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*Research Article*

# Quantitative ethno botanical survey of medicinal plants used in the infertility by local people in Cameroon

Noiha Noumi V<sup>1\*</sup>, Awe Djongmo V<sup>1</sup>, Nyeck B<sup>2</sup>, Noubissi T<sup>1</sup>, Kouam Kamning P<sup>1</sup> and Zapfack L<sup>3</sup>

<sup>1</sup>Division of Life Science, Higher Teacher Training College of Bertoua, University of Bertoua, P.O.Box: 652 Bertoua, Cameroon

<sup>2</sup>Institute of Agricultural Research for Development (IRAD) Wakwa Regional Research Centre, P.O. Box 65 Ngaoundere, Cameroon

<sup>3</sup>Department of Plant Biology, Faculty of Science, University of Yaounde I, Yaoundé, Central Province, Cameroon

E- mail: [noiha64@yahoo.fr](mailto:noiha64@yahoo.fr); Phone: (00237) 670 835 813

## Abstract

The study aims to identify and catalogue the medicinal plants used in the treatment of infertility in Cameroon. Based on the prevalence of infertility, 138 people were interviewed in 3 localities of the Littoral region. The interviewees were of both sexes and aged between 50-60 years (43%). A total of 36 species in 32 genera and 21 families were identified. The most represented families are Asteraceae, Liliaceae, Acanthaceae, Malvaceae and Zingiberaceae. *Aframomum letestuanum*, *Ageratum conyzoides*, *Tetrapleura tetraptera*, *Allium sativum*, *Crinum distichum*, *Cyathula prostrata*, *Bryophyllum pinnatum* and *Gingiber officinale* are the most cited species. Herbaceous are the most used (64%). This survey has led to recording 25 recipes, most of which are prepared using combinations of plants. Water (80%), white wine (8%) and palm oil (12%) are the most used solvents. Maceration and decoction are the most common methods of preparation. Syrups and powders are the forms of conservation of the recipes. These recipes are administered orally (76%); anally (17%) and by combined oral and anal routes (7%). Several plants listed in this study have not yet been the subject of laboratory studies related to their beneficial effects on female and male fertility and could constitute interesting subjects of research. Phytochemical screening in the laboratory is necessary to know the chemical compounds contained in these plants and their degree of toxicity.

**Keywords:** Infertility, Medicinal plants, Phytotherapy, Recipe, Survey

## INTRODUCTION

Nowadays, plants continue to meet an important need despite the growing influence of the modern health system and socio-cultural habits. Plant remedies are low toxic, less expensive, accessible and bioavailable compared to conventional medicines (Tahri *et al.*, 2012). Unfortunately, this traditional knowledge is being eroded simultaneously

with the loss of plant biodiversity and modernization. Today, plant species of great value to rural communities are threatened in their natural habitat by deforestation, wildfires, extensive cattle grazing, land clearing, agriculture and destruction of natural habitats (Fleurentin, 2004). It is therefore necessary to develop strategies for the development and sustainable use of these plants, because when the costs of pharmaceutical products developed

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in the laboratory are compared, it can be seen that they are more expensive than products from medicinal plants (Betti & Gueri, 2002; Fleurentin, 2004). Moreover, the use of medicinal plants depends on the cultures. Therefore, ethnobotanical work conducted in several regions would certainly contribute to a better knowledge of the plants used in the treatment of various diseases. Numerous ethnobotanical surveys have been conducted on medicinal plants in various regions of Cameroon (Betti & Gueri, 2002; Nana et al., 2011; Emmanuel & Didier, 2012; Mapi, 1988; Mbenkum and Duncan, 1989; Mehdioui & Kahouadji, 2007; Lakouéténé, 2009; Ndah et al, 2013; Tsague, 2019; Epouopa, 2019; Kapnang, 2021; Magny, 2021; Noubissi, 2021; Tamotsop, 2021; Nyeck et al., 2021) However, very little work on infertility has been undertaken in Cameroon.

The present work aims to contribute to a better knowledge of medicinal plants used in the treatment of infertility in men with resource persons (traditional doctors, old people, patients or any other persons using plants for therapeutic purposes).

