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## RESEARCH ARTICLE

# DIVERSITY OF LORANTHACEAE AND FRUIT SPECIES: CASE OF PLANTATIONS IN RURAL AREAS OF THE CITY OF DALOA IN CÔTE D'IVOIRE

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**ABSTRACT**

The study aims to know the diversity of Loranthaceae in fruit species associated with crops and to establish their degree of infestation in the plantations in the rural area of the city of Daloa. The inventories by surface and intinerant surveys combined with direct observations were carried out in the plantations. Twelve fruit species being to 8 genera and 7 families were inventoried. They are parasitized by 3 species of Loranthaceae: *Phragmanthera capitata*, *Tapinanthus bangwensis* and *T. globiferus*. *T. bangwensis* is the most infesting parasite. Among the fruit species recorded, *Citrus sinensis* (78.92% and 4.46 tufts/plant), *Persea americana* (73.82% and 5.23 tufts/plant), *Psidium guajava* (69.69% and 2.55 tufts/plant) and *Cola nitida* (56.24% and 9.84 tufts/plant) registered elevated pairs of infestation values (rate and intensity). *Citrus* with 41.67% of the host taxa is the most infested genus. The infestation rate of every fruit trees is of the order of 32.65% for an infestation intensity of 5.67 tufts/plant. For sustainable agriculture, the association of some fruit species with annuity crops under the influence of Loranthaceae should be followed and controlled.



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## INTRODUCTION

Loranthaceae or mistletoe are hemiparasitic vascular plants that negatively affect the growth and economic value of the other plants they parasitize (Salle, 2004). These hemiparasitic, once developed on the branches of an individual, turn away water and mineral salts from the parasitic subject with the help of a sucker. The growth of the host is then slowed down and eventually fades away (Boussim, 2002; Jiofack *et al*., 2010). In Côte d'Ivoire, the fruit species associated with crops in the plantations of the rural area of the city of Daloa, which constitute an important food and economic source for the peasants, have over the years become their preferred target because of deforestation abusive (Soro, 2010; Dibong *et al*., 2009). Today, crossing the countryside, rare are these fruit species that are not parasitized. Observed with this circumstances, it is serious to set the degree of expansion of this plant biodiversity of the Loranthaceae family on fruit species for the sake of their sustainable conduct. In this context, what are the species of Loranthaceae involved in the infestation of fruit species in plantations of the rural areas of the city of Daloa? What is their degree of infestation on fruit species? To answer these questions, this study proposes to contribute to a better knowledge of Loranthaceae, parasites of fruit species associated with crops and to assess their degree of infestation in the plantations of rural areas of the city of Daloa.

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## MATERIAL AND METHODS

**Study Area :** The study was carried out in the plantations of the rural area of the city of Daloa with geographical coordinate's 6°27'00" North Latitude and 5°56'00" West Longitude. It is located 408 km from Abidjan. The climate of the study area is equatorial with two rainy seasons and two dry seasons. The annual rainfall oscillate from 1300 to 1800 mm. The annual average temperature is 27.0°C. The vegetation belongs to the mesophilic sector of the Guinean domain (Guillaumet and Adjanohoun, 1971), today made up of mosaics of forests and shrub savannhas.

**Collection of data :** The methods used were 50 m x 50 m level surveys, itinerant and direct remarks of Loranthaceae species for data collection. Parasitized and non-parasitized fruit species were identified in the plantations in the rural area of the city of Daloa.

On fruit species, the number of Loranthaceae tufts was counted. The data collected made it possible to determine (Amon 2014):

- Infestation rate (Txi): $Txi = \frac{Nip}{Nti} \times 100$

with Txi - Infestation rate; Nip - Number of parasitized individuals; Nti - Total number of individuals identified;

- Intensity of infestation (Ii): $Ii = \frac{Nt}{Ntii}$

with Ii - Intensity of infestation ; Nt - Total number of Loranthaceae tufts; Ntii - Total number of infested individuals identified.

These are: *Globimetula dinklgei*, *Phragmanthera capitata* (Spreng.) Ballé, *Tapinanthus bangwensis* (Engl. and K. Krause) Danser, *T. globiferus* (A. Rich.) Tiegh..

**Fruit species hosts of Loranthaceaeae :** Inventories showed that 12 fruits species parasitized by Loranthaceae in the plantations of the rural area of city of Daloa. They belong to 8 genera and 7 families (Table 2). Rutaceae with 5 taxa, or 41.67% is the most parasitized family. Next come the Myrtaceae with 2 taxa (16.67%). The other 4 families have 1 species each (8.33%). *Citrus* (5 species) is the most infested genus, eiyher 41.67%.

