European Journal of Medicinal Plants
33(9): 22-36, 2022; Article no.EJMP.90669
ISSN: 2231-0894, NLM ID: 101583475

Characteristics of Medicinal Plants used in Traditional Medicine for Oral Diseases Treatment in Southern Benin

Adam Abdoulaye a, Agossou P. Noumavo a,b, Nicéphore M. Glodjinon a, Adolphe Adjanohoun c, Lamine Baba-Moussa b and Farid Baba-Moussa a*

a Laboratoire De Microbiologie Et Des Technologies Alimentaires, Faculté des Sciences et Techniques, Université D’Abomey-Calavi, Abomey-Calavi, Bénin.
b Laboratoire De Biologie Et De Typage Moléculaire en Microbiologie, Faculté des Sciences et Techniques, Université d’Abomey-Calavi, Abomey-Calavi, Bénin.
c Institut National Des Recherches Agricoles du Bénin, BP-884 Cotonou, Benin.

Authors’ contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/EJMP/2022/v33i930488

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/90669

Received 08 June 2022
Accepted 17 August 2022
Published 20 August 2022

ABSTRACT

Background of the Study: In the oral health field, dental caries and periodontal diseases are the most frequent pathologies that affect all population to different degrees. In Benin, oral diseases constitute a serious public health problem. Care, whether curative or preventive, requires an investment that many cannot afford in developing countries like Benin. Because of oral diseases extent, appropriate solutions must be found to improve oral health in Benin. Place and Duration of Study: Data were collected through ethnobotanical surveys in the districts of Allada, Abomey-Calavi, Cotonou and Porto-Nov from May to August 2021.
Aim: This study aims to identify the medicinal plants used in traditional medicine to treat oral diseases.
Methodology: Prior to the ethnobotanical study itself, we proceeded to locate the markets where medicinal plants are sold in the study area. Then, in order to ensure a high objectivity degree of the data obtained during our study, the survey is carried out used a preestablished questionnaires. The questionnaire focused on the following main points: (1) Profile of the respondent (surname, first

*Corresponding author: E-mail: fbmouss@yahoo.fr;
name, age, gender, education level and experience in the field), (2) informations on the recipe (oral uses, vernacular and scientific names, parts used, preparation method, route and mode of administration, contraindications and side effects). The medicinal plants vendors were selected based their availability displays size and frequency level of displays.

**Results:** One hundred and three (103) medicinal plants species were identified, divided into forty-four (44) families and ninety-one (91) genera. The most used plants are *Zanthoxylum zanthoxyloides* (11.72%), *Ocimum americanum* (4.88%), *Ocimum gratissimum* (4.39%), *Lantana camara* (2.93%), *Bridelia ferruginea* (2.93%), *Moringa oleifera* (2.44%), *Lippia multiflora* (2.44%), *Magnifera indica* (2.44%), *Dialium guineense* (2.44%), *Pseudocedrela kotschyi* (1.95%), *Justicia flava* (1.95%), *Uvaria chamae* (1.95%) and *Xylopia aethiopica* (1.95%). The most commonly plant parts used were leaves and roots. The decoction of these parts in mouthwash or gargle is most used for oral diseases treatment.

**Conclusion:** The flora of Benin contains a rich diversity of plants. Many of which are used in traditional Beninese medicine and have the potential to provide pharmacologically active natural products. In order to know the different plants used to treat oral diseases, an ethnobotanical survey was conducted in southern Benin (district of Allada, Abomey-Calavi, Cotonou and Porto-novo).

**Keywords:** Medicinal plants; oral diseases; public health; ethnobotanical study; Benin.

### 1. INTRODUCTION

Oral diseases are a group of diseases and disorders that affect the teeth and mouth, including a craniofacial disorder, congenital anomalies, injuries and various infections. Oral diseases have a huge impact on the individual's well-being, social behaviour and physical behaviour. They are characterised by various dental and periodontal lesions that can lead to the formation of infectious foci [1]. The high frequency of oral diseases, their impact on general health and on life quality, as well as their very unequal distribution in the population, make them a major public health [2]. In oral health field, the most frequent pathologies are dental caries and periodontal diseases because of their frequency, which affect all population class to varying degrees, their consequences on the individual and society and the expense of their treatment [3]. According to the World Health Organisation, it is the fourth most common global disease after cancer, heart disease and HIV/AIDS, affecting over 3.5 billion people worldwide [4]. In Africa, between 54.28% and 73.70% of the population is affected by oral diseases [5]. Like in other developing countries, oral diseases are a serious public health problem in Benin. Over 50% of the population suffers from oral diseases, both in rural and urban areas [6]. These diseases are caused by risk factors common to all non-communicable diseases including the consumption of sugar, smoking, alcohol and poor hygiene practices, as well as the socio-economic factors that underpin them [7]. Both curative and preventive care require an investment that many people in developing countries are unable to afford. In addition, as in other health sectors, there is a shortage of staff and other necessary resources [8]. As such, in low and middle income countries, as well as in disadvantaged populations, the morbidity rate of these diseases is undeniably higher. Antibiotic use, surgeries, debridements and tooth extractions are common treatment methods. These treatments are expensive and require specialised dental workers, both of which are lacking in developing countries such as Benin. Modern oral hygiene products, such as mouthwash, contain chemical agents such as chlorhexidine and ethanol. In this context, the search for a solution deserves to go beyond the conventional medicines used. In Africa, due to our limited financial resources, there is a tradition of oral hygiene based on toothpaste sticks and mouthwash teas use for oral diseases management. Thus, this study aims to identify the medicinal plants commonly used in oral health care in southern Benin.