## MATERIAL AND METHODS

### Knowledge of the study site

This study was done in three selected localities in the Mounjo Division in the Littoral region of Cameroon. With a population of 452722 inhabitants, the Mounjo Division covers an area of 3723 km<sup>2</sup> (INS, 2011). The localities of Lala, Manjo and Nlowe cover the territory of the manoj subdivision which is one of the 13 subdivisions of Mounjo. The subdivision of Manjo is bordered to the south by the subdivision of Loum, to the north by the subdivision of Nkongsamba and Mount Manengouba, to the east by the subdivision of Nlonako and to the west by the division of Koupé Manengouba. Its surface area is 305 km<sup>2</sup>. The climate is equatorial with two seasons. Two distinct climatic zones characterize the subdivision, the southern part is hotter and the northern part is colder. Concerning the relief, Manjo is at an altitude of 450 m in its southern part and 1200 m in its northern part. It is surrounded by mountainous massifs, the most important of which are: Manengouba at 2400 m, Kupe at 2070 m and Nlonako at 1800 m. The vegetation is made up of forest in full regression, replaced by vast industrial plantations of bananas, pineapples, cocoa trees and food and fruit crops. The main river is the Dibombe. The soils are diverse and varied. Generally, they are of volcanic origin, rich in organic matter and very fertile. Typical ferrallitic soils, soils that are not very developed on basalts, and hydro morphic soils are also found in the lowlands.

### Sampling

The sampling principle is based on the non-probability method whose technique concerns the sample size (n)

based on a 95% confidence interval and a 5% risk of error calculated according to the Schwartz (1993) formula:  $n = \frac{P(1-P) \times \alpha^2}{i^2}$ .

P=10% is the prevalence of hepatitis B in Cameroon;  $\alpha=1.96$  is the standard deviation corresponding to the 5% risk of error and  $i=5\%$  is the precision. This results in a sample of 148 individuals who were interviewed.

### Ethno botanical survey

To achieve our objectives, a pre-survey was conducted in March 2020 in the study area to assess the feasibility of the project. The aim was to identify the resource persons (informants) who should be interviewed at the time of the survey and to become better acquainted with them and the study area. These resource persons are phytotherapists, old people, patients or any other people using plants for therapeutic purposes. The actual investigation was conducted between June-October 2020 and was consisted of interviews with 138 people (herbalists or not) who had used several times plants for the treatment of hepatitis B, using a previously established survey form. These interviews were carried out with the help of forms made of closed questions (answers by yes or no); open (answers according to the point of view of the respondent) and directed (several answers to the choice proposed to the respondent). Semi-open-ended questions were preferred in order to allow informants greater freedom of expression. The main headings of this questionnaire concern the informant's profile (age, sex, religion, level of education, marital status, professional status, type of collector, origin of information), the medicinal plants used by the informant (vernacular or common names of the plants used, diseases, method(s) of preparation, part(s) used, types of plants, place of procurement of his/her plants, period of collection, method of administration, condition of the plant used, duration of treatment, dose, method of diagnosis, method of preservation, follow-up of treatment) (**Figure 1**).

After the interview with these people, the indicated plants were photographed on the site for those for which it was possible or in the forests to help with the identification of the plants. Samples of fertile organs (fruits) and samples of sterile organs (leaves, bark) were collected. Once collected, the samples were identified with the help of botanical experts and the national herbarium of Cameroon. In this study, we followed the APG (2009) nomenclature for the classification of the recorded species.

### Data analysis

The data obtained from the surveys were inserted into the EXCEL 2016 software. The frequency of distribution of a species within the Phytotherapists community is expressed

as the percentage of citations of a species in relation to the total number of people surveyed. The citation frequency of each taxon surveyed is calculated by the formula used by Gbeckley et al. (2019) and Orsot (2016):  $FC = \sum(n/N) * 100$ ; n= number of people who cited the species; N: total number of respondents.

## RESULTS

### Ethno botanical surveys

During the investigation carried out in the Commune of Manjo, 36 species of which 30% were spontaneous, 42% cultivated and 28% semi-cultivated were identified. These species are distributed in 21 families and 32 genera. The most represented families are Asteraceae and Liliaceae with 4 species, followed by Acanthaceae, Malvaceae and Zingiberaceae with three species each, then Anacardiaceae, Myrtaceae and Rutaceae, with two species each and the rest one species.

