

Original Research Article

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Contribution to traditional knowledge used for the prevention and healing of the Covid-19 symptoms by local people of Deng-Deng massif forest Cameroon

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Abstract

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SARS-CoV-2 which causes the corona virus disease 2019 (Covid-19) continues to spread worldwide, causing death and panic in rural communities with little emergency medical facilities. The efficiency of traditional medicine has become the priority to prevent this pandemic. The aim of this study was to identify local knowledge and forest plant species used by local populations of the Deng-Deng massif forest against the Covid-19 pandemic. Semi-structured questionnaires was used; and inquired including the naturopaths, healers and heads of households (men and/or women). A total of 405 people were interviewed in 22 villages. Available lexicons were used to find correspondence to the vernacular/common names provided by inquired people. Five major Covid-19 symptoms including fever, headache, cough, dyspnea, cold/nasal discharge were identified by local people and 48 forest plants species were identified to prevent these symptoms, while 26 plant species were identified as treatment of specific Covid-19 symptoms. The frequent use of the various plant species for the prevention of the Covid-19 emerged as follow: *Alstonia booneii* (95%), *Annickia chlorantha* (72%), *Picralima nitida* (50%), *Pycnanthus ivorensis* (20%) and *Milicia excelsa* (16%). This study confirms the importance of forest plant species in traditional medicine against the Covid-19 pandemic.

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Introduction

The contribution of plants in traditional medicine is well-established worldwide (Muhammad, 2020) and has been recognized by the WHO (Singh et al., 2010) as

80% of the worldwide population relies on plant natural products for health. Compared to conventional drugs, plants are more accessible locally, cheap with little side effects (Tsabang et al., 2016). Most African local communities still relies on traditional medicine although

it usually appears as the result of absence of modern health centers (Kognou et al., 2020; Vroh, 2020). Traditional medicine is commonly used to cure various diseases symptoms including fever, headache, cough, diarrhea, and nasal discharge (Ngwewondo et al., 2020), common symptoms of Covid-19.

Covid-19 is an emerging respiratory disease caused by the highly contagious SARS-CoV-2 virus. Firstly detected in December 2019 in China (Wuhan), it has so far been reported in more than 215 countries (Ngwewondo et al., 2020) and constitutes a major public health emergency concern (declared by the WHO 4th March 2020). In Cameroon, the first confirmed case was observed on 6th March 2020 and at the current date, the number of confirmed cases is 74 946 with 1152 deaths. The virus is commonly spread when people come in close contact with each other. It is spread via small droplets produced when coughing, sneezing, and talking. One can get infected by touching a contaminated area and then touching their nose, eyes, and mouth. It is also possible for the virus to spread without showing any symptoms. The cold, cough, fever, tiredness and difficulty in breathing are the most common symptoms of Covid-19 (Vroh, 2020; Mondal et al., 2020; Fongnzossie et al., 2021); and people with lungs problems, cancer patients, chronic diseases, heart problem, high blood pressure, diabetic are more vulnerable (Ngwewondo et al., 2020). To limit and avoid the rapid spread of the ongoing Covid-19 outbreak in the countries several, Governmental measures were put in place.

As most viral diseases, two main approaches are recommended against the Covid-19. They include prevention and curative measures. There's currently no conventional and approved Covid-19 treatment. Various vaccines have been approved as emergency measures. This includes Astrazeneca, Fizer (Biontec), and many others from Russia and China. None of these vaccines guarantee an absolute protection against the currently known emerging strains of SARS-CoV-2 virus (e.g. Indian, South-African, English). Alongside the conventional medicine, the use of various plants extracts such as *Artemisia* has been recommended as treatment of various Covid-19 symptoms (Lui et al., 2009) and Covid-Organics (CVO+) capsules produced from the traditional plants in Madagascar, while many others were recommended as preventive method (Gourch et al., 2020; Vroh, 2020; Mondal et al., 2020, Muhammad, 2020; Fongnzossie et al., 2021).

The East region of Cameroon is the largest ecological zone in terms of surface area covered by forest, which nearly cover 80% of the regional land. Traditional medicine is of great importance to these living populations. Local populations currently believe that the low number of reported Covid-19 cases in the region is due to the regular consumption of plant decoctions (traditional medicine). Globally, this belief gained support from the WHO, which has welcomed traditional medicine in its strategy against the Covid-19 pandemic (Muhammad, 2020). It's therefore important to expand knowledge on the diversity of plants used in Covid-19 prevention or treatment in the East region of Cameroon, more precisely in the Deng-Deng massif.

