Ethnobotanical study of plants used in the treatment of dysmenorrhoea in traditional medicine in Manjo, Littoral-Cameroon

Abstract

**Aim**: An ethnobotanical survey was carried out in the city of Manjo with the aim of identifying the different uses of plants used in the treatment of Dysmenorrhea.

**Methodology and results**: An ethnobotanical study was carried out among one hundred and ninety-two women and seven traditional health practitioners in the city. Twenty-five plant species divided into twenty-three (23) genera and nineteen (19) families were listed. The most represented family is Asteraceae (12%). *Eremomastax* *speciosa* (17.05%) and *Myrianthus* *arboreus* (12.50%) are the most requested species. Phytochemical tests were carried out on these two species using the standard procedures described by Brunetton (1999) and revealed the presence of several chemical compounds in all the drugs. The most abundant were alkaloids, phenolic compounds, flavonoids, anthraquinones, coumarins and anthocyanins. Leaves were the most commonly used organs (52%). Decoction (44%) is the most common method of preparation for the majority of medicinal recipes. The oral route is the only one used for all recipes.

**Conclusion**: These results can be considered as a source of information for scientific research in the field of phytochemistry and pharmacology.

***Key words:*** *Medicinal plant, Phytochemical tests, Dysmenorrhoea, Manjo, Cameroon.*

1. Introduction

Menstruation is a physiological phenomenon characterised by the periodic flow of blood due to the elimination of the uterine lining. It occurs in women from puberty to the menopause, in the absence of fertilisation [1]. In around two out of three women, it is heralded by mild discomfort or pain in the pelvic and/or lumbar regions. For some women, in addition to the pain, significant problems such as headaches, nausea, dizziness and fatigue can occur before and during menstruation, making it extremely difficult and a serious handicap in everyday life. These conditions are described as dysmenorrhoea [1,2].

Dysmenorrhoea is more explicitly defined as all the pelvic and/or lumbar pain that precedes or accompanies menstruation [3]. There are two types of dysmenorrhoea: primary and secondary. Dysmenorrhoea is said to be primary when it begins in adolescence in the months or years following the first menstrual period; it is often essential, with no organic support [4]. It is said to be secondary when it appears or worsens after puberty, and is generally linked to an organic aetiology such as endometriosis, adenomyosis, myoma, endometrial polyps, anaemia or chronic genital infections (metritis, salpingitis) [4-6]. Women suffering from dysmenorrhoea experience moderate or intense pain as a result of uterine contractions. Intense contractions during menstruation are associated with an overproduction of prostaglandins and inflammatory mediators [7]. All of these factors contribute to an increase in body temperature, insomnia, anxiety, behavioural problems and loss of balance. However, it is under-diagnosed, under-treated and even under-appreciated by women themselves, who accept it as part of the menstrual cycle [7].

Primary dysmenorrhoea is a real public health problem because of its very high frequency and its psychological and socio-economic impact. Between 40% and 90% of women worldwide complain of dysmenorrhoea, between 5% and 14% of adolescent girls are regularly absent from school and between 13% and 51% of adult women are absent from work at least once because of this condition [1,6]. In Cameroon, and more specifically in Yaoundé, the prevalence rate among students is 75.5% [8]; at the University of Dschang, the rate is 63.86%, with the main consequence being a 23.1% rate of absenteeism from academic activities [9].

Women use a variety of methods to combat this problem. Depending on the anamnesis and the absence of pelvic abnormalities on clinical examination, various treatments are used. Several drugs are available to alleviate the pain of dysmenorrhoea. These include synthetic drugs such as non-steroidal anti-inflammatories (diclofenac), analgesics (paracetamol), hormonal contraceptives, antispasmodics (phloroglucinol) and dietary supplements (vitamins C and E) [10,11]. Although these recommended drugs are effective in relieving the symptoms of dysmenorrhoea, many adverse effects have been associated with their use. These include gastrointestinal problems and fatigue, as well as difficulties in accessing certain drugs, especially in developing countries [12].

