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AMON Anoh Denis-Esdras
Agroforestry Training and
Research Unit, University Jean
Lorougnon Guedé, BP 150
Daloa, Côte d'Ivoire

SEGUENA Fofana
Institute of Agropastoral
Management, University
Péléforo Gon Coulibaly, BP 1328
Korhogo, Côte d'Ivoire

SORO Kafana
Ecology Research Center,
University Nangui Abrogoua
(CRE / UNA), 08 BP 109
Abidjan 08, Côte d'Ivoire

SORO Dodiomon
Botanical Laboratory,
Biosciences Training and
Research Unit, University Félix
Houphouët-Boigny, 22 BP 582
Abidjan 22, Côte d'Ivoire

N'GUESSAN Koffi
Botanical Laboratory,
Biosciences Training and
Research Unit, University Félix
Houphouët-Boigny, 22 BP 582
Abidjan 22, Côte d'Ivoire

Correspondence

AMON Anoh Denis-Esdras
Agroforestry Training and
Research Unit, University Jean
Lorougnon Guedé, BP 150
Daloa, Côte d'Ivoire

Ethnobotany study of Loranthaceae, hemiparasitic plants used in traditional medicine by population, in the Sud-Comoé region (Côte d'Ivoire)

AMON Anoh Denis-Esdras, SEGUENA Fofana, SORO Kafana, SORO Dodiomon and N'GUESSAN Koffi

Abstract

Hemiparasitic vascular plants of the Loranthaceae family constitute an important part of biodiversity. Widely distributed throughout the world in tropical and temperate zones, the latter play an important role in the health of local populations. It is estimated that more than 80% of the population uses medicinal plants, including Loranthaceae for its health care. It is therefore important to make an inventory of traditional uses of these plants. This work was undertaken in order to know the therapeutic uses of Loranthaceae in the Sud-Comoé Region. Ethnobotanical surveys were conducted among regional traditional therapists for 3 years. In total, 7 species of Loranthaceae distributed in three genera are used to treat 33 human diseases. Of these 33 diseases, 8 are constantly cited: diarrhea, tooth decay, high blood pressure, fontanelle, malaria, migraine, rheumatism and sterility. The organs are mainly employed in the fresh state (95% response). Various modes of preparation are noted. Maceration (87% response) and decoction (58%) are most commonly used. The most frequently used modes of administration are drinking (79% responses), steam bath (55%) and enema (35%). Treatments are often accompanied by incantations. In view of the undeniable therapeutic properties of Loranthaceae, studies on the phytochemical and pharmacological properties of these plants should be carried out for possible applications in modern medicine.

Keywords: Loranthaceae, ethnobotany study, traditional medicine, medicinal virtues, pharmacological properties

1. Introduction

In Africa, medicinal plants are still the main recourse for the majority of the rural population in the face of the disease for socio-cultural, socio-economic and health reasons [16]. Today, according to studies, nearly 80% of this African population relies on traditional medicine for their primary health care [17]. The use of therapeutic plants by populations, especially epiphytic hemiparasitic plants of the family Loranthaceae, in the world for their care is very old.

Loranthaceae, which form a significant part of biodiversity, are strongly represented in the tropical and temperate world, with 950 species distributed among 77 genera [8]. In Côte d'Ivoire, where they are widely distributed according to the works of Aké-Assi [4], Amon [6], 24 species distributed in 6 genera have been reported. While the Loranthaceae have always enjoyed an extraordinary reputation and a mythical aura, it is because of their growth and particular way of life on the branches of other living plants [5]. According to the literature, they are widely used in the treatment of various pathologies [1, 21].