The morphological types are dominated by grasses with 64% of species followed by trees with 19% and shrubs with 17% species.

Concerning the state of use of the plants, 94% of the plants recorded are used in a fresh state against 6% of the plants used in a dry state (**Table 1**).

### Socio-demographic characteristics

The epidemiological profile of the informants is characterized by the predominance of men (65%) compared to women (35%). The age group [50-60] years are the most represented (43%), while that of (20-30) years is the least represented (5%). Of the 138 people interviewed, 20% are illiterate, 27% have primary education, 47% have secondary education, and 7% have university education. As for the marital status of the informants, 53% are married, 23% are single, 16% are widows/widowers and 6% are divorced.

### Recipes

The study identified 25 recipes. Leaves are the most used organs (48%). Fruits and rhizomes (14%), leaves and stems (10%), pods (7%), barks (5%) and roots (2%) are also used. Our recipes are prepared in the form of macerations and decoction (38%). It is followed by syrups and infusions (10%) and powders (3%). In these localities, the most used solvent is water (80%), followed by palm oil (12%) and palm wine (8%). The recipes are administrated orally (*Per os*; 76%); anally (17%) and often both orally and anally combined (7%) (**Table 2**).

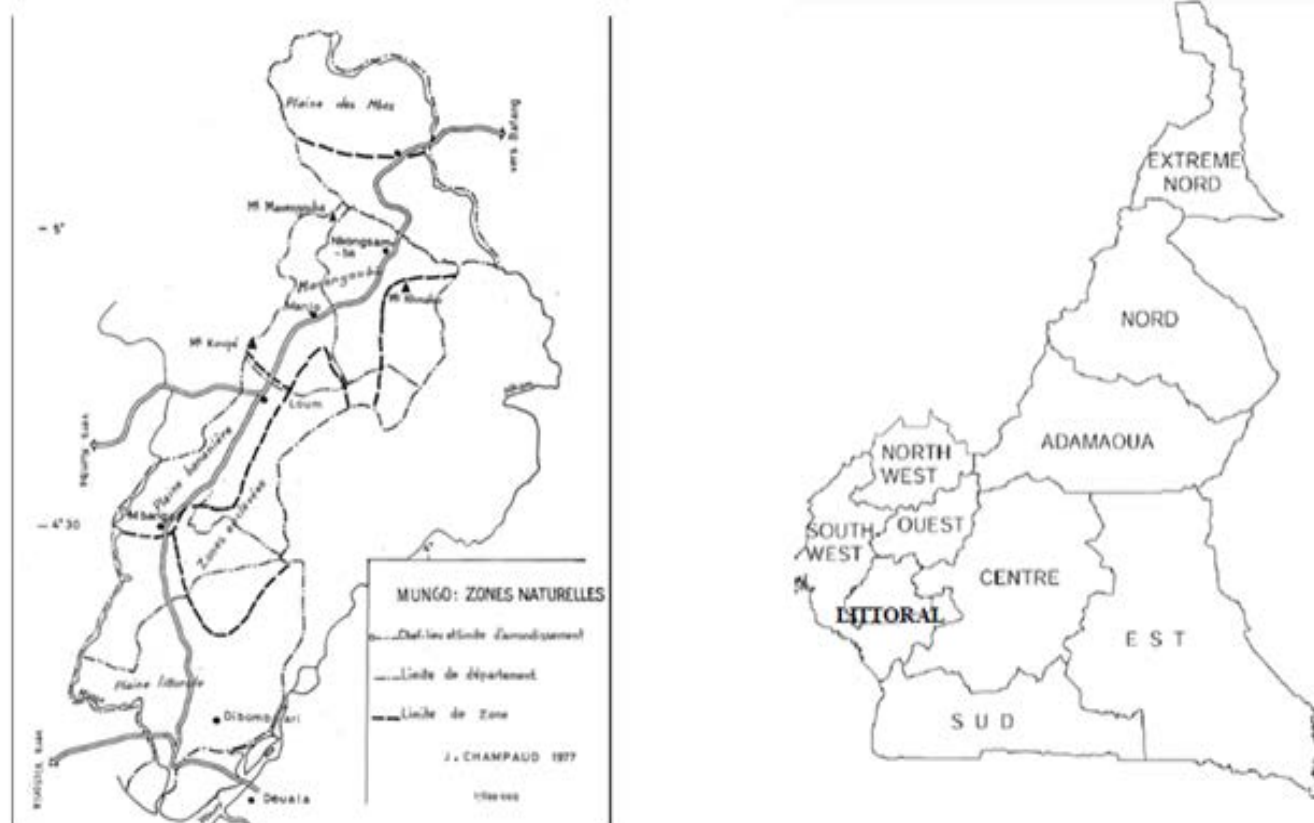


Figure 1. Map of the different study areas.

**Table 1.** Catalog of plants used in the treatment of infertility.

Families	Scientific name	Organs	State	Fc
Acanthaceae	<i>Eremomastax speciosa</i>	Roots	Fresh	02
	<i>Dicliptera verticilata</i>	Leaves	Fresh	03
	<i>Justicia insularis</i>	Leaves	Fresh	08
