Ethnopharmacological Insights into the Use of *Chenopodiumambrosioides* for Cough Treatment Among Togolese Traditional Healers

Original Research Article

Abstract

Togo has an ethnobotanicalpotentialwith a greatdiversity of medicinal plants widelyused to treathumandiseases. Coughassociatedwithrespiratorydiseasesis one of the pathologiestraditionallytreatedwithmedicinal plants in Togo. *Chenopodiumambrosioides*is a speciesused in the traditionaltreatment of cough in Togo. The aim of thisstudywas to document the ethnopharmacological uses of *Chenopodiumambrosioides* in Togolesetraditionalmedicine in the treatment of cough. An ethnopharmacologicalsurveywasconductedusing the semi-structured interview methodamongTraditionalMedicinePractitioners (TMPs) from six health districts spread across four healthregions. The ethnopharmacological and ethnobotanical data collectedwereanalyzedusing the UserValue (UV) and Frequency of Citation (FC) of medicinal plants associatedwith the species. A total of 127 TMPsparticipated in thisstudy and 96 (76%) of themwere male and 31 (34%) werefemale. 73% of the informantsclaimedusually use *Chenopodiumambrosioides* in the coughtreatmentcompared to 27%whoclaimed to not use it to treatcough. *Chenopodiumambrosioides*wasused in combinationwithfifty-two (52) otherbotanicalspecies in the treatment of cough and in the study area, *Abrus precatorius* Linn. (13.59%) followed by *Ocimumgratissimum* Linn. (11.58%), *Zingiber officinale*Rosc. Trans. Linn. (9.73%), *Mangiferaindica* Linn. (6.21%), *Eucalyptus citriodora* Hooker (4.87%), *Xylopiaaethiopica* (Dunal) A. Rich. (4.36%) and *Eugenia caryophyllata*Thunb. (4.19%) were the mostpopular plants used for coughtreatmentamong the plants recorded. Sixteen (16) other pathologies includingpulmonary infections are alsotreated by the speciesrecorded. Abscesses, intestinal parasiticdiseases, incurable wounds, stomach aches and headaches are the mostpathologies commonlytreated by this plant. The whole plant (72%) and leaves (22%) are the primary parts utilized for medicinal purposes. Decoction (77.50%) is the main preparation method, with oral (80.83%) and cutaneous (10.83%) routes being the most common modes of administration. The findings from this study provide a solid ethnopharmacological foundation for future pharmacological and toxicological investigations into *Chenopodiumambrosioides.*

Key words : *Chenopodiumambrosioides*, Cough, Ethnopharmacology, Togo.

INTRODUCTION

“Cough is a protective immune response of the respiratory airways to expel or eliminate irritants and mucous. It is the most common symptom for which individuals seeks medical advice”[1,2]. “Cough is the commonest symptom leading patients to consult with their doctor”[3]. “The

epidemiology of cough can be neatly dividedinto these two diagnostic subgroups: acute cough,which is usually due to viral respiratory tract infection,and chronic cough, which may be arbitrarilydefined as cough lasting longer than eight weeks"[3,4]. "The common causes of cough may be either of viral, or bacterial or chemical origin that include common cold, chronic bronchitis, rhinitis, sinusitis, asthma, environmental agents smoke, dust, angiotensin converting enzymes inhibitors and synthetic opioid analgesic"[5]."Most coughs are acute and self-limiting, secondary to respiratory tract infection, but when cough becomes chronic (8weeks duration) it can account for up to one third of all referrals to chest physicians"[6]."Chronic cough has a major effect on the quality of life, and patients consume substantial healthcare resources, often seeing several specialists over many years. It may prove diagnostically difficult, requiring multiple investigations and treatment trials, with diagnostic success quoted as ranging from 100% in a general respiratory clinic setting to 58% in the specialist cough clinic setting"[6,7]."According to World Health Organization 80% of the Asian and African population relies on the medicinal plants for prevention and treatment of various diseases including cough"[8,9]."Different communities and ethnic groups use medicinal plants, animal and minerals to treat different diseases. The people of the rural areas used traditional remedies to treat diseases"[2]. "They use traditional medicines due to i) knowledge from parents with firm belief, ii) knowledge of usage without consulting a physician, and iii) general perception of safety and economy"[2]."*Chenopodiumambrosioides*, commonly called Mexican tea, is an aromatic plant belonging to Chenopodiaceae family and is known for its virtues"[10]. "Some research works have demonstrated that this medicinal plant is widely used by Togolese communities to treat several diseases including the treatment of abscesses, epilepsy, nausea, stomachache, skin infections"[10,11]. "Some studies showed that *Chenopodiumambrosioides* is used in the cough and respiratory infections management in several Africa countries such as Benin, Ghana, Gabon, Ivory coast, Maroc, Nigeria and Senegal"[12–17]. But few studies have documented the endogenous uses of the species in the treatment of respiratory diseases in Togo. According to our literature review, no study on the endogenous knowledge of the uses of Togolese plants and*Chenopodiumambrosioides* in the treatment of cough in Togo is available.This is the main motivation of this study with the aim of documenting the uses of *Chenopodiumambrosioides* in the treatment of different forms of cough by traditional medicine practitioners in Togo.The objective of the study was to document and quantitatively analysed the traditional cough management recipes based on *Chenopodiumambrosioides* and preserve the traditional knowledge of the Togolese community for later uses. This ethnopharmacological study of *Chenopodiumambrosioides*is reported in Togo for the first time to treat cough and respiratory infections.

