



Full Length Research Article

EVALUATION OF THE LEVEL OF INFESTATION SPECIES OF AGROECOSYSTEMS WOODY BY LORANTHACEAE IN THE REGION SUD-COMOE (CÔTE D'IVOIRE)

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ABSTRACT

In Côte d'Ivoire, the Loranthaceae infect many wild and cultivated woody species. In the Sud-Comoe region, a study evaluating the level of infestation of Loranthaceae on woody species of agroecosystems showed that 115 host species distributed in 77 genera and 34 families are parasitized by the Loranthaceae. The families of the attacked host taxa are Caesalpiniaceae, Moraceae, Euphorbiaceae, Mimosaceae, Apocynaceae and Rutaceae. The results, show that the average infection rate is 37,94 p.c. (per cent) and intensity of infestation is 8,15 tufts/tree. Seven Loranthaceae species have been identified. *Tapinanthus bangwensis* is ubiquitous with greater frequency and abundance (39,84 p.c.) in the study area. Parasitism Loranthaceae is a scourge to be considered. It is therefore essential and urgent to develop a targeted control research program for fruit trees, source of income for farmers.

INTRODUCTION

The Loranthaceae are shrubs, chlorophyll hemiparasites who live on cultivated tree branches or not (Aké-Assi, 1984). Their presence on the branches of a subject, causes a decrease in the growth of the host individual. According Sallé *et al.* (1998), parasitic plants, once attached to the host branch through a sucker, takes water, minerals needed to develop on its hosts. Following the various climate changes as a result of ecological changes linked to the destruction of primary vegetation, became the Loranthaceae an ecological and agronomic problems (Kuijt, 1969) given the extent of the damage. Keeping in view the above facts, this work is a contribution to the knowledge and the effective fight against parasitism Loranthaceae on woody plants in agroecosystems.

MATERIALS AND METHODS

Study site

The study site chosen is the Sud-Comoe, an administrative area that covers an area of 800 km².

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It includes three departments: Aboisso (5° 66 'and 5° 28' north latitude and 3° 12 'and 3° 20' west longitude), Grand-Bassam (5° 26 'and 5° 13' North latitude and 3° 44 'and 3° 58' east longitude), Adiaké (5° 28 'and 5° 21' north latitude and 3° 16 'and -3° 08' west longitude). The choice of this region is driven by a high frequency of Loranthaceae on trees and shrubs of agro-ecosystems. Average annual rainfall is 1500 mm. The annual average temperature is 27 ° C. The vegetation is characterized by small islands of forest, protected forests and anthropogenic formations (fields, plantations).

Materials

The plant material was composed of woody flora of agro-ecosystems and species Loranthaceae. The technical equipment includes a global positioning system (GPS), digital camera, binoculars, rope and ribbon-meter.

Methods

The work took place from 2007 to 2009. Investigations were carried out in agroecosystems of the Sud-Comoe region, particularly in cocoa and coffee farms. The farms were selected by a random draw, at random, based on the list of all

the plantations of cocoa and coffee, listed by the Departmental Directorate of Agriculture. The method of surface readings was used to collect data from the field. It was to delineate plots of one hectare each area (100m x 100m), arranged alternately at different places in the plantations. For a thorough floristic inventory, the plot was divided into strips 10 meters wide and 100 meters long. For a thorough floristic inventory, the plot was divided into strips 10 meters wide and 100 meters long. For band, parasitized and healthy individuals, the clumps of parasites parasitized on each individual were counted.

The collected data were used to determine: - rate of infestation (Tx)= (number of individuals infected / total number of individuals present) x100;

- intensity of infestation (Ii) = total number of tufts of Loranthaceae / number total individuals infested identified. Statistical analyzes of the results were made in Excel 5.0.

RESULTS

Floraagroeco systems inventoried

Table 1 shows the floristic composition of agroecosystems inventoried. There is a high proportion of fruit trees and bushes (avocado, citrus...) present in the plantations. In total, 115 species distributed in 77 genera and 34 families, parasitized by seven Loranthaceae species were inventoried. The seven parasitic species encountered are *Tapinanthus bangwensis* (Engl. K. Krause) Dancing (Figure 1), *Tapinanthus belvisii* (DC) Dancing, *Tapinanthus sessilifolius* var. *glaber* (P. Beauv.) Van Tiegh. (Figure 2), *Phragmanthera capitata* (Spreng.) Ballé (Figure 3), *Phragmanthera capitata* var. *alba* (Spreng.) Ballé (Figure 4), *Globimetula braunii* (Engl.) Van Tiegh. and *Globimetula dinklagei* subsp. *assiana* (Engl.).



