The ant species belong to two sub-families, the Formicinae and the Myrmicinae (Table 2).

The most abundant sub-family Myrmicinae (94.24%) has six (06) species: *Crematogaster* sp.1 ,*C*rematogaster sp.2, *Myrmicaria* sp., *Paratrechina longicornis, Pheidole megacephala, Tetramorium aculeatum, T. bellicosum.* This sub-family is equally most diversified. Ants of the *Crematogaster* genus are most abundant (90.19%).

Among the ants identified, some are ground-nesting, arboreal-foraging and others are arboreal-dwelling. This stratification of nesting sites has an impact on their foraging activity. Strictly arboreal-dwelling ants belong to the *Camponotus* and *Crematogaster* genera that occupy two types of habitats: on smaller trees, the ants can nest in the domatia of a myrmecophyte host that provide ants with a shelter: the pouches at the base of the leaf blades, in hollow dead branches, and more rarely, in the space between the tree bark and the wood. On taller trees, the ants nest on the trunk in natural cavities of the bark. Only *Crematogaster* sp. workers forage on all of these hosts and their parasites, and their foraging activity can have one of three patterns (Table 3).

Table 3. Relative abundance of *Crematogaster* on host species and their parasite of houses' gardens and orchards parasitized by Loranthaceae at Logbessou (Period: June-December 2009)

Host species	Supports	*Cr* sp.1 (%)	*Cr* sp.2 (%)
Citrus maxima	Host	6.9	18.6
	parasite	5.9	30.6
C. reticulata	Host	17.5	0
	Parasite	16.7	0
C. sinensis	Host	26.2	0
	Parasite	9.5	13.9
Dacryodes edulis	Host	2.5	0
	Parasite	25.6	0
Manilkara zapota	Host	10	0
	Parasite	25.6	8.3
Persea americana	Host	6.3	13.9
	Parasite	4.2	33.3
Psidium guajava	Host	11.9	0
	Parasite	10.7	13.9
Spondias	Host	3.1	30.5
mangifera	Parasite	11.3	0
Theobroma cacao	Host	15.6	1.7
	Parasite	11.9	0

Cr sp. 1: Crematogaster sp.1; Cr sp.2: Crematogaster sp.2

The first pattern is represented by *Crematogaster* sp. workers that forage on host species more than they do on the parasite, although their relative abundance on the parasite is

consistently high. Some of the host species include *Dacryodes edulis* (2.5% on the host and 25.6% on the parasite), *Spondias mangifera* (3.1% on the host and 11.3% on the parasite) and *Manilkara zapota* (10% on the host and 25.6% on the parasite).

The second trend includes the host species for which the relative abundance of *crematogaster.* sp.1 is roughly equal on the parasite and on the host species. The host species include *Citrus maxima* (6.9% on the host and 5.9% on the parasite), *C. reticulata* (17.5% on the host and 16.7% on the parasite) and *Psidium guajava* (11.9% on the host and 10.7% on the parasite).

The third pattern shows that the relative abundance of *Crematogaster* sp. is lower on the parasite than on the host. Three species have this type of pattern: *Persea americana* (6.3% on the host and 4.2% on the parasite), *Citrus sinensis* (26.2% on the host and 9.5% on the parasite) and *Theobroma cacao* (15.6% on the host and 11.9% on the parasite).

3.2 Discussion

The majority of the ants recorded in orchards are dominant species with numerous workers. According to Dejean, A. (1991), they are of particular interest because they are found in abundance on plants of economic interest. Their proportion varies based on tree species. The genus *Crematogaster* is the most frequent species found in home gardens and orchards in Logbessou and Ndogbong (Mony et al., 2009). Dejean (1991) also noted an abundance of *Crematogaster* (88.6%) in a canopy edge in Campo, Cameroon. The abundance of ants from the genus *Crematogaster* can be explained by the availability of the ecological niche and favorable trophic conditions (Leston, 1973; Mony et al., 2010a,b).

Phragmanthera capitata is a ubiquitous species in southern Cameroon. This Loranthaceae has become a scourge, especially in home gardens and orchards, commercial plantations, and agricultural and industrial farmlands (Dibong et al., 2008; 2009a, b, c, d, e, f).