Materials and methods

Study site

This study was carried out from January to March 2021 in 22 villages around the Deng-Deng forest massif. The relief of this area is relatively flat, with small low hills. The average altitude is 600 to 800 m. The hydrographic network is dense and characterized by the presence of several tributaries. The climate is equatorial Guinean type, with four unevenly distributed seasons with count: two dry seasons (a short dry season from July to August and a long dry season from mid-October to mid-March) and two rainy seasons (a long rainy season from mid-March to June and a short rainy season from September to mid-October). The average annual temperature varies between 23 °C and 25 °C; and the average rainfall of 1600 mm/year. The soils are essentially lateritic. Phytogeographically, the Deng-Deng massif belongs to the Guinean-Congolese domain (Letouzey, 1985) characterized by semi-deciduous with dominance of Cannabaceae and Malvaceae. The most common commercial species are *Triplochiton scleroxylon*, *Pterocarpus sayauxii*, *Terminalia superba*, *Mansonia altissima*, *Entandophrama cylindricum*, etc. In addition to wild logging, shifting cultivation, poaching and the collection of non-timber forest products (NTFPs) are the common activities that significantly contribute to the degradation of Deng-Deng massif forest.

Data collection

The methodological approach was based on the administration of a questionnaire that had been tested in advance, amended and updated. In each sampled village, a guide/translator has been used as a facilitator during the

interviews with the resource persons. This facilitator was put at our disposition by the chiefs of each target village. The resource persons targeted for this study were mainly naturopaths, healers, and heads of households (men and/or women) who use traditional medicine for their household, relatives and non-family members. The interview with heads of household was done in presence of their spouse when it was possible in the perspective to obtain more information. Thus, a total of 405 questionnaires were administered in 22 randomly villages (Table 1). These villages belong to 5 main ethnic groups/clans, namely Bobilis, Kepere Deng-Deng, Mbamvele, Maka and Pols.

The questions were focused on general knowledge about the CoviD-19 pandemic, traditional preventive and curative measures against this pandemic, forest species and parts of these species used in these preventive and curative means against CoviD-19. Whenever this was possible, the local residents were bringing us to the trees near their houses, so that we could gather the information needed to identify them. However, it should be noted that with vernacular or commons names, identification was done using available lexicons (e.g. TIAMA (software program put in place by the Ministry in Charge of Forests); Onana and Mezili, 2018).

Table 1. Number of person inquired in respect to the village.

Cantons	Villages sampled	No. of inquired persons
Bobilis	Ebaka	5
	Yebi	21
	Mbiombi	18
	Yanda	25
	Adiah	12
	Ndemba 1	21
Kepere Deng-Deng	Mbaki 1	8
	Mbaki 2	23
	Bambo	16
	Satando	17
Mbamvele	Bizeh	10
	Bikelka	6
	Bigomo	9
	Motombo	24
Maka	Djaglassi	38
	Bonando	27
	Petit Bonando	7
	Djamonome	12
Pol	Yoko-Betougou	34
	Mbethen 1	29
	Mbethen 2	18
	Dondi	25
Total	22	405

Data analysis

The survey forms were processed and encoded in an Excel spreadsheet. The analysis of the data was essentially based on descriptive analyses. The frequency of citation (Fc) of species was calculated in order to evaluate the most commonly used species. It represents the percentage of informants citing the species (S) in relation to the total number of informants surveyed (N) $FC = S/N \times 100$ (Dibong et al., 2020). The frequency of citation indicates the potential importance of the species reported in this study area. Knowledge of the citation

frequency of a specific plant was used to determine its reliability and effectiveness in treatment of or more diseases.

Results

Demographic characteristic of respondents

The majority of local people inquired were male (71%); and most of these inquired are belonging to the age class [30-40] year. Only 1% has a higher education level; 20% have none level and 59% with primary

level. 80% of them are married and belong to the 5 mean ethnic groups. They were more Catholic (63%)

and their main occupation activity was Agriculture (86%) (Table 2).

