Indigenous knowledge and uses of medicinal plants in Ouagadougou, Burkina Faso

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Research

Abstract

Background: In Burkina Faso, plant-based products are widely used by city dwellers to treat and/or prevent various diseases and ailments. Due to rapid population growth, the demand for plant products is increasing with high harvesting pressure on medicinal plants. This pressure combined with the erosion of indigenous knowledge related to medicinal use of plants, compromise the conservation and sustainable use of these plants. To this end, this study aimed to develop a checklist of medicinal plants used for human health in cities, as well as their applications.

Methods: Ethnobotanical surveys were conducted from March 3, 2020, to December 15, 2020, in the city of Ouagadougou to account for plant availability based on their phenological occurrences. A total of 155 participants involved in traditional medicine (herbalists and healers) were interviewed using semi-structured approach.

Results: A total of 42 plant species, comprising herbaceous and wood species were identified as medicinal plants and used for the treatment of seven disease categories. Results also indicated that liver diseases were the main category for which medicinal plants are highly demanded. Leaves and trunk bark were the most commonly used parts. The most frequently cited method of preparation (58%) was decoction.

Conclusions: This study revealed that medicinal plant species supports the treatment of diseases for which conventional medicine failed to provide curative solutions such as liver diseases. Our findings are useful for guiding future investigations on quality control of plant-based products in the treatment of diseases by demonstrating their ethnopharmacological relevance.

Keywords: Ethnobotany, Traditional medicine, Human health

Background

Plant resources play an important role in people's well-being in developing countries where they are exploited daily to meet vital needs such as food and medicine as well as income generating (Nabaloum et al. 2022). Meeting health needs is a great challenge for vulnerable people who have limited access to conventional medicine. Therefore, medicinal plants are highly exploited by people to treat many diseases and ailments that they suffer from. For instance, medicinal plants provide relief for about 80% of the African population (Malami et al. 2020). Most conventional medicines are derived from medicinal plants (digoxin from *Digitalis spp*., quinine and quinidine from *Cinchona spp*., vincristine and vinblastine from *Lochnera rosea*).

Phytotherapy is a field that is influenced by a number of factors, including social and cultural factors (Zörgo, Purebl, and Zana 2018). The practice requires knowledge acquired from a variety of sources (Papa et al. 2020). This knowledge can be inherited or passed on by a supernatural being.

Medicinal plant species attract great interest in cities in developing countries (Alkhamaiseh and Aljofan 2020), where they are used in the treatment of various human diseases. The widespread origin and therapeutic richness of medicinal plant species could justify the empirical nature and frequency of their use in the treatment of various diseases in humans. Harvesting pressure on medicinal plants is increasing due to rapid population growth, implying the need to control their use and concern for their sustainable conservation. In addition, indigenous knowledge in traditional medicine is poorly documented while there is a substantial basis for scientific investigations, essential for establishing the scientific basis of traditional knowledge (Albuquerque et al. 2021). In Burkina Faso, previous studies related to traditional medicine in urban settings have focused on plants used in the treatment of specific illnesses such as metabolic diseases (Zongo et al. 2021). Therefore, in-depth ethnobotanical investigation in urban areas is absolutely necessary to promote both indigenous knowledge and sustainable use of medicinal plants. This study aimed to develop a checklist of medicinal plants used for human health in cities, along with their applications.

The survey focused on medicinal plants used to treat human illnesses. The research concentrated on three large markets in the city of Ouagadougou, where many traditional pharmacopoeia products are sold. This study aimed to develop a checklist of medicinal plants used for human health in cities, as well as their applications.

A well-honed questionnaire was used to gather information from the holders of traditional knowledge about medicinal plants. The people who answered the questions helped generate the results which were the subject of this manuscript. These results highlight the different practices around medicinal plants used by people initiated into traditional medicine in the city of Ouagadougou and practicing in the city's three major markets.

Given the cultural, ethnic and climatic diversity of the flora, this study is particularly valuable given that few ethnobotanical surveys have been carried out in Ouagadougou.

Materials and Methods

Study area

Ouagadougou is the capital of Burkina Faso. The city of Ouagadougou belongs to the province of Kadiogo and constitutes the Center. This city is located between: 12.20819 -1.68709; 12.52819 -1.36709. Three representative markets recording huge diversity and quantity of medicinal plant products were selected for data collection, namely the “Dassosgho” market (1238881; -1.47831); the “zone 1” market (12.36779; -1.47048) and the “nabiyaar” market (12.36594; -1.49351). The three markets are represented on the map as follows: “Dassosgho” market; the “zone 1” market and the “nabiyaar” market.

Ouagadougou has experienced sustained demographic growth for almost three decades. It is therefore faced with different forms of expansion, the most important of which is spatial (figure 1). To do this, we are witnessing numerous adaptations in several areas including the health sector (Compaore and Nébié 2022). The average altitude is 306 m with respectively 272 m and 362 m as minimum and maximum altitude (Vallée et al. 2006).

Climate

Ouagadougou experiences pronounced rainfall, which reaches its maximum during the boreal summer (from June to August), and experiences very dry winters (from December to February). Maximum summer rainfall depends on the West African monsoon. The city enjoys a tropical climate with average monthly temperatures varying between 20 and 30 °C (Waongo, Laux, and Kunstmann 2015).

Population

The city of Ouagadougou covers an area of 518 km² (Mèvo and Kêdowidé 2010), which represents 0.2% of the national territory of Burkina Faso. The urban commune of Ouagadougou has an average density of 39.4 inhabitants/hectare. This average hide deep spatial disparities in the distribution of the population. The most densely populated sectors are made up of old traditional populous neighbourhoods in the central districts where the density reaches 139 inhabitants/hectare; densely populated areas (80 to 100 inhabitants/ha).
It is limited to the north by the rural communes of Pabré and Loumbila, to the east by that of Saaba, to the south by those of Koubri and Komsilga and finally to the west by the rural commune of Tanghin-Dassouri. Ouagadougou has 2,415,266 inhabitants according to the results of the fifth general population and housing census (5th RGPH), carried out in 2019, i.e. 11.78% of the country's total population and 45.1% of that cities of Burkina Faso (Institut National de la Statistique et de la Démographie (INSD) 2022).