Figure 1. Flowering Branches of *Tapinanthus bangwensis* (Engl. et K. Krause)

The data in the table show that over 12 086 individuals inventoried, 4 586 are infected (Table 1). The families of the

parasitized host species are Caesalpiniaceae (13 taxa, or 48,23 p.c.), Moraceae (10 taxa, or 29,41 p.c.), Euphorbiaceae and Mimosaceae each with 9 taxa (26,47 p.c.), Apocynaceae and Rutaceae taxa with 7 each, or 20,59 p.c.



Figure 2. Flowering and fruiting branches of *Tapinanthus sessilifolius* (P. Beauv) Van Tiegh

Estate of infestation of trees and shrubs identified

Regarding the degree of infestation, Table1 indicates that the rate of parasitism varies host species. It is between 1,46 and 84,95 p.c. Attacked taxa include *Cecropia peltata* (84,95 p.c.), *Spondias mombin* (75,24 p.c.), *Acacia mangium* (71,42 p.c.), *Theobroma cacao* (67,27 p.c.), *Hevea brasiliensis* (58,18 p.c.), *Pycnanthus angolensis* (56,20 p.c.), *Cola nitida* (54,98 p.c.), *Funtumia elastica* (51,78 p.c.), *Anthocleista djalonenis* (50,98 p.c.), *Bombax buonopozense* (49,80 p.c.), *Gmelina arborea* (50 p.c.), *Rauwolfia vomitoria* (44,97 p.c.) and *Persea americana* (44,34 p.c.). As for the intensity of infestation, there in *Acacia mangium* (19,60 tufts/tree), *Hevea brasiliensis* (14,14 tufts/tree), *Tectonia grandis* (13,28 tufts/tree) and *Persea americana* (12,76 tufts/tree). Eleven well-known fruit species are variously parasitized by Loranthaceae in agroecosystems. Their infestation rate is between 1,46 and 58,33 p.c. These are in descending order, *Anacardium occidentale* (58,33 p.c.), *Cola nitida* (54,98 p.c.), *Persea americana* (44,34 p.c.) *Citrus grandis* (35,71 p.c.), *Citrus limon* (35,41 p.c.), *Citrus reticulata* (33,33 p.c.), *Citrus sinensis* (27,31 p.c.), *Citrus aurantium* (23,91 p.c.), *Annona muricata* (10, 22 p.c.), *Psidium guajava* (13,83 p.c.) and *Mangifera indica* (1,46 p.c.). Similarly, perennial crops have a parasitism rate of between 6,36 and 67,27 p.c. This is *Theobroma cacao* (67,27 p.c.), *Hevea brasiliensis* (58,18 p.c.), *Coffea arabusta* (10,51 p.c.) and *Coffea canephora* var. *robusta*(6,36p.c.). Overall, about 12,086 individuals surveyed, 4,586 are infected. The average infestation rate is 37,94 p.c. and infestation intensity tufts 8,15/tree for the 115 individuals identified (Table 1).

Table 1. Flora and woody estate of infestation of host taxa according to the inventory