Table 2. Summary of demographic characteristic of respondents.

Socio-demographic characteristic		Percentage of respondents (%)
Gender	Male	71
	Female	29
Age (year class)	<20	2
	[20-30]	16
	[30-40]	38
	[40-50]	25
	[50-60]	8
School level	≥60	12
	None	20
	Primary	59
	Secondary	20
Matrimonial statute	Superior	1
	Bachelor	14
	Married	80
	Divorced	2
Ethnical group	Widower	3
	Bobilis	19
	Kepere Deng-Deng	14
	Maka	35
	Mbamvele	12
Religion	Pol	15
	Others	5
	Adventist	23
	Catholic	63
	Moslem	1
Principal activity	Pentecotist	8
	Protestant	5
	Agriculture	86
	Craftsmen	2
	Hunting	3
	Naturopaths /healers	5
	Civil servant	2
	Others	2

According to the data survey, 94% of local people inquired personally used traditional medicine for themselves and those of their family and others. 94% of those who used traditional medicine have acquired it through heritage from their parents; only 6% percent acquired the knowledge by training from naturopaths or healers of the village. 65% of local people inquired collected medicinal plant used against Covid-19 symptom in forest; 17% and 18% say that their collected these plants in forest-agroforest-farm and forest-field-behind the house respectively.

Knowledge of Covid-19 pandemic by local people of Deng-Deng forest massif

Although no case of Covid-19 had been recorded in the Deng-Deng forest massif, all the local residents' surveyed said they had already heard about Covid-19 through various means like television/radio (69%), conversation (26%), sensibilization (4%) and social media (1%). However, when we asked them if they know about Covid-19 manifestations/symptoms in an affected person, 30% said they do not know, as opposed

to 70% who said they have only followed up through various means. The Covid-19 symptoms like identified by local people inquired are grouped in 5 main symptoms: Fever, Headache, Cough, Dyspnea, and Cold and nasal discharge.

Preventive measures against Covid-19

Only 87% of local people inquired applied preventive method against Covid-19. Measures prescribed by the Head of State are only applied when they leave their villages or go to town. However, at the village level, the preventive measures were essentially the use of medicinal plant decoctions (80 %); 10% thought that taking their traditional *wine 'kembé'* or, '*ha'a'*', protects

them against Covid-19. Only 10% thought that it was the preventive methods like washing of hands with water and soap, using hydro-alcoholic gel, wearing face mask, and social distancing which can protect them against Covid-19.

Diversity of plant species used by local people like preventive or curative against Covid-19's symptoms

A total of 48 forest plants species were identified for treatment or preventive measure against the Covid-19 symptoms. Among these plants, scientific name of 41 were identified and 7 were identified only with their vernacular names; these plant belong to 22 plant families (Table 3).

Table 3. List of Plant species identified in the treatment of Covid-19 symptom. Bo: Bobilis; Ma: Maka, Mb: Mbamvele, Po: Pol and Ke: Képré Deng-Deng. For symptom treated; Fe=fever; He= headache; Co=Cough; Dy=Dypnea, Cl=Cold and nasal discharge.

