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Therapeutic recipes based on medicinal plants used for the treatment of Flu, Cold, Cough and Covid-19 at cities of Mbanga and Yaounde (Cameroon)

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ABSTRACT

The recent worldwide pandemic of Covid-19 induced major issues through herbal medicine. This study was conducted between August 2020 and March 2021, with the aim to evaluating the knowledge of the population on the usefulness of herbal medicine in the treatment of Flu, cough, cold and Covid-19 and identifying therapeutic recipes used at Mbanga and Yaounde cities. The results showed that 88.46% and 67.69% of population respectively at Mbanga and Yaoundé agreed to the use of medicinal plants. Of the 130 people interviewed per city, the most affected were between 40-50 years old for Mbanga (33.07%) and 30-40 years old for Yaounde (43.84%). A total of 16 therapeutic recipes, mostly prepared by infusion or fermentation, were identified. These recipes use 11 plant species which belong to 9 genera and 9 botanical families. Herbal medicine seems to be a major solution in the treatment of upper respiratory diseases in these cities, although some fear the risks associated with this practice, due to the dosage as dosing is not mastered.

Keywords: Herbal medicine, therapeutic recipes, infusion, fermentation.

Recettes thérapeutiques faites à base de plantes médicinales utilisées pour le traitement de la Grippe, du rhume, de la toux et du Covid-19 dans les villes de Mbanga et Yaoundé (Cameroun)

RESUME

La récente crise sanitaire du Covid-19 répandue à travers le monde a conduit à apporter des solutions en phytothérapie. La présente étude a été menée entre août 2020 et mars 2021, dans le but

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de recenser les connaissances des populations sur l'utilité de la phytothérapie dans le traitement de la grippe, du rhume, de la toux et du Covid-19 et d'identifier les recettes thérapeutiques utilisées dans les villes de Mbanga et Yaoundé. En effet, les populations ont été très favorables à l'usage des plantes médicinales soit 88,46 et 67,69% respectivement à Mbanga et Yaoundé. Des 130 personnes interviewées par ville, les plus affectées avaient respectivement un âge compris entre [40-50[ans soit 33,07% à Mbanga , [30-40[ans (43,84%) à Yaoundé. Au total 16 recettes thérapeutiques préparées pour la plupart par infusion ou fermentation, ont été recensées. Cette étude a permis de recenser 11 espèces de plantes appartenant à 9 genres et 9 familles botaniques pour les différentes espèces. La phytothérapie semble être une solution majeure dans le traitement des maladies des voies respiratoires dans ces villes bien que certains redoutent des risques liés à cette pratique, dû à la posologie et aux doses très peu connues.

Mots clés : Phytothérapie, recettes thérapeutiques, infusion, fermentation.

INTRODUCTION

Since the ancient culture of societies, man has often had to find relief or cure his physical and mental illnesses by using many plants or derivate products (Bussman et al., 2010). The use of traditional medicine as a means of fighting disease is a common practice observed until today, despite the presence of modern or conventional medicine. In developing countries, traditional medicine is very often the only means of treatment accessible to populations (Tsobou et al., 2020). Apart from cultivated plants, several thousands of little-known wild plants have a great socio-cultural and socio-economic importance (Ouro-Djeri et al., 2022). They are endowed with nutritional and therapeutic properties (Effoe et al., 2020). In Cameroon, this means is also observed for the treatment of upper respiratory tract diseases such as flu, cough, cold and recently Covid-19. These diseases have symptoms that are often confused with those of fever, cold, cough, headache, tearing, throat irritation, etc. (WHO, 2017; Pan et al., 2018), thus justifying traditional dosages sometimes similar during processing. The same is true for certain active substances that have proven effective for Covid-19 and malaria (Kamp et al., 2020; Lu, 2020; Wang et al., 2020). Medicinal plants are therefore occasionally coveted for the treatment of these various diseases in view of the endogenous values useful for pharmacological activities (Tsobou et al., 2020). Many research works have been carried out on traditional plants, in this case ginger and lemongrass, from which we know the virtues of the essential oils extracted. The occurrence and severity of respiratory diseases remain high in both developed and developing countries (Lawal et al., 2020) However, few of these works have focused on the role of these plants in the treatment of the pathologies mentioned below. Indeed, little information on therapeutic recipes or dosages is known. It sometimes happens that the treatment requires the combination of several plants for these diseases (Etamé-Loé et al., 2018; Ngotta et al., 2023). This work aimed to provide information on the use of medicinal plants in the treatment of Flu, Cold, Cough and Covid-19, the different therapeutic recipes used and the reasons leading people to herbal medicine at Mbanga and Yaounde.