### 2. MATERIALS AND METHODS

#### 2.1 Study Area

Benin is a West Africa country bordered by Burkina Faso, Niger, Nigeria, Togo and Atlantic Ocean (Fig. 1). Benin lies between the Niger River in the north and the coastal plain in the south. The present study was carried out in southern Benin. This region belongs to the Guinean-Congolese zone, contains a mosaic dense rainforest, savannahs, grasslands, mangrove swamps and fallow lands. It is located between 6°25 N and 7°30 N over an area of
17,109 km². The climate is sub-equatorial, characterised by a bimodal rainfall regime (April-June and September-November) with two rainy seasons alternated by two dry seasons. The average annual rainfall is 1200 mm per year. The average annual temperature is 28 °C and the air humidity between 69% and 97% [9]. Ferralitic soils on clayey sediments, hydromorphic soils in valleys, lowlands and alluvial plains, vertisols in the Lama depression and tropical eutrophic brown soils are the most dominant soils [10].

2.2 Data Collection

The study was conducted during the period from May to August 2021. Data were collected through ethnobotanical surveys in the districts of Allada, Abomey-Calavi, Cotonou and Porto-Novo. Prior to the ethnobotanical study itself, we proceeded to locate the markets where medicinal plants are sold in the study area. Then, in order to ensure a high objectivity degree of the data obtained during our study, the survey is carried out by using a preestablished questionnaires. The questionnaire focused on the following main points: (1) Profile of the respondent (surname, first name, age, gender, education level and experience in the field), (2) informations on the recipe (oral uses, vernacular and scientific names, parts used, preparation method, route and mode of administration, contraindications and side effects). The medicinal plants vendors were selected based their availability displays size and frequency level of displays. Fifty-five (55) displays of medicinal plant and 17 markets (Ouando, Agbokou, Dantopka, Wologuèdè, Fifadjī, Gbégamey, Mènontin, Godomey, Kpota, Cococodji, Cocotomey, Hévié, Ouédo, Akassato, Glo-djibgé, Allada and Sékou) were visited (Fig. 1). The plants cited by the respondents were purchased and placed in an herbarium for taxonomic identification at the botanical garden of Abomey-Calavi university (Benin).

2.3 Data Analysis

The data collected from the surveys were processed using Excel 2007 spreadsheet software to establish the use frequencies of medicinal plan. The use frequency (F) of each plant was calculated using the formula: (Number of plant citations under consideration) / (Total number of citations for all plants).

![Fig. 1. Overview of medicinal plant markets involved in this study](image-url)
3. RESULTS

3.1 Social-Cultural Profile of Respondents

The present study enrolled 55 herbalists (51 females and 4 males). These herbalists were divided into four age groups. Table 1 analysis shows that the age range of the herbalists surveyed is between 20 and 72 years with an average age of 45. The age group of 41-50 was the most represented (43.63%). Of these, 56.36% were illiterate, 30.90% had a primary level and 12.72% had a secondary level. As regards the respondents experience in traditional medicine, they have at least ten (10) years of experience. As for the origin of the knowledge, 78.18% of the herbalists surveyed were initiated into traditional medicine practices within the family, while 21.81% acquired it through their experiences outside the family framework.

3.2 Characteristics of Medicinal Plants used to Treat Oral Diseases in Southern Benin

One hundred and three (103) species were identified. These medicinal plants species belong to 91 genera and 44 botanical families. Among these 44 families the most represented were: Leguminosae (15.90%), Euphorbiaceae (11.36%), Lamiaceae (11.36%) then Annonaceae, Asteraceae, Meliaceae, Sterculiaceae and Verbenaceae (9.09%) (Fig. 2A). The medicinal plant species most commonly sold by herbalists for oral diseases treatment are: Zanthoxylum zanthoxyloides (11.72%), Ocimum americanum (4.88%), Ocimum gratissimum (4.39%), Lantana camara (2.93%), Bridelia ferruginea (2.93%), Moringa oleifera (2.44%), Lippia multiflora (2.44%), Mangifera indica (2.44%), Dialium guineense (2.44%), Pseudocedrela kotschyi (1.95%), Justicia flava (1.95%), Uvaria chamae (1.95%) and Xylopia aethiopica (1.95%). Regarding the parts used, the survey revealed that almost all organs are used in the oral diseases treatment. The most used parts are: leaves (27.77%), roots (22.22%), leafy stems (19.04%), bark (17.46%), stems (7.93%), fruits (2.38%), seeds (1.58%), flowers (0.79%) and tubers (0.79%) (Fig. 2B). Overall, 6 preparation methods were recorded in this study. Decoction is the most used (86.66%), followed by trituratio (10.47%), maceration (6.66%), crushing (4.76%), infusion (2.85%) and then poultice (0.95%) (Fig. 2C). Regarding the mode of administration, gargling is the most used (94.17%) followed by dressing (4.85%) and inhalation (0.97%) (Fig. 2D). Six (6) oral diseases are most frequently treated with medicinal plants: Tooth decay, gingivitis, odontolgy, bad breath, dental disorder and mouth ulcers (Table 2).

