



ETHNOBOTANICAL STUDY AND ANTIOXIDANT ACTIVITY OF PLANTS USED TO TREAT RESPIRATORY INFECTIONS OF DISTRICT OF BOBO-DIOULASSO (BURKINA FASO)

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Article Received on 15 Dec. 2025,
Article Revised on 05 Jan. 2026,
Article Published on 12 Jan. 2026,

<https://doi.org/10.5281/zenodo.18279968>

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How to cite this Article: Pawende Kabre^{*1}, Nina Gouba^{1,2}, Eric Sami Kam^{1,3}, Windemi Kagambega¹, Benjamin Kouliga Koama^{1,2}, Roland Nâg-Tiero Meda^{1,2}, Lassina Ouattara^{1,2}, Anicet Georges Ouedraogo¹ (2026). Ethnobotanical Study And Antioxidant Activity Of Plants Used To Treat Respiratory Infections Of District Of Bobo-Dioulasso (Burkina Faso). World Journal of Pharmacy and Pharmaceutical Sciences, 15(1), 1349–1369.

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ABSTRACT

The management of respiratory infections has become a global health problem due to the resistance observed in bacterial strains to antibiotics. The aim of this study was to identify the medicinal plants commonly used to treat respiratory infections in the Bobo-Dioulasso district. A Survey questionnaire was used to collect information from 50 traditional practitioners. The results revealed 28 plant species Belonging to 17 families. The most frequently cited species were *Sterculia setigera* (18%), *Entada africana* (12%), *Faidherbia albida* (8%) and *Annona senegalensis* (6%). Decoction and methanol macerations were prepared made from the barks of these four species. Spectrophotometric methods were then used to determine total polyphenols and flavonoids, and to assess antioxidant activity using DPPH, FRAP and ABTS tests. These assays showed that the highest levels of total polyphenols were found in the aqueous (56.127 mgGAE/100 mg extract) and methanolic (52.806 mg GAE/100 mg extract) extracts of *Entada africana*. The aqueous extract of *Faidherbia albida*

(1.509 mgQE/100 mg) showed the highest total flavonoid content. As for antioxidant activity, the methanolic extract of *Faidherbia albida* ($8125.3075 \pm 208.187 \mu\text{mol AAE/g extract}$) showed the highest capacity to trap the ABTS^{++} radical. The DPPH^+ radical was most reduced with the aqueous extract of *Sterculia setigera* ($767.688 \pm 5.901 \mu\text{mol AAE/g extract}$). The aqueous extract of *Entada africana* ($4245.966 \pm 52.1010 \mu\text{mol AAE/g extract}$) showed the highest capacity to reduce Fe^{3+} . These results open up new perspectives in the search for new molecules to combat oxidative stress.

KEYWORDS: ethnobotany, respiratory infections, antioxidant.

INTRODUCTION

The respiratory system (nasal passages, bronchi and lungs) is a major route of exposure to environmental contaminants (Briguiche and Zidane, 2019). Among these contaminants, bacterial and viral germs are the most frequently encountered (Galmès, 2013). These respiratory infections represent a major public health problem in terms of their frequency, morbidity, mortality and socio-economic cost (Pasque, 2012). They are among the ten leading causes of mortality worldwide, with 4 million deaths per year (WHO, 2015). Current basic therapy is based on administering antibiotics such as penicillin V (angina), amoxicillin, amoxicillin + clavulanic acid combination to the patient (Aubry and Gaüzère, 2018). However, the exaggerated and inappropriate use of these antibiotics has led to the emergence of resistant germs, rendering many treatments ineffective (Pasque, 2012). Antibiotic resistance is progressing rapidly. According to the World Health Organization, by 2050, antibiotic-resistant infectious diseases will be the leading cause of death from disease. They will cause more than 10 million deaths a year worldwide, compared with 700,000 today, more than cancer (Mangin, 2016). In addition, acute respiratory infections such as these lead to the production of reactive oxygen and nitrogen species, which are implicated in lung tissue damage (Ivanov *et al.*, 2017).

Faced with the growing phenomenon of antibiotic resistance, combined with the effects of oxidative stress, the search for new, more active molecules has become a necessity. Natural resources, in particular plants, could be a source of bioactive compounds. Indeed, according to the World Health Organization, over 80% of the African population uses medicinal plants for their basic health care needs (WHO, 2002). Several previous studies have revealed the traditional use of plants for the management of respiratory disorders (Saraswathy *et al.*, 2014; Briguiche and Zidane, 2019). These plants could contain biomolecules such as phenolic

compounds capable of combating oxidative stress and inhibiting the germs responsible (Méda *et al.*, 2010). The overall aim of this study is to inventory the plants used by traditional practitioners in Bobo-Dioulasso for the traditional treatment of respiratory infections. It will also verify the phenolic compound content and antioxidant activity of the plants most cited in this survey.

MATERIALS AND METHODS

Study framework

The survey took place in the city of Bobo-Dioulasso during the months of March and April 2019. The city of Bobo-Dioulasso is the urban commune of the Houet province in the Hauts Bassins region. Burkina Faso's second-largest city, Bobo Dioulasso covers an area of 1,805 km². The terrain is relatively flat, with a rocky range to the south, low-lying areas and plains suitable for development. The climate is South Sudanian, with a long dry season (October to April) and a 5-month rainy season (May to September). The vegetation is South Sudanian, consisting of wooded savannahs, and shrub savannahs. There are nine (09) classified forests and numerous gallery forests along the watercourses. It is in the Bobo Dioulasso area that the Mouhoun (one of the country's main rivers) rises. Some twenty springs have been counted here, the most important of which is the Guinguette spring.