METHODOLOGY OF THE STUDY

Study Area

Togo is a Western African country surrounded in the North by the Republic of Burkina Faso, in the East by the Republic of Benin, in the West by the Republic of Ghana and in the South by the Atlantic Ocean. Togo has been divided into five economic regions from North to South: Savannah region, Kara region, Central region, Plateaux region, and Maritime region. After the general surveyof the population in 2022[18], Togo has an estimated population of8 095 498 residentsincluding 4 150 988 females (51,3%) with a rate ofpopulation growth of 2,3%. Our study area has an estimated population of 2 270 209 residents[18]. According to the organization of the health ministry, Togo has thirty-nine health districts grouped into six health regionssuch us Savannah, Kara, Central, Plateaux, Maritime and Grand Lome[19]. The present ethnopharmacological study was carried out in six health districts including Golfe, Ave, Yoto, Vo, Ogou and Tchamba(Figure 1). Many languages are spoken in our study area but the most popular are Ewe, Mina, Ife and Tchamba.

Data collection period and data collection forms

The survey was carried out from August 2021 to July 2022, to identify and record ethnopharmacological treatment of cough by traditional healers using *Chenopodiumambrosioides* alone or with other medicinal plants. The study objectives were explained to the healers and the most frequently asked questions were related tothe local name of *Chenopodiumambrosioides*, medicinal uses in the cough management, parts used of the plant, the method of preparation, complete ingredients of the recipes, administration route and adverse effects. The data collection forms were prepared and explained to the informants in their local language before the interview.[20–23]