In Europe, Loranthaceae, commonly referred to as "African mistletoe", were once revered and used for care by the Celts, Greeks and Romans, as they symbolize a sign of immortality (Salle, 2004) [19]. Herbalists in Europe, since the 17th century, prescribed mistletoe against epilepsy and nervous disorders [14]. In many civilizations in Africa, Loranthaceae were used in medicinal or occult recipes linked to beliefs, to combat various human diseases [6, 20, 23]. Their frequent use in the treatment of certain pathologies is reported by several scientific works [10, 13, 18]. In Côte d'Ivoire, the use of these herbs in preparations of numerous medicinal recipes to treat diseases and spells has been reported by studies in various localities [3, 6, 20]. This study is a preliminary work that is based on ethnobotanical surveys. The objectives of the study are to take stock of the species of Loranthaceae used in the traditional environment of the

Sud- Comoé Region and to know their therapeutic virtues, in order to draw up research routes that can lead to the use of Loranthaceae in modern medicine.

2. Material and Methods

2.1 Study site

The study was conducted in the Sud-Comoé Region (Fig. 1), composed of the Department of Aboisso (coordinates between 5 ° 66 'and 5 ° 28' north latitude, between 3 ° 12 'and 3 ° 20' (located between 5 ° 28 'and 5 ° 21' north latitude, between 3 °

16 '3 ° 08' west longitude) and the Department of Grand-Bassam. Climate of the region is of the equatorial type of transition [9]. Is characterized by classified forests, sacred forests and anthropogenic formations [6].

The population of the Sud-Comoé is composed of indigenous people: Agnis (Sanwi, Ehoutilé, Essouma, Adouvlaïsohié) in the Departments of Aboisso and Adiaké; Abouré (Ehivé) and N'zimas in the Department of Grand-Bassam [7]. They are peasants, farmers, fishermen in general.



Fig 1: Administrative map of the Sud-Comoé Region (Côte d'Ivoire)

To these indigenous people are added allochtones (Baoulé, Senoufo, Wobe, Yacouba, Gouro, Abey, M'gbato, Attié and Bété) and allogenic from the sub region (Malian, Ghanaian, Nigerian, Nigerien, Mauritanian, Liberian, Togolese, Guinean and Beninese) employed as laborers in coffee, cocoa and rubber plantations. Within this population, there are people who often practice as healers or traditional therapists.

2.2 Material

The plant material is composed of the species of Loranthaceae used in the preparation of drug recipes. The ethnobotanical survey form constituted the bulk of the technical material (annex). A digital camera enabled shots.

2.3 Methods

Ethnobotanical surveys on Loranthaceae used in traditional medicine were carried out for 3 years in 30 villages in the Sud-Comoé Region (Côte d'Ivoire).

In order to conduct the investigation, a guide was used. On the basis of the information gathered and the indications received, traditional therapists were contacted. Appointments were made with 289 of them, 97 in Grand-Bassam, 105 in Aboisso and 87 in Adiaké. There are 268 men and 21 women from 7 ethnic groups. All are adults, aged between 35 and 60 years. The methodological approach used is semi-direct maintenance. Indeed, on the basis of an elaborated fact sheet, a questionnaire was proposed to the trained therapists interviewed. The interviews took place through interpreters speaking both French and a spoken language of the trained therapists interviewed.

Ethnobotanical surveys have identified the species of Loranthaceae cited by traditional therapists, the specific hosts on which they are actively sought, and the therapeutic uses associated with them. For each species, the plant organs used in the preparations for treating the pathology (s), the various drug recipes, as well as the methods of preparation and administration thereof, were noted.

In order to gain insight into the knowledge available to traditional healers about Loranthaceae, photos collected of certain species of Loranthaceae were presented during the interviews.

The samples of the latter used by the traditional therapists themselves were harvested. Identification of the samples taken was done at the National Center of Floristics (C.N.F.).

The survey data collected were grouped by village, gender and ethnic group and then processed using Excel 5.0 to determine the "response rate of people interviewed" (f). To facilitate the calculations, classes of uses were established: (1) medicinal uses and (2) medico-magical uses. The respondent response rate (f) is the percentage of the number of respondents to a given question (S) on the total number of interviewees (N). This parameter, as used by Van Den Eynden *et al.* [22], Kouyaté [13], Amon [6], allowed us to determine the proportion of people interviewed.