These limitations have led to a growing interest in alternatives that are accessible, effective and better tolerated than conventional therapies. The WHO notes that a high proportion of people in developing countries (80%) use medicinal plants for their general health problems. This is also true of localities in Cameroon, such as the coastal town of Manjo, where there is a wide variety of medicinal plants used both by the general public and by traditional practitioners in particular. However, despite the importance of alternative methods and the widespread use of phytotherapy, there has been little or no specific research into identifying and verifying the effectiveness of the plants used to treat dysmenorrhoea in this locality.

# Material and methods

# Geographical framework of the study

Manjo was founded in the 19th century by one of Ewang's descendants, who settled in a place called Manewang (Child of Ewang in the Mbo'o language). This was the very first quarter of the town. The name Manjo means baby elephant in Mbo'o. It has a population of 40,250, 132 inhabitants/km², 70% of whom are young, with an average age of 24. There are 02 indigenous ethnic groups: Manehas and Mouaménam. The population is spread over two districts and 33 villages. The Manehas chiefdom is in Namba, while the Mouamenam chiefdom is in Nsoung. The districts are administered by two 2nd class chiefs and 31 villages by 3rd degree chiefs. In the centre of Manjo, the non-natives are governed by family heads. The main non-indigenous ethnic groups are: Bamiléké, Mbo'o, Haoussa, Bakaka, Bamenda, Bassa, Diboum, Ewondo, Bororo and Yabassi [13].

Manjo has an equatorial climate with two seasons. Two distinct climatic zones characterise the district: the southern part is warmer and the northern part colder. Manjo's relief is at an altitude of 450 m in the south and 1,200 m in the north. It is surrounded by mountain ranges, the most important of which are Manengouba at 2,400 m, Koupé at 2,070 m and Nlonako at 1,800 m. The vegetation consists of virgin forest, with natural vegetation in full regression, replaced by vast industrial banana and pineapple plantations, small coffee and cocoa farms and food and fruit crops. The fauna is characterised by the presence of birds, small rodents (rats, squirrels, partridges, hedgehogs, etc.), and large game in the Mantem 1 and 2, Abang-Ngol, Mouandong, Njoumbeng, Badjoungué and Mouakoumel forests, as well as endangered protected species such as the Goliath frog [13].

In the municipality of Manjo, there are savannahs and forests. The forests are rich in timber and non-timber products, and the trees are abusively cut for timber and firewood. Economic activity is essentially based on agriculture and small-scale livestock farming. These include food crops (maize, cassava, cocoyams, plantain, beans, etc.), cash crops (coffee, cocoa, oil palm) and fruit crops [13].



Figure 1: **Map of Study site**

# Materials

# Ethnobotanical survey materials

Conventional materials were used for the ethnobotanical survey. These included survey sheets, a notebook and a digital camera. Machetes and pruning shears were used to collect the samples.

#  Methods

# Data collection

The ethnobotanical survey was carried out from October 2023 to January 2024. Data were collected using an approach based on ethnobotanical surveys. Using survey forms containing two structured questionnaires, one for the women and the other for the traditional healers, a direct interview and a series of interviews were conducted with the women and the traditional healers. The women's questionnaire covered their socio-demographic characteristics, menstrual patterns and the use of plants to treat dysmenorrhoea. The traditional healers were asked about their socio-demographic characteristics and their knowledge of dysmenorrhoea. For each respondent questioned, the remedy used was asked. If information on plants was cited, all information relating to their use was recorded.

# Data analysis

The forms obtained at the end of the survey were analysed. The various plants and associated recipes were listed. The plant samples and photographs taken were identified at the Pharmacy Laboratory of the Faculty of Medicine and Pharmaceutical Sciences of the University of Dschang and at the National Herbarium of Cameroon. The data collected were entered and analysed using Microsoft Excel, version 2013. Citation frequencies (CF) were determined using the formula below: 𝐹𝐶=NC\*N𝑇×100 Where: NC represents the number of times the species is cited and NT is the total number of citations.

**2.3.3. Phytochemical tests**

The plant material used consisted of the leaves of Myrianthus arboreus P. Beauv (Cecropiaceae) and Eremomastax speciosa (Hochst.) Cufod (Acanthaceae). These plants were chosen on the basis of the highest number of citations. The phytochemical test consists of searching for the main chemical groups (alkaloids, tannins, flavonoids, saponins, coumarins, sterols and triterpenes) by tube reactions. Using the standard procedures described by Brunetton (1999) [14]. These tests aim to highlight the chemical groups with pharmacological properties.