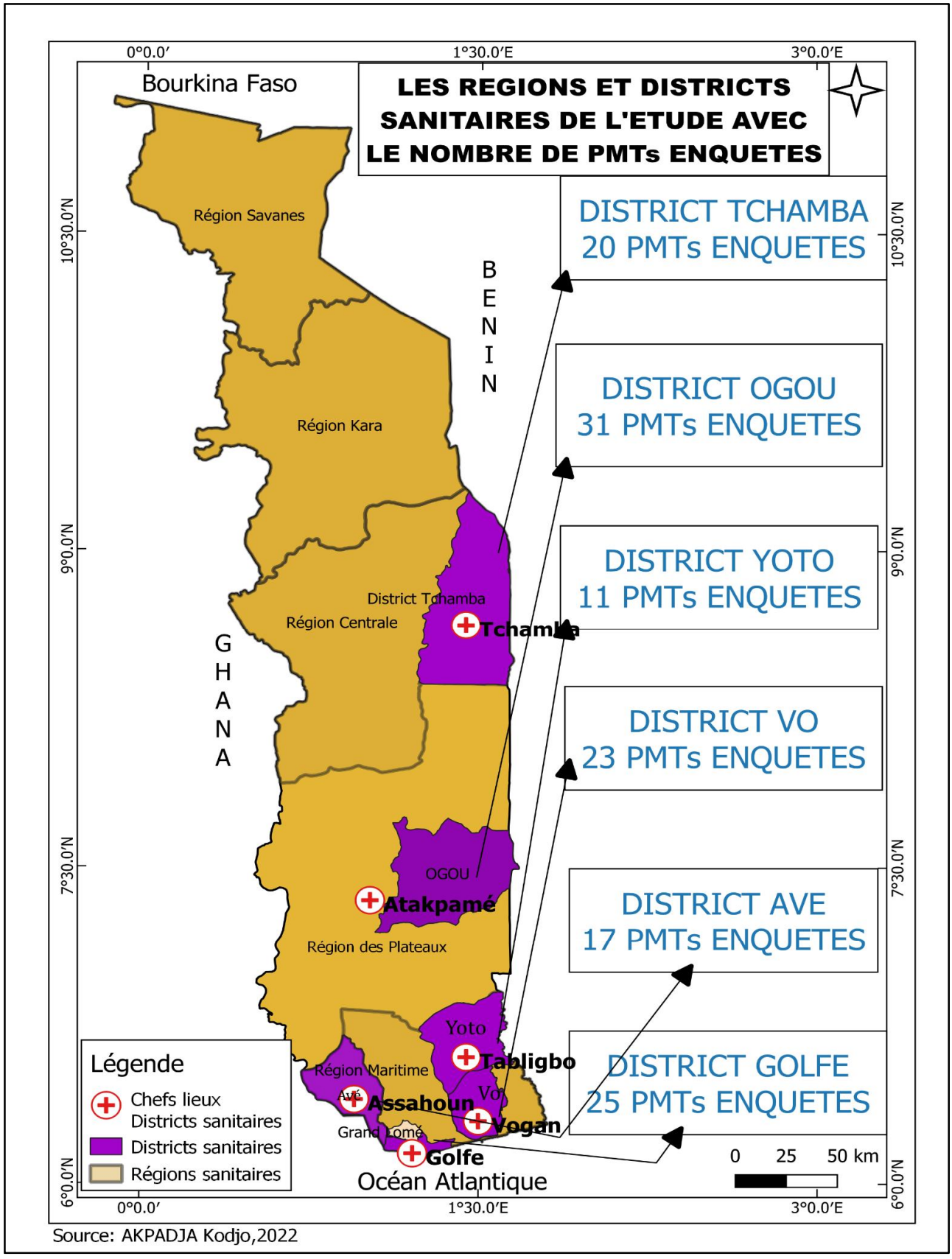


Figure 1: Map of Togo with focus on the survey areas.

Interview techniques with the traditional healers

The data was collected throughindividual interviews following thesemi-structured form previously prepared. The approach was in afirst time, the group meeting with all the healers of the health district before the individual interview survey[21,24,25].Conversations with the healers were used to obtain information on the uses of *Chenopodiumambrosioides*in the management of cough and respiratory infections. The healers that consented were asked to give their knowledge about the respiratory diseases they used *Chenopodiumambrosioides*against, the method of preparation of the remedy, details of administration, including the approximate amounts and number of doses per day or week, the composition of the remedy, the adverse effects of the remedy and how to treat these adverse effects. The conversations were built ontrust with the common goal to improve the health situation in Togo and to preserve and increase the knowledge on medicinal plants, especially on *Chenopodiumambrosioides*.

Data processing and data analysis

Analytical Flora of Benin[26]and the online database of PROTA4U (www.prota4u.org), were used for the botanical identification ofspecies of plants species collected. An ethnobotanical and ethnopharmacologicalstudies were carried out following the studiesof[20,24,27,28]. Thelocal names confirmation was carried out with reference to[26,29], West Africa Monograph Dictionary[30]and to theWest African Pharmacopoeia[31]. Data collected was tabulates and Excel 2016 spreadsheet softwarewere used to make simple calculations. The collected data from the surveyquestionnaire were analyzed using a quantitative method including Use Value (UV) andFrequency of Citation (FC). This method enables us to make a consensus of the plant species which is frequently used to treat cough. FL indicates the percentage of informants who claimed to use plant species for the same purpose regarding diseases' treatment. FL (%) = (Np/N) × 100, where Np indicates the number of the interviewed healers who claimed to use a plant species to treat a particular disease and N indicates the interviewed healers who used herbs as a medicine to cure any disease[24,32]. FC (%) = (number of remedies containing the plant/total of remedies collected) × 100. The Use Value, a quantitative method that demonstrates the relative importance of species known locally, was also calculated as follows: UV = ΣU/n, where UV is the Use value of a species, U is the number of citations per species, and n is the number of informants[25].

RESULTS AND DISCUSSION

A total of 127 participants was interviewed on average of 10 minutes. All the products of natural origin associated with *Chenopodiumambrosioides* were considered as part of the traditional recipes that were used to treat cough and respiratory diseases

Characteristics of Traditional Healers

Of the 127 traditional healers surveyed, 96 were men (76%) and 31 were women (24%). Most of them (89%) inherited the profession of "traditional healer" from their parents. This finding is in agreement with that of Dahounom et al., 2023 in Togo [33] and Umair et al., 2017 in Pakistan [34]. Sixty-two percent (62%) of the respondents claimed to have been practicing for 11–50 years (Table 1) with the majority (89%) having acquired the knowledge through ancestral inheritance. These findings are similar to those of Orch et al., 2020 in Morocco[35]and Odebunmi et al., 2022 in Nigeria[36].This profession requires a long experience for the practitioner to be able to identify plants for effective management of diseases. Traditional religion (53%) and Christianity (33%) were the predominant religions of the respondents. About 37% of the healers were in the age between 18 and 40 years, 54% between 41 and 70 years, and 09% between 70 and 105 years (Table 1).This age distribution confirms the findings in Togo [37] and is similar to the findings in Cameroon[38] where a significant dominance of elder or very aged healers was documented. It suggests that the profession of traditional healers was mainly done by elders. About healers' education level, 15% held a university degree, 38% attended high and middle school, 30% attended primary school, and 17% were illiterate (Table 1. This finding is in agreement with that of Odebunmi et., 2022 in Nigeria [36]

Table 1. **Sociodemographic data of the respondents**

Parameters	**Respondents N(%)**
Gender	
Male	96 (76%)
Female	31 (24%)
Age range (Years)	
[18-40]	47 (37%)
[41-70]	69 (54%)
71 and above	11 (9%)
Educational level	
Illiterate	22 (17%)
Primary	38 (30%)
Secondary	48 (38%)
University	19 (15%)
Ethnic group	
Ewe	81 (64%)
Ifè	18 (14%)
Tchamba	13 (10%)