The "response rate of individuals interviewed" (f) is expressed

as a percentage and is calculated by the following formula:

$$f = \frac{S}{N} \times 100$$

3. Results

3.1 Socio-demographic Characteristics of traditional therapists

The data in table 1 show that 289 trained therapists belonging to 7 ethnic groups were interviewed, of which 268 men (92.73% of the total number of interviewees) and 21 women (7.27%) were interviewed.

More than half (60.21%) of the total number of respondents is illiterate. On average, 27.68% have primary school level and 12.11% have limited themselves to secondary school level.

Table 1: Distribution of traditional therapists according to their intellectual level

Sex	Intellectual level						Total number of individuals interviewed	%
	Illiterate		Primary		Secondary			
	Number of individuals interviewed	%	Number of individuals interviewed	%	Number of individuals interviewed	%		
H	157	54,32	76	26,30	35	12,11	268	92,73
F	17	5,89	4	1,38	0	0	21	7,27
Total	174	60,21	80	27,68	35	12,11	289	100

H - Men; F - Women

3.2 Reconnaissance des Loranthaceae par les tradipraticiens

The results of the survey (Table 2) show that traditional healers recognize (59% responses) the Loranthaceae species used. Of these, two are 100% recognizable by the majority of traditional healers, while the others are very often confused with these two species by 183 out of 289 trained therapists interviewed, or nearly 64%. It is *Tapinanthus bangwensis* (Engl. And K. Krause) Danser, from its red-colored flowers and the dark green apex and *Phragmanthera capitata* (Spreng.) Ballé, with its yellow-colored, red apex flowers,

widespread on the woody species of the region. They are denominated (63% of answers) under several names in local languages: "*gnamien tchouchouatchou*" in abouré, "*gnagon zoulé*" in agni, "*wakassou adjirè*" in the baoulé language, "*Ladon*" in malinké.

The results also reveal that at the genus level, the response rate for the Loranthaceae name varies from 0 to 75% in women and 64 to 100% in men. On the other hand, they are unable to attribute a name specifically to each species presented.

Table 2: Recognition of Loranthaceae by therapists (% of responses)

Recognition	Sex	Ethnic of traditional therapists							Av
		Yacouca	Malinké	Abouré	Mossi	Agni	Gouro	Baoulé	
Identification	H	67	85	83	84	76	80	73	59
	F	0	67	75	33	75	0	33	
Denomination local	H	67	85	100	84	97	80	64	63
	F	0	67	75	67	63	0	33	

H - Men; F - Women; Av - Average

3.3 Used Loranthaceae Species

In total, 7 species of Loranthaceae used by traditional healers in the Sud-Comoé Region have been identified and identified. They belong to three genera, namely: *Globimetula*, *Phragmanthera* and *Tapinanthus*. The genus *Tapinanthus* contains 3 species, representing 42.85% of the total species used. These are: *Tapinanthus bangwensis* (Engl. and K. Krause) Danser (Fig. 2), *Tapinanthus belvisii* (D C) Danser *Tapinanthus sessilifolius* var. *glaber* (P. Beauv.) Van Tiegh. Genus *Phragmanthera* is represented by two species. These are *Phragmanthera capitata* (Spreng.) Ballé (Fig. 3) and *Phragmanthera capitata* var. *alba* (Spreng.) Ballé. Similarly, *Globimetula* genus contains two species, *Globimetula braunii* (Engl.) Van Tiegh. and *Globimetula dinklagei* subsp. *assiana* (Engl.).



Fig 2: Inflorescences of *Tapinanthus bangwensis*



Fig 3: Leafy and flowering twigs of *Phragmanthera capitata*

3.4 Therapeutic uses of Loranthaceae

The results of the surveys show that Loranthaceae are recognized by traditional healers, of all sexes, as having therapeutic virtues to treat several pathologies. The results show that thirty-three (33) cases of diseases relieved by Loranthaceae were cited by all the traditional healers interviewed (Table 3). malinké treat 28 diseases with Loranthaceae, agni: 27 ailments and abouré, 24 against 19 in the mossi environment, 18 diseases in the traditional baoulé healers, 16 in the gourou milieu and 13 diseases among the yacouba healers. Of these, 8 are concomitantly cited by the majority of traditional healers. These include tooth decay, diarrhea, fontanelle, high blood pressure, sexual impotence, malaria, rheumatism and infertility.