***2.3.3.1. Shinoda test:*** *identification of flavonoids*

*A few drops of concentrated hydrochloric acid (HCl) and some magnesium shavings were added to a methanolic solution of the plant extract. The presence of flavonoids was indicated by the appearance of a purple color.*

***2.3.3.2. Polyphenols test***

*About 1 mg of product was solubilized in ethanol and a few drops of FeCl3 were added to this solution. The presence of phenolic compounds causes the formation of complexes of the type [Fe (OAr) 6]3- of blue or violet color.*

***2.3.3.3. Molisch test:*** *identification of sugars*

*In a test tube, a few milligrams of the product were dissolved in ethanol and an ethanolic solution of α-naphthol 1% was added. After homogenization, a few drops of concentrated H2SO4 were slowly dripped onto the wall of the test tube. The presence of sugars is indicated by the appearance of a purplish-red ring at the interface.*

# *2.3.3.4. Liebermann-Buchard test: identification of triterpenes and steroids*

# *It was a question of dissolving a few milligrams of the product*

# *in 1 ml of chloroform, then a few drops of acetic anhydride were added to the solution obtained, followed by concentrated sulfuric acid and the mixture was stirred. The presence of triterpenes is manifested by the appearance of a purplish red color and that of steroids by the appearance of a blue-greenish color.*

# *2.3.3.5. Dragendorff test: identification of alkaloids*

# *The alkaloids were highlighted by Mayer's reagent. The addition of a few drops of this reagent to 2 ml of the plant extract solution results in the formation of an orange-red precipitate in the presence of the alkaloids.*

# *10 mg of extract was dissolved in 5 ml of 1% ethanolic HCl and 5 drops of Dragendoff's reagent were added. The formation of an orange precipitate indicates the presence of alkaloids.*

# *2.3.3.6. Komarowski test: identification of triterpene saponins*

# *It was a question of dissolving a few milligrams of product in an appropriate solvent, preparing a TLC plate on which a small amount of extract was deposited, developing the plate in an appropriate system and revealing the plate with the previously prepared Komarowski reagent. The presence of triterpene saponins will be manifested by the appearance of purple spots.*

# *2.3.3.7. Coumarin test*

# *It was a question of dissolving a drop of extract in methanol and depositing on a silica plate cast on a glass plate. Then covering the spots with 10% NaOH and heating the plate. The appearance of fluorescence indicates the presence of coumarins in the extract.*

# Results

# 3.1Sociodemographic characteristics of the women

We interviewed a total of 192 women with experience of using plants in traditional medicine. Table 1 presents the socio-demographic data of the women participating in the surveys. The women ranged in age from 14 to 62 years, with an average age of 22.31±7.37 years and a predominance of those aged between 14 and 23 years (68.23%). Most of the participants had reached secondary school (152; 79.2%), were students (47.4%) and single (76%).

Table 1: Breakdown of participants by socio-demographic characteristics

|  |  |  |
| --- | --- | --- |
| **Variable** | **Numbers N=192** |  **Percentage (%)**  |
| **Age**14-2324-3334-4344-5354-63 |  |   |
| 131 | 68.23 |
| 47 | 24.,48 |
| 9 | 4.69 |
| 41 | 2.08 0.52 |
| Level of educationPrimarySecondaryUniversity |  |  |
| 3 | 1.6  |
| 15237 | 79.219.3 |
| **Marital status**SingleDivorcedEngagedMarriedWidows |  |  |
| 146 | 76.0  |
| 1 | 0.5  |
| 13 | 6.8  |
| 311 | 16.1 0.5 |
| **Occupation**StudentsFemale studentsHousewivesBeauticiansOthers |  |  |
| 91 | 47.4  |
| 18 | 9.4  |
| 15 | 7.8  |
| 1256 | 6.329.16 |

# 3.2. Socio-demographic characteristics of the traditional healers

A total of 07 traditional healers were surveyed, including 4 men and 3 women. Three were aged between 40 and 50, three between 51 and 60 and one between 71 and 80. Most had between 1- and 5-years’ experience (3; 42.85%) or more than 5 years (3; 42.85%) (Table 2).