The presence of the Loranthaceae can directly weaken the host plant, reducing its growth and impairing the quality of its wood (Guinier, 1934; Peter-Contesse, 1937; Plagnat, 1950; Pourtet, 1961). In a country like Cameroon that depends on its logging industry for vital revenue, the obvious economic impact can be easily quantified (Frochot and Sallé, 1980). On the other hand, *Crematogaster* ants tend Hemiptera that live on the succulent leaves of the Loranthaceae and feed on the extrafloral nectar that it produces. The Hemiptera are considered pest insects for the Loranthaceae responsible for causing diseases, and thus, reducing their fitness. Since the *Crematogaster* ants protect the Hemiptera from possible attacks by enemies, these ants contribute to the biological control of the Loranthaceae, and, in this way, may also help to promote the growth and development of host plants, on the condition that this not the same for the host tree.

Ants from the genus *Pheidole* were much less abundant (1.7%) in home gardens and orchards, despite the fact that Dejean (1991) found a significant and high abundance (52.2%) on trees in a forest edge in Campo, Cameroon. *Pheidole megacephala* workers often show little intra-specific aggressiveness, but a high inter-specific aggressiveness so that they are able to displace or even eliminate local fauna. When introduced in other areas than their native range (West and Central Africa), this species is found in perennial plantations where they can tend local or introduced Hemiptera (Holway et al., 2002; Le Breton et al., 2005). The temporal and spatial occupation of a territory by this species is often regulated by anthropogenic factors.

4. CONCLUSION

The methods most often used to control the spread of the Loranthaceae are either mechanical (e.g., involving the elimination of the infested branch) or chemical. These methods disturb dominant ant populations that may, in fact, act as biological control agents for the hemi-parasites. Further studies are needed to elucidate the interactions of host plant species, pests and insects with the goal of controlling these parasitic plants.

.

ACKNOWLEDGEMENT

We sincerely thank Ms. Andrea Dejean and Dr. Henry Fankem for the improved form of this work and Prof. Alain Dejean for the relevance of his critics.

REFERENCES

Balle**,** S. (1986). Les Loranthacées, Flore du Cameroun, vol. 23, Satabié B., Leroy JF, Yaoundé, Cameroun, 82p.

Boussim, I.J., Sallé, G., Giunko G. (1993). *Tapinanthus* parasite du karité au Burkina Faso, 2^{e} partie : phénologie, biologie et dégâts. Bois et Forêts des Tropiques, 238, 53-65.

Boussim, I.J. 2002. Les phanérogames parasites du Burkina Faso : inventaire, taxonomie, écologie et quelques aspects de leur biologie. Cas particulier des Loranthacées parasites du karité. Thèse de doctorat d'état ès Sciences Naturelles. Université de Ouagadougou, Ouagadougou, 285 p.

Dejean, A. (1991). Adaptation d'*Oecophylla longinoda* (Formicinae) aux variations spatio-temporelles de la densité de proies. Enthomophaga, 36, 29-54.

Dejean, A., Djiéto-Lordon, C., Ngnokam, S. **(**1992). Les relations plantes-fourmis : nouvel aperçu. Mém. Soc. R. Belge, Ent., 35, 563-567.

Dibong, S.D., Din, N., Priso, R.J., Taffouo, V.D., Fankem, H., Sallé, G., Amougou, A. (2008). Parasitism of host trees by the Loranthaceae in region of Douala (Cameroon). Afr. J. Environ. Sci. Technol., 2(11), 371-378.

Dibong, S.D., Engone Obiang, N.L., Din, N., Priso, R.J., Taffouo, V.D., Fankem, H., Sallé, G., Amougou, A. (2009a). Artificial infestations of three host species by *Tapinanthus ogowensis* (Engler) Danser (Loranthaceae) in the Logbessou plateau (Douala, Cameroon). Afr. J. Biotechnol., 8(6), 1044-1051.