Table 1. Socio-cultural data of respondents

| Socio-cultural parameters | Frequency | Percentage (n=55) |
|---------------------------|-----------|------------------|
| Gender                    |           |                  |
| Female                    | 51        | 92.72            |
| Male                      | 4         | 7.27             |
| Age                       |           |                  |
| 20-30                     | 9         | 16.36            |
| 31-40                     | 18        | 32.72            |
| 41-50                     | 24        | 43.63            |
| 51-72                     | 4         | 7.27             |
| Level of study            |           |                  |
| Illiterate                | 31        | 56.36            |
| Primary                   | 17        | 30.90            |
| Secondary                 | 7         | 12.72            |
| Experience in the field   |           |                  |
| 10-20                     | 19        | 34.54            |
| 21-30                     | 26        | 47.27            |
| > 30                      | 10        | 18.18            |
| Origin of knowledge       |           |                  |
| Family legacy             | 43        | 78.18            |
| Experience                | 12        | 21.81            |
Fig. 2. Botanical families, parts used, preparation and administration modes of medicinal plants
| Scientific name | Family name | Local name | Part used | Diseases treated | Preparation modes | Utilisation modes | FC (%) |
|-----------------|-------------|------------|-----------|------------------|--------------------|-------------------|--------|
| Zanthoxylum zanthoxyloides (Lam.) | Rutaceae | Hèdo | Root, root bark | Tooth decay, gingivitis, toothache | Decoction, infusion | Mouthwash | 11.22 |
| Ocimum americanum L. | Lamiaceae | Kesu kesu, bohonoroku | Leafy stem | Tooth decay, gingivitis | Trituration | Mouthwash | 4.88 |
| Ocimum gratissimum L. | Lamiaceae | Tchao (f), chukula (ba) | Leafy stem | Tooth decay, gingivitis | Trituration | Mouthwash | 4.39 |
| Lantana camara L. | Verbenaceae | Nyèya, Hlatchiayo(f); tona (ba) | Leafy stem | Tooth decay, gingivitis | Decoction | Mouthwash | 2.93 |
| Bridelia ferruginea Benth. | Euphorbiaceae | Honsou kokoué (f, g); tona (ba) | Trunk bark | Tooth decay | Maceration | Mouthwash | 2.93 |
| Moringa oleifera Lam. | Moringaceae / Myristicaceae | Kpatima (f) | Root, leafy stem | Toothache | Decoction | Mouthwash | 2.44 |
| Lippia multiflora Moldenke | Verbenaceae | Aglala (g) | Leafy stem | Tooth decay, toothache | Pounding | Bandage | 2.44 |
| Mangifera indica L. | Anacardiaceae | Mango (f), mango (ba) | Stem, root, leaves | Tooth decay, gingivitis | Decoction | Mouthwash | 2.44 |
| Dialium guineense Willd. | Leguminosae - Caesalpinioideae | Asswensswen (f, g) | Root | Tooth decay, gingivitis | Decoction | Mouthwash | 2.44 |
| Pseudocedrela kotschyi (Schweinf.) Harms. | Meliaceae | Atindodokpwe(f) | Leafy stem | Tooth decay, bad breath | Decoction | Mouthwash | 1.95 |
| Justicia flava (Forssk.) Vahl | Acanthaceae | Fiofioma (f). | Leafy stem | Tooth decay | Decoction | Mouthwash | 1.95 |
| Uvaria chamae P. Beauv., Xylopia aethiopica | Annonaceae | Ayadaha (f), tijera (ba) | Root | Tooth decay, bad breath | Decoction | Mouthwash | 1.95 |
| Capsicum annuum L. | Solanaceae | Gbatakin (f, g) | Fruit | Gingivitis, toothache | Decoction | Mouthwash | 1.95 |
| Carissa spinarum L. | Apocynaceae | Ahanzodo (f) | Root | Tooth decay, bad breath | Decoction | Mouthwash | 1.46 |
| Hyptis suaveolens (L.) Poit. | Lamiaceae | Azongbidi (f, disibu (ba) | Leafy stem | Gingivitis, bad breath | Decoction | Mouthwash | 1.46 |
| Piper guineense Schumach. & Thonn. | Piperaceae | Poivre de guiné (fr)énélénkoun (f, g) | Fruit | Tooth decay | Decoction | Mouthwash | 1.46 |
| Allium sativum L. | Alliaceae | Ayo (f, g, y) | Leaves | Tooth decay | Decoction | Mouthwash | 1.46 |
| Ceropogia racemosa N.E.Br | Asclepiadaceae | Tchirigoun | Root | Bad breath, gingivitis | Decoction | Mouthwash | 1.46 |
| Scientific name                      | Family name                      | Local name       | Part used      | Diseases treated                  | Preparation modes | Utilisation modes | FC (%) |
|--------------------------------------|----------------------------------|------------------|----------------|-----------------------------------|-------------------|-------------------|--------|
| Caesalpinia pulcherrima (L.) Sw.     | Leguminosae-Caesalpinioideae     | Orgeuil de Chine (fr) | Leafy stem    | Toothache, teething disorder      | Decoction         | Mouthwash         | 0.98   |
| Acacia nilotica (L.)                 | Leguminosae-Mimosoideae          | Bani (ba)        | Leafy stem    | Gingivitis, bad breath            | Decoction         | Mouthwash         | 0.98   |
| Securidaca longepedunculata Fresen.  | Polygonaceae                     | Kpatado          | Root          | Tooth decay                       | Decoction         | Mouthwash         | 0.98   |
| Parkia biglobosa (Jacq.) R.Br. ex Benth. | Leguminosae-Mimosoideae          | Néré(fr)         | Trunk bark    | Gingivitis, canker sores          | Decoction         | Mouthwash         | 0.98   |
| Petiveria alliacea L.                | Piperaceae                       | Zoroma (f), Déssi kanwé | Leafy stem    | Tooth decay, gingivitis           | Decoction         | Mouthwash         | 0.98   |
| Periploca nigrescens Afzel.          | Asclepiadaceae                   | Trunk bark, leaves, stem | Leafy stem    | Tooth decay, gingivitis           | Decoction         | Mouthwash         | 0.98   |