Education and health services

The municipality of Ouagadougou’s education sector remains embryonic and underdeveloped. It comprises both formal and non-formal education. Formal education comprises basic education, which includes pre-school, primary, post-primary,

secondary and higher education. The literacy rate is estimated at 27%, which is a handicap for the implementation of education policies, particularly in terms of quality and accessibility for all. (N'tsoukpoe et al. 2023). The city of Ouagadougou brings together very heterogeneous sectors where tradition and modernity mix with 11,699 inhabitants per Doctor of Medicine (Compaore and Nébié 2022). This disparity exposes the precarious health of residents. This precariousness is characterized by the persistence of certain local endemics such as malaria, respiratory diseases and diarrhoea. Added to these diseases are epidemics such as cerebrospinal meningitis and measles.

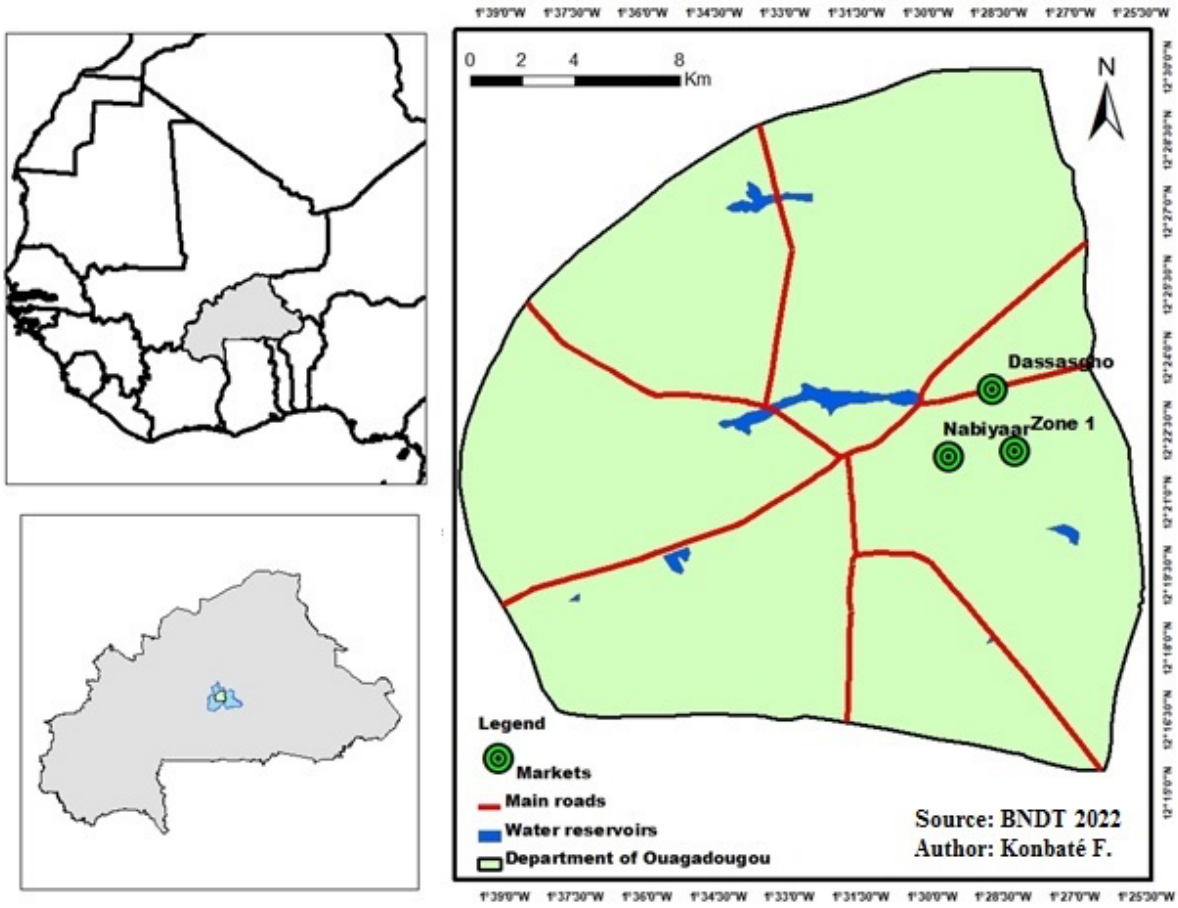

Figure 1. Organization of the city of Ouagadougou (Compaore and Nébié, 2022)

Ethnobotanical surveys

The information was collected in accordance with the recommendations for ethnobotanical surveys (Macía, García, and Vidaurre 2005). Ethnobotanical surveys were conducted from March 3, 2020, to December 15, 2020, to take into account the availability of plant materials on the markets. A semi-structured interview with randomly selected traditional practitioners, herbalists and medicinal plant sellers from the target markets was adopted for data collection. Traditional health practitioners are people who provide health care through the use of plant, animal or mineral substances. Herbalists are collectors and/or sellers of medicinal plants. According to sources from the general directorate of traditional medicine, the city of Ouagadougou registers 179 traditional health practitioners, herbalists and sellers of medicinal plants. The main information collected from the two first stakeholders were related to: (i) socio-demographic profile of informants (gender, age, social level, education level, profession), (ii) medicinal plants with their part used and corresponding diseases treated and (iii) origin of knowledge (acquired, bequeathed, by experience). Information recorded from the sellers included the number of products sold per display, the three best-selling products, their applications in care, instructions for use and possible combinations. Guided field walks were organized with the interviewees and other local indigenous populations to search for additional wild species of medicinal plants. All the specimens of the species were collected to obtain a herbarium specimen. During a guided walk, the control specimens were harvested, numbered, pressed and dried for identification. Specimens have been identified both in the field and in the biodiversity laboratory of Joseph Ki-Zerbo University. The voucher specimens were deposited with codes assigned to the herbarium of Joseph KI-ZERBO University. Plant nomenclature in this study was based on the Angiosperm Phylogeny Group (APG) classification (Bremer et al. 2009).