MATERIALS AND METHODS

Studies areas

This study was conducted in Mbanga and Yaounde, two cities in Cameroon. Mbanga is a city located between 9° 34' 05'' east longitude and 4° 30' 33" north latitude in the Littoral region. It stretches on either side of the national road n°5 Douala-Bafoussam over an area of approximately 544 km². It is the chief town of the district whose name it bears in the division of the Moungo Littoral region. However, the healthcare infrastructure is not well developed, and it is not widely

used by populations. Yaounde political Chief-town of Cameroon is located between 3°52'00" latitude North and 11°31'00" longitude East in the region of the Center, Mfoundi division and subdivided into seven subdivisions. It extends over approximately 304 km². There are a multitude of public and private health centers, hospitals and pharmacies. However, the access to the healthcare centers is increasingly difficult with the cost of living.

Data collection

Data collection was carried out using an approach based on the ethnobotanical survey model. The approach technique was the participatory survey method, carried out using forms designed for the occasion and by direct interview. A series of interviews was carried out in the two cities with 130 people per city and this in an equitable way over the extent of each of these cities. Interviewees were made up of users, traders, traditional healers and modern practitioners (nurses, doctors) during a period from August 2020 to March 2021. The survey sheet made it possible to collect information on the use of medicinal plants in the treatment of the four diseases of the upper respiratory tract above-mentioned, the different therapeutic recipes, methods of preparation, the dosage, the duration of the treatment and the reasons leading the populations to herbal medicine in the two cities.

Data analysis

The data collected were recorded in an Excel spreadsheet, and then transferred to the SPSS12 software for statistical analysis. The analysis of variance (ANOVA) with one classification factor was made to show if there is a significant difference between the number of recipes on the one hand and the number of species on the other hand at the 5% probability level. An ethnobotanical indicator was evaluated; the citation frequency (CF) (Aburjai et al., 2006). The citation frequency (CF) of each species was evaluated to appreciate the regularity in the distribution of the plant species using the following formula: CF = (CP/CT) x100.

CP represents the number of times the species is cited and CT the total number of citations.

RESULTS

Diseases and consultations

Interviewees were very supportive of the use of traditional medicine. Indeed, 203 of the 260 agreed, 88 in Yaounde (67.69%) and 115 in Mbanga (88.46%). These responses were driven by the empirical knowledge that these people possessed, and by economic reasons that constrained them in each city (Table 1). They presented the empirical reasons as a serious asset which adequately addressed the economic situation which has become increasingly difficult over the years in the country. However, the legacy of ancestral knowledge of traditional medicine was presented as the origin of the practice of the profession by most of the interviewees traditional therapists for both cities.

The oldest people interviewed were found in the city of Mbanga where the average age was about 43.53 ±11.64 years old, unlike those in Yaoundé 38.53 ± 9.22 years old. There was a high concentration of individuals of these populations in the age group of 30-50 years (66.15%) in both cities. Of the 130 people interviewed per city, the most affected were between 40-50 years old for Mbanga (33.07%) and 30-40 years old for Yaounde (43.84%) (Table 2).

To treat themselves, these people consulted either a trained medical doctor at the hospital, a traditional therapist, or they used their own basic knowledge (self-medication). It was noted that modern medicine is in greater demand in Yaounde (32.30%), unlike in Mbanga where self-medication and its association with modern medicine predominate at 24.62% and 23.85% respectively. Moreover, this association was also one of the most carried out in Yaounde. However, the use of traditional therapists or their association with the basic knowledge of these people (self-medication) as means of treatment are equally word noting, with an

average of 13.08% for each of the two means mentioned above in the two cities (Figure. 1).

The 20 traditional healers interviewed were mostly men (92.5%) with a mean age of approximately 55.17 ± 4.81 years and with years of experience ranging from 10 to 35years (Table 3). They were illiterate (32.5%) for some and with a level of primary education (37.5%) or secondary education (30%) for others.