Dibong, S.D., Din, N., Priso, R.J., Taffouo, V.D., Fankem, H., Sallé, G., Amougou, A. (2009b). Niveau d'infestation des arbres fruitiers des groupements végétaux par *Phragmanthera capitata* (Sprengel) S. Balle (Loranthaceae) dans la région littorale du Cameroun. Int. J. Biol. Chem. Sci., 3(2), 347-354.

Dibong, S.D., Din, N., Priso, R.J., Taffouo, V.D., Fankem, H., Sallé, G., Missoup, A.D., Boussim, I.J., Amougou, A. (2009c). An assessment on the uses of Loranthaceae in ethnopharmacology in Cameroon: a case study made in Logbessou, North of Douala. J. Medicinal Plants Res., 3(6), 592-595.

Dibong, S.D., Engone OBiang, N.L., Din, N., Priso, R.J., Taffouo, V.D., Fankem, H., Sallé, G., Amougou, A. (2009d). Les Loranthaceae: un atout pour l'essor de la pharmacopée traditionnelle au Cameroun. Int. J. Biol. Chem. Sci., 3(4), 746-754.

Dibong, S.D., Din, N., Priso, R.J., Taffouo, V.D., Fankem, H., Sallé, G., Amougou, A. (2010a). Germination et régénération de *Phragmanthera capitata* (Loranthaceae) sur les arbres fruitiers à Douala, Cameroun, in : Van der Burgt, X., Van der Maesen J.,

Onana, J.M. (Eds.), Systématique et Conservation des Plantes Africaines, Kew Publishing, pp. 839-846.

Dibong, S.D., Din, N., Priso, R.J., Taffouo, V.D., Fankem, H., Sallé, G., Amougou, A. (2010b). Statut écologique des Loranthaceae de la région littorale du Cameroun, in : Van der Burgt, X., Van der Maesen J., Onana, J.M. (Eds.), Systématique et Conservation des Plantes Africaines, Kew Publishing, pp. 797-803.

Dibong, S.D., Mony, R., Ondoua, J.M., Engone Obiang, N.L., Boussim, I.J., Amougou, A., Bilong Bilong. (2010c). Struggle against *Phragmanthera capitata* (Sprengel) S. Balle (Loranthaceae) parasite of agroecosystem fruit trees. J. Agric. Biotechnol. Sustain. Dev., 2(5), 076-081.

Dibong, S.D., Taffouo, V.D., Ngotta, B., Din, N., Priso, R.J., Boussim, I.J., Amougou, A. (2010d). Faut-il éradiquer les Loranthaceae sur les ligneux à fruits commercialisés de la région littorale du Cameroun ? Int. J. Biol. Chem. Sci., 4(3), 555-562.

Dibong, S.D., Taffouo, V.D., Ndiang, Z., Din, N., Ngotta, B., Mony, R., Engone Obiang, N.L., Din, N., Priso, R.J., Boussim, I.J., Amougou A. (2010e). Sodium and potassium partitioning in five species of *Phragmanthera capitata* (Sprengel) S. Balle (Loranthaceae) in littoral region of Cameroon. J. Appl. Biosci., 30, 1839-1844.

Dibong, S.D., Ndiang, Z., Mony, R., Boussim, I.J., Amougou, A. (2010f). A parasitic study of *Phragmanthera capitata* (Sprengel) S. Balle (Loranthaceae) in the anthropic environments : the case of the Ndogbong chieftaincy's orchard (Douala, Cameroun). Afr. J. Agric. Res., 5(15), 2051-2055.

Din, N., Seanger, P., Priso, R.J., Dibong, S.D., Blasco, F. (2008). Logging activities in mangroves forests: a case study of Douala, Cameroon. Afr. J. Environ. Sci. Technol., 2(2), 022-033.

Frochot, H., Sallé G. (1980). Modalités de dissémination et d'implantation du gui. Rev. For. Fr., 32, 505-519.

Guinier, P. (1934). Les dommages causés par le gui. Annales de l'école nationale des eaux et forêts *et* de la station de recherches et expériences, tome V, fasc. 2, 221-231.