Data analysis

Statistical analysis

Information on medicinal plants, their uses and ethnobotanical knowledge was analyzed. The checklist of medicinal plants used in Ouagadougou was established and the relative diversity of species families (RDF) was calculated using equation 1 (Bognini et al., 2023) to explore their importance in traditional medicine.

$$\text{(1): RDF=}(\ Number\ of\ species\ in\ a\ family/Total\ number\ of\ species) * 100$$

Informant consensus factor (ICF)

The diseases of the study area were grouped into various categories based on the site of occurrence of the disease, condition of the disease, and treatment resemblance of the disease to the local people. In order to evaluate the reliability of information during the interview, informants are contact at least two times for the same ideas and the validity of the information is proving and record. The informant consensus factor (ICF) was calculated for each category to identify the agreements of the informants on the reported cures for the group of ailments (Heinrich et al. 1998). The ICF was calculated as follows (equation 2): number of use citations in each category (N_{ur}) minus the number of species used (N_t), divided by the number of use citations in each category minus one.

$$\text{(2): ICF=}\ (Nur - Nt)/(Nur - 1)$$

Use value (UV)

The use value (UV), a quantitative method highlighting the relative importance of species known locally, was also calculated using the following formula (equation 3) :

$$\text{(3): UV=}\ \sum U/N.$$

Where UV, the use value of a species; U, the number of citations per species; N, the number of informants (Upadhyay et al. 2011).

Preference ranking

Key informants were selected to assess the degree of effectiveness of medicinal plants when used to treat most treated human diseases according to our respondents (Tefera and Kim 2019). Medicinal plants considered the most effective for treating disease were assigned the highest value (5), while the lowest value was assigned to the least effective medicinal plants (1). The value of each species was summed, and the rank of each species was determined based on the total score. This helped indicate the most effective medicinal plants used by the community to cure illnesses.

Pairwise comparison (PC)

A pairwise comparison method was used to determine the relative importance of plant species, where items were presented in pairs and decisions were made by individual respondents regarding the relative importance of one of the items in the pair (Martin 1995). The popularity of five species of medicinal plants used to treat respiratory tract diseases were calculated. For this purpose, 10 key informants were randomly selected by drawing lots to independently say what they thought of the five pairs of traditional medicinal plants known to treat respiratory diseases. A list of pairs of selected items containing all possible combinations was created, the order of the pairs and the order within each pair were randomized, and then each pair was presented to the selected informants and the responses were recorded (Jeruto et al. 2008). Total scores were summarized and ranked. The total number of possible pairs (10) was obtained by applying the following formula (equation 4).

$$\text{(4): PC=}\ N(n-1)/2\ ,\ \text{where n is the number of elements.}$$

Results

Informants socio-demography data

In total, 155 people participated in the survey. Gender included 72% male and 28% female. The results also showed that the majority of respondents (80%) belonged to the age group of [55;60[. This proportion represented 83 men and 9 women. In this group of 92 people surveyed, all were married.

Medicinal plants species recorded in the study area

A total of 42 plant species belonging to 21 families were recorded as medicinal plants in Ouagadougou (Appendix 1). The most represented families based their relative diversity of family (RDF) were *Fabaceae* (RDF= 26.19%), *Combretaceae* (RDF=7.14%), *Rubiaceae* (RDF= 7.14%), and *Anacardiaceae* (RDF=7.14%). The relative diversity of all families is shown in Figure 2.

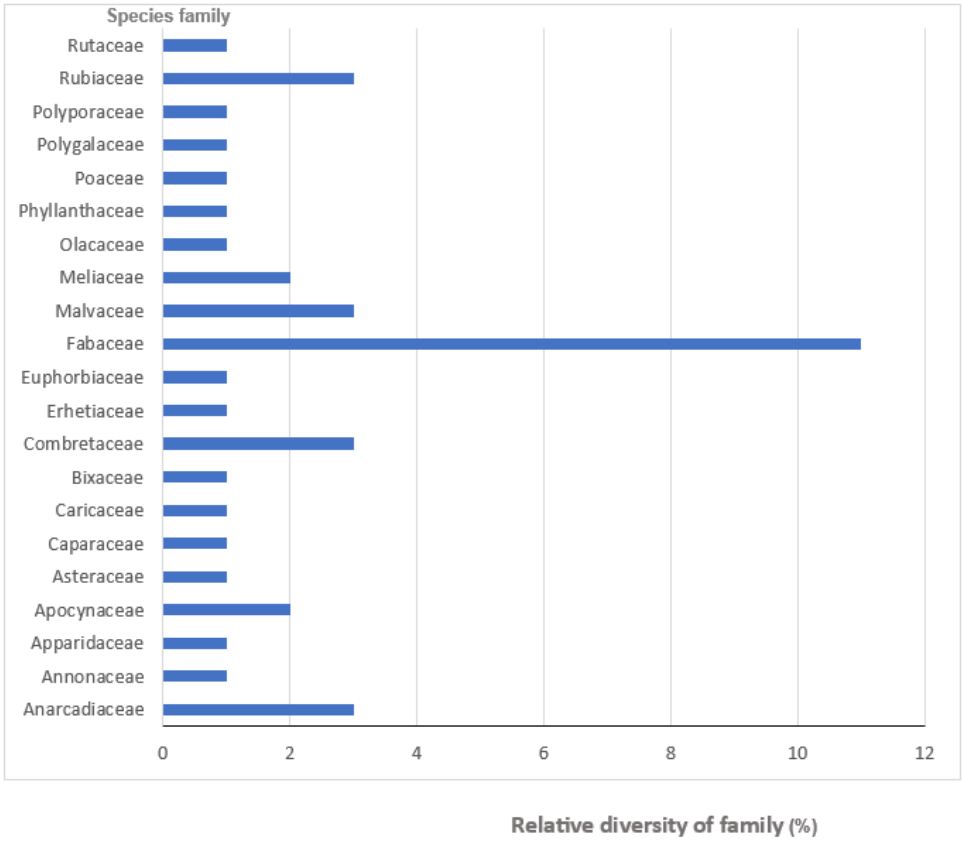

Figure 2. Relative diversity of the family of medicinal plant species used in Ouagadougou