Therapeutic recipes and preparation

For the preparation of recipes, traditional users and healers use several parts of plants. The roots and the leaves were the most parts used with 41.57% and 37.95% at Yaounde, 36.99% and 31.96% at Mbanga (Table 4). However, in addition to these parts, other elements from animal or plant products (mint crystals, menthol, cooking salt, sugar or honey) shall be combined.

These included infusion, fermentation, maceration and Trituration (Table 5). Infusion and fermentation were the most used. For them, infusion was a quick way to obtain the recipe. In this case, the preparation did not require more than of 5 to 10 minutes or even 15 in some cases. For most users, this was the most common "hot-mix" technique, the most requested for its execution time. Fermentation turned out to be the second most used preparation method. They called this method "cold-preparation" of recipes. Most traditional healers claimed that the fermentation process allowed the parts of the essences collected to release the toxins and to retain only the metabolites with the desired ingredient. It took an average of at least two days or little longer to get an effective recipe.

They consider that this technique had a very important advantage. Indeed, the revenue generated could also be used as a preventive measure.

Plant species and illnesses

A total of 16 therapeutic recipes were proposed for the treatment of these diseases. Each had more or less common ingredients and dosage (Table 6). These recipes use 11 plant species which belong to 9 genera and 9 botanical families (Table 7). The plants which were the most sought were *Zingiber officinale* and *Cymbopogon citratus* (Figure 2). In fact, each of these plants was used as a basic element on which was established a recipe to be prepared either by the traditional healers or by the patient himself.

However, the details of therapeutic recipes (settings and directions) were given by users and traditional healers (Table 6). Both Flu and Cough were the most illnesses' therapeutic recipes (Table 8).

Indeed, according to some traditional healers, herbal medicine appeared to be a means for anyone with knowledge required in the field or those who were forced to do so because of lack of financial incomes in a context where the wave of Covid-19 epidemic was rife in the country. Between these four diseases, the 11 species of plants, and the 16 therapeutic recipes identified.

Besides, the statistical analysis of the averages of the species by disease revealed that there was no significant difference (Figure 3); however, that of the average receipts by species shows a significant difference (Figure 4).

Table 1: Origin of the use of traditional medicine.

Parameters / Town	Answer (%)		Motive (%)			
	No	Yes	EK	EC	EK+EC	Heritage
Yaounde	32.31	67.69	19.23	27.69	5.38	15.38
Mbanga	11.54	88.46	40.77	18.46	13.85	15.38

EK: Empirical knowledge. EC: Economic cause.

Table 2: Percentage of illnesses distribution according to age.

Age / Town	Percentage (%)					
	[20-30[	[30-40[	[40-50[	[50-60[	[60-70[	[70-80[
Yaounde	16.15	43.84	30.76	7.69	0.76	0.76
Mbanga	13.14	24.61	33.07	20	7.69	0.76

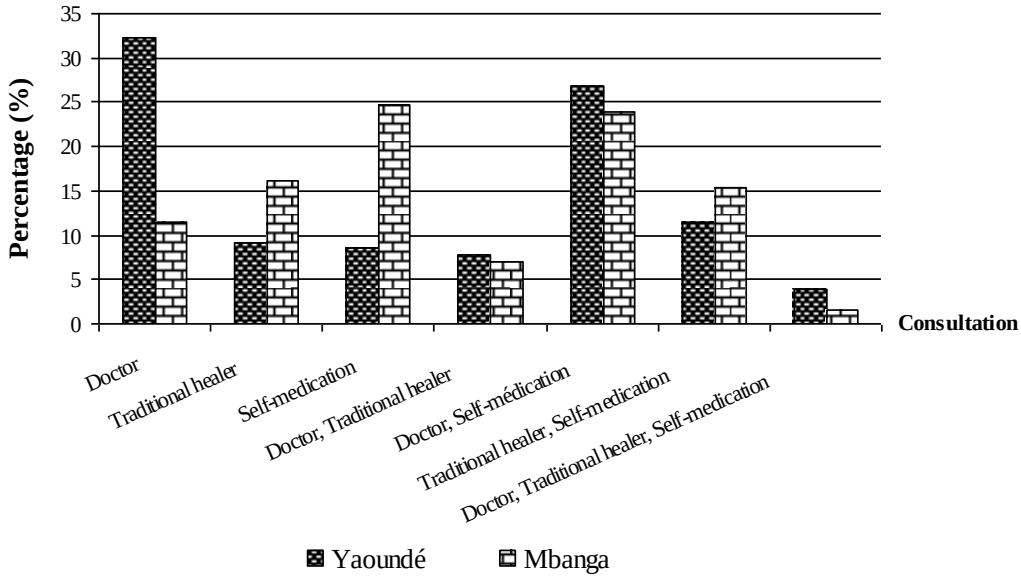

Figure 1: Means of treatment in both towns

Table 3: Characteristics of traditional healers interviewed in both cities.