Common names	Vernacular names	Scientific names	Families	Used by ethnics	Parts used	Treated symptom
Nsangomo		<i>Allablankia floribunda</i> Oliv.	Clusiaceae	Bo, Ma	bark	Co, Cl
Emien	Ikouk, rombo, guga	<i>Alstonia booneii</i> De Wild.	Apocynaceae	Bo, Ma, Mb, Po, Ke	bark	Fe, He
Moambe jaune	Pol/poro	<i>Annickia chlorantha</i> (Oliv.) Setten & Maas	Annonaceae	Bo, Ma, Mb, Po, Ke	bark	Fe, He
Moambe blanc	ébom	<i>Annonidium manii</i> (Oliv.) Engl. & Diels	Annonaceae	Ma	bark	He
Neem		<i>Azadirachta indica</i>	Meliaceae	Mb	Bark	He, Fe
Moabi	Aya'a	<i>Baillonella toxisperma</i> Pierre	Sapotaceae	Ke, Ma	bark	Fe, Dy
Ant tree	Gokomo, angokomo	<i>Barteria fustulosa</i> Mast.	Passifloraceae	Ke	bark	He, Fe
Kanda	noumkon	<i>Beilschmiedia obscura</i> Engl. ex Stapf	Lauraceae	Ke	Bark, fruit	Dy
Ayéfé	Bélé/ibigue	<i>Canarium schweinfurthii</i> Engl.	Burseraceae	Bo, Ke, Ma	bark	Dy
Acacia	Acacia	<i>Cassia</i> spp.	Leguminosae-Caesalpinioideae	Ke	bark	He
Squirrels' cola	bassindi	<i>Cola</i> sp.	Malvaceae	Ke	Bark	Dy
Cordia		<i>Cordia platythyrsa</i> Baker	Ehretiaceae	Ma	bark	Fe, He, Co, Cl, Dy
Okang		<i>Cylicodiscus gabunensis</i> Harms	Leguminosae-Mimosoideae	Ma	Leave, Bark	Fe, He, Co, Cl, Dy
Bois d'ébene		<i>Disopyros crassiflora</i> Hierm	Ebenaceae	Ma	bark	He
Sapelli	Sei	<i>Entandrophragma cylindricum</i> Sprague (Sprague)	Meliaceae	Ke, Ma	bark	He
Tali	Londe, ngoulou	<i>Erythrpheum ivorensis</i> A.Chev.	Leguminosae-Caesalpinioideae	Ke, Ma	bark	He, Co
Eucalyptus		<i>Eucalyptus</i> sp.	Myrtaceae	Mb	Bark	He
	wan	<i>Ficus exasperate</i> Vahl	Moraceae	Ma	bark	Dy
Bitter kola	Yieul, wélé	<i>Garcinia kola</i> Heckel	Clusiaceae	Bo, Ke, Ma	Bark, seed	Co, Fe, He
Bubinga	Mbaya/tonde, boka	<i>Guirbourtia demeusei</i> L.	Leguminosae-Caesalpinioideae	Ma	bark	He
	panpandé	<i>Hylodendron gabunensis</i> Taub.	Leguminosae-Caesalpinioideae	Ma	bark	He
Mangue sauvage	Doko, Mbiya	<i>Irvingia goboneensis</i> Baill. ex. Lanen	Irvingiaceae	Ma	bark	Fe

Common names	Vernacular names	Scientific names	Families	Used by ethnics	Parts used	Treated symptom
golong	Ngolo	<i>Khaya ivorensis</i> A. chev.	Meliaceae	Bo, Ma	bark	Fe
Iroko	Abang	<i>Milicia excelsa</i> (Welw.) C.C. Berg	Moraceae	Bo, Po, Ma	Sap, bark	Fe, He, Co
parassolier		<i>Mussanga cecropioides</i> R. Br. apud Tedlie	Urticaceae	Ke, Ma, Po	bark	Co
Monkey pineapple	Dogo, ngata, Idouk	<i>Myrianthus arboreus</i> Beauv.	Urticaceae	Ke, Pol, Ma	bark	He, Cl
Bilinga	Monsé, iza	<i>Nauclea diderrichii</i> (De Wild. & T.Durand) Merrill	Rubiaceae	Bo, Ma, Mb	bark	Co, Dy
Kinkeleba	Adingding	<i>Nauclea poboguenii</i>	Rubiaceae	Mb	Bark	Fe, Dy
	Ibam, mbola, gombou	<i>Picralima nitida</i> (Stapf) Th. & H. Durand	Moraceae	Bo, Ma, Mb, Po, Ke	Fruit, bark	Fe, He, Dy
Dabema		<i>Piptadeniastrum africanum</i> (Hook.f.)Brenan	Leguminosae-Mimosoideae	Ma	bark	He
Cérisier rouge	Imbouri	<i>Prunus cerasus</i>		Mb	Bark	Co
Ilumba	Tingue, etin	<i>Pycnanthus ivorensis</i> (Welw.) Exell	Myristicaceae	Bo, Ma, Mb, Po, Ke	bark	Co
	Ngomdé	<i>Rauvolfia vomitoria</i> Afzel.	Apocynaceae	Bo, Ke	leaf	Fe
Djansang	Izol	<i>Ricinnodendron heudolotii</i> (Baill.) Heckel	Euphorbiaceae	Ke, Bo	bark	Co, Dy
	Titemote	<i>Schumanniophyton magnificum</i> (K. Schum.) Harms	Rubiaceae	Mb	Bark	He, Fe
Tulipier of Gabon	Issoussou	<i>Spathodea campanulata</i>	Bignoniaceae	Bo	Bark	Co, Cl
Fraké	Landeu, Ngolu	<i>Terminalia superba</i> Engl. & Diels	Combretaceae	Ma	bark	He, Fe
Cacao	Kaka	<i>Theobroma cacao</i> L.	Malvaceae	Ke, Ma	Bark, leaf	Co
Amvout	Mbouti, Ngoyo, landar	<i>Tricoschypha acumulata</i> . Engl.	Anacardiaceae	Bo, Ke, Ma, Po, Mb	Bark, fruit	Co, Cl
	Hassan, assam	<i>Uapaca</i> spp.	Cannabaceae	Bo, Ke, Ma		Co
Voacanga	Itongli	<i>Voacanga africana</i> Stapf ex Scott-Elliot	Apocynaceae	Bo, Ma, Mb, Po, Ke	Bark, leaf, fruit	He, Fe, Dy
	Binzou	Not identified		Ma	Bark	Fe, He, Co
High Nivaquine	Kolcoissi, samanier	Not identified		Bo, Ma	Stem (liana)	Fe
	Nkoube	Not identified		Ma	bark	Co, Dy
	Papadeh/papondé	Not identified		Bo	Bark	He
	Sambek	Not identified		Ma	Bark	Fe
	Foaleu	Not identified		Ma	Bark	He, Fe
	Fande	Not identified		Ma	bark	Cl