Amaranthaceae	<i>Cyathula prostrata</i>	Leaves	Fresh	04
Anacardiaceae	<i>Mangifera indica</i>	Leaves, Barks	Fresh	01
	<i>Spondias dulcis</i>	Leaves, fruits	Fresh	02
Asparagaceae	<i>Dracaena kupensis</i>	Leaves	Fresh	01
Asteraceae	<i>Ageratum conyzoides</i>	Leaves and Stem	Fresh or Dried	04
	<i>Vernonia guineensis</i>	Rhizomes	Fresh or Dried	01
	<i>Erigeron floribundus</i>	Leaves and Stem	Fresh or Dried	01
	<i>Emilia coccinea</i>	Leaves and Stem	Fresh	01
Caricaceae	<i>Carica papaya</i>	Leaves	Fresh	02
Clusiaceae	<i>Garcinia kola</i>	Seeds, Barks	Fresh	03
Commelinaceae	<i>Commelina benghalensis</i>	Leaves and Stem	Fresh	03
Convolvulaceae	<i>Ipomoea batatas</i>	Leaves	Fresh	02
Crassulaceae	<i>Bryophyllum pinnatum</i>	Leaves	Fresh	06
Fabaceae	<i>Tandrapleura tandraptera</i>	Fruit	Dried	15
Liliaceae	<i>Crinum distichum</i>	Leaves	Fresh	5
	<i>Allium sativum</i>	Bulbs	Fresh	4
	<i>Aloe vera</i>	Leaves	Fresh	1
	<i>Aloe buandtheri</i>	Leaves	Fresh	1
Malvaceae	<i>Hibiscus macranthus</i>	Flowers, Leaves	Fresh	04
	<i>Hibiscus noldeae</i>	Flowers, Leaves	Fresh	02
	<i>Cola acuminata</i>	Barks, Nuts.	Fresh & Dried.	01
Myrtaceae	<i>Psidium guajava</i>	Leaves	Fresh	01
	<i>Syzygium aromaticum</i>	Fruits	Dried	01
Moringaceae	<i>Moringa oleifera</i>	Leaves, fruits.	Fresh & Dried	04
Oxalidaceae	<i>Oxalis corniculata</i>	Leaves & Stem	Fresh	01
Plantaginaceae	<i>Scoporia dulcis</i>	Leaves & Stem	Fresh	01
Rutaceae	<i>Citrus sinensis</i>	Leaves	Fresh	01
	<i>Citrus limon</i>	Leaves, fruit.	Fresh	02
Solanaceae	<i>Solanum torvum</i>	Leaves, Fruits.	Fresh	01
Zingiberaceae	<i>Aframomum landestuanum</i>	Rhizomes	Fresh or Dried	09
	<i>Zingiber officinale</i>	Rhizomes	Fresh or Dried	03
	<i>Curcuma longa</i>	Rhizomes	Fresh or Dried	03
Zygophyllaceae	<i>Tribulus terrestris</i>	Leaves	Fresh	02