Number of citations according to family

The frequency of citations of different species per family indicated that *Fabaceae* (79), *Combretaceae* (44), *Malvaceae* (35), *Apocynaceae* (34) and *Anacardiaceae* (33) recorded the best number of citations according to family (Figure 3).

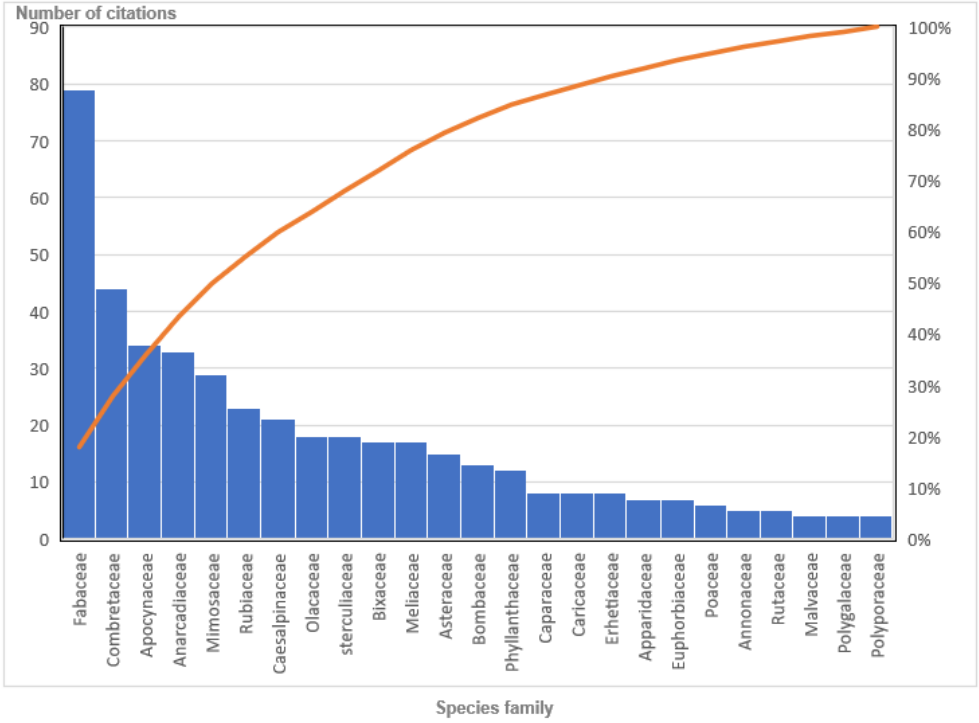

Figure 3. Number of citations according to family of different plant species

Plant parts used

The trunk bark and leaves were the most used parts with frequencies of 26.95% and 24.11%, respectively (Figure 4).

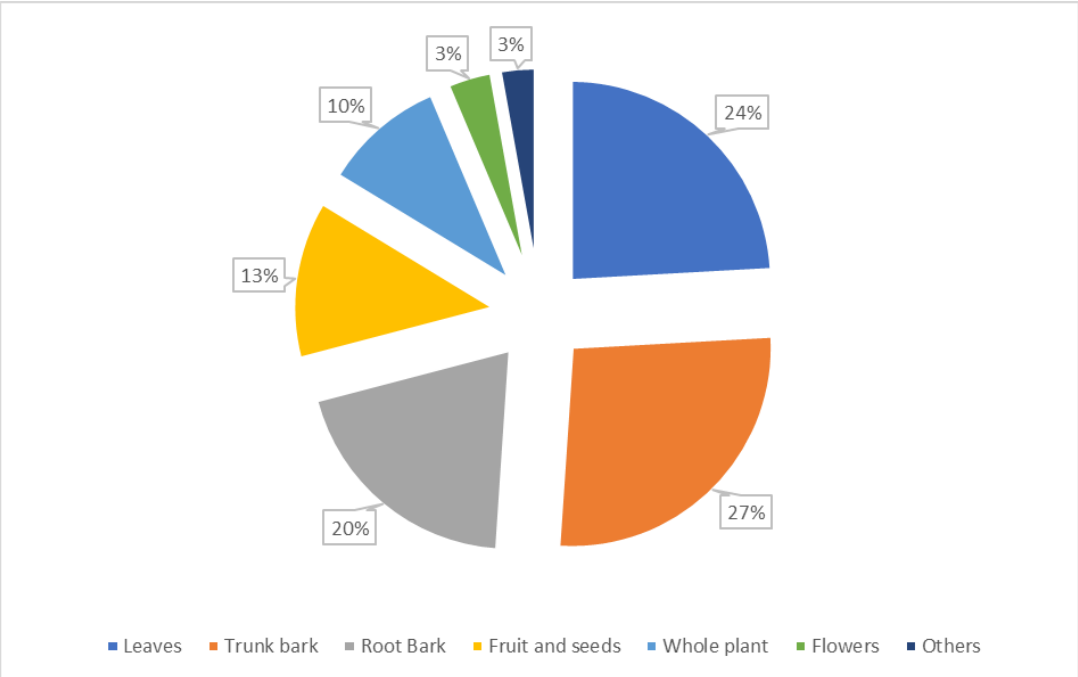

Figure 4. Frequency diagram of the different parts used by the respondents

Method of preparation and mode of acquisition of knowledge by informants

The method of preparation most used by respondents was decoction (58%) and infusion (25%) (Figure 5). From the results of the investigation, it emerged that the knowledge had been acquired orally, and that there was no inspiration on a scientific basis.