Among these medicinal plants identified, 6 of them were commonly used in all these five ethnic group studies. It is the case of: *Alstonia booneii*, *Annickia chlorantha*, *Picralima nitida*, *Pycnanthus ivorensis*, *Tricoschypha acumulata*, *Voacanga africana*. Some of them were specifically used only by one, two, three or four studied ethnic groups. For example the case of *Azadirachta indica*, *Eucalyptus* sp., *Nauclea poboguenii*, *Prunus cerasus* which have been identified only for Mbamvele clan group; and *Barteria fistulosa*, *Beilschmiedia obscura*, *Cassia* spp. and *Cola* sp. Which have been identified only for Keperere Deng-Deng clan group (Table 3).

Different parts of medicinal plants used by local people for the treatment or prevention of some diseases are: barks, fruits, leaves, seeds, sap and stems (liana). For some plant species, they used barks and fruits, barks and leaves. In general; the barks of 80% of plant species identified are used by the local populations in the preparation of medicinal plant decoction used for the treatment against Covid-19, 7% of these plants, their barks associated to the fruits of others plants to treat the Covid-19 and 4% of barks of these plants are associated with the leaves of some plants.. Concerning leaves, bark-seed, bark-sap, bark-leaves-fruit and stem (liana), they represented 2% each.

Concerning plants used in the treatment of Covid-19 symptoms, 26 plant species have been identified as treating a specific symptom among the 5 symptoms of Covid-19 identified. Then, 5 (10% of total medicinal plants identified) are used by local peoples against cough (Co) treatment; 4 (8%) medicinal plant species are used against Dyspnea (Dy), 5 (10%) medicinal plant species are used against Fever (Fe), and 10 (21%) against Headache (He). among these plant species, 2% are used for the treatment of treat all the Covid-19 symptoms, 3 plant species (6%) are used against Cough-Dypnea, 3 (6%) against Cough-Cold/nasal discharge and Fever-Dypnea each; 1 plant species (2%) against Headache-col/nasal discharge and Headache-Cough. Concerning the number of plant species used in the treatment of 3 Covid-19 symptoms, 3 and 2 plant species are used to treat respectively Fever-Headache-Cough and Fever-Headache-Dypnea. Only two medicinal plant species (4%) have been identified like

treating all the 5 Covid-19 symptoms; these 2 plant species were *Cordia platythyrsa* and *Cylicodiscus gabunensis*; they were identified only in Maka ethnic group (Table 3).