**Table 2.** Recipes used in the treatment of infertility.

N°	Solvent	Preparation	Recipes & posology	Administration
R1	Water	Maceration	Collect about 600g of <i>Commelina benghalensis</i> plants, wash and crush adding 2litres of water. Purge with it in a pear of 6 every morning, in pregnant women to keep a pregnancy at term.	Anal route
R2	Water	Decoction, Infusion or Maceration.	Decoct, infuse or macerate 300g of <i>Eremomastax speciosa</i> roots in 2litres of water for 30minutes. Land cool and take 1 glass of 200 to 250ml, 3 times a day for 1 to 14 weeks in pregnant women.	Per os
R3	Palm oil	Syrup	Mix the dry leaves and stems of <i>Ageratum conyzoides</i> , <i>Erigeron floribundus</i> with red oil and consume 2 pickings per day.	Anal route
R4	Water	Maceration.	Macerate 500g of <i>Ageratum conyzoides</i> leaves and add 3litres of water. Take 1.5 for the purge in a pear of 6 each morning and the rest take 1 glass of 200ml morning noon and evening for 1 month.	Per os and anal route
R5	Water	Decoction	Boil 1kg of <i>Cola acuminata</i> bark in 5litres of water and drink 1 glass of 200ml each morning and evening to avoid abortion.	Per os
R6	Water	Maceration.	Rub 300g of <i>Citrus sinensis</i> leaves in 2liter of water. Purge every morning with a 6 pear to clean the genital tract and facilitate labor before delivery.	Anal route

R7	Palm oil	Syrup	Mix the dry leaves of <i>Eremomastax speciosa</i> then mix with palm oil, consume a soup spoonful in the morning and another in the evening for 14 days	<i>Per os</i>
R8	Water	Maceration.	Macerate 400g of <i>Ipomea batatas</i> leaves in 3 liters of water and drink 1 glass of 200ml morning, noon and evening for one month to solve erection problem in men.	<i>Per os</i>
R9	Water	Decoction	Boil 200g of the leaves of <i>Spondias dulcis</i> and 3g of the fruits in 5litres of water and drink 1 glass of 250ml morning, noon and evening to solve erection problems in men.	<i>Per os</i>
R10	Water	Infusion	Make an Infusion of 200g of leaves and pods of <i>Moringa oleifera</i> in 1liter of water for 15minutes. Take 1 glass of 200 ml in the morning on an empty stomach, at noon and in the evening for 1 to 4 weeks for infertility problems of men and women.	<i>Per os</i>
R11	Water	Decoction	To decoct 300g of <i>Allium sativum</i> to which one adds 200g of <i>Cola acuminata</i> and 300g of <i>Zingiber officinale</i> in 3,5litres of water. To drink 1 glass of 200ml morning midday and evening during one month by adding to each glass a cueillerez with soup of honey. This helps to unblock the tubes and to fight against ovarian cysts and fibroids.	<i>Per os</i>
R12	Palm wine	Decoction	Decoct in 2 liters of palm wine <i>Hibiscus noldeae</i> (leaf plus stems) and <i>Aframomum letestuanum</i> (Fruits) then consume 2 glasses/day until cured	<i>Per os</i>
R13	Water	Infusion and Maceration.	Infuse 300g of <i>Bryophyllum pinnatum</i> leaves in 2litres of water for 15 minutes and macerate. Drink 1 glass of 200ml morning, noon and night for three weeks to solve the problem of oligospermia in men.	<i>Per os</i>
R14	Water	Maceration	Put 20g of <i>Syzygium aromaticum</i> nail with slices of three Citrus limon in 1,5liter of water and land macerate for 48h and drink 1 glass of 250ml morning, noon and evening to gand rid of ovarian cysts.	<i>Per os</i>
R15	Water	Maceration	Put 30g of <i>Tetrapleura tetraptera</i> in 1,5liter of water and land macerate for 24 hours. Drink 0,5 glass of 200l in the morning and evening and purge in the mornings for problems of fibroid cysts and myomas.	<i>Per os &amp; Anal route.</i>
R16	Water	Maceration	Collect 40g of <i>Emilia coccinea</i> and leaves of <i>Dracaena kupensis</i> crush or crush in 2litres of water filter then collect 1litre of macerated. Take a purge every morning in a prey of 6 to not lose a fandus.	Anal route.
R17	Water	Powder	Crush 30g of <i>Panax ginseng</i> and <i>Zingiber officinale</i> , sieve and obtain a very fine powder. Mix a tablespoon of powder with pure honey and lick in the morning and evening for one month to treat erectile dysfunction.	<i>Per os</i>
R18	Water	Decoction	Take 3 Citrus limon, 3 <i>Tetrapleura tetraptera</i> 200g of <i>Allium sativum</i> and 200g of <i>Zingiber officinale</i> chopped then bring to boil in 5l of water. and drink 1 glass of 200ml morning, noon and evening during 2 months to clean the blocked tubes.	<i>Per os</i>
R19	Water	Maceration	Take leaves and stems of <i>Hibiscus noldeae</i> and macerate them in 1 liter of water then drink 0.5 glass morning and evening to limit the risks of abortion.	<i>Per os</i>
R20	Water	Decoction	Boil the leaves of <i>Solanum torvum</i> in 2 liters of water and then drink 0.5 glasses of 200ml morning and evening for one month to solve erection problems in men.	<i>Per os</i>
R21	Water	Decoction	Decoct 1kg of <i>Mangifera indica</i> bark in 3l of water. Use a 6 pear to purge every morning in women to clean the genital tract and solve the problem of ovarian cyst.	Anal route
R22	Palm wine	Maceration	Maceration of the leaves of <i>Eremomastax speciosa</i> , <i>Aloe buettneri</i> , <i>Justicia insularis</i> in palm wine and consume 2 glasses of 200ml morning and evening during 7 days.	<i>Per os</i>
R23	Water	Decoction	Decoct 400g of <i>Carica papaya</i> , <i>Psidium guajava</i> , <i>Allium sativum</i> and <i>Zingiber officinale</i> leaves in two liters of water and take 1 glass of 200ml morning, noon and night for 1 to 3 months to solve the problems of fibroids and myomas and other uterine cavity tumors.	<i>Per os</i>
R24	Water	Decoction	Decoct 300g of <i>Curcuma longa</i> , <i>Allium sativum</i> l and <i>Zingiber officinale</i> in 3l of water then drink 1 glass of 250ml morning, noon and evening for one month to solve the problems of vaginal infections.	<i>Per os</i>
R25	Palm oil	Syrup	Mix the dry leaves of <i>Crinum distichum</i> (leaf) and the crushed seeds of <i>Aframomum letestuanum</i> (Fruit) then mix with red oil and take 2 picks a day.	<i>Per os</i>