The data in table 4 indicate that the plant parts used in the preparations of the medicated recipes are leaves, bark of stems or branches, inflorescences and fruits or pseudo-berries. (100% responses), stem barks (87% responses), flowers (44% responses) and fruits (20% responses) were listed in descending order of use. These organs are mainly employed in the fresh state (95% response).

It is noted that traditional therapists gourou and yacouba do not use the fruits of Loranthaceae in the treatment of pathologies (Table 4), while their homologues malinké, mossi, abouré,

agni and baoulé use the 4 plant organs mentioned (bark of stems, Leaves, flowers and fruits).

Fig 4 shows the different ways of preparing drug recipes. Maceration, decoction, infusion, pounding, mastication and softening are noted. Maceration with 87% of responses and decoction (58% of responses) are the most popular methods of preparation.

The drugs are administered in various forms (Fig. 5): in drinking, enema, steam bath and nasal instillations. Drugs are administered in various forms of beverage with 79% response is the most widely used method of administration.

3.5 Some recipes collected from traditional therapists

Gourou traditional healers use drinks and / or decoctate leaves of the Loranthaceae (*Zorhou*) associated with those of *Alchornea cordifolia*, crushed enema to treat amenorrhea.

In a malinké environment, traditional healers use a decoction of leaves and inflorescences of the Loranthaceae (*Ladon*) in a steam bath with application of the marks still warm on the chest to treat asthma.

Interviewed agni and abouré traditional therapists reported the use in friction of an ointment based on the leaves and fruits of dried Loranthaceae and *Xylopiya aethiopica* to cure rheumatism.

Table 3: Diseases treated with the Loranthaceae, quoted by the traditional therapists in ethnicity

Diseases	Yacouca	Malinké	Abouré	Mossi	Agni	Gourou	Baoulé
Amenorrhea			x	x	x	x	x
Asthma		x					x
Gonorrhea	x	x		x	x		x
Tooth decay	x	x	x	x	x	x	x
Cholera					x	x	
Constipation	x	x	x		x		
Cramp			x				
Itch		x		x	x	x	x
Diabetes		x			x		
Diarrhea	x	x	x	x	x	x	x
Back pain		x					
Lower back pain			x		x		x
Dysentery		x		x			
Swelling of the feet		x	x		x		x
Tired	x	x	x	x	x		
Gingivitis		x			x	x	
Influenza	x		x	x			x

x - treaty

Table 3: (following)

Diseases	Yacouca	Malinké	Abouré	Mossi	Agni	Gouro	Baoulé
Hemorrhoids		x	x		x	x	
High blood pressure	x	x	x	x	x	x	x
Sexual Impotence	x	x	x		x	x	x
Ovarian cysts				x			
Infant diseases	x	x	x	x	x	x	x
Sore throat	x	x	x			x	x
Chest pain			x				
Headache		x	x	x	x	x	
Earache					x		
Early menopause		x	x	x			x
Palpitation		x			x		
Malaria	x	x	x	x	x	x	x
Paralysis		x	x		x		
Painful periods		x			x	x	x
Rheumatism	x	x	x	x	x	x	x
Cold			x		x		
Sinusitis		x		x	x		
Sterility diseases	x	x	x	x	x	x	x
Cough			x				
Mental disorders		x		x	x		
Stomach ulcer		x	x		x		
Total individuals	13	28	24	19	27	16	18

x- treaty

Table 4: Organs of Loranthaceae used by traditional therapists (% of responses)

Organs	Ethnic of traditional therapists							Aver
	Yacouca	Malinké	Abouré	Mossi	Agni	Gouro	Baoulé	
Bark of stems	67	92	96	96	99	100	57	87
Leaves	100	100	100	100	100	100	100	100
Fruits	0	20	20	57	20	0	20	20
Flowers	67	57	20	67	20	20	57	44