| Azadirachta indica A. Juss.          | Meliaceae                        | Quininetin (f), , neem (ba) | Trunk bark, leaves, stem | Tooth decay, bad breath           | Decoction         | Mouthwash         | 0.98   |
| Ehretia cymosa Thonn. ex Sehum. var Trilepisium madagascariensis De., | Boraginaceae                     | Myoma (g)        | Leaves        | Teething disorder                 | Trituration       | Mouthwash         | 0.98   |
| Anacardium occidentale L.,           | Anacardiaceae                    | Akaju (f)        | Trunk bark    | Canker sores, tooth decay         | Decoction         | Mouthwash         | 0.98   |
| Khaya senegalensis (Desr.) A.Juss.,  | Meliaceae                        | Zunzatin (f)     | Trunk bark    | Tooth decay                       | Decoction         | Mouthwash         | 0.98   |
| Baphia nitida Lodd                    | Leguminosae-Papilionoideae       | Sokpakkè         | Leafy stem    | Toothache                         | Trituration       | Mouthwash         | 0.49   |
| Pteleopsis suberosa Engl. & Diels,  | Combretaceae                     | Kluklu godo      | Trunk bark    | Tooth decay, gingivitis           | Decoction         | Mouthwash         | 0.49   |
| Senna alata (L.) Roxb.               | Leguminosae-Caesalpinioideae     | Amasu yovotèm (f) | Leafy stem    | Tooth decay                       | Decoction         | Mouthwash         | 0.49   |
| Eugenia unijlora L., Tetrapleura tetraoptera (Schumach. & Thonn.) | Leguminosae-Mimosoideae         | Pitanga (y, n)   | Leafy stem    | Toothache                         | Decoction         | Mouthwash         | 0.49   |
| Scientific name                                      | Family name | Local name       | Part used              | Diseases treated             | Preparation modes | Utilisation modes | FC (%) |
|-----------------------------------------------------|-------------|------------------|------------------------|------------------------------|-------------------|-------------------|--------|
| Taub., *Imperata cylindrica* (L.) P.Beauv., *Clausena anisata* (Wild.) Hook.f. ex Benth., *Phyllanthus amarus* Schumach. & Thonn., *Casuarina equisetifolia* L., *Ocimum basilicum* L., *Chenopodium ambrosioides* L., *Monodora myristica* (Gaertn.) Dunal, *vernonia cinerea* (L.) Less., *Jatropha curcas* L., *Chromolaena odorata* (L.) R.M.King, *Zingiber officinale* Citrullus lanatus (Thunb.) Matsum. & Nakai, *Abrus precatorius* L., *Triclisia subcordata* Oliv., *Landolphia dulcis* (Sabine) Pichon, *Newbouldia laevis* | Poaceae, Rutaceae, Euphorbiaceae, Lamiaceae, Chenopodiaceae, Annonaceae, Asteraceae, Zingiberaceae, Cucurbitaceae, Fabaceae, Menispermaceae, Apocynaceae, Bignoniaceae, Capparaceae, Arecaceae | Sè (f), abosu (ba), Gbozohouin (f), Henlenwe (f), sobaru (ba), Filao (fr), Akohun (g), Amahun kokwe(f), Sasalikun (f), dukubinu (ba), Hunsi kouse, Gbagidi kpotin (f, g), Bukatu (ba) agatouma, Dote, Goussi (f, g), Vivima (f), Yfoglosu (g), Aboto (f), Hounmanhounmantin (f), Onton zunzen (f, g), gorigiberu (ba), Gonkè (tin) (f), kpaakpa | Root, leaves, Root, Leafy stem, Trunk bark, Root, stem, leaves, Leafy stem, Root, Trunk bark, Stem, | Tooth decay, Gingivitis, teething disorder, Tooth decay, Tooth decay, Tooth decay | Mouthwash, Mouthwash, Mouthwash, Mouthwash, Mouthwash | 0.49   |
| Scientific name | Family name | Local name | Part used | Diseases treated | Preparation modes | Utilisation modes | FC (%) |
|-----------------|-------------|------------|-----------|------------------|-------------------|------------------|--------|
| Prosopis africana (Guill. & Perr.) Taub., Psidium guajava L., | Leguminosae-Mimosoideae, Myrtaceae | agbo (ba), Kakè (t); Kenkuntin (f) | root, Stem, leaves | Tooth decay, bad breath, Tooth decay, bad breath, Gingivitis | Decoction, Mouthwash | 0.49 |
| Vitellaria paradoxa C.F.Gaertn. ssp. Olax subscorpioidea Oliv., | Scrophulariaceae, Oleaceae | Limutin (f), Mitin | Leaves | Tooth decay, gingivitis | Decoction, Mouthwash | 0.49 |
| Triplochiton scleroxylon K.Schum., Senna siamea (Lam.) H.S.Irwin & Barneby, Acanthospermum hispidum DC., Pavetta corymbosa (DC.) F.N.Williams var. corymbosa, Pterocarpus erinaceus Poir., Carica papaya L., Raphiostylis beninensis Planch. ex Benth., Philenoptera cyanescens (Sehumacb. & Thonn.) Roberty, Melaleuca leucadendron L., Acacia sieberiana DC. var. vil/osa, | Sterculiaeae, Rubiaceae, Cucurbitaceae, Leguminosae-Papilionoideae, Caricaceae, Loganiaceae, Myrtaceae, Leguminosae-Mimosoideae | Xwetin (f), Nyensinken(f), Loxu (g) | Leaves | Tooth decay, gingivitis, Toothache | Decoction, Mouthwash, Trituration | 0.49 |
| Vitellaria paradoxa C.F.Gaertn., Leguminosae-Mimosoideae | agbo (ba) | root | Tooth decay, bad breath | Decoction, Mouthwash | 0.49 |
| Scientific name                  | Family name          | Local name          | Part used | Diseases treated     | Preparation modes | Utilisation modes | FC (%) |
|---------------------------------|----------------------|---------------------|-----------|----------------------|-------------------|-------------------|--------|
| Annona senegalensis Pers.       | Annonaceae           | Nyiglwe, wenglema (f), sampuru (ba) | Leaves   | Canker sores, bad breath | Trituration       | Mouthwash         | 0.49   |
| Jatropha gossypifolia L.         | Euphorbiaceae        | Nyikopotin vovo (f), bukatu duabinu (ba) | Leaves   | Tooth decay           | Decoction         | Mouthwash         | 0.49   |
| Hymenocardia acida Tul.,        | Euphorbiaceae        | Sokpintin, sojatin (f), Seseleviken (f, g), afatoka (ba) | Leaves   | Canker sores, bad breath | Decoction         | Mouthwash         | 0.49   |
| Paullinia pinnata L.,           | Sapindaceae          |                     | Leaves   | Tooth decay           | Decoction         | Mouthwash         | 0.49   |