Kabyè	05 (4%)
Others*	10 (8%)
Religion group	
Endogenous religion	67 (53%)
Christianism	42 (33%)
Muslim	17 (13%)
Buddism	01 (1%)
Origin of the knowledge	
Familial inheritance	113 (89%)
Initiation from traditional healers	12 (9%)
Divine revelation	02 (2%)
Period of pratice (Years)	
[0-10]	44 (35%)
[11-50]	79 (62%)
51 and above	04 (3%)

**Kotocoli (2%), Fon (2%), Nawoudba (2%), Anyanga (1%) and Moba (1%)*

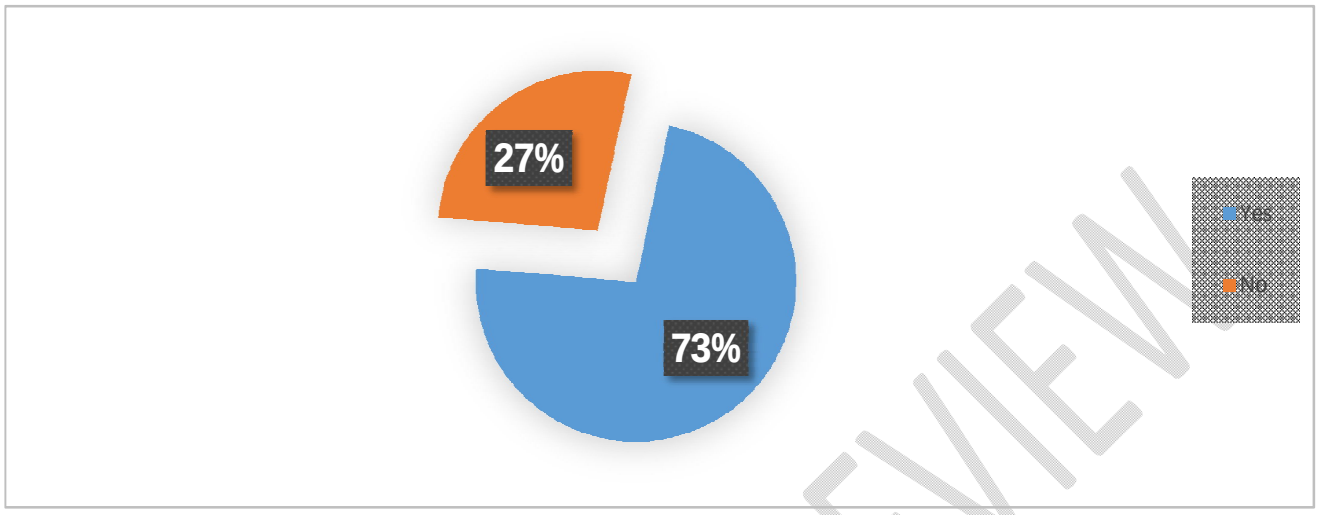
***Chenopodiumambrosioides* and cough treatment in the study area**

Cough being a symptom associated with several diseases, especially respiratory diseases, it remains the most common pathology in our communities. For the cough treatment, our communities mainly use medicinal plants including Chenopodiaceae genus. In our study, 73% of traditional healers claim used *Chenopodiumambrosioides* to treat cough (Figure 2). Similarly, various authors have carried out the ethnobotanical studies in different countries and they reported *Chenopodiumambrosioides* for cough management[17,38–43]. Cough is a global issue so various traditional remedies have been reported by different communities. Some of the plants like *Abrusprecatorius*Linn.;*Ocimumgratissimum* Linn.;*Zingiberofficinale*Rosc. Trans. Linn.;*Mangiferaindica*Linn.;*Eucalyptus citriodora* Hooker;*Xylopiaaethiopica* (Dunal) A. Rich. and*Eugenia caryophyllata* have also been reported in our study for the treatment of cough. This result is in agreement with the study carry out in Nigeria by Adesina et al., 2017 [40]. Similarly, various authors have carried out the ethnobotanical studies in different areas and they reported those species of plants for treating cough [17,36,43,44]. Our recent study corroborated the reported cough suppressive effect of *Chenopodiumambrosioides*L. [17]. This study with traditional practitioners revealed a varied use of *Chenopodiumambrosioides*, often in the form of decoctions,infusions or inhalations, to relieve cough symptoms. These practices are rooted in ancestral traditions that transmit not only knowledge about medicinal plants, but also cultural and social practices that shape the perception and application of treatments.