Aver – Average

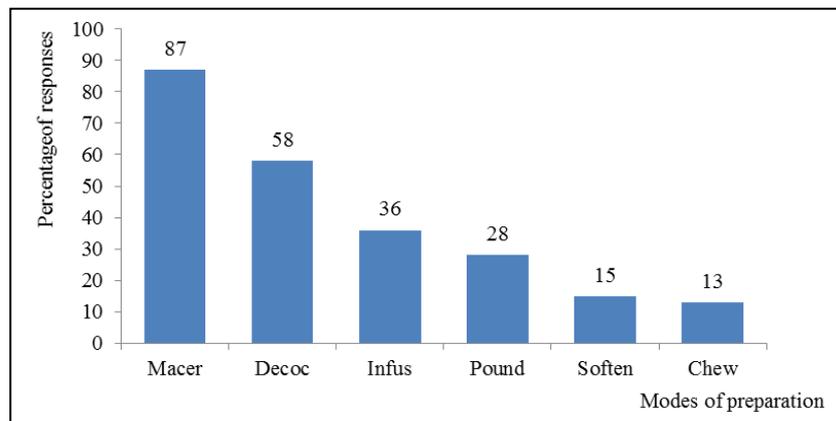


Fig 4: Percentage responses by drug preparation Macer - Maceration; Decoc - Decoction; Infus - Infusion; Soften - Softening; Chew – Chewing

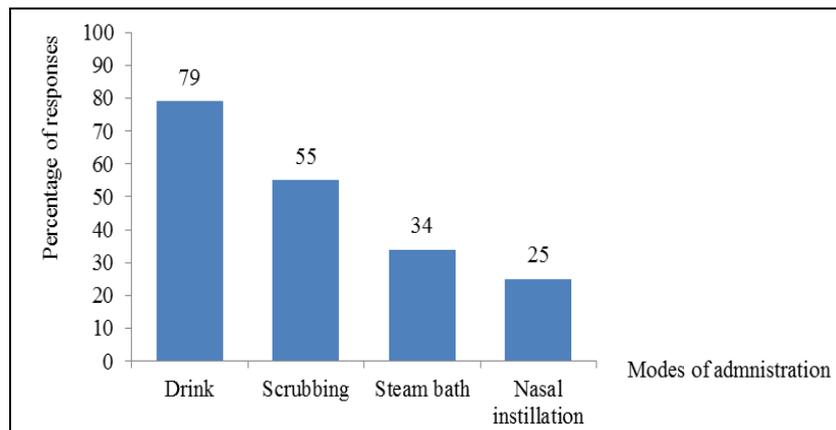


Fig 5: Percentage of responses by drug administration

3.6 Medico-magical uses of Loranthaceae

The surveys have also noted that the species of Loranthaceae are medico-magically used in potions. These plants possess, according to the traditional therapists encountered mystical powers. Table 5 shows a response rate of 0 à 16% recorded for their medico-magical uses in the study area.

The results show that the traditional practitioners yacouba,

malinké, abouré, mossi, agni, gouro and baoulé interviewed use Loranthaceae in medico-magic recipes to treat various supposedly mysterious diseases of origin such as sexual impotence, sterility, madness and spell. They recognize in these plants a certain power or mystical aura depending on whether they develop on specific host species (Table 6), especially on *Bombax buonopozense*,

Table 5: Loranthaceae uses by traditional therapists (% of responses)

Uses	Sex	Ethnic of traditional therapists							Aver
		Yacouca	Malinké	Abouré	Mossi	Agni	Gouro	Baoulé	
Medicinal	H	67	94	87	91	96	80	82	64
	F	0	67	75	67	50	0	33	
Medico magic	H	33	35	35	22	17	20	18	16
	F	0	0	25	0	13	0	0	