Parameters / Town	Age (years)	Gender (%)		Year of experience (%)		
	Mean	Male	Female	[10;20[	[20;30[	[30;35[
Yaounde	54.65	95	5	55	35	10
Mbanga	55.70	90	10	25	60	15

Table 4: Percentage of parts of plants used for therapeutic recipes.

Parts / Town	Percentage (%)		
	Roots	Leaves	Fruits
Yaounde	41.57	37.95	20.48
Mbanga	36.99	31.96	31.05

Table 5: Mode of preparation and characteristics of therapeutic recipes.

Parameters / Town	Type (%)				Duration (%)	
	Decoction	Fermentation	Infusion	Trituration	[5-10 min[	[10-15 min[
Yaounde	7.95	31.82	48.86	11.36	67.05	32.95
Mbanga	8.70	29.57	56.32	5.22	77.39	22.61

Table 6: Therapeutic recipes registered against upper respiratory diseases at Yaounde and Mbanga.

N°	Main plants	**Families**	**Used part**	**Plants and added products**	**Illnesses**	**Type of preparation**	**Posology/Duration of treatment**	**Frequencies of citation (%)**	
								Yde	Mb
1	*Zingiber officinale*	Zingiberaceae	Dried roots mashed	*Citrus lemon* or *C. sinensis*	Flu and cough	Trituration	One teacup morning and night, during 3-5 days	6.32	6.98
2	*Zingiber officinale*	Zingiberaceae	Dried roots mashed	*C sinensis* or *C. lemon* and honey	Flu, cough	Infusion	Half of glass morning and night, during 3-5 days.	11.46	10.85
3	*Zingiber officinale*	Zingiberaceae	Dried roots mashed	*C. lemon* or *C. sinensis*, honey and menthol	Flu, cough and cold	Infusion	Half of glass morning and night, during 3-4 days.	2.77	3.10
4	*Zingiber officinale*	Zingiberaceae	Dried roots mashed	*Allium sativum, Cymbopogon citratus and Eucalyptus globulus*	Flu, cough and Covid-19	Infusion	Half of glass morning and night, during 3 days.	2.77	1.94
5	*Zingiber officinale*	Zingiberaceae	Fresh roots mashed	*C. lemon* or *C. sinensis*, honey and *Mentha spicata*	Flu, cough, cold, Covid-19	Infusion	Teacup morning and night, during 3-7 days.	12.25	12.40
6	*Zingiber officinale*	Zingiberaceae	Dried roots mashed	*E. globulus, C. lemon* or *C. sinensis, Allium cepa* and *A. sativum*	Covid-19 and Flu.	Infusion	One glass morning and night during 3-7 days.	1.19	2.33