| Senega occidentalis (L.) Link,   | Leguminosae-         | Kinikiniiba, kpayoywe(f) | Stem, leaves | Tooth decay, toothache | Decoction         | Mouthwash         | 0.49   |
| Siphonochilus aethiopicus        | Caesalpinioideae     |                     | Root     |                      |                   |                   |        |
| Vernonia adoensis Sch.Bip. ex   | Asteraceae           | Alomaklu            | Root     | Tooth decay           | Decoction         | Mouthwash         | 0.49   |
| Waltheria indica L.,            | Sterculiaceae        | Adassounsoun-ma (f, g, nangara (ba). | Leaves   | Tooth decay           | Decoction         | Mouthwash         | 0.49   |
| Amaranthus dubius Mart. ex Thell., | Celastraceae        | Jaduma, howutinm(f), sasisakinè (ba). | Leaves   | Tooth decay           | Trituration       | Mouthwash         | 0.49   |
| Chamaecrista rotundifolia (Pers.) | Leguminosae-Caesalpinioideae |                     | Leaves   | Teething disorder     | Trituration       | Mouthwash         | 0.49   |
| Nicotiana tabacum L.,           | Solanaceae           | Agboke, azowii      | Leaves   | Tooth decay           | Pounding          | Bandage           | 0.49   |
| Heliotropium indicum L.,        | Boraginaceae         | Koklosu denpaja,     | Leaves   | Tooth decay, teething disorder | Decoction         | Mouthwash         | 0.49   |
| Afraegle paniculata             | Rutaceae             | Atinkeke            | Trunk bark, leaves | Tooth decay, gingivitis | Decoction         | Mouthwash         | 0.49   |
| (Schumach. & Thonn.) Engl.,     | Anacardiaceae        | Zuzu (f), mon (ba) | Trunk bark | Tooth decay           | Pounding          | Bandage           | 0.49   |
| Lannea A.Rich.,                 | Bombacaceae          | Guédéhunsou (f)     | Trunk bark | Gingivitis            | Decoction         | Mouthwash         | 0.49   |
| Ceiba pentandra (L.) Gaertn.,    | Capparaceae          | Koto (d)            | Root     | Teething disorder     | Maceration         | Mouthwash         | 0.49   |
| Capparis tomentosa Lam.,        |                      |                     |          |                      |                   |                   |        |
| Scientific name                        | Family name                     | Local name                      | Part used        | Diseases treated                        | Preparation modes | Utilisation modes | FC (%) |
|---------------------------------------|---------------------------------|---------------------------------|------------------|----------------------------------------|-------------------|-------------------|--------|
| Tamarindus indica L.,                 | Caesalpinioideae                | Bokoso, mupèn (f)               | Leaves           | Toothache                              | Decoction         | Mouthwash         | 0.49   |
| Diospyros mespiliformis Hochst.       | Ebenaceae                       | Ken, kenwi (f), wonyibu, wibi (ba) | Leaves           | Tooth decay                            | Decoction         | Mouthwash         | 0.49   |
| Indigofera tinetoria L. var. tinetoria, | Papilionoideae                 | Agonjema (f)                    | Root             | Toothache, teething disorder           | Decoction         | Mouthwash         | 0.49   |
| Pterocarpus erinaceus Poir.,          | Papilionoideae                  | Kozo, gbèngètin (f)             | Trunk bark       | Tooth decay                            | Decoction         | Mouthwash         | 0.49   |
| Hyptis spicigera Lam.                 | Lamiaceae                       | Civi, chivi (f)                 | Leaves           | Tooth decay                            | Decoction         | Mouthwash         | 0.49   |
| Trichilia emetica Vahl,               | Meliaceae                       | Menè (d)                        | Root             | Toothache                              | Decoction         | Mouthwash         | 0.49   |
| Diospyros mespiliformis Hochst.       | Leguminosae-Mimosoideae         | Klovowe (f), so munoro (ba)     | Trunk bark, leaves | Tooth decay, canker sores              | Decoction         | Mouthwash         | 0.49   |
| Indigofera tinetoria L. var. tinetoria, | Oleaceae                      |                                | Root, trunk bark, leaves | Tooth decay                        | Infusion           | Mouthwash         | 0.49   |
| Hyptis spicigera Lam.                 | Poaceae                         | Gbezen (f)                      | Leaves           | Toothache                              | Decoction         | Mouthwash         | 0.49   |
| Trichilia emetica Vahl,               | Poaceae                         |                                 | Flower            | Tooth decay gingivitis, teething disorder | Trituration       | Mouthwash         | 0.49   |
| Diospyros mespiliformis Hochst.       | Sterculiaceae                   | Adassoustoun (f, g)             | Root             | Tooth decay, gingivits, toothache      | Decoction         | Mouthwash         | 0.49   |
| Indigofera tinetoria L. var. tinetoria, | Sterculiaceae                 |                                | Stem, leaves     | Toothache                              | Decoction         | Mouthwash         | 0.49   |
| Diospyros mespiliformis Hochst.       | Verbenaceae                     | Fontin, koto (f)                | Root             | Tooth decay                            | Maceration         | Mouthwash         | 0.49   |
| Hyptis spicigera Lam.                 | Leguminosae-Mimosoideae         | Enwa agogo (y)                  | Root             | Tooth decay                            | Decoction         | Mouthwash         | 0.49   |