Plant species most implicated against Covid-19's symptoms preventive or curative

According to citation frequency of plant species used against Covid-19 symptom, most plant species whose citation frequency are at least 10% are present in the Fig. 1. Thus, 12 plant species count between the 45 plant species identified were: *Alstonia booneii* (95%), *Annickia chlorantha* (72%), *Picalima nitida* (50%), *Pycnanthus ivorensis* (20%), *Milicia excelsa* (16%), *Tricoschypha acumulata* (15%), *Voacanga africana* (15%), *Mussanga cecropioides* (14%), *Myrianthus arboreus* (12%), *Garcinia kola* (11%), *Rauvolfia vomitoria* (10%) and *Allablankia floribunda* (10%).

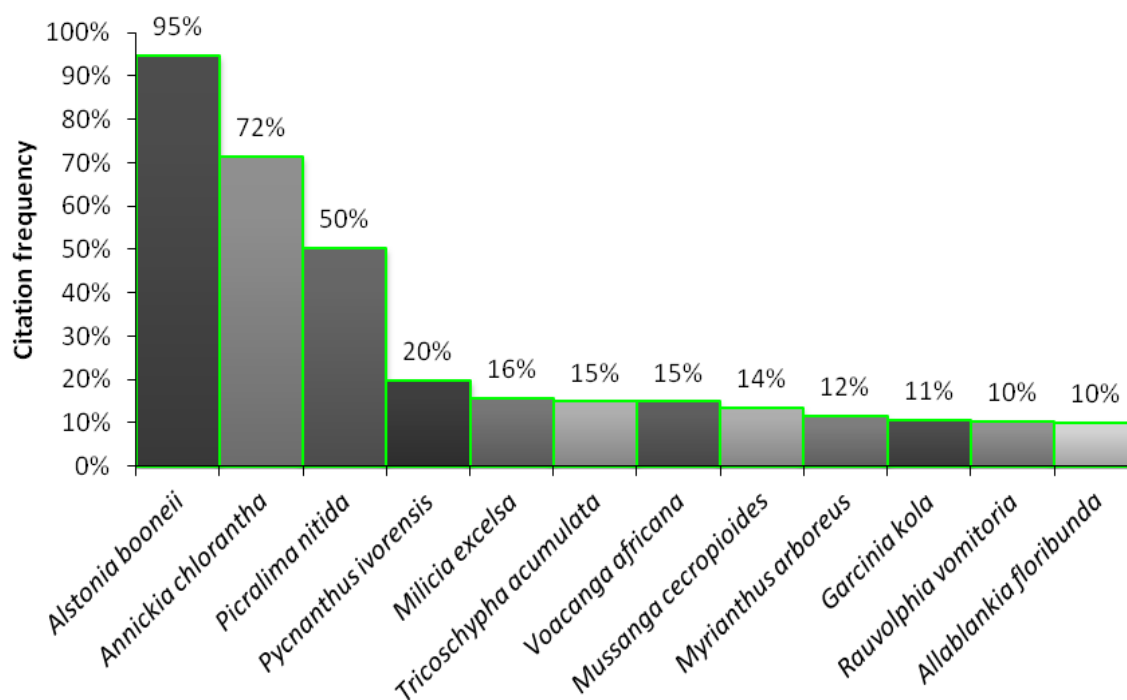


Fig. 1: Main species used by local people against Covid-19 symptoms.

Discussion

In Cameroon like in many other sub-Saharan African countries, the advent of modern medicine has not reduced the confidence placed in traditional medicine by rural populations, who commonly use plants for the

treatment of several diseases (Fongzossie et al., 2021). It is in this light that endogenous knowledge of traditional medicinal plants have a very high importance for the improvement of the health status of local populations. Indeed, as it was the case in this study, traditional medicine occupies a place of choice in the

habits of the local populations of the Deng-Deng forest massif because almost all the persons surveyed use medicinal plants for themselves, their families and others persons. This is justified by the diversity of 45 species of medicinal forest plants identified in the Deng-Deng forest massif as part of the preventive and curative measures related to the symptoms of Covid-19. As it was also observed in this study, several authors had already shown the importance of traditional medicine as a mean of prevention/treatment of Covid-19 symptoms (Mpondo et al., 2017; Gouch et al., 2020; Vroh, 2020; Mondal et al., 2020; Muhammad, 2020; Fongnzossie et al., 2021).