**Degree of infestation of fruit species :** The values of infestation rates of fruit species by Loranthaceae in the plantations of the rural area of the city of Daloa oscillate 31.56 to 78.92% (Table 2). The most attacked fruit trees are:

**Table 2. Degree of infestation of fruit species of Loranthaceae**

| Species & Families | Parasitic species | | | | Nb ind | Nb indinfts | Nb tufts | Inf rate (%) | Infint |
|---|---|---|---|---|---|---|---|---|---|
| | *Gd* | *Pc* | *Tb* | *Tg* | | | | | |
| Anacardiaceae | | | | | | | | | |
| *Anacadium occidentale* L. | - | - | + | - | 412 | 197 | 275 | 47.82 | 1.40 |
| Annonaceae | | | | | | | | | |
| *Annona muricata* L. | - | + | + | - | 995 | 314 | 427 | 31.56 | 1.36 |
| Rutaceae | | | | | | | | | |
| *Citrus aurantium* L. | - | + | + | - | 1076 | 491 | 565 | 45.63 | 1.15 |
| *Citrus grandis* Osbek | - | + | + | - | 514 | 195 | 203 | 37.94 | 1.04 |
| *Citrus limon* (L.) Burm. f. | - | + | + | - | 1040 | 351 | 479 | 33.75 | 1.36 |
| *Citrus reticulate* Blanco | - | - | + | - | 7 | 3 | 3 | 42.86 | 1.00 |
| *Citrus sinensis* (L.) Osbek | + | + | + | - | 370 | 292 | 1301 | 78.92 | 4.46 |
| Sterculiaceae | | | | | | | | | |
| *Cola nitida* (Vent.) Schott & Endl. | + | + | + | + | 873 | 491 | 4832 | 56.24 | 9.84 |
| Myrtaceae | | | | | | | | | |
| *Eugenia malaccensis* L. | - | + | + | - | 106 | 59 | 107 | 55.66 | 1.81 |
| *Psidium guajava* L. | - | + | + | - | 881 | 614 | 1564 | 69.69 | 2.55 |
| *Persea americana* Mill. | + | + | + | - | 1081 | 798 | 4170 | 73.82 | 5.23 |
| Combretaceae | | | | | | | | | |
| *Terminalia catappa* L. | - | + | + | - | 733 | 379 | 1052 | 51.71 | 2.78 |
| Total | 3 | 10 | 12 | 1 | 8088 | 4184 | 14978 | 52.13 | 2.83 |

NB: (-) - Absence; (+) - Presence; Nb - Number; ind - individuals; tfs - tufts; Tx - Rate; inf - infestation; Int - Intensity; infts-infested

**Fig. 6. Avocado tree: *Persea americana* strongly parasitized**

## RESULTS

**Diversity of Loranthaceae encountered :** Four species of Loranthaceae have been identified on the fruit species of plantations in rural areas of the city of Daloa. They are divided into 3 genres.

*Citrus sinensis* with an average rate of 78.92%, *Persea americana* (73.82%) figure (1), *Psidium guajava* (69.69%) and *Cola nitida* (56.24%). Among these fruit species, *Annona muricata* (31.56%), *Citrus limon* (33.75%) and *Citrus grandis* (37.94%) recorded the lowest infestation rates. The infestation intensities of Loranthaceae on fruit trees evaluated change from 1 to 9.84 tufts/plant (Table 2).

*Citrus sinensis* (4.46 tufts/plant), *Cola nitida* (9.84 tufts/plant) and *Persea americana* (5.23 tufts/plant) constitute the most infested fruit trees. The average infestation rate of fruit trees in plantations in rural areas of the city of Daloa is 52.13% and the infestation intensity is 2.83 tufts/plant.

## DISCUSSION AND CONLUSION

The study on the diversity of Loranthaceae and fruit species in plantations in the rural area of the city of Daloa made it possible to identify 4 species of Loranthaceae: *Phragmanthera capitata* var. *capitata* (Spreng.) Ballé, *Tapinanthus bangwensis* (Engl. And K. Krause) Danser, *T. globiferus* (A. Rich.) Tiegh. This result is related to that of Soro (2010) who inventoried 5 species in Oumé, Gagnoa and Soubré, in the Central-West and in the South-West of Côte d'Ivoire. Among these parasitic species, three (3) have already been reported by Amon (2014) in agroecosystems in the South-East of Côte d'Ivoire. The presence of these parasites on fruit trees in the Central-West is said to be dependent on their wide distribution in Côte d'Ivoire (Amon, 2014). Ofthe 11 fruit species mentioned, *Citrus sinensis* with a rate of 78.92%, followed by *Persea americana* (73.82%), *Psidium guajava* (69.69%) and *Cola nitida* (56.24%) are the most parasitized. The strong parasitism ofthese fruit species by Loranthaceae. These results confirm the work of Cleck (1978) in Ghana on *Cola nitida*, Dibong *et al.* (2009) *on Persea americana* in Cameroon and Ahamide *et al*. (2015) on *Citrus sinensis* in Benin. The rate of infestation of Loranthaceae on fruit species associated with the crops of plantations in rural areas ofthe city of Daloa is 32.65%. This rate is significantly lower than the 59.87% obtained in Benin in citrus plantations by Houenon *et al*. (2012). This observed difference could be explained by the difference in the areas explored, some of which would be more favorable to the infestation of Loranthaceae. The Loranthaceae of the plantations of the rural area of the city of Daloa include 4 species (*Phragmanthera capitata* var. *capitata*, *Tapinanthus bangwensis* and *T. globiferus*). They parasitize 12 fruit species. Among these parasitic species, *Tapinanthus bangwensis* is the most infesting. Three of the 12 fruit species were identified as with a higher parasite sensitivity: *Citrus sinensis*, *Cola nitida* and *Persea americana* and 4 having a high rate of infestation, namely: *Cola nitida*, *Citrus sinensis*, *Persea americana* and *Psidium guajava* are the most attacked fruit species. The infestation rate of Loranthaceae on all the fruit species is 32.65% and the infestation intensity is 5.6 tufts/plant.

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**Conflict of interest**

The authors declare that they have no conflict ofinterest.

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