## DISCUSSION

From this study, 138 resource persons were interviewed. According to them, when knowledge about the virtues of medicinal plants is hidden and held by few people, it is economically profitable. The epidemiological profile of the

informants is characterized by the predominance of men (65%) over women (35%). This finding can be explained by the inability of women to travel to the forest to collect samples, even though they have the same traditional knowledge. Diame (2010) has assimilated this dominance with a power imbalance.

For the distribution of resource persons according to age, the distribution of interviewees according to the age group [50-60] years is the most represented (43%), while that of (20-30) years is the least represented (5%). This is explained by the fact that the information provided by older people is more reliable, since they hold a good part of the ancestral knowledge that is part of the oral tradition.

Of the 138 people interviewed, 26.67% have a primary level of education; 46.67% have a secondary level of education; 20% are illiterate and 6.67% have a university level of education. The very low proportion of resource persons with a university level could explain the lack of documentation of traditional medicine in these localities.

The experience of informants in terms of administering care in the condition studied varied from 2 to at least 13 years. This result is consistent with the work of Benkhniqne *et al* (2011) who reported that knowledge of medicinal plant ingredients and uses are generally acquired through long accumulated experience and passed down from one generation to the next. Thus, experience accumulated with age is the main source of information at the local level.

It is noted, that on 25 listed recipes, leaves are cited 20 times in the preparations and are the most used organs for the therapy of our disease. Fruits and rhizomes are cited 6 times in the recipes. The combination leaves and stems is cited 4 times, pods 3 times, barks and roots 2 times in preparation. The more recurrent use of leaves can be explained by the ease and speed of harvesting, but also by the abundance of chemical groups they contain, as they are known to be the place of synthesis of primary and secondary metabolites (Simbo, 2010). As for the barks, they are the places of storage of secondary metabolites. According to Hseini (2008) and Lahsissene & Kahouadji (2010), several organs of the same plant can be used in the treatment of one or several diseases. It is also noted that each exploited part has a disadvantage on the survival of the species. The overexploitation of plant organs (roots, leaves, bark, and wood) leads to physiological disorders and a decrease in the reproductivity of the exploited plants.