Others pathologies treated by *Chenopodiumambrosioides*L. in the study area

In addition to its use to treat different forms of cough, participants in this study reported that *Chenopodiumambrosioides* L.is also used to treat 16 other pathologies including abscesses,

intestinal parasitic diseases, incurable wounds, stomach-aches, headaches, dermatosis, angina and lung infections (Figure 3). This result is in agreement with other studies carried out in Togo by Tettegah et al., 2009 and Ouadja et al., 2021[11,25], in Nigeria by Adesina et al., 2017[40], in



Benin by Alitonou et al., 2012 [15], in Morocco by Orch et al., 2020 [35] then in South Korea by Lee et al., 2023[45]

Figure 2: *Chenopodiumambrosioides* and cough treatment in the study area

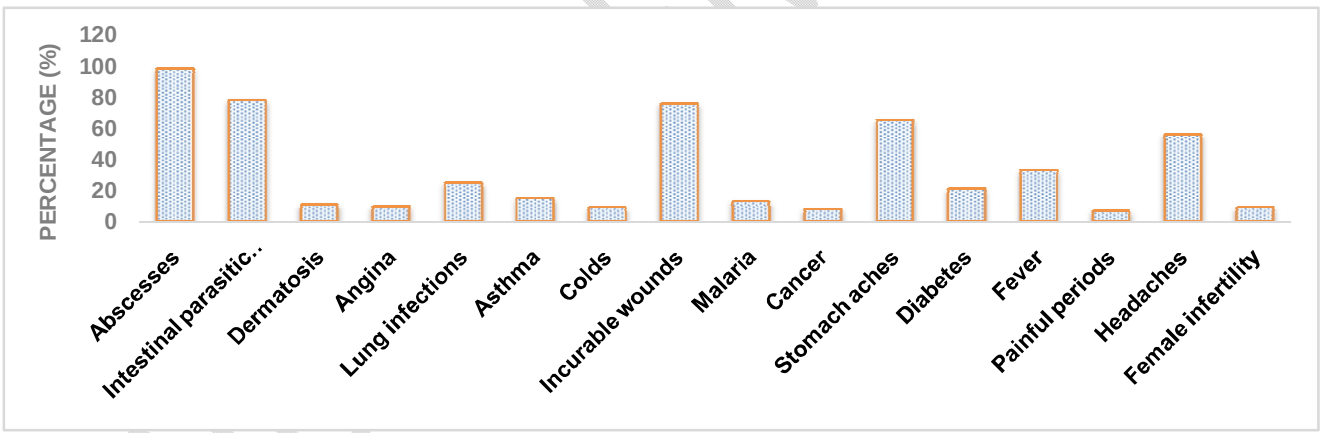
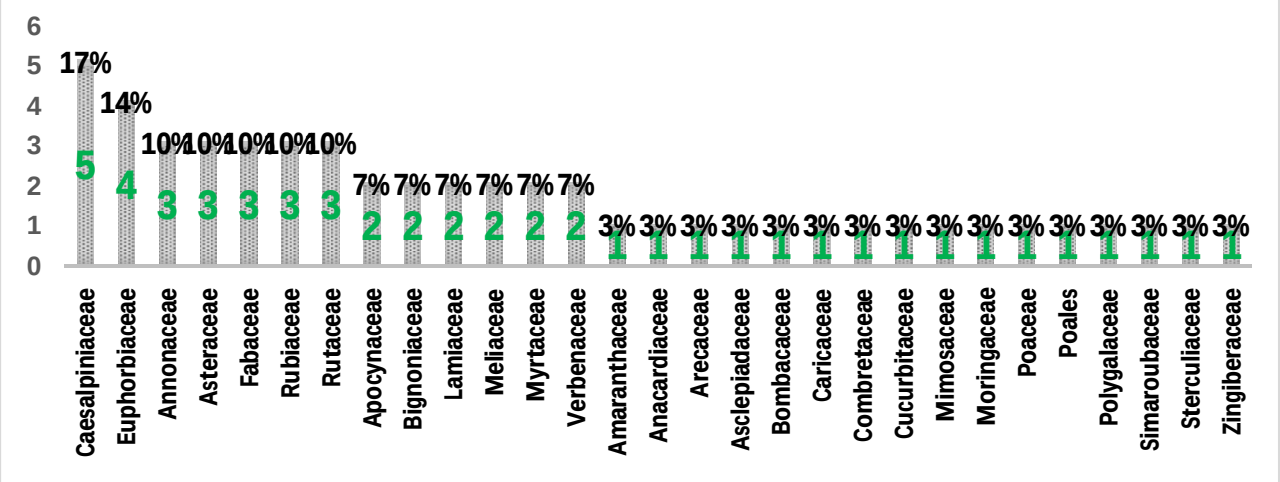


Figure 3: Others pathologies treated by*Chenopodiumambrosioides* in the study area

Botanical diversity and ethnobotanical indices of plantsused in the treatment ofcough associated with respiratory diseases