7	*Zingiber officinale*	Zingiberaceae	Fresh or dried roots	*Garcinia kola* and salt.	Cough	None	Chewing morning and night during 3 days	3.56	5.81
8	*Zingiber officinale*	Zingiberaceae	Fresh roots mashed	*A. sativum, A. cepa and Petroselinum crispum.*	Flu, cough, cold, Covid-19, rheumatism, neuralgia	Fermentation (3 days)	One spoon of tea morning and night, during 3 days.	12.65	12.79
9	*Zingiber officinale*	Zingiberaceae	Fresh roots mashed	*Cymbopogon citratus*	Flu, cough, and cold	Infusion	One glass morning and night during 3-4 days	7.91	4.65
10	*Cymbopogon citratus*	Poaceae	Fresh leaves	*Citrus lemon* or *C. sinensis* and honey	Flu and cold	Infusion	One glass morning and night during 3-7 days	11.07	9.30
11	*Cymbopogon citratus*	Poaceae	Fresh leaves	*Garcinia kola*, salt and honey.	Cough, cold	Infusion	One glass morning and night during 7 days	5.14	5.81
12	*Cymbopogon citratus*	Poaceae	Fresh leaves	*Mentha spicata*	Flu and cold	Infusion	One glass morning and night during 3-4 days	2.37	3.10
13	*Cymbopogon citratus*	Poaceae	Fresh leaves	*Eucalyptus globulus*	Flu, cold and Covid-19	Infusion	One glass morning and night during 7 days.	2.77	4.65
14	*Cymbopogon citratus*	Poaceae	Fresh leaves	*Artemisia annua.*	Covid-19 and flu.	Infusion and decoction	One glass morning and night during 7 days	6.32	5.43
15	*Cymbopogon citratus*	Poaceae	Fresh leaves	*A. annua, E. globulus, Zingiber officinale and Allium sativum.*	Covid-19, Flu, neuralgia.	Infusion and decoction	One glass morning and night during 7 days	4.35	6.59
16	*Cymbopogon citratus*	Poaceae	Whole plant (Leaves and roots)	*A. sativum*	Cold, cough and fever.	Decoction	One glass morning, midday and night during 5-7 days	7.11	4.26

Yde: Yaounde ; Mb:Mbanga

Table 7: Synthesis of plants used according to therapeutic recipes.

Families (9)	Gender (9)	Species (11)	Recipes (16)	Frequency de citation (%)
Amaryllidaceae	*Allium*	*Allium cepa*	R6, R8	12.5
		Allium sativum	R4, R6, R8, R15, R16	31.25
Apiaceae	*Petroselium*	*Petroselinum crispum*	R8	6.25
Asteraceae	*Artemesia*	*Artemesia annua*	R14, R15	12.5
Clusiaceae	*Garcinia*	*Garcinia kola*	R7, R11	12.5
Labiaceae	*Mentha*	*Mentha spicata*	R3, R5, R12	18.75
Myrtaceae	*Eucalyptus*	*Eucalyptus globulus*	R4, R6, R13, R15	25
Poaceae	*Cymbopogon*	*Cymbopogon citratus*	R4, R9, R10, R11, R12, R13, R14, R15, R16	56.25
Rutaceae	*Citrus*	*Citrus lemon, Citrus sinensis*	R1, R2, R3, R5, R6, R10	37.5
Zingiberaceae	*Zingiber*	*Zingiber officinale*	R1, R2, R3, R4, R5, R6, R7, R8, R9, R15	62.5

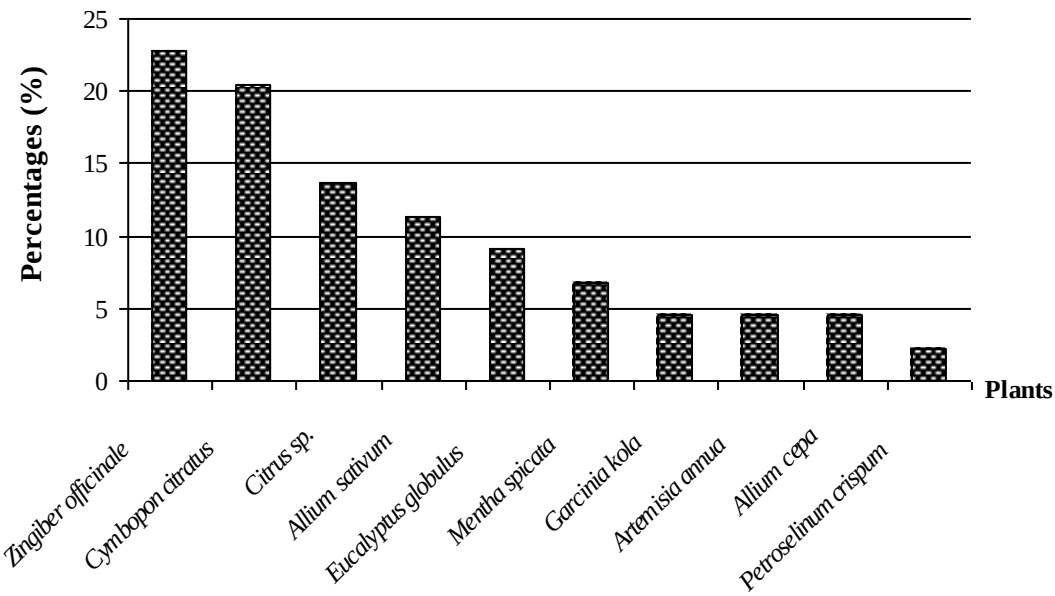

Figure 2: Frequency of use of plants for different recipes.