Abdoulaye et al.; EJMP, 33(9): 22-36, 2022; Article no.EJMP.90669
4. DISCUSSION

This ethnobotanical study collected information on medicinal plants commonly used in oral health care in four districts in southern Benin, namely Allada, Abomey-Calavi, Cotonou and Porto-Novo. In this study, the choice of traditional herbalists is based on their experiences and their rich knowledge in the medicinal uses of plant species acquired through generations. The results of this survey show that a large number of plants are traditionally used in the treatment of oral diseases in Benin. About 92% of herbalists are women. This shows that the medicinal plants trade is dominated by women in southern Benin. This result confirms those obtained by Agbankpé et al. [11] and Dounon et al. [12] in which the practice of traditional medicine is much more reserved for older women in southern Benin. These results are also contrary to the findings of Najem et al. [13] who proved that traditional medicine is more practiced by the male gender in Morocco. Similarly, it contradicts the findings of Mutie et al. [14] in Kenya who showed that 66.67% of herbal medicine traders are male. It should be noted that in Benin, it is the men who pick the medicinal plants mainly in the forests. They then sell them to women who set up shop in the markets. Also, in some countries like Morocco, women work less than men because of their culture. Furthermore, most of the respondents notably 43.63% belong to the age group of 41-50 years, 32.72% are in the age group of 31-40 years, 16.36% are below 30 years and 7.27% are above 50 years. This shows a clear trend of rejuvenation of the herbalist profession and the return of the society to the use of traditional herbal medicine with a good transmission of popular knowledge from the elderly to the young. Also, the current study shows an increasing involvement of young people in the medicinal plant trade, which could be due to the lack of employment but not necessarily to their expertise in plant knowledge. These results are close to those obtained by Fatira et al. [15] who showed that trading and traditional herbal medicine are day by day activities carried out by the youth. Illiterates represent 56.36% of the respondents. Although people are becoming aware of the side effects of pharmaceutical treatments based on chemical molecules, the lack of formal training may be a contributing factor to poor handling of medicinal plants. The use and trade of medicinal plants is no longer restricted to traditional healers but has entered the informal and increasingly formal commercial sector. This presents a health hazard due to the lack of education. Regarding the origin of medicinal plants knowledge, family heritage predominates (78.18%). Agbankpé et al. [11] noted, following a survey in South Benin that 87.86% of respondents had inherited this practice from their ancestors. Our survey allowed us to observe that knowledge of a recipe in traditional medicine is above all a family secret that is transmitted from generation to generation through customs and oral tradition without distinction of gender or age. Indeed, the elderly are believed to provide the most reliable information and have some confidence that they hold much of the ancestral knowledge that has been transmitted orally [16]. This same observation has also been made by other researchers [17,18]. Our results also indicate that 47.27% of the respondents have been practicing the herbalist profession for a long period (21 to 30 years), 34.54% have been practicing the same profession for 10 to 20 years, and 18.18% have more than 30 years of experience as an herbalist. This is a positive indicator, as the profession requires longer experience, especially in plant identification, diagnosis and patient therapy. These results are close to those of Haouari et al. [19] who demonstrated the importance of experience in traditional herbal medicine.