Regarding the state of the plants, 94% of the plants are used in a fresh state compared to 6% of the plants used in a dry state. Drying a plant can lead to the loss of many therapeutic properties (Nga *et al.*, 2016). In addition, the best use of a plant would be the one that preserves all its properties, while allowing the extraction and assimilation of the active principle (Betti, 2001; N'Guessan *et al.*, 2009; Didier *et al.*, 2011).

The majority of our plants are prepared in the form of macerations and decoctions 38%. This is explained by the fact that maceration allows the extraction of the active principle for the purge very used to clean the genital tract in

women suffering from ovarian cysts or any other pathology blocking the tubes. The decoction, allows to collect the most active principle, disinfect the plant and could attenuate or cancel the toxic effects of certain recipes (Betti, 2002; Gurib-Fakim, 2006; Ameenah, 2006; Salhi *et al.*, 2010; Hele *et al.*, 2014). In addition, decoctions have a longer shelf life than other preparation methods (Betti, 2001; Jiofack *et al.*, 2009; Jiofack *et al.*, 2010). The preparations mentioned are almost administrated orally or anally or both. This could be explained by the fact that the disease is related to bacterial, fungal and/or parasitic infections localized in deep organs. To reach these organs, the compound must pass through the digestive tract to facilitate uptake and action (Tra-Bi *et al.*, 2008; Jiofack *et al.*, 2008; Didier *et al.*, 2011).

Most of these recipes are prepared using a combination of plants. Several studies conducted on traditional treatments in Africa have highlighted this complexity in the preparation and content of traditional remedies, which rarely contain a single plant species, with some recipes containing more than three to four different plant ingredients. This form of combining various plant species in treatment could present risks of interactions or toxicity. However, Fleurentin *et al.* (2004), emphasized that the real therapeutic activities of certain medicinal plants cannot be explained by the sole presence of one or other of the constituents. Indeed, in these complex mixtures that are the molecular soups of extracts of various plants, it is the association or the synergy that exists between the molecules, which is very often responsible for the desired effect. The contribution of plants to the constitution of recipes is relatively higher in some plants than in others. In this case with species such as *Aframomum landestuanum*, *Ageratum conyzoides*, *Tandrapleura tandraptera*, *Allium sativum*, *Crinum distichum*, *Cyathula prostrata*, *Kalanchoe pinnata*, and *Zingiber officinale*; their presence in many recipes could be a proof of their efficacy in the treatment of infertility. These species are found domesticated in agro-ecosystems, as domestication of plants may prove to be an alternative in strategies for sustainable exploitation of this resource (Mvogo, 2013; Ndjouondo *et al.*, 2015). The dosage depends on the gender involved.

## CONCLUSION

This study allowed making a non-exhaustive inventory of medicinal plants used in the treatment of infertility in the localities of Lala, Nlowe and Manjo. The survey series led to identifying 36 species belonging to 32 genera and 21 families from 138 informants. The most represented family is Asteraceae, Liliaceae, Acanthaceae, Malvaceae and Zingiberaceae. The most used plants in the treatment of female and male infertility in the localities are *Aframomum letestuanum*, *Ageratum conyzoides*, *Tetrapleura tetraptera*, *Allium sativum*, *Crinum distichum*, *Cyathula prostrata*,



*Bryophyllum pinnatum* and *Zingiber officinale*. Some findings were made during this study most of the recipes are prepared in the form of maceration (48%). It is followed by decoction (35%), Infusion (13%) and powder (4%). Leaves are the most used organs in the treatment (42%), followed by whole plants (16%), fruits (13%), rhizomes (9%), barks (7%), seeds (5%), flowers (4%), bulbs (2%) and roots (2%). According to the literature review, several plants listed in this study have not yet been the subject of laboratory studies for the verification of their beneficial effects on female and male fertility and could constitute interesting subjects of research. Also, phytochemical screening in the laboratory is necessary to know the chemical compounds contained in the main plants and their degree of toxicity.

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