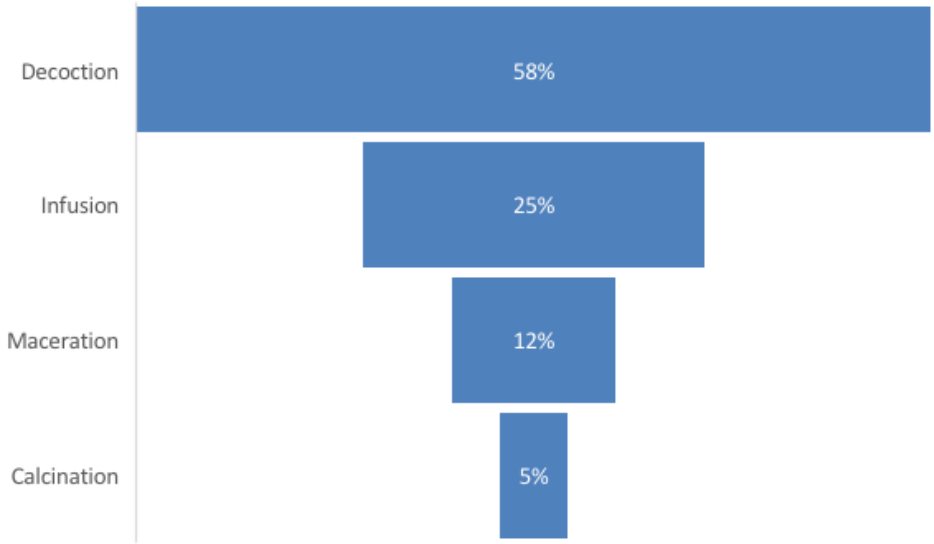

Figure 5. Frequency of preparation methods used by respondents

Ranking of the most important medicinal plants

Consensus of informant (CI) and Use Value (UV)

Out of a total of 42 species recorded, all were cited as medicinal plants used in the treatment of human illnesses. Six had the highest number of citations. *Combretum micranthum* was cited 29 times with a use value of UV=0.19, followed by *Piliostigma reticulatum, Sterculia setigera* and *Ximenia americana* which each had 18 citations with a use value of UV=0.12. (Table 1).

Table 1. Frequency of mention of plants in the three markets

Species	Family	Numbers of citations	Use value (UV)
***Combretum micranthum* G.Don**	*Combretaceae*	29	0.19
***Piliostigma reticulatum* (DC.) Hochst.**	*Fabaceae*	18	0.12
***Sterculia setigera* Del.**	*Meliaceae*	18	0.12
***Ximenia americana* L.**	*Olacaceae*	18	0.12
***Neltuma chilensis* (Molina) C.E.Hughes & G.P.Lewis**	*Fabaceae*	17	0.11
***Saba senegalensis* (A. DC.) Pichon**	Apocynaceae	17	0.11

Informant Consensus Factor (ICF)

The different diseases were classified into seven (7) categories based on certain aspects such as pathophysiology, the part of the body concerned, the status of the disease. The medicinal plants best indicated in the treatment of a category of diseases were characterized by A higher informing consensus factor (ICF) was associated with medicinal plants that were most effective in treating a specific disease category. Category 5 "snake bites, wounds, bleeding, elephantiasis" had the highest ICF of 0.91 while category 1 "vision disorders, mental disorders, epilepsy" had the lowest (0.74). This parameter revealed very interesting ICF which were all between 0.74 and 0.91 (Table 2).

Table 2. Consensus factors informing categories of diseases recorded in the study area

Disease categories	Numbers of species	Numbers of citations	ICF
Vision disorders, mental disorders, epilepsy	7	24	0.74
Fever, headaches, malaria	8	51	0.84
Cough, tuberculosis, cold, pneumonia	14	107	0.87
Constipation, sexual weakness, infertility, nausea	20	178	0.89
Snake bites, incurable wounds, bleeding, elephantiasis	2	13	0.91
Hepatitis, jaundice, heart disease, hypertension, lower back pain, bone pain, arterial hypotension	25	185	0.87
Mycoses, dermatoses, ringworm, candidoses, skin burns	6	27	0.81

Preference ranking

According to the results of the survey, hepatitis is the disease, which recorded the most citations. Several plant species were cited as a remedy against hepatitis. According to the perception of the people surveyed, *Piliostigma reticulatum* was the most cited species against hepatitis with an index of 37. On the other hand, in this same order, *Trichilia emetica* had recorded the fewest citations against hepatitis (Table 3).

Table 3. Preferences of medicinal plants used to treat hepatitis by respondents (R1-10)

Medicinal plants	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total	Rank
Neltuma chilensis *(Molina) C.E.Hughes & G.P.Lewis (Fabaceae)*	2	4	3	2	1	4	3	2	4	2	27	3rd
***Pseudocedrela kotschyi* Harms (Meliaceae)**	3	2	4	4	3	4	3	4	4	4	35	2nd
***Sarcocephalus latifolius* (Sm.) E.A.Bruce (Rubiaceae)**	2	1	2	1	2	1	3	2	2	2	18	6th
***Sclereocarya birrea* A.Rich. (Anacardiaceae)**	2	1	3	3	3	2	3	2	2	4	25	5th
***Terminalia laxiflora* Eng. & Diels (Combretaceae)**	3	2	3	2	3	3	2	3	3	2	26	4th
***Trichilia emetica* Vahl subsp. suberosa J.J. de Wilde (Meliaceae)**	2	2	2	1	1	1	3	2	1	1	16	7th
***Piliostigma reticulatum* (DC.) Hochst. (Fabaceae)**	3	3	3	3	4	5	3	4	5	4	37	1st

Paired comparison

The informants were asked about medicinal plants used to treat respiratory diseases. Ten (10) key informants expressed their opinions regarding the medicinal plants taken in pairs. The first place was occupied by *S. setigera* with a score of 39, *C. Pancholi* came fifth. The scores ranged from 31 to 39 (Table 4).