One hundred and three different plant species are used in oral diseases treatment according to our study. This correspond to 3.67% of Beniness total flora, estimated at 2807 species [20]. The most represented plant families are: Leguminosae, Euphorbiaceae, and Lamiaceae. Ahouanse [21] noted the predominance of Leguminosae in oral diseases treatment through an ethnobotanical study of plants for oral use in the district of Kétou in Benin. Our study identified Zanthoxylum zanthoxyloides as the most used plant for oral diseases treatment. These results are close to those obtained by Dangboe [6]. Indeed, this specie seems to contain chemical active principles with antimicrobial activity against bacteria responsible for several oral diseases [22,23]. Different oral diseases treatable by herbal medicine are common in traditional health practices namely: dental caries, toothache, gingivitis, ulcerative gingivitis, canker sores, swollen tonsil, oral thrush, tonsillitis and black tongue [24]. This study shows that the major oral diseases frequently treated by medicinal plants in southern Benin are dental caries (43.87%), gingivitis (20.64%) and odontology (14.19%). Indeed, the main oral diseases, namely caries and periodontal
diseases constitute a health problem in the world. They affect all segments of the population and remain a cause of morbidity closely linked to the difficulty of access to care and to socioeconomic, cultural and environmental problems. All parts of the different plant are used against a variety of diseases. For the treatment of oral diseases, the part of the plant to be used depends on the traditional recipe advocated. Therefore, traditional medicine practitioners seem to have acquired knowledge about the properties of each part, allowing them to know which one is the most effective. Sometimes more than one organ of the same plant species, especially a combination of parts, is used in the preparation of different therapies [25]. However, in this study, the commonly used plant parts were found to be the aerial parts of the plant especially the leafy leaves and stems for oral diseases treatment (46.81%). This is close to the literature provided by [25] who showed that leaves are the seat of photosynthesis and synthesize exudates containing bioxidative secondary metabolites that protect the plant from external aggressions. As such, they contain many chemical groups responsible for the biological properties which have medicinal value for humans. They are also easy to collect and do not pose a threat to the plant [26-28]. In order to treat oral diseases, and depending on the plants part and the pathology treated, traditional practitioners use different modes of preparation and administration. As some preparation methods allow higher concentrations of active components to be extracted than others, the best way to use a plant is the one that preserves its properties while allowing the extraction of all active components. The southern Benin community uses different methods of preparing medicines such as decoction, trituration, maceration, pounding, infusion and poultice for the treatment of oral diseases. The most frequently used method is decoction. Indeed, decoction allows to collect the most active principles and attenuates or cancels the toxic effect of certain recipes. These results confirm the findings of ethnobotanical studies conducted on medicinal plants by several authors [29; 14]; [30]. Finally, regarding administration method, gargling is the most used route for the treatment of oral diseases. According to herbalists, gargling allows traditional remedies to reach the entire oral cavity. These results are supported by Najem et al., [14] who demonstrated the effect of gargling in the treatment of oral diseases from medicinal plants.

5. CONCLUSION

The flora of Benin contains a rich diversity of plants. Many of which are used in traditional Beninese medicine and have the potential to provide pharmacologically active natural products. In order to know the different plants used to treat oral diseases, an ethnobotanical survey was conducted in southern Benin (district of Allada, Abomey-Calavi, Cotonou and Porto-novo) It identified one hundred and three (103) species of medicinal plants commonly used in the treatment of oral diseases. Among these species, Zanthoxylum zanthoxyloides is the most used. These plants are divided into forty- four (44) families and ninety-one (91) genera. The family Leguminosae is the most represented (15.21%). The plants parts most used in the traditional treatment of oral diseases are the aerial parts (leaves and stems). Decoction is the mode of preparation most often used in mouthwash or gargle for the treatment of oral diseases.