H - Men; F - Women; Aver – Average

Table 6: Specific host species on which Loranthaceae are highly sought

Host species	Families	Host species	Families
<i>Adansonia digitata</i> L.	Bombacaceae	<i>Ficus capensis</i> Thunb.	Moraceae
<i>Alchornea cordifolia</i> (Schum. & Thonn.) Müll. Arg.	Euphorbiaceae	<i>Ficus exasperata</i> Vahl	Moraceae
<i>Alstonia boonei</i> De Wild.	Apocynaceae	<i>Ficus thonningii</i> Blume	Moraceae
<i>Annona muricata</i> L.	Annonaceae	<i>Garcinia kola</i> Heckel	Clusiaceae
<i>Anthocleista nobilis</i> G. Don	Loganiaceae	<i>Gossypium barbadense</i> L.	Malvaceae
<i>Azadirachta indica</i> A. Juss.	Meliaceae	<i>Jatropha curcas</i> L.	Euphorbiaceae
<i>Baphia nitida</i> Lodd.	Fabaceae	<i>Macaranga heudelotii</i> Baill.	Euphorbiaceae
<i>Bombax buonopozense</i> P. Beauv.	Bombacaceae	<i>Mangifera indica</i> L.	Anacardiaceae
<i>Bombax costatum</i> Pellegr. et Vuillet	Bombacaceae	<i>Newbouldia laevis</i> (P. Beauv.) Seemann ex Bureau	Bignoniaceae
<i>Butyrospermum paradoxa</i> (Gaertn. F.) Herpper	Sapotaceae	<i>Persea americana</i> Mill.	Lauraceae
<i>Capsicum annuum</i> L.	Solanaceae	<i>Piptadeniastrum africanum</i> (Hook. F)	Mimosaceae
<i>Carapa procera</i> DC.	Meliaceae	<i>Psidium guajava</i> L.	Myrtaceae
<i>Carica papaya</i> L.	Caricaceae	<i>Pycnanthus angolensis</i> (Welw.) Warb.	Myristicaceae
<i>Cecropia peltata</i> L.	Cecropiaceae	<i>Rauwolfia vomitoria</i> Afzel	Apocynaceae
<i>Citrus aurantium</i> L.	Rutaceae	<i>Spondias mombin</i> L.	Anacardiaceae
<i>Citrus limon</i> (L.) Burm. f.	Rutaceae	<i>Sterculia tragacantha</i> Lindl.	Sterculiaceae
<i>Citrus sinensis</i> (L.) Osbek	Rutaceae	<i>Tamarindus indica</i> L.	Caesalpiniaceae
<i>Cola nitida</i> (Vent.) Schott et Endl.	Sterculiaceae	<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.	Mimosaceae
<i>Detarium microcarpum</i> Guill et Perr.	Caesalpiniaceae	<i>Vitellaria paradoxa</i> Gaertn. F.	Sapotaceae
<i>Detarium senegalensis</i> J. f. Gmel.	Ebenaceae	<i>Xylopiya aethiopica</i> (Dunal) A. Rich.	Annonaceae
<i>Eugenia owariensis</i> P. Beauv.	Rubiaceae		

Carica papaya, *Mangifera indica* (Fig. 6), *Newbouldia laevis*. Loranthaceae sampling on these hosts is usually accompanied by rituals or special observances according to the days and the time (aurora, noon, midnight). Potions preparation in these cases are usually followed by specific rituals or prayers related to beliefs. We were not able to gather enough information on this aspect, because considered secret. However, here we present, some recipes little detailed as revealed by some traditional therapists.

Malinkés and Mossis use a complete decoctate and a powder based on leaves of species of Loranthaceae (Malinkés: *Ladon*, Mossi: *Wallèba*) cut on *Detarium microcarpum*, associated with the leaves of the tree to protect against Works of sorcery and remove all curse. They also use them to hunt "djinn", that is, superhuman beings. According to these traditional healers, only young leaves are harvested at dawn.