Table 8: Synthesis of plants used on therapeutic recipes according to illness.

Illnesses	Numbers of recipes	Plants
Covid-19	6	*Allium cepa, A. sativum, Artemesia annua, Citrus lemon, C. sinensis, Cymbopogon citratus, Eucalyptus glomurus, Petroselinum crispum, Zingiber officinale*.
Flu	11	*A. cepa, A. sativum, A. annua, C. lemon, C. sinensis,*

		C. citratus, E. globulus, Mentha spicata, P. crispum, Z. officinale.
Cold	7	*A. cepa, A. sativum, C. lemon, C. sinensis, C. citratus, Garcinia kola, M. spicata, P. crispum, Z. officinale*.
Cough	10	*A. sativum, C. lemon, C. sinensis, C. citratus, G. kola, P. crispum, Z. officinale*.

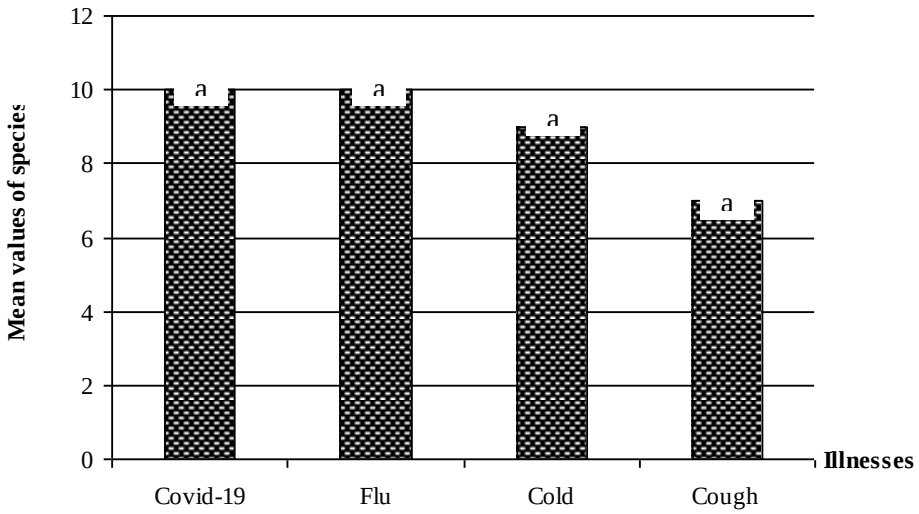

Figure 3: Average values of plant species by disease. Bars with the same letter are not statistically different at the 5% probability level.