Hull, R., Leonard, O. (1964). Physiological aspect of parasitism in mistletoes (*Arceuthobium* and *Phoradendron*). The photosynthetic capacity of mistletoes. Plant Physiol., 30, 1008-1017.

Holway, D., Lach, L., Suarez, A.V., Tsutui, N.D., Case, T.J. (2000). The causes and consequences of ant invasions. Annual Review of Ecology and Systematics, 33, 181-233.

Kenné, M., Corbara, B., Dejean, A. (1999). Impact des fourmis sur les plantes cultivées en milieu tropical. L'année Biologique*,* 38, 195-212.

Kuijt, J. (1969). The biology of parasitic flowering plants. Univ. of California Press (Ed.), Berkeley and Los Angeles, 246p.

Le Breton, J., Jourdan H., Chazeau, J., Orivel, J., Dejean, A. (2005). Niche opportunity and ant invasion: the case of *Wasmannia auropunctata* in a new Caledonian rain forest. J. Trop. Ecol., 21, 93-98.

Leston, D. (1973). The ant mosaic-tropical tree crops and the limiting of pest and deseases. Pans, 19, 311-341.

Mony, R., Ondoua, J.M., Dibong, S.D., Boussim, I.J., Amougou, A. (2009). Myrmécofaune arboricole associée aux couples *Phragmanthera capitata* (Sprengel) S. Balle*/* hôtes au verger de la chefferie de Ndogbong (Douala, Cameroun). Int. J. Biol. Chem. Sci., 3(6), 1346-1356.

Mony, R., Dibong, S.D., Ondoua, J.M., Boussim, I.J., Amougou, A., Bilong Bilong. (2010a). Ants and *Phragmanthera capitata* (Sprengel) S. Balle (Loranthaceae) impacts on considerable damages caused on the fruit trees of the Ndogbong (Douala, Cameroon) chieftaincy. J. Agric. Ext. Rural Dev., 2(3), 048-053.

Mony, R., Dibong, S.D., Ondoua, J.M., Engone Obiang, NL.., Boussim, I.J., Amougou A., Bilong Bilong. (2010b). Contribution of tree ants towards the low production of fruits in *Phragmanthera capitata* (Sprengel) S. Balle (Loranthaceae). J. Cell Animal Biol., 4(6), 96-102.

Ngnegueu, P.R., Dejean, A. (1991). Relations plantes-fourmis au niveau des troncs d'arbres. In biologie d'une canopée de forêt équatoriale II. Rapport de mission : radeau des cimes octobre-novembre 1991. Réserve de Campo, Cameroun. F. Hallé et O. Pascal, Fondation ELF, p. 81-82.

Overfield, D., Riches, C., Asamoah, M., Sarkodie, O., Baah, F. (1998). A farming systems analysis of the Mistletoes problem in Ghanaian cacao. Cacao Growers Bull., 51, 43-49.

Peter-Contesse, J. (1937). Influence du gui sur la production de bois de service. Journal Forestier Suisse, 7, 145-153.

Plagnat, F. (1950). Le gui du sapin. Annales de l'école nationale des eaux et forêts, tome XII, 155-231.

Polhill, R., Wiens, D.W. (1998). Mistletoes of Africa. Kew ed. ISBN, 370p.

Pourtet, J. (1961). La culture du peuplier. Paris, Baillières et fils, 2^{e} éd., 261 p.

Priya, D. (1983). Birds and neotropical mistletoes. Effects on seedling recruitment. *Oecologia,* 60, 271-273.

Sallé, G., Turquet, C., Raynal-Roques, A. (1998). Biologie des phanérogames. C. R. Biol., 192, 36p.

Sonké, B., Kenfack, D., Tindo, M. (2000). Parasitisme de l'avocatier, *Persea americana* (Lauracées) par les Loranthacées dans la région de Yaoundé (Cameroun). Fruits, 55, 325-331.

Schulze, E.D., Lange, O.D., Ziegler, H., Gebacier, G. (1992). Carbon and Nitrogen fixing hosts on CAM plants in the Namib desert confirm partial heterotrophy. Oecologia, 88, 457-462.