With respect to the Covid-19 related symptoms as perceived by Deng-Deng residents, socio-economic surveys carried out among 424 residents revealed 5 major Covid-19 related symptoms (headache, fever, cough, cold/nose discharge and breathing difficulties) which are similar to those found by several authors in sub-Saharan Africa (Gouch et al., 2020; Vroh, 2020; Fongnzossie et al., 2021). It is the specific richness of 45 forest species that are used to alleviate these Covid-19 symptoms; among these species four (4) (*Cola* spp., *Khaya* sp., *Rauwolfia* sp, *Terminalia* sp.) have already been confirmed as containing secondary metabolites as anti-Covid-19 molecules (Fongnzossie et al., 2021). With the literature review in Cameroon conducted by Fongnzossie et al. (2021) on plant species alleviating Covid-19 related symptoms, eleven species common to these authors have been also listed in this study to treat the same symptoms. These are: *Alstonia booneii*, *Annickia chlorantha*, *Azadirachta indica*, *Cola* spp, *Diospyros* sp, *Eucalyptus* sp., *Garcinia kola*, *Khaya* sp, *Milicia excelsa*, *Picalima nitida*, *Spathodea campanulata*, *Terminalia* sp. However, the richness of 45 species found in this study is low compared to the 99 of 230 species recorded by Vroh (2020) and Fongnzossie et al. (2021) this difference could be explained by the fact that these authors have done a literature review of species potentially used against Covid-19 in Sub-Saharan Africa and Cameroon, whereas we only surveyed the ethnic groups around the Deng-Deng forest massif. Furthermore, we limited ourselves to woody forest species whereas these authors inventoried all plants including herbaceous, ruderal, fruit trees, etc. Globally, we can note that plant species which have a high citation frequency are those which are perceived by local population as more efficient against Covid-19 symptom. It is the case of the species identified with citation frequency greater than 10%.

Despite the fact that leaves and fruits could be responsible for medicinal properties as they accumulate the most molecules such as antioxidants, vitamins, inulins, tannins and other alkaloids (Kpatcha et al., 2016), we found in this study that for 80% of the identified species, it is the bark that is used, which is contrary to the work of Fongnzossie et al. (2021). This can be explained by the fact that, since we limited ourselves only to woody forest species generally reaching up to 40 m in height, it is mostly the bark that is easily accessible; therefore, the choice relies on individuals with a large diameter as they have high quantities of molecules with medicinal properties.

It should be noted that the habits of the populations are also a factor influencing the choice of species used. This is the case, for example, of the barks of *Allanblanckia floribunda* and *Polyscias fulva* listed in the literature as treating coughs (Mpondo et al., 2017), whereas in the context of this study, it is *Pycnanthus angolensis* that is the species most used to relieve coughs. Fongnzossie et al. (2021) reviewed the literature on medicinal plants used against Covid-19 did not listed this species although it had a high frequency of citation in the study area.

Conclusions

The present study allows an inventory to be made of the forest plants potentially effective against the major symptoms of Covid-19 (headache, cough, fever, breathing difficulties and runny nose/cold) identified by the residents of the Deng-Deng forest massif. A total of 48 plants forest species have been identified as commonly used by local people living in the area to prevent or treat Covid-19 symptoms. Species with a citation frequency of more than 10% were: *Alstonia booneii* (95%), *Annickia chlorantha* (72%), *Picalima nitida* (50%), *Pycnanthus ivorensis* (20%), *Milicia excelsa* (16%), *Tricoschypha acumulata* (15%), *Voacanga africana* (15%), *Mussanga cecropioides* (14%), *Myrianthus arboreus* (12%), *Garcinia kola* (11%), *Rauvolphia vomitoria* (10%) and *Allablankia floribunda* (10%). Thus, this study further confirms the attachment of the local populations to traditional medicine.

It should be noted that although this study is a significant contribution to the knowledge of plant species used in the prevention or treatment of Covid-19, it does not justify the use of these species in any form

for the prevention or treatment of this pandemic unless clinically tested and approved. However, although the active ingredients and efficacy of some of these species have already been proven, we believe that the results of this study could contribute to a greater focus on the biochemical properties of those for which the information is still unknown in order to assess the clinical value of the main compounds derived from these plants against the symptoms of Covid-19 and therefore their large scale valorization.

Conflict of interest statement

Authors declare that they have no conflict of interest.

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