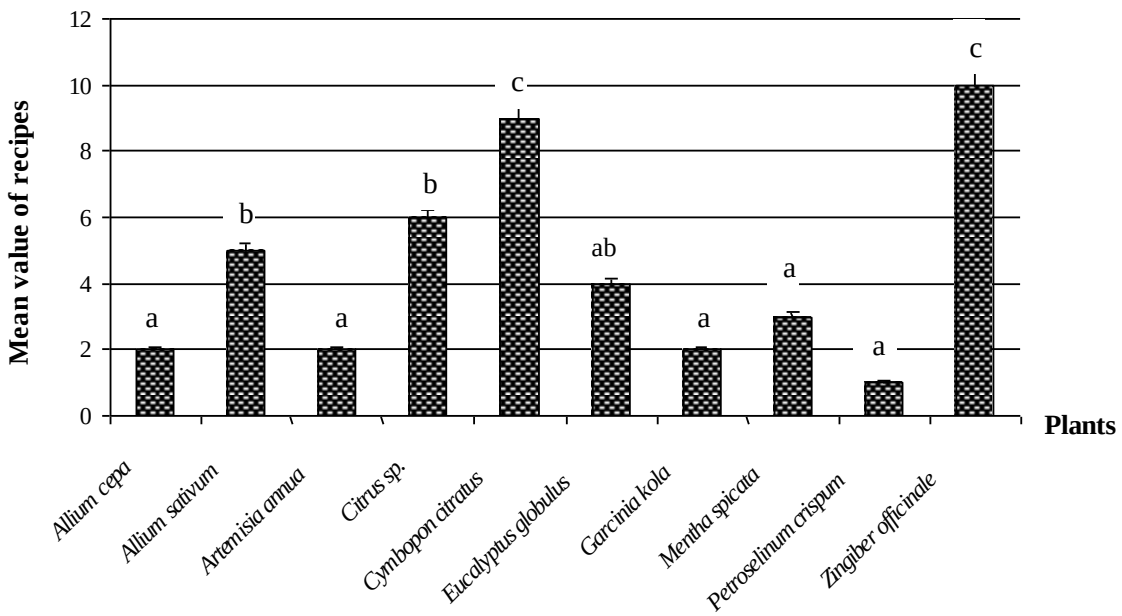

Figure 4: Average values of plant species by disease. Bars with the same letter are not statistically different at the 5% probability level.

DISCUSSION

The aim of this study was to evaluate people's knowledge of the usefulness of herbal medicine in the treatment of Flu, Cold, Cough and Covid-19, and to identify the therapeutic recipes used in these cities. The populations of different social ranks (traders, users or traditional healers) interviewed were very favorable to traditional medicine 88.46 and 67.69% respectively in Mbanga and Yaounde. Flu and cough were the illnesses that most had therapeutic recipes. *Cymbopogon citratus* and *Zingiber officinale* proved to be the base plants from which therapeutic recipes were made. Both were also cited as plants used for the treatment of certain upper respiratory tract diseases such as bronchitis, asthma or tuberculosis (Lawal et al., 2020). The therapeutic recipes were obtained using roots, leaves and fruits. Dongock et al. (2018) during their work also found leaves, roots and bark as major part of plants used on recipes. Infusion and fermentation were the most used mode of preparation. This result is contrary to those obtained by Yapi et al., 2015 who found that decoction is generally the most used in herbal medicine. Although a gender balance was established during the surveys, it is important to note that almost all of the traditional healers interviewed were men (92.5%) with an average age of 55.17 ± 4.81 years. These results are similar to those of previous ethnopharmacological studies which revealed the predominance of seniors (Kpodar et al., 2016; Ouro-Djeri et al., 2022). The most cited reasons for recourse are empirical or inherited (52.70%). It was found that the transmission of knowledge in medicinal plants was done from generation to generation and at an age considered mature. It is therefore necessary to be of a mature age and to have a certain confidence in order to have access to the knowledge of traditional medicine and this is probably the main reason why this profession is practiced by elderly people (Effoe et al., 2020). Nearly 90% of the traditional healers interviewed between 10 and 35 years had experience in traditional medicine. These results are similar to those obtained by Afanyibo et al. (2018), Kpabi et al. (2020), Ouro-Djeri et al. (2022) who obtained 85.96% of men between 10 and 50 years of experience in traditional medicinal plants in Tomety-Kondji (Togo). Ouro-Djeri et al. (2022) during their work obtained 29% of recipes with side effects. The dose administered is one of the concerns that accompanies this practice. In fact, drug overdoses would impose significant work on the nephron, which could go so far as to create lesions, especially when we know that the time between the appearance of kidney lesions and exposure to the drug is very variable and sometimes prolonged (Izzedine et al., 2014), this ranging from one week to 12 months (Izzedine et al., 2019), and even in some cases after the cessation of treatment (2 months).

Conclusion

This study has provided insight into the therapeutic recipes consumed by populations to treat upper respiratory tract diseases such as Flu, cold, cough and Covid-19. It revealed the motivations of the populations in the use of this practice. Since the advent of Covid-19, the Cameroonian populations have got the proof of virtues and especially the effectiveness of treatments based on medicinal plants. This would have helped some traders and traditional healers increase their income. However, it would then be necessary to carry out studies on the place and frequencies of supply of these plants which are mostly non-timber forest products (NTFPs) on the one hand; and others on the dosage of these therapeutic recipes that needs to be mastered in order to ensure that they would not have toxic effects on their long-term health.

COMPETING OF INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

WGN contributed to design and structuring of the study, to the literature search, to the collection, analysis and interpretation of data, and to the writing of the manuscript; JM contributed to the structuring of the study and collect data; JMP, EN and

FAN contributed to design of the study; ZA contributed to the structuring of the study and to the analysis and interpretation of the data.

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