Genres & species	family	present individuals	infected individuals	Total tufts	Rat. Inf. (p.c.)	Int. inf.
<i>Acacia mangium</i>	Mimosaceae	126	90	1764	71,42	19,6
<i>Adansonia digitata</i>	Bombacaceae	6	2	7	33,33	3,5
<i>Azelia africana</i>	Caesalpiniaceae	137	27	112	19,7	4,14
<i>Azelia bipindensis</i>	Caesalpiniaceae	12	5	13	41,66	2,6
<i>Albizia adianthifolia</i>	Mimosaceae	23	4	6	17,39	1,5
<i>Albizia ferruginea</i>	Mimosaceae	7	3	6	42,85	2
<i>Albizia zygia</i>	Mimosaceae	12	5	12	41,66	2,4
<i>Alchornea cordifolia</i>	Euphorbiaceae	19	8	18	42,1	2,25
<i>Alstonia boonei</i>	Apocynaceae	30	6	19	20	3,16
<i>Amphimas pterocarpoides</i>	Caesalpiniaceae	18	6	9	33,33	1,5
<i>Anacardium occidentale</i>	Sapindaceae	12	7	15	58,33	2,14
<i>Annona muricata</i>	Annonaceae	88	9	27	10,22	3
<i>Anthocleista djalensis</i>	Loganiaceae	51	26	87	50,98	3,34
<i>Anthocleista nobilis</i>	Loganiaceae	165	29	116	17,57	4
<i>Antiaris toxicaria</i>	Moraceae	3	1	2	33,33	2
<i>Azadirachta indica</i>	Meliaceae	12	2	15	16,66	7,5
<i>Baphia bancoensis</i>	Fabaceae	4	2	5	50	2,5
<i>Baphia nitida</i>	Fabaceae	480	105	195	21,87	1,85
<i>Baphia pubescens</i>	Fabaceae	24	5	8	2083	1,6
<i>Berlinia heudelotiana</i>	Caesalpiniaceae	7	2	8	28,57	4
<i>Bixa orellana</i>	Bixaceae	4	1	2	35	2
<i>Blighia sapida</i>	Sapindaceae	57	3	12	5,26	4
<i>Blighia welwitschi</i>	Sapindaceae	4	2	4	50	2
<i>Bombax buonopozense</i>	Bombacaceae	251	125	326	49,8	2,58
<i>Bombax costatum</i>	Bombacaceae	5	3	6	60	2
<i>Bridelia grandis</i>	Euphorbiaceae	53	4	6	7,54	1,5
<i>Bridelia micrantha</i>	Euphorbiaceae	51	4	6	7,84	1,5
<i>Caesalpinia bondouc</i>	Caesalpiniaceae	8	3	13	37,8	4,33
<i>Callistemon speciosus</i>	Myrtaceae	14	4	9	28,57	2,25
<i>Cassia alata</i>	Caesalpiniaceae	32	15	111	46,87	7,4
<i>Cassia mimosoides</i>	Caesalpiniaceae	7	2	5	28,57	2,5
<i>Cassia siamea</i>	Caesalpiniaceae	28	5	20	17,85	4
<i>Cassia sieberiana</i>	Caesalpiniaceae	6	2	5	33,33	2,5
<i>Cecropia peltata</i>	Cecropiaceae	226	192	1298	84,95	6,76
<i>Celtis mildbraedii</i>	Ulmaceae	8	3	10	37,5	3,33
<i>Chrysobalanus ellipticus</i>	Chrysobalanaceae	5	1	3	20	3
<i>Citrus aurantium</i>	Rutaceae	46	11	71	23,91	6,45
<i>Citrus grandis</i>	Rutaceae	14	5	13	35,71	2,6
<i>Citrus limon</i>	Rutaceae	144	51	142	35,41	2,78
<i>Citrus reticulata</i>	Rutaceae	3	1	1	33,33	1
<i>Citrus sinensis</i>	Rutaceae	410	112	741	27,31	6,61
<i>Clappertonia minor</i>	Tiliaceae	12	3	4	25	1,33
<i>Cleppertonia ficifolia</i>	Tiliaceae	21	4	15	19,04	3,75
<i>Cnestis ferruginea</i>	Connaraceae	6	2	8	33,33	4
<i>Coffea arabusta</i>	Rutaceae	352	37	73	10,51	1,97
<i>Coffea canephora</i> var. <i>robusta</i>	Rutaceae	424	27	70	6,36	2,59
<i>Cola caricifolia</i>	Sterculiaceae	2	1	2	50	2
<i>Cola nitida</i>	Sterculiaceae	893	491	4754	54,98	9,68
<i>Cordia platythyrsa</i>	Boraginaceae	5	2	4	40	2
<i>Delonix regia</i>	Caesalpiniaceae	3	1	2	33,33	2
<i>Detarium microcarpum</i>	Caesalpiniaceae	12	2	5	16,66	2,5
<i>Detarium senegalensis</i>	Ebenaceae	7	2	5	28,57	2,5
<i>Diospyros crassifolia</i>	Ebenaceae	5	1	2	20	2
<i>Diospyros mannii</i>	Caesalpiniaceae	23	7	21	30,43	3
<i>Erythrina fusca</i>	Fabaceae	44	5	17	11,36	3,4
<i>Eugenia jambos</i>	Myrtaceae	123	9	11	7,31	1,22
<i>Eugenia malaccensis</i>	Myrtaceae	6	2	7	33,33	3,5
<i>Eugenia miegeana</i>	Myrtaceae	8	3	14	37,5	4,66
<i>Eugenia owariensis</i>	Rubiaceae	13	2	6	15,38	3
<i>Ficus capensis</i>	Moraceae	7	2	5	28,57	2,5
<i>Ficus exasperata</i>	Moraceae	280	25	121	8,92	4,84
<i>Ficus leonensis</i>	Moraceae	45	13	23	28,88	1,76
<i>Ficus lutea</i>	Moraceae	36	4	12	11,11	3
<i>Ficus sur</i>	Moraceae	2	1	2	50	2
<i>Ficus thonningii</i>	Moraceae	59	5	19	8,47	3,8
<i>Funtumia elastica</i>	Apocynaceae	112	58	97	51,78	1,67
<i>Garcinia kola</i>	Clusiaceae	4	1	3	25	3
<i>Glyphaea brevis</i>	Tiliaceae	481	65	115	13,51	1,76
<i>Gmelina arborea</i>	Verbenaceae	2	1	2	50	2
<i>Gossypium barbadense</i>	Malvaceae	3	1	3	33,33	3
<i>Hevea brasiliensis</i>	Euphorbiaceae	605	352	4978	58,18	14,14
<i>Jatropha curcas</i>	Euphorbiaceae	30	3	9	10	3
<i>Leucaena leucocephala</i>	Mimosaceae	7	2	4	28,57	2