Despite the relative high number of plants utilised for cough purpose, their ethnobotanical indices including FC (1-13%) and UV (0.03-0.64) were generally low (Table2). In the study area, *Abrusprecatorius*Linn. (13.59%) followed by *Ocimumgratissimum* Linn. (11.58%), *Zingiberofficinale*Rosc. Trans. Linn. (9,73%), *Mangiferaindica* Linn. (6.21%), *Eucalyptus citriodora* Hooker (4.87%), *Xylopiaaethiopica* (Dunal) A. Rich. (4.36%) and *Eugenia caryophyllata* Thunb. (4.19%) were the most popular plants used for cough treatment among the plants recorded. Locally

known as “dzindzinkoudze (ewe) or vivima (ewe) or bibignakou (Tchamba)”, *Abrusprecatorius*(Linn.) has long been regarded as a potent remedy for relieving cough among the Togolese population[25,32,37]. Member of the genus Abrus are known to often be used for diverse ailments including respiratory diseases in Africa [43,46,47] and in Togo[37]. The alkaloidal constituents, which are often characteristically of the family Fabaceae including the genus Abrus, are known to significantly contribute to their diverse medicinal attributes[48].In total 52 medicinal plant species belonging 29 families were documented (Table 2). Caesalpiniaceae (5 species) and Euphorbiaceae (4 species) were the most dominant families, followed by Annonaceae, Asteraceae,Fabaceae, Rubiaceae and Rutaceae (3 species each)while other families were represented by one species only (Figure 4). The utilization of medicinal plant species belonging to Caesalpiniaceae, Euphorbiaceae, Annonaceae, Asteraceae and Fabaceaefamilies was in agreement with ethnomedicinal flora reported from other parts of Togo and in other areas of the world[2,28,33,48–51]. This may be due to their wide distribution of plant species and their traditional uses known by the indigenous communities living in different parts of the world.Moreover, in a systematic review conducted by Lee et al.,[45]in South Korea in 2023 on



medicinal plants used to treat chronic cough, the most cited species (*Glycyrrhizaglabra*) with 61 citations is part of the Fabaceae family. This confirms the use of species from the main families listed in this study in the treatment of respiratory diseases including cough.

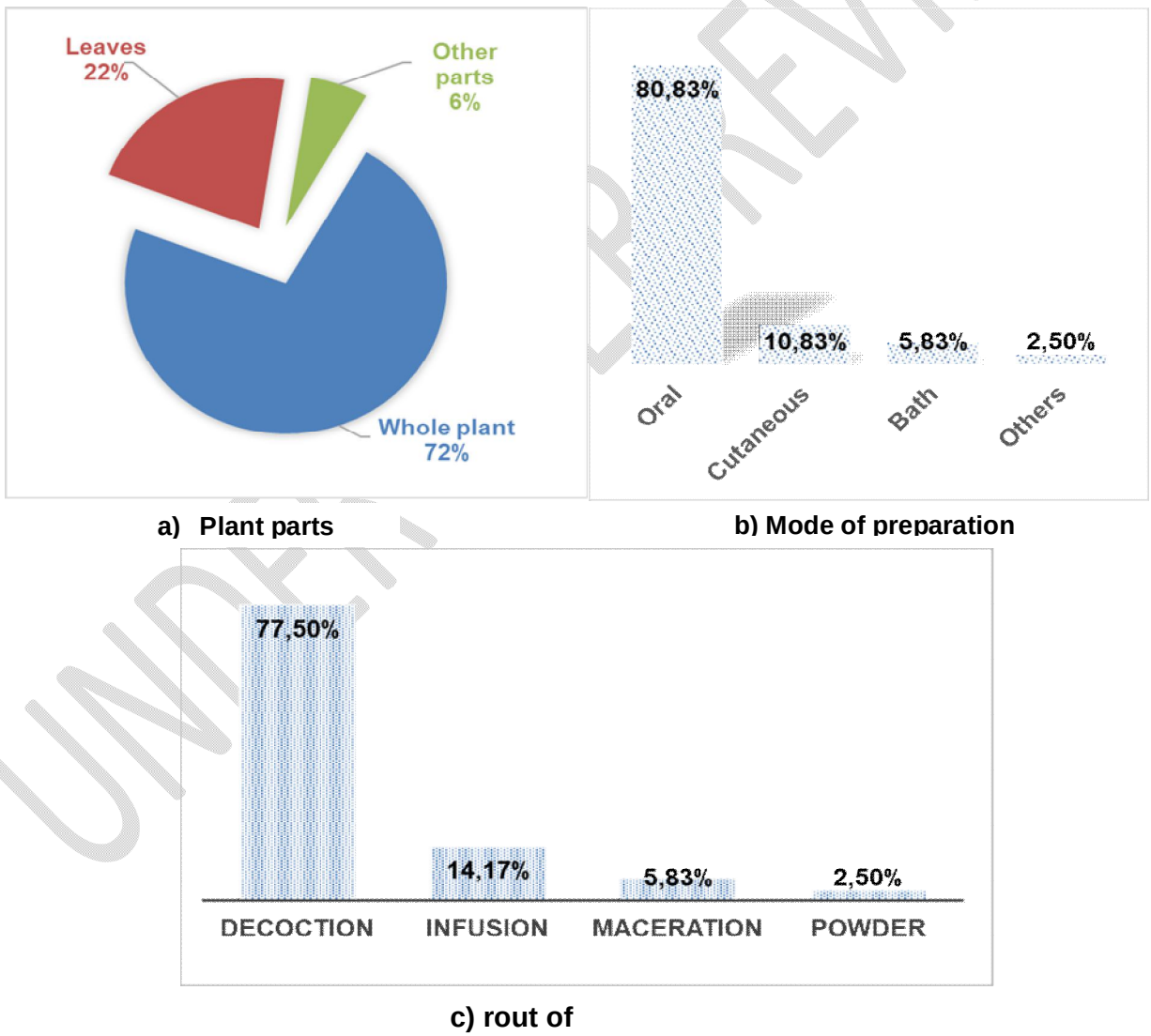
Figure 4: Families of medicinal plant species used to treat and manage coughin the study area