Table 2: Distribution of traditional healers according to socio-demographic characteristics

|  |  |  |
| --- | --- | --- |
| **Variable** | **Numbers** N=7 |  **Percentage (%)**  |
| **Age group**[40 - 50][51 - 60][71 - 80] |  |  |
| 3 | 42.85 |
| 31 | 42.85 14.3 |
| **Sex**FemaleMale |  |  |
| 34 | 42.957.1 |
| **Professional experience**1-5 years Less than 1 yearMore than 5 years |  |  |
|  |  |
| 313 | 42.85 14.2042.85 |
| **Marital status**Married | 7 | 100 |
| **Level of education**PrimarySecondaryUniversity |  |  |
| 2 | 28.6 |
| 41 | 57.114.3 |
| **Additional occupation**Driver SaleswomanBreeder Nurse Planter |  |  |
| 1 | 14.3 |
| 1 | 14.3 |
| 1 | 14.3 |
| 13 | 14.342.9 |

# Clinical characteristics of dysmenorrhoea in women

Table 3 on the characteristics of dysmenorrhoea shows that most of the participants had their first menstrual period between the ages of 12 and 14 (78.65%); but for the majority, the first pains appeared between the ages of 14 and 16 (48.96%). Dysmenorrhoea was a problem for most women (136; 70.83%), with periods characterised by the presence of a clot (57.29%) and a bright red colour (54.69%).

Table 3: Distribution of participants according to Clinical characteristics of dysmenorrhoea

|  |  |  |
| --- | --- | --- |
| **Variables** | **Number N=192** | **Percentage (%)**  |
| **Menarche** 9-1112-1415-18 |  |  |
| 9 | 4.69  |
| 15132 | 78.6516.67 |
| **Age of first pain**11-1314-1617-1920-22 |  |  |
| 66 | 34.38 94  |
| 94 | 48.96  |
| 275 | 14.06 2.60 |
| **Period of life concerned**PastCurrent  |  |  |
| 56136 | 29.1770.83 |
| **Period of cycle concerned**Around the time of menstruation During menstruationAround the time of menstruation and during menstruation**Consistency of menstruation**  |  |  |
| 127 | 66.15 |
| 5411 | 28.135.73 |
| With clotsFluidFluid + clotsMucose Ignore | 110 | 57.29 |
| 29 | 15.1 |
| 7 | 3.65 |
| 11 | 5.73 |
| 35 | 18.23 |
| **Menstrual color**Bright redDark redAlternating bright and darkIgnore |  |  |
| 105 | 54.69 |
| 69 | 35.94 |
| 315 | 1.567.81 |

# Women's therapeutic approach to dysmenorrhoea

In the event of dysmenorrhoea, Table 4 shows that women's first choice is to obtain medication (83.3%), mainly modern medicines (47.9%).

# Table 4: Distribution of participants according to Women's therapeutic approach to dysmenorrhoea

|  |  |  |
| --- | --- | --- |
| **Variable** | **Number (N=192)** | **Percentage (%)**  |
| **First line action** Penalties Go to the hospitalPain preventionNothing  |  |  |
| 157852260 92 1822 |  |
| 834.2 |
| 32.6011.5 |
| Local plants**First line treatment**Modern medications Plants and medications Nothing  | 31.347.99.411,5 |

# Traditional practitioners and dysmenorrhoea

Table 5 on the involvement of traditional practitionersin the treatment of dysmenorrhoea shows that most of the traditional healers 6 (85.71%) inherited their knowledge of herbal medicine; Similarly, all 7 (100%) stated that dysmenorrhoea is considered to be an illness, but 3 (42.87%) diagnosed the illness on the basis of signs and symptoms reported by patients, and 3 (42.29%) did not know what the causes of dysmenorrhoea were. According to 3 (42.89%), infertility and stomach ache are consequences of dysmenorrhoea.