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<i>Leucaena glauca</i>	Mimosaceae	7	2	7	28,57	3,5
<i>Lophira alata</i>	Ochnaceae	5	2	7	28,57	3,5
<i>Macaranga heudelotii</i>	Euphorbiaceae	63	27	143	42,85	5,29
<i>Magaritaria discordea</i>	Euphorbiaceae	41	7	42	17,97	6
<i>Mangifera indica</i>	Anacardiaceae	342	5	31	1,46	5,2
<i>Manihot esculenta</i>	Euphorbiaceae	223	15	28	6,72	1,86
<i>Manihot glaziovii</i>	Euphorbiaceae	49	2	6	4,08	3
<i>Milicia excelsa</i>	Moraceae	9	2	13	22,22	6,5
<i>Milicia regia</i>	Moraceae	22	6	14	27,27	2,33
<i>Millittia zechiana</i>	Fabaceae	5	2	7	40	3,5
<i>Morinda lucida</i>	Rubiaceae	6	3	6	50	2
<i>Newbouldia laevis</i>	Bignoniaceae	220	25	52	11,36	2,08
<i>Pentaclethra macrophylla</i>	Mimosaceae	9	2	7	2,22	3,5
<i>Persea americana</i>	Lauraceae	681	302	3855	44,34	12,76
<i>Picralima nitida</i>	Apocynaceae	9	2	5	22,22	2,5
<i>Piptadeniastrum africanum</i>	Mimosaceae	33	12	143	36,36	11,91
<i>Psidium guajava</i>	Myrtaceae	535	74	330	13,83	4,45
<i>Psidium pyriferum</i>	Myrtaceae	4	1	1	25	1
<i>Pycnanthus angolensis</i>	Myristicaceae	532	299	2758	56,2	9,22
<i>Rauwolfia macrophylla</i>	Apocynaceae	13	4	14	30,76	3,5
<i>Rauwolfia vomitoria</i>	Apocynaceae	438	197	959	44,97	4,86
<i>Rhizophora racemosa</i>	Rhizophoraceae	3	1	13	33,33	13
<i>Sabicea africana</i>	Rubiaceae	7	2	5	28,57	2,5
<i>Solanum melongena</i>	Solanaceae	243	23	64	3,46	2,78
<i>Spondias mombin</i>	Anacardiaceae	1244	939	6831	75,24	7,27
<i>Spondias purpurea</i>	Anacardiaceae	5	2	6	40	3
<i>Sterculia tragacantha</i>	Sterculiaceae	21	7	24	33,33	3,42
<i>Tamarindus indica</i>	Caesalpiniaceae	9	2	5	22,22	2,5
<i>Tarrieta utilis</i>	Sterculiaceae	5	2	9	40	4,5
<i>Terminalia catappa</i>	Combretaceae	13	5	56	38,46	11,2
<i>Tectonia grandis</i>	Verbenaceae	124	21	279	16,93	13,28
<i>Terminalia ivoriensis</i>	Combretaceae	9	3	11	33,33	3,66
<i>Terminalia mantaly</i>	Combretaceae	4	1	5	25	5
<i>Terminalia superba</i>	Combretaceae	6	2	7	33,33	3,5
<i>Tetrapleura tetraptera</i>	Mimosaceae	23	6	28	26,08	4,66
<i>Theobroma cacao</i>	Sterculiaceae	773	520	5854	67,27	11,25
<i>Thevetia peruviana</i>	Apocynaceae	3	1	2	33,33	2
<i>Treculia africana</i>	Moraceae	8	2	8	25	4
<i>Trichilia djalonensis</i>	Meliaceae	5	2	7	40	3,5
<i>Trichilia monadelpha</i>	Meliaceae	13	3	15	23,07	5
<i>Voacanga africana</i>	Apocynaceae	51	12	31	23,52	2,58
<i>Xylopiya aethiopica</i>	Annonaceae	27	12	34	44,44	2,83
Total		12086	4586	37383	37,94	8,15
Average		105,1	39,87	325,06	37,94	8,15