Plant parts, mode of preparation and rout of administration

Even though all plant parts are significant in the treatment of different ailments; nevertheless, in the present study as shown in Figure 5a, whole plant were the most commonly utilized part of *Chenopodiumambrosioides*with72% application in traditional medicinal recipes, followed by leaves (22%) and others (root, seed, flower) with 5% application. Tettegah et al., 2009 and Ouadja et al., 2021 reported whole plants and leaves as commonly utilized plant part in herbal medicine used by

the population of Togo[11,25].However, it has been reported that the use of leaves is better for the survival of medicinal plants collected by herbalists compared to the collection of whole plant, roots and stem, which may cause severe threat to local flora [40].

To facilitate the treatment of cough and pathologies ofrespiratory system with *Chenopodiumambrosioides*, different preparation modes andadministration are employed, namely decoction,Infusion, maceration, powder and others (fumigation).The decoction remains the most used mode (77,50%), becausesome questioned people believe that this mode allowsto collect the most active ingredients and to mitigate or cancelthe toxicity of certain recipes. Then come otherspreparation modes, such as: infusion (14,17%), maceration (5,83%) and powder (2,50%)(Fig.5b).Oral (80.83%) and cutaneous (10.83%) (Fig. 5c) are the main routes of administration. The similar results were reported by Orch et al. in Morocco[35]. Decoction and infusion constitute the essentials ofpreparation and use recommended in therapytraditional



a) Plant parts **b) Mode of preparation**

c) rout of

Figure 5: a) Plant parts; **b)**Mode of preparation; **c)** Rout of administration

Table 2: Medicinal plants used for the treatment of cough in Togo

Vernacular names	Species	Families	Citation	FC*(%)	UV*
Dzedzinkoudzen (ewe), Bibignakou (Tchamba)	*Abrusprecatorius* Linn.	Fabaceae	81	13,59%	0,64
Dzogbeti (ewe)	*Ocimumgratissimum* Linn.	Lamiaceae	69	11,58%	0,54
Dotè (ewe)	*Zingiberofficinale*Rosc. Trans. Linn.	Zingiberaceae	58	9,73%	0,46
Mangoti (ewe)	*Mangiferaindica* Linn.	Anacardiaceae	37	6,21%	0,29
Ekalypti (ewe)	*Eucalyptus citriodora* Hooker	Myrtaceae	29	4,87%	0,23
Etso (ewe); Ekamanté (Tchamba)	*Xylopiaaethiopica* (Dunal) A. Rich.	Annonaceae	26	4,36%	0,20
Plingota (ewe)	*Eugenia caryophillata*Thunb.	Myrtaceae	25	4,19%	0,20
Zanguarati (ewe)	*Cassia siamea Linn.*	Caesalpiniaceae	19	3,19%	0,15
Zokon (mina)	*Indigoferapulchra*Willd.	Fabaceae	18	3,02%	0,14
Exeti (ewe)	*Zanthoxylumxanthoxyloides* Lam.	Rutaceae	17	2,85%	0,13
Nyimon (ewe)	*Sarcocephaluslatifolius*	Rubiaceae	17	2,85%	0,13
Donti (ewe)	*Citrus sinensis*	Rutaceae	16	2,68%	0,13
Kpatima (ewe)	*Newbouldialaevis* Seem.	Bignoniaceae	14	2,35%	0,11
Tsaka-tsaka (ewe)	*Securinegavirosa* (Reyb.) Baill.	Euphorbiaceae	13	2,18%	0,10
Yovovigbe (ewe)	*Moringaoleifera* Linn.	Moringaceae	11	1,85%	0,09
Ahamè (ewe)	*Ocimumcanum*Sams	Lamiaceae	9	1,51%	0,07
Aloma (ewe)	*Vernoniacolorata* (Willd.) Drake Bull.	Asteraceae	9	1,51%	0,07
Mahougen (ewe)	*Khaya senegalensis* (Desr.) A. Juss.	Meliaceae	9	1,51%	0,07
Avlokouigbe (ewe)	*Pleiocarpa pycnantha* (K. Sch.) Stapf.	Apocynaceae	8	1,34%	0,06
Ehlinvi (ewe)	*Phyllanthusamarus* Sch. et Th.	Euphorbiaceae	7	1,17%	0,06
Ewoti (ewe); Boudo (Tchamba)	*Parkiabiglobosa* (Jacq.) Benth.	Mimosaceae	7	1,17%	0,06
Kiniti (ewe)	*Azadirachtaindica*Linn.	Meliaceae	7	1,17%	0,06
Yovoninti (ewe)	*Cocos nucifera Linn.*	Arecaceae	7	1,17%	0,06
Akamati (ewe)	*Brideliaferruginea*Benth.	Euphorbiaceae	6	1,01%	0,05
Damelatsu'nko (ewe);Efoulandikonkon (tchamba)	*Acanthospermumhispidum* (DC).	Asteraceae	6	1,01%	0,05
Pamplemousse	*Citrus Lemon*	Rutaceae	6	1,01%	0,05
Adako (ewe)	*Sorghum caudatum* Linn. var. colorans	Poales	5	0,84%	0,04
Anonsikan (ewe)	*Euphorbia hirta* Linn.	Euphorbiacea	5	0,84%	0,04