**Table 5: Distribution of traditional** **practitioners according to their involvement in the treatment of dysmenorrhea.**

|  |  |  |
| --- | --- | --- |
| **Variable** | **Number (N=7)** | **Percentage (%)**  |
| **Origin of knowledge in herbal medicine**HeritageSpiritualism |  61 | 85.7114.29 |
| **What is dysmenorrhea?**Disease  | 7 | 100 |
| **Diagnosis** It dependsPatient’s statementSigns and symptoms | 223 | 28.5728.5742.586 |
| **Causes**Nighttime diapersDirty water in the bloodHereditary I don’t knowNighttime poison | 11131 | 14.2914.2914.2942.2914.29  |
| **Consequences**Early abortionInfertilitystomachache |  133 | 14.2942.8642.86 |

# Diversity of plants used

Analysis of the survey data identified 25 plant species used in the pharmacopoeia to treat dysmenorrhoea. They are grouped into 23 genera and 19 families (Figure 2). The most represented family is the Asteraceae with 03 species (12%). Analysis shows that *Eremomastax speciosa* Cufod (17.05%) is used extensively by the majority of respondents, followed by *Myrianthus arboreus* (12.50%) and *Aloe barbadensis* (10.23%) (Figure 3). Table 6 shows the different plants harvested at Manjo.

**Figure 2:** Botanical families of plants identified.

**Figure 3:** Botanical characteristics of the plants identified.

# *Parts of the plants used*

Various parts of the plants were used to prepare the recipes (Figure 4). Leaves (52%), fruit (16%) and bark (12%) were the most popular.

**Figure 4:** Parts of plants used in this study

# *Methods of preparation*

Figure 5 shows the methods of preparation. Analysis of the data shows that decoction (44%) and maceration (36%) are the main methods of preparation.

**Figure 5 :** Methods of preparation

# *Dosage forms and route of administration*

Herbal tea is the only dosage form used in Manjo for the treatment of dysmenorrhoea. All the remedies used to treat dysmenorrhoea are administered orally.

Table 6: Distribution of recorded plant species used in the treatment of dysmenorrhoea in Manjo

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Familie** | **Scientific names** | **Trade name**  | **Part used**  | **Method of preparation** | **Route of administration** | **Number of citations** |
| Acanthaceae | *Eremomastax speciosa* (Hochst.) Cufod. | Red on one side | Leaves | Decoction | Oral | 15 |
| Anacardiaceae | *Mangifera indica* L. | Mango tree | Bark  | Decoction | Oral | 4 |
| Annonaceae | *Annona muricata* L. | Soursop | Leaves | Decoction | Oral | 1 |
| Apiaceae | *Petroselinum sativum* (Mill.) Fuss | Parsley | Leaves | Decoction | Oral | 1 |
| Apocynaceae | *Picralima nitida* (Stapf) T. Durand & H. Durand | Kinkeliba | Fruits | Infusion | Oral | 6 |
| Asteraceae  | *Vernonia amygdalina* Merr. | Ndole | Leaves | Maceration | Oral | 4 |
| *Ageratum conyzoides* L. | King of herbs | Leaves | Maceration | Oral | 2 |
| *Emilia coccinea* (Sims) G. Don. | Rabbit leaves | Leaves | Maceration | Oral | 1 |
| Bombacaceae | *Adansonia digitata* L. | Baobab | Bark  | Decoction | Oral | 1 |
| Caricaceae | *Carica papaya* L. | Papaw tree | Leaves | Decoction | Oral | 3 |
| Cecropiaceae | *Myrianthus arboreus* P. Beauv. | Monkey pineaple | Leaves | Decoction | Oral | 11 |
| Clusiaceae | *Garcinia lucida* Vesque | Bark essok | Bark  | Maceration | Oral | 4 |
| *Garcinia kola* Heckel | Small cola or biter cola | Fruits | Maceration | Oral | 2 |
| Fabaceae | *Tetrapleura tetraptera* (Schumach. & Thonn.) Taub. | 4sides | Fruits | Infusion | Oral | 2 |
| Irvingiaceae | *Irvingia gabonensis* Baill. | Wild mango | Stone  | Decoction | Oral | 1 |
| Lamiaceae | *Ocimum basilicum* L. | Basil | Leaves | Infusion | Oral | 1 |
| *Ocimum gratissimum* A. Chev. | African basilic  | Leaves | Maceration | Oral | 1 |
| Liliaceae | *Aloe barbadensis* Miller | Aloe vera | Leaves | Maceration | Oral | 9 |
| Malvaceae | *Gossypium hirsurtum* L. | Cotton | Leaves | Decoction | Oral | 1 |
| *Hibiscus sabdariffa* L. | Bissap | Leaves | Infusion | Oral | 3 |
| Myrtaceae | *Syzygium aromaticum* (L.) (Merr. & L. M. Perry) | Clove  | Fruits | Decoction | Oral | 7 |
| Poaceae | *Zea mays* L. | Corn  | Flower  | Decoction | Oral |  |
| Ranunculaceae | *Nigella sativa* L. | Nigella seed | Seed | Maceration | Oral | 2 |
| Zingiberaceae | *Curcuma longa* L. | Turmeric | Roots  | Maceration | Oral | 1 |
| *Zingiber officinale* Rosc. | Ginger | Roots | Infusion | Oral | 4 |