Table 4: Paired comparison of medicinal plants used against respiratory diseases by respondents (A1-10)

Medicinal plants	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Total	Rank
***Cochlospermum planchonii* Hook.f. (Cochlospermaceae)**	3	2	3	3	3	3	3	4	3	4	31	5th
***Entada africana* Guill. & Merr. (Fabaceae)**	3	3	4	5	5	4	3	3	4	4	38	2nd
***Phyllanthus maderaspatensis* L. (Phyllanthaceae)**	2	3	4	3	4	3	4	3	3	3	32	4th
***Sterculia setigera* Del. (Malvaceae)**	4	5	3	4	5	3	4	4	4	3	39	1st
***Ximenia americana* L. (Olacaceae)**	3	3	4	3	4	4	3	3	3	3	33	3rd

Discussion

Medicinal plants in the study area

Forty-two medicinal plant species belonging to 21 families were recorded in Ouagadougou. The highest number of species belonged to *Fabaceae*, *Combretaceae, Malvaceae*, *Apocynaceae* and *Anarcadiaceae.* Nadembega et al. (2011) found a very high representativeness of *Fabaceae* and *Anarcadiaceae* in an ethnobotanical survey carried out in the province of Kouritenga (Burkina Faso). This part of the country has almost the same climatic conditions as the commune of Ouagadougou (Nadembega et al. 2011). These two plant families are very widespread in the area. This is partly due to the favorable climatic conditions for their development. *Fabaceae* and *Anarcadiaceae* have a very great diversity from an anatomical and physiological point of view (Aye and Lin 2020).

Combretaceae, *Apocynaceae* and *Anarcadiaceae* had the highest number of citations per family as observed by Welcome and Van Wyck (2020). Several factors influence the choice of medicinal plants for treating patients in the survey area (Soule et al. 2017), including the accessibility of natural resources and ease of conservation. Some medicinal plants are under-utilized because they are inaccessible at certain times of the year, or because the material is hard to preserve, resulting in denaturing and loss of therapeutic properties. The flora of Burkina Faso is very rich in certain species such as the *Combretaceae*, *Anarcadiaceae* and *Fabaceae*. Some plant samples were collected in outlying areas, for example, *Afzelia africana* (*Fabaceae*) was collected in a "Houet region" reserve. Anthropogenic pressure on certain species, such as *A. africana*, highlights the need to define conditions for the proper use of medicinal plants and their development through reforestation (Tilman et al. 2017). This will reduce the risk of extinction of certain species, such as *A. africana*, which are already threatened (Stévart et al. 2019).

Types of plants and plant parts used

The most commonly used parts were leaves, which are used in plant-based treatments, and trunk bark. This process raises awareness among the people in the survey area, by demonstrating how difficult it is to gain access to certain natural resources. Harvesting the leaves increases the chances that the plants will develop new leaves, which can be harvested if necessary. In their description of good practices for harvesting plant parts, Pérez-Harguindeguy et al. (2016) also noted the need to prioritize the collection of leaves in particular species Harvesting of leaves does not threaten the survival of the plant compared with other parts of the plant such as the roots and seeds or fruit. In addition, leaves contain a high number of secondary metabolites with therapeutic properties (Twaij and Hasan 2022). In terms of the bark of the trunk, if good harvesting techniques are not implemented, the plant's survival may be threatened. As part of the assessment of the pharmaceutical evidence for certain parts of the plant, proposals on the best ways to use medicinal plants should emerge clearly.

Methods of administration

The route of administration of plant-based products in the survey area were administered orally. This option could give the active molecules of the medicinal plant extract a chance to be close to the target organ through the principle of absorption. Most health problems originate within the body, and proximity to the active ingredients of medicinal plants would be a determining factor in the patient's recovery. On the other hand, external treatments could be linked to possible toxicity of the recipe used. This way of applying the plant-based product would reduce the absorption of the supposedly toxic active ingredient.

The preparation method most commonly used was decoction. This technique is known to be effective in extracting a large number of secondary metabolites. This was what emerged from the work of Mohti et al. (2020) on different forms of extraction of plant-based products used against diseases caused by pathogenic microorganisms.

In addition, there were often instructions on the type of container to be used to boil the plant material. Materials such as terracotta or aluminum pots can improve therapeutic properties by adding minerals. Mineral therapy is a branch of science

that highlights the therapeutic properties of certain minerals (Nomicisio et al. 2023). After decoction comes infusion, which is a more flexible technique for extracting certain metabolites that could be denatured by the high heat of decoction.

With regard to dosage, it emerged that some of the people surveyed had difficulty defining a clear dosage for the plant-based products they use (Lane et al. 2022). The lack of precision in the treatment of certain illnesses in traditional medicine is a weakness of this alternative medicine. In this study, criteria such as sex, age and build were considered by the majority of respondents. The reference material in terms of measurement was very diverse, ranging from spoonful to glasses, from pinches to wrists, from bottle lids to earthenware dishes.

Informant Consensus Factor (ICF)

The Informant Consensus Factor indicated a high index for diseases in classes 4 and 5. These classes include diseases considered to be "community-based". Following these classes are classes 3 and 6. These classes include diseases that are public health problems, such as acute respiratory infections and liver diseases. Respiratory infections are the leading cause of consultation in hospital health centers in Ouagadougou (Ouédraogo et al. 2014). As for hepatitis, its prevalence is growing exponentially in the city of Ouagadougou (Sawadogo et al. 2020). This has been noted by some authors such as Heinrich et al. (1998), who through a survey carried out in Mexico found in their analysis of gastrointestinal diseases, a significant ICF of 0.75.