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Fefeti (ewe)	*Gardenia ternifolia* Sch. et Th.	Rubiaceae	5	0,84%	0,04
Hédjati (ewe)	*Harrisoniaabyssinica*	Simaroubaceae	5	0,84%	0,04
Hehetsi (ewe)	*Anogeissusleiocarpus*Guill. et Pers.	Combretaceae	5	0,84%	0,04
Tsigbe (ewe)	*Cymbopogoncitratus*Stapf.	Poaceae	5	0,84%	0,04
Ekloti (ewe)	*Piliostigmathonningii* (Sch.) Miln. Redh.	Caesalpiniaceae	4	0,67%	0,03
Fonti (ewe)	*Vitexdoniana* Sweet	Verbenaceae	4	0,67%	0,03
Azingbe (ewe)	*Cassia rotondifolia* Linn.	Caesalpiniaceae	3	0,50%	0,02
Etritou (ewe), Forze (tchamba)	*Securidacalongepedunculata* Fres.	Polygalaceae	3	0,50%	0,02
Adikouti (ewe)	*Caesalpiniabonduc*Roxb.	Caesalpiniaceae	2	0,34%	0,02
Alangbati (ewe), Ditori (tchamba)	*Adansoniadigitata* Linn.	Bombacaceae	2	0,34%	0,02
Avakofé (mina), Faux kinkeliba	*Cassia occidentalis* Linn.	Caesalpiniaceae	2	0,34%	0,02
Somboegbé (ewe)	*Cleome viscosa* Linn.	Cucurbitaceae	2	0,34%	0,02
Tèckti (ewe)	*Tectonagrandis* Linn.	Verbenaceae	2	0,34%	0,02
Adoubati (ewe)	*Carica papaya* Linn.	Caricaceae	1	0,17%	0,01
Agbanlan (mina)	*Uvariachamae* P. Beauv.	Annonaceae	1	0,17%	0,01
Agnigli (ewe) ; Choechoere (Tchamba)	*Annona senegalensis* Pers.	Annonaceae	1	0,17%	0,01
Assiviatoe (ewe)	*Cola millenii* K. Schum.	Sterculiaceae	1	0,17%	0,01
Gbolobavi (ewe)	*Calotropisprocera* (Ait.) Ait.	Asclepiadaceae	1	0,17%	0,01
Gnakpekpe (ewe)	*Kigeliaafricana* (Lam.) Benth.	Bignoniaceae	1	0,17%	0,01
Nawa (Kotocoli)	*Vernoniaguineensis*	Asteraceae	1	0,17%	0,01
Nyamidua (Ashanti)	*Alstoniaboonei* De Wild.	Apocynaceae	1	0,17%	0,01
Papatahé (ewe)	*Gomphrenacelosioides* Mart.	Amaranthaceae	1	0,17%	0,01
Sifafa (ewe)	*Pavettacorymbosa* (DC) F.N. Will.	Rubiaceae	1	0,17%	0,01
Vénaviwogbe (ewe)	*Urariapicta* (Jacq.) DC	Fabaceae	1	0,17%	0,01

*FC = Frequency; *UV = Use Value

Conclusion

This ethnopharmacological survey on coughin the four regions of Togo, including: Grand Lome,

Maritime, Plateaux and Centrale, revealed that traditionalhealers had anendogenous understanding of cough associated with the respiratorydiseases. Thepresent study documented anticough medicinalplant species. As the emergence of resistance of microorganisms that can cause cough such us *Streptococcus pneumonia* and *Mycobacterium tuberculosis*to antibiotics is a deep concern, Togolese flora must beexplored for new bioactiveanticough drugs. The commonlyrecommended strategy in the discovery of drugs is toevaluate plant extracts *in vitro*(antimicrobial activity) and *in vivo*(antitussive activity) to confirm theirtherapeutic potential. Keeping this in mind, our ethnopharmacological survey is the first step before confirmationin vitro and in vivo. Some studies are in progress to validate theantioxidant, antimicrobial, and antitussive effects of*Chenopodiumambrosioides* associated with some species documented in this study.

Disclaimer (Artificial intelligence)

Author(s) hereby declares 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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