CONSENT

As per international standard or university standard, respondents’ written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Dongmo Voufo HJ. Etude de l’état bucco-dentaire des élèves du lycée Alfred Garçon. Doctoral dissertation, USTTB. 2019 :1-76.
2. Tembely A. Etude phytochimique et activité antiradicalaire de trois plantes pour la mise au point de bains de bouche. Doctoral dissertation, Usttb. 2021:1-119.
3. Dash TR, Singh N, Gupta D, Panwar E, Amisetty S. Role of medicinal herbs in oral health management. Int. J. Tooth. Med. Res. 2014;1(2):113-119.
4. World Health Organization. Achieving better oral health as part of the universal health coverage and noncommunicable
disease agendas towards 2030.[Internet]; 2020.
5. Niang A, Ba B, Diawara O, Ba M, Sacko K, Wane O, Traore AS. Etat bucco-dentaire des enfants diabétiques à l'hôpital du mali: 79 observations. African Journal of Dentistry & Implantology. 2018;12:1-9.
6. Dangboe NP. Etude ethnobotanique des plantes à usages bucco-dentaires au sud-ouest du benin. Rapport de fin de formation. Abomey-Calavi, Bénin. 2015: 1-53.
7. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. Bulletin of the World Health Organization. 2005;83:661-669.
8. Da Luz K. Le" Sothiou" ou bâtonnet frotte-dents comme outil d'hygiène bucco-dentaire dans les pays en développement : exemple du Sénégal. Doctoral dissertation, Université Toulouse III-Paul Sabatier. 2018:1-178.
9. Akogègninou A. Recherches botaniques et écologiques sur les forêts actuelles du Bénin. Thèse d'Etat, Université de Cocody-Abidjan, Côte d'Ivoire. 2004:326.
10. Igue AM, Saidou A, Adjanhoun A, Ezui G, Attiqobe P, Kpagbin G, Sokbedji JM. Evaluation de la fertilité des sols au sud et centre du Bénin. Bulletin de la Recherche Agronomique du Bénin. 2013 :12-23.
11. Agbankpé AJ, Dougnon TV, Bankolé HS, Neyhouenou B, Yédomonhan H, Légonou M, Dougnon TJ. Etude ethnobotanique des légumes feuilles thérapeutiques utilisés dans le traitement des diarrhées au sud-Bénin (Afrique de l'Ouest). International Journal of Biological and Chemical Sciences. 2014;8(4):1784-1795.
12. Dougnon TV, Attakpa E, Bankolé H, Hounmanou YMG, Déhou R, Agbankpé J, Baba-Moussa L. Etude ethnobotanique des plantes médicinales utilisées contre une maladie cutanée contagieuse: La gale humaine au Sud-Bénin. Pharmacoopée et médecine traditionnelle africaine. 2017;18 :16-22.
13. Najem M, Harouak H, Ibibijen J, Nassri L. Oral disorders and ethnobotanical treatments: A field study in the central Middle Atlas (Morocco). Helyon. 2020; 6(8):e04707.
14. Mutie FM, Gao LL, Kathambvi V, Rono PC, Musili PM, Ngugi G, Wang QF. An ethnobotanical survey of a dryland botanical garden and its environs in Kenya: the Mutomo hill plant sanctuary . Evidence-Based Complementary and Alternative Medicine; 2020.
15. Fathi BA, Ouafae B, Souad S, Jamila D, Allal D, Lahcen Z. Ethnobotany study of medicinal plants used in the treatment of respiratory diseases in the middle region of Oum Rbai. International Journal of Environment, Agriculture and Biotechnology. 2017;2(4), 238815.
16. Holaly GE, Simplice KD, Charlemagne G, Kodjovi A, Kokou A, Tchadjobo T, Jacques S. Etude ethnobotanique des plantes utilisées dans le traitement du diabète dans la médecine traditionnelle de la région Maritime du Togo. The Pan African Medical Journal. 2015: 20.
17. Klotoé JR, Dougnon TV, Koudouvo K, Atégbo JM, Loko F, Akoègninou A, Gbeassor, M. Ethnopharmacological survey on antihemorrhagic medicinal plants in South of Benin. European Journal of Medicinal Plants. 2013:3(1):40.
18. Guinnin FF, Sacramento TI, Sezan A, Atégbo JM. (Etude Ethnobotanique des plantes médicinales utilisées dans le traitement traditionnel des hépatites virales B et C dans quelques départements du Bénin.International Journal of Biological and Chemical Sciences. 2015;9(3):1354-1366.
19. Haouari E, Makaou SE, Jnkh M, Haddaouy A. A survey of medicinal plants used by herbalists in Taza (Northern Morocco) to manage various Foods, Journal of Materials and Environmental Science. 2018;9:1875-1888.
20. Akoègninou A, Van der Burg WJ. Van der Maesen, L. J. G. Flore analytique du Bénin (No. 06.2). Backhuys Publishers; 2006:1034.
21. Ahouanse MM. Etude ethnobotanique des plantes à usages bucco-dentaires dans la commune de ketou au Bénin. Bachelor thesis, University of Abomey-Calavi, Abomey-Calavi, Benin. 2015:1-61.
22. Agbulu CO, Aboje EE, Akande T. Antimicrobial Activity of Zanthoxylum zanthoxyloides provides the root bark of zanthoxylum zanthoxyloides. Aqueous methanol extract of the root bark of zanthoxylum zanthoxyloides provides natural remedy for dental caries and
toothache. World Journal of Pharmaceutical Research; 2017.

24. Trivedi P, Chauhan J, Ishnava K. In vitro assessment of inhibition potential of ethanomedicinal plants against cariogenic bacteria. Acta Sci Microbiol. 2018;1(6): 43-49.

25. Rahayu SE, Oktapianti R, Matondang I. Ethnobotany survey of medicinal plants used for traditional maternal healthcare by Serawai tribe, Seluma district, Bengkulu-Indonesia. Journal of Current Medical Research and Opinion. 2020;3(04) :441-448.

26. Khitri W, Lachgueur N, Tasfaout A, Lardjam A, Khalfa A. Plantes antilithiasiques utilisées en médecine traditionnelle dans la ville d’Oran, Algérie. Approche ethnobotanique et phytochimique. Revue d’ethnoécologie. 2016; 9.

27. Lazli A, Beldi M, Ghouri L, Nouri NEH. Étude ethnobotanique et inventaire des plantes médicinales dans la région de Bougous (Parc National d’El Kala,-Nord-est algérien). Bulletin de la Société Royale des Sciences de Liège. 2019:1-22.

28. Kpabi I, Agban A, Hoekou Y, Pissang P, Tchacondo T, Batawila K. Etude ethnobotanique des plantes à activités antiparasitaires utilisées en médecine traditionnelle dans la préfecture de Doufélou au nord du Togo. Journal of Applied Biosciences. 2020;148:15176-15189.

29. Gnagne AS, Camara D, Bene K, Zirihi GN. Étude ethnobotanique des plantes médicinales utilisées dans le traitement du diabète dans le Département de Zouémonla (Côte d’Ivoire). Journal of Applied Biosciences. 2017;113:11257-11266.

30. Al-Somaiday HM, Al-Samaray ME, Al-Samydai A. Role of Herbal Medicine in Oral and Dental Health; Ethnopharmacological Study of Medicinal Plants in Iraq/Baghdad. International Journal of Research in Pharmaceutical Sciences. 2020;11(1):553-560.

© 2022 Abdoulaye et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/90669

36