Important medicinal plants

In traditional medicine, as in modern medicine, when several species are cited for the treatment of the same disease, people prefered one species. For example, in the treatment of hepatitis, the people questioned used *Piliostigma reticulatum* and *Pseudocedrela kotschyi*. According to a minority of those surveyed, the choice was in favor of *A. africana*. The respondents' preference for plants used against respiratory tract diseases was for *S. setigera*. Preference in the choice of a plant is governed by several parameters such as differences in locality and cultures of the populations (Sanchez 2017).

Conclusion and perspectives

Traditional medicine constitutes an important part of the health system in developing countries like Burkina Faso. These results provide scientific evidence for traditional knowledge, which is still relevant today because this knowledge is used by populations. This survey made it possible to identify 42 species of medicinal plants belonging to 21 plant families. It was carried out with 155 people who had knowledge of medicinal plants. The data analysis allowed for the identification of preferred plant species in the treatment of specific human diseases, such as liver diseases and respiratory infections in Ouagadougou. These results as a foundation for further research into the quality control of medicinal plants, which are widely consumed in the city of Ouagadougou.

Declarations

Ethics approval and consent to participate: The data were collected with confidentiality, anonymity and consent. All respondents were informed of the purpose of the study and provided prior informed consent.
Consent for publication: Not applicable.
Availability of data and materials: Data used in this article are available for any requests.
Competing interests: Authors declare no conflict of interest.
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Authors' contributions: Jotham Yhi-pênê N'do: Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Visualization, writing – original draft, writing – review and editing, Data conservation. Dramane Paré: Formal analysis, writing – revision. Loyapin Bondé: data curation, formal analysis. Samson Guenne: conceptualization, methodology. Adama Hilou: methodology, conceptulization, supervision. Martin Kiendrebeogo: Formal analysis, Supervision. All authors have read, reviewed and approved the manuscript.

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Appendix

Appendix 1. List of medicinal plants used to treat humans in the three Ouagadougou markets

Scientific name, family, herbarium code	Parts used	Method of preparation	Method of administration	Associated plants	Frequency of use	Number of quotations	Diseases
***Lannea velutina* A. Rich. (Anacardiacea) - 16690**	Bark of trunk	Maceration, infusion	Oral use	*Manihot esculenta, Carica papaya*	3.52	14	Diarrhea, Hypertension, Fever, Jaundice, Constipation
***Sclereocarya birrea* A. Rich. (Anacardiaceae) - 16689**	Trunk bark	Decoction or infusion	Oral use	*Guiera senegalensis, Manihot esculenta*	3.27	13	Hepatitis, Ulcers, Diabetes
***Spondias mombin* L. (Anacardiacea) - 16662**	Leaves and trunk bark	Decoction	Oral use, purgation		1.51	6	Jaundice, malaria
***Annona senegalensis* Pers. (Annonaceae)**	Young shoots, leaves and trunk bark	Decoction	Orale use	*Chrysanthellum americanum*	1.26	5	Strengthens liver and heart activity
***Calotropis procera* Ait.F (Apocynaceae) - 16695**	Roots	Maceration et decoction	Oral and inhalation		4.27	17	Gonorrhea, Malaria, Asthma, Hemorrhoids, Hepatitis, Coughs
***Saba senegalensis* (A. DC.) Pichon (Apocynaceae) - 16692**	Leafy branches	Infusion, maceration	Oral use and inhalation		4.27	17	Anorexia, inappetence, athrepsia, bilious fever, liver crisis, food poisoning, tuberculosis, vomiting
***Boscia angustifolia* A. Rich (Apparidaceae)**	Roots	Decoction	Drink and bath	*Cassia nigricans*	1.76	7	Malaria, Asthma, Hemorrhoids, Hepatitis, Dermatoses
***Chrysanthellum americanum* L. (Asteraceae) - 16688**	Whole plant	Decoction, maceration, infusion	Oral use	*Gardenia erubescens, Acanthospermum hispidum*	3.77	15	Wounds, snake bites, high blood pressure, malaria, hepatitis, lithiasis, cough,
***Maerua angolensis* DC. (Capparaceae) - 16669**	Leaves	Decoction, infusion	Oral use, purgation		2.01	8	Hypertension, malaria, jaundice
***Carica papaya* L. (Caricaceae)- 16682**	Leaves	Maceration	Drink, enema and purgation	*Manihot esculenta, Citrus limon, Cordia africana*	2.01	8	Fever, stomachache, hepatitis, low blood pressure, ringworm
***Cochlospermum planchonii* Hook.f. ex (Bixaceae) - 16684**	Root barks	Decoction, infusion	Oral use and inhalation	*Tamarindus indica*	4.27	17	Malaria, Jaundice, Colic, Cough
***Combretum micranthum* G. Don (Combretaceae) - 16687**	Leaves	Decoction, maceration, infusion	Oral use and inhalation	*Manihot esculenta, Citrus limon, Carica papaya*	7.29	29	Fever, Malaria, Jaundice, Abdominal pain, Cough
***Guiera senegalensis* J.F. Gmel. (Combretaceae) - 16671**	Leafy branches	Decoction	Bath	*Saba senegalensis*	2.26	9	Hemorrhoids, Abdominal pain