# Phytochemical test of plants

Phytochemical test revealed the presence of the main chemical groups in the two hydroalcoholic extracts of *M*. *arboreus* and *E*. *speciosa*. The results are given in Table 7.

Table 7: Phytochemical composition of methanolic extracts of *M*. *arboreus* and *E*. *speciosa* leaves.

|  |  |  |
| --- | --- | --- |
| **Test** | *Myrianthus arboreus* P. Beauv. | *Eremomastax speciosa* (Hochst.) Cufod |
| Alkaloids | **+++** | **+++** |
| Phenolic compounds | **++** | **+++** |
| Flavonoids | **++** | **-** |
| Terpenoides | ND | ND |
| Sterols | ND | ND |
| Tannins | **+** | **+** |
| Saponins  | **-** | **-** |
| Anthraquinone | **++** | **++** |
| Coumarines | **++** | **-** |
| Anthocyanins | **++** | **++** |
| Molish  | **+** | **+** |

+++ : Strongly positive; ++ : moderately positive; + : slightly positive; - : negative; ND : Not Determined

Alkaloids, phenolic compounds, anthraquinones, anthocyanins and Molisch are present in each of the plant extracts. Saponins were absent in both extracts. The qualitative composition of these metabolites in the aqueous plant extracts showed slight differences depending on the plant. Thus, we note an abundance of alkaloids, phenolic compounds, anthraquinones and anthocyanins in the two plant species involved in this study. However, the aqueous extract of *E*. *speciosa* is very rich in phenolic compounds, whereas these metabolites are in the medium range in the *M*. *arboreus* extract. The results also highlight the presence of flavonoids and couramins in the aqueous extract of *M*. *arboreus*, in contrast to *E*. *speciosa* where these compounds are absent.

# Discussion

The aim of this study was to identify the plants used to treat dysmenorrhoea in Manjo. The survey involved 192 women suffering from dysmenorrhoea and 07 traditional healers. The women ranged in age from 14 to 62 years, with an average age of 22.31±7.37 years and a predominance of those aged between 14 and 23 years (68.23%). Most of the participants had reached secondary school (152; 79.2%), were students (47.4%) and single (76%). The age at menarche was mostly between 12-14 years (78.65%), with an average of 13 years. These results are similar to those of Unsal & *al*., 2010 [15] who showed that the majority of respondents had a menarche age of 13, which is in line with the average menarche age found in the studies by Chang in 2008 which was 13.6 years  [16] and Ameade & Garti, 2016 [17]. Other studies have found lower menarche ages, following the example of Santina and Sinha, who found a mean age of 12.5 and 12.8 years respectively [17]. The difference in mean age at menarche corresponds to the age of adolescence, a period of normal growth for girls.

Of the 7 traditional healers surveyed, the majority were men. This can be explained by the fact that knowledge of medicinal plants is primarily passed down from father to son through custom. This result is in line with the findings of research carried out in Togo [18]. According to Gbekley & *al*., 2018 [19] knowledge of a recipe in traditional medicine is above all a family secret that is passed down from generation to generation through customs and oral tradition. It is therefore necessary to be of a mature age and to have a certain amount of confidence in order to have access to the knowledge of this medicine. This is the main reason why this profession is practised by older people.