At the abouré, the traditional therapists prescribe in a bath, the decanted of Loranthaceae or "*Gnamien tchoutchou tchou*" harvested nightly on *Mangifera indica* or *Newbouldia laevis*, at the rate of 7 treatments per day for a week to protect the patient against evil spirits or sorcery.

To treat sexual impotence or infertility, traditional Agni practitioners use in bath and drink the decoctate of leafy twigs of Loranthaceae (*Gnangon zoulé*) harvested on *Jatropha curcas* on Fridays during the early hours of the day.

In malinké environment, the leaves of the Loranthaceae (*Ladon*) collected on *Vitellaria paradoxa* serve to protect the patient from envy or witchcraft.

According to the baoulé traditional healers interviewed, an ointment made from leaves of species Loranthaceae (*Wakasso adjré*) harvested on *Jatropha curcas* charred and powdered mixed with python fat and shea butter serves to attract happiness and success in the life of an individual.



Fig 6: *Tapinanthus bangwensis*, parasite on *Mangifera indica*, highly sought after

4. Discussion

This work allowed to record seven species of Lorantheaceae used in traditional pharmacopoeia by the populations of the Sud-Comoé region to treat various human diseases. The involvement of these plants in drug recipes to treat the symptoms of certain diseases has already been confirmed by Soro [20], Jiofack *et al.* [11].

The results of the surveys have shown that traditional therapists succeed in attributing a local name to the Lorantheaceae, according to their ethnic group. The local name assignment to the latter indicates that they know the Lorantheaceae [3, 5]. This confirms the remarks made by Adjanohoun [1], that local populations do not name plants they do not use.

The results showed that Lorantheaceae are used to treat thirty eight (38) diseases. These results are in agreement with those of Kalis [12]. This broad spectrum of diseases may be justified by the therapeutic properties of Lorantheaceae. Indeed, according to this same author, the Gauls gave the name "mistletoe" only to any plant that cures all diseases.

The different prepared potions consist of barks of stems, leaves, flowers and fruits (pseudo berries). The leaves with 100% responses, constitute the part of the species of Lorantheaceae very used. These results are in agreement with the results of the work of Adjanohoun [1] (2001) and Jiofack *et al.* [10].

The results showed that Lorantheaceae are used medicomagically to treat certain diseases, which are supposed to be mystical. According to some traditional healers, there are diseases caused by spirits (anger of the gods, bad luck) and these will not disappear by treating only the symptoms. It is necessary, they say, to treat the cause of invisible evil. Information already reported by several authors [2, 6, 13, 20].

It appears that the species of Lorantheaceae are used in preparations according to the hosts and certain cases of diseases. The results show that Lorantheaceae harvested on *Mangifera indica*, *Tamarindus indica*, *Ceiba pentandra*, *Newbouldia laevis* and *Detarium microcarpum* are often accompanied by rituals or incantations. Practices already reported by several authors [6, 10, 20].

It results that the Lorantheae harvested on *Mangifera indica*

and *Detarium microcarpum* are used to protect the patient against evil spirits. They are highly sought after by traditional therapists because of their rarity and the specific powers they contain. This is in line with the information gathered by Amon [5].

5. Conclusion and Recommendations

Ethnobotanical research, conducted in the Sud-Comoé region (Côte d'Ivoire), shows that six seven species of Lorantheaceae are used in traditional medicine to treat several human diseases. These plants are used in preparations by traditional therapists in various forms to cure thirty eight (38) diseases in the study area. 8 cases of illnesses: tooth decay, diarrhea, fontanelle, high blood pressure, sexual impotence, malaria, rheumatism and sterility are treated by all traditional therapists, all ethnic groups combined. It is evident that Lorantheaceae play an important role in the traditional pharmacopoeia of local populations. However, there are limitations to the use of products for care that need to be elucidated. These limitations include lack of awareness of the chemical composition, inaccuracy of the doses to be administered and the duration of product intake. In order to do this, additional phytochemical and pharmacological studies are needed to isolate the active ingredients and, above all, to assess their toxicity for their proper management, as is the case with modern medicine.

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