***Terminalia laxiflora* Eng. & Diels (Combretacea) - 16660**	Trunk bark	Calcination	Sucking	*Cochlospermum planchonii, Sterculia setigera*	1.51	6	Malaria, Hepatitis
***Cordia africana* Lam. (Erhetiaceae) - 16678**	Leaves and bark of trunk	Decoction, Infusion	Oral use, bath and purgation	*Carica papaya*	2.01	8	Lack of appetite, childhood fever, chest pain and hepatitis
***Manihot esculenta* Crantz (Euphorbiacea) - 16668**	Leaves	Infusion, maceration	Drink and bath		1.76	7	Jaundice, Hepatitis
***Phyllanthus maderaspatensis* L. (Phyllanthaceae)- 16683**	Whole plant	Decoction and alcoholic maceration	Oral use	*Chrysanthellum americanum, Carica papaya*	3.02	12	Headaches, bronchitis, otalgia, ophthalmia, diabetes, snake bites
***Vachellia nilotica (L.) P.J.H.HURTER & Mabb* (Fabaceae) - 16683**	Fruits	Infusion	Oral use and purgation	*Citrus limon, Parkia biglobosa*	0.75	3	Painful periods, jaundice, shingles
***Vachellia seyal* (Delile) P.J.H.Hurter (Fabaceae) - 16684**	Bark from trunk	Decoction	purgation		1.01	4	Constipation, hernia, hepatitis, arterial hypertension Snake bites
***Afzelia africana* Sm. & Pers. (Fabaceae)-16657**	Leaves and bark of trunk and roots	Decoction	Oral use		4	4	Malaria, hepatitis, coughs, wounds, snake bites, high blood pressure
***Cassia mimosoïdes* L. (Fabaceae) - 16681**	Whole plant	Decoction	Drink	*Senna obtusifolia*	2.26	9	Icterus, mycosis
***Cassia nigricans* Vahl (Fabaceae) - 16680**	Whole plant	Decoction, Infusion	Oral use and purgation	*Boscia angustifolia*	1.76	7	Hepatitis and heartache
***Daniellia oliveri* Benn. (Fabaceae) - 16675**	Bark of the trunk	Decoction	Oral use and purgation	*Tamarindus indica*	1.76	7	Ulcers, haemorrhoids, hepatitis
***Detarium microcarpum* Guill. & Perr. (Fabaceae) - 16674**	Bark of the trunk	Decoction	Drink	*Guiera senegalensis*	1.26	5	Hepatitis
***Entada africana* (L.) Merr (Fabaceae) - 16673**	Roots and bark of trunk	Decoction, infusion	Oral use	*Adansonia digitata*	1.01	4	Hepatitis, jaundice, nausea, gastric disorders, cough
***Parkia biglobosa* (Jacq.) R.Br. exG.Don (Fabaceae) - 16667**	Flowers	Calcination	Digestive	*Vachellia nilotica*	1.26	5	Hepatitis, snake bites
***Piliostigma reticulatum* (DC.) Hochst. (Fabaceae) - 16691**	Leaves	Decoction, infusion	Oral use and inhalation	*Manhhot esculenta*	4.52	18	Pneumonia, colds, coughs, bronchitis, headaches, hepatitis

***Neltuma chilensis* (Molina) C.E.Hughes & G.P.Lewis (Fabaceae) - 16686**	Ripe fruit	Decoction, maceration and infusion	Oral use and inhalation		4.27	17	Female infertility, Hepatitis, Ulcers
***Senna obtusifolia* (L.) (Fabaceae) - 16663**	Leaves	Infusion	Drink and bath	*Cassia mimosoïdes*	0.50	2	Icterus
***Tamarindus indica* L. (Fabaceae) - 16661**	Leaves, trunk bark	Decoction	Drink and bath	*Adansonia digitata, Daniellia oliveri, Crossopteryx febrifuga*	1.76	7	Stomachache, Hepatitis, vision problems
***Adansonia digitata* L. (Malvacea) - 16685**	Leafy fragmentation	Decoction and maceration	Oral use	*Cassia nigricans, Entada africana*	3.27	13	Malaria, diarrhea, fever, kidney and bladder diseases
***Hibiscus sabdariffa* Mendonça & Torret (Malvaceae) - 16670**	Leafy stems	Infusion	Drink		1.01	4	Hepatitis, Hemorrhoids
***Sterculia setigera* Del. (Malvaceae) - 16693**	Trunk bark and root bark	Decoction, infusion and maceration	Oral use and inhalation	*Cochlospermum planchonii*	4.52	18	Malaria, Cough, Diarrhea, Dysentery, Abscess, Sexual weakness, Epilepsy, Elephantiasis
***Pseudocedrela kotschyi* Harms (Meliaceae) - 16666**	Trunk and root barks	Maceration	Drink and bath		2.76	11	Hepatitis
***Trichilia emetica* Vahl subsp. suberosa J.J. de Wilde (Meliaceae) - 16658**	Root bark	Maceration	Bath and drink		1.51	6	Hepatitis
***Ximenia americana* L. (Olacaceae) - 16694**	Trunk bark	Maceration, decoction and infusion	Inhalation and bath	*Saba senegalensis*	4.52	18	Cough, Jaundice
***Cymbopogon giganteus* Chiov. (Poaceae) - 16676**	Grass stems	Maceration	Oral use		1.51	6	Hepatitis in children, indigestion, colic
***Securidaca longipedunculata* (Polygalaceae) - 16664**	Leafy branches	Decoction	Inhalation and bath		1.01	4	Stomachache, Hepatitis
***Trametes versicolor* var and Burkart (L.) Lloyd (Polyporaceae) - 16659**	Hat	Infusion	Oral use		1.01	4	Hepatitis, arterial hypertension
***Crossopteryx febrifuga* (Afzel. ex G. Don) Benth. (Rubiaceae) - 16677**	Leaves	Infusion	Oral use	*Tamarindus indica*	2.26	9	Jaundice, candidiasis

***Gardenia erubescens* Stapf & Hutch (Rubiaceae) - 16672**	Fruit and bark of trunk	Decoction, infusion	Oral use	*Chrysanthellum americanum*	1.26	5	Hepatitis, backache, aches and pains
***Sarcocephalus latifolius* (Sm.) E.A.Bruce (Rubiaceae) - 16665**	Leaves and bark of trunk	Decoction or infusion	Oral use, enema and purgation		2.26	9	Stomach aches, dermatitis, hepatitis
***Citrus limon* (L.) Burm. F. (Rutaceae) - 16679**	Leaves	Macération	Boisson	*Manhhot esculenta, Carica papaya, Vachellia nilotica*	1.26	5	Malaria, hepatitis, lithiasis