With regard to the general public, the clinical characteristics showed that all the women suffering from dysmenorrhoea were aged between 14 and 62. The predominance of women was explained by the fact that the vast majority of women suffer from dysmenorrhoea. This result is similar to that of studies carried out in Turkey by Unsal in 2010 in women aged 18-45 years [15] and in Singapore in 1992 in women aged 15-54 years and Adham in Morocco in 2006 [20], which obtained an age range of 12-21 years and the latter investigated only adolescent girls in order to determine the prevalence of primary dysmenorrhoea. In this study, a total of 25 species belonging to 19 families were identified. The most represented plant family was the Asteraceae because of its richness in species and the large number of chemical substances it can produce. Bnouham in 2002 [21], in an ethnobotanical survey carried out in Morocco, arrived at a similar result, with the Asteraceae family being the most represented. The high representation of the Asteraceae (16%) could be justified by the fact that it is a family of ubiquitous subspontaneous and ruderal plants, accessible to local populations, which facilitates their use.

This study revealed that the most commonly used species were *Eremomastax speciosa* and *Myrianthus arboreus*. *Eremomastax speciosa* is a herbaceous plant found in humid forest areas and intertropical mountainous zones in Africa. *Myrianthus arboreus* is a fruit tree native to tropical Africa. The organs of these plants are used in phytotherapy in Africa. The seeds of *Myrianthus arboreus* have considerable nutritional potential [22].

Characterisation reactions revealed the presence of several chemical compounds in all the drugs. The most abundant were alkaloids, phenolic compounds, flavonoids, anthraquinones, coumarins and anthocyanins. These molecules are secondary metabolites that give plants their antibacterial, antifungal, antiparasitic, antiviral and antioxidant activities (15).

The parts of these plants frequently used to treat dysmenorrhoea were the leaves, followed by the fruit and the bark. The frequent use of leaves is justified by the fact that they are the site of synthesis of the plant's secondary metabolites [23]. This result corroborates those found by Koudouvo in 2011 [24] and Effoe & *al*., in 2020 [18] who found that leaves were the parts of plants most used for therapeutic purposes. The high use of bark is linked to the natural richness of these organs in certain active principles such as anthraquinones, which give them high antioxidant properties [25]. This could also be explained by the availability of these organs at all times of the year in the study area.

In the light of the results, it appears that decoction is the most widespread preparation method, followed by maceration. This can be explained by the fact that this technique is most often used with plant parts such as barks and leaves. This result is similar to that of Tsouh Fokou in 2015 [26] and Bayaga & *al*., 2017 [27], who found that maceration and decoction were the most commonly used methods for preparing medicinal plants. For Azonbakin & *al*., 2021 [28], decoction is the most commonly prescribed form of medicine in traditional medicine. Similarly, Mahmoudi & *al*., (2013) [29] have shown that extraction by decoction gives a better yield than maceration. In addition to maceration and decoction, there are other forms of plant preparation, in particular infusion, which is similar to the results obtained by Ratthas 2016 [30], who found that infusion was the most commonly used method of treatment with medicinal plants. All the remedies used in the treatment of dysmenorrhoea are administered orally, which is the preferred route of administration in traditional medicine [31].

# Conclusion

The aim of this study was to identify the plants and plant recipes used in traditional medicine to treat dysmenorrhoea in Manjo. At the end of this work, we identified 25 plant species. Leaves are the most commonly used organs. Most of the recipes are obtained by decoction and administered orally. *Eremomastax speciosa* and *Myrianthus arboreus* are the species most commonly used in the treatment of dysmenorrhoea. Phytochemical testing of macerates from these plants showed an abundance of secondary metabolites: alkaloids, phenolic compounds, flavonoids, anthraquinones, coumarins and anthocyanins. These molecules are secondary metabolites that give the plants their antibacterial, antifungal, antiparasitic, antiviral, antioxidant and analgesic activities. This work has enabled us to discover the diversity of traditional medicine and the knowledge of biodiversity and its therapeutic virtues by the women and traditional practitioners of Manjo. With a view to the future, plants with a high frequency of use will be biologically screened and the effects of their extracts on acetic acid-induced pain assessed.

**Disclaimer (Artificial intelligence)**

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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