Tx int -Rate infestation; Int inf - infestation intensities

Table 2. Summary of the number of stray tufts per timber depending on inventory inventory

	Total tufts	Number of live parasites tufts						
		<i>Tb</i>	<i>Tbel</i>	<i>Ts</i>	<i>Pcva</i>	<i>Pc</i>	<i>Gbr</i>	<i>Gd</i>
Total	37383	14891	319	3930	6583	9231	2248	181
Average	325,06	129,49	2,77	34,17	57,24	80,27	19,55	1,57
		39,84	0,85	10,51	17,61	24,7	6,01	0,48

Tb - *Tapinanthus bangwensis*; *Tbel* - *Tapinanthus belvisii*; *Ts* - *Tapinanthus sessilifolius* var. *glaber*; *Pcva* - *Phragmanthera capitata* var. *alba*; *Pc* - *Phragmanthera*; *Gbr* - *Globimetula braunii*; *Gd* - *Globimetula dinklagei* subsp. *assiana*

Table 2 on parasitism Loranthaceae on this timber *Tapinanthus bangwensis* as the species most common (ubiquitous) and most abundant in the region, with an average number of tufts of 39,84 p.c. It is followed in the order descending by *Phragmanthera capitata* (24,7 p.c.), *Phragmanthera capitata* var. *alba* (17,61 p.c.) and *Tapinanthus sessilifolius* var. *glaber* (10,51 p.c.). Furthermore, *Tapinanthus belvisii* is the only species found in the littoral part of the study area (Grand-Bassam)

DISCUSSION

Seven species of Loranthaceae were inventoried and identified the 11 identified in the Ivorian forest zone (Balle and Halle, 1961).

This difference in number of species is due to the extent of the study area and the ecological environment studied. However, this number is higher than 5 species inventoried by Soro (2010) in orchards to the west. *Tapinanthus bangwensis* ubiquitous species, the most abundant of the seven parasitic species inventoried in agroecosystems of the region. This high parasitism *Tapinanthus bangwensis* also reported by Soro *et al.* (2004b) who say it is one of the most abundant parasites on Karités natural park Tengrela. *Tapinanthus belvisii* is encountered in the coastal part of the study area. These results were confirmed Amon (2006). The average rate of infection of woody hosts by Loranthaceae in agro-ecosystems is 37.4 p.c. This rate is higher than that obtained by Soro *et al.* (2009) which is 29,05 p.c. in Legumes test/cocoa trees in forest area of the Côte d'Ivoire. The results for the magnitude of the

scourge show that most of the known fruit trees (*Cola nitida*, *Persea americana*, *Psidium guajava*...) are parasitized by Loranthaceae. The parasitism of the fruit by Loranthaceae is confirmed by Dibong *et al* (2008 and Houénon *et al.* (2012). *Dolonix regia* and *Mangifera indica* resistant to parasitism Loranthaceae according to the literature were found infested (Boussim *et al.*, 1995; These results make us think that today there is certainly no Loranthaceae resistant species, but rather undiscovered species parasitized by hemiparasites.

Conclusion

Agroecosystems of the Sud-Comoé region of south-eastern Côte d'Ivoire are home to seven species of parasites. The degree of parasitism of wood in the study area by Loranthaceae depends guests. *Tapinanthus bangwensis* and *Phragmanthera capitata* are ubiquitous and the most abundant of the seven species of Loranthaceae inventoried. In view of the different degrees of attack and especially the socio-economic importance of certain fruit species attacked, an outreach program and a major struggle remain essential.

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