Figure 1: Geographical carte showed study site.

Source www.insd.bf consulted at 20 septembre 2019 at 11H44mn.

Data collection

During the survey, a questionnaire was used to collect information from the interviewees. Interviews were selected at random. Their knowledge of respiratory infections and any plants used as remedies was collected. In addition, questions were also asked about the plant parts used, the method of preparation and the method of administration of the medicine. The interviews (semi-structured) were conducted in local languages (Dioula, Mooré) and in French.

Harvesting and sample preparation

Plants were selected on the basis of information gathered from respondents. Samples of these plants were collected in August and September in the Dindéresso classified forest (11° 11' 23.3"N and 004° 16' 7.3" W) in Bobo-Dioulasso. The harvesting site is located in a tropical climate with an average temperature of 27.0°C. Average annual rainfall is 1051 mm. August is the wettest month. The various species were authenticated at the plant biology and ecology laboratory of Nazi BONI University. After harvesting, the samples were dried before being pulverized and stored until use.

Extraction

Decoction

50 g of trunk bark powder from the respective plant species *Annona senegalensis*, *Entada africana*, *Faidherbia albida* and *Sterculia setigera* were each introduced into a flask containing 500 mL distilled water and boiled for 10 min. A series of filtrations were carried out using nylon cloth (two filtrations), cotton (two filtrations) and filter paper (one filtration). Each filtrate was frozen at -4°C, then freeze-dried.

Maceration

A quantity of 20 g of bark powder from each plant (*Annona senegalensis*, *Entada africana*, *Faidherbia albida* and *Sterculia setigera*) was mixed in 200 mL of 95 % methanol. The mixture was mechanically stirred with a magnetic stirrer for 24 h. The mixture was filtered once with cotton, then with filter paper. The crude macerate was obtained after evaporation using a rotavapor.

Determination of phenolic compounds

Determination of these compounds followed the method described by Meda *et al.* (2010). For this purpose, a 10 mg/mL stock solution of each extract was prepared with methanol.

Determination of total polyphenols

Each of the stock solutions was diluted with 1:100 distilled water to give a final volume of 10 mL. A volume of 125 μ L of each extract solution was mixed with 625 μ L of 0.2 N Folin Ciocalteu reagent. This mixture was allowed to stand at room temperature for 5 min, then 500 μ L of an aqueous solution of sodium carbonate (75 mg/mL) was added. After 2 h incubation, absorbances were read at 760 nm against a water blank using a spectrophotometer (Thermo Scientific). Gallic acid was used as the standard. The average of three readings was used, and results were expressed as mg gallic acid equivalents (GAE)/100 mg extract.

Total flavonoids assay

For the total flavonoids assay, a volume 625 μ L of extracts diluted in methanol were mixed with 625 μ L of aluminum trichloride (AlCl_3) in 625 μ L of methanol (2 %). Absorbances were read after 10 min at 415 nm against a blank consisting of 625 μ L of extracts and 625 μ L of methanol without AlCl_3 . Quercetin (0-50 mg/L) was used as a reference compound. The mean of three readings was used and results were expressed as mg quercetin equivalent (QE)/100 mg dry extract.

Antioxidant activity

Antioxidant levels were calculated using the formula below

$$C = \frac{c \times D}{M \times C_i}$$

C: concentration in μ mol AAE/g extract; c: concentration read in mg/L; D: dilution factor; C_i : initial concentration in mg/L; M: molar mass of ascorbic acid.

DPPH (2,2-diphenyl-1-picrylhydrazyl) test

The DPPH radical-scavenging capacity of extracts was assessed according to the method described by Meda *et al.* (2005). From each extract, 375 μ L were mixed with 750 μ L of DPPH solution (0.02 mg/mL methanol) for the test and with only 750 μ L of methanol for the blank. After incubation for 15 min at ambient laboratory temperature, absorbances were read against the blank at 517 nm. Tests were performed in triplicate. Average radical scavenging activity was expressed as μ mol ascorbic acid equivalent (AAE)/g dry extract.

ABTS (2, 2-azinobis-3-ethylbenzothiazoline-6-sulphonate) test

The test for ABTS radical bleaching by extracts was carried out according to the method described by Meda *et al.* (2010). 10 μ L of methanolic extract solution was mixed with 990

μL of fresh ABTS^{•+} solution and incubated in the dark. Absorbances were read 15 min after initial mixing at 734 nm. The average free radical scavenging capacity of three readers was expressed as μmol ascorbic acid equivalent (EAA)/g dry extract.

Ability of extracts to reduce Fe^{3+} to Fe^{2+}

FRAP testing of extracts was carried out according to the method used by Meda *et al.* (2010). 0.5 mL of each extract was mixed with 1.25 mL phosphate buffer (0.2 M, pH 6.6) and 1.25 mL aqueous potassium hexacyanoferrate solution $[\text{K}_3\text{Fe}(\text{CN})_6]$ (1%). After 30 min incubation at 50°C, 1.25 mL trichloroacetic acid (10 %) was added and the mixture centrifuged at 3000 rpm for 10 min. Next, 0.625 mL of the supernatant was mixed with 0.625 mL distilled water and 0.125 mL freshly prepared FeCl_3 solution (0.1 %). Absorbances were read at 700 nm. Fe^{3+} reducing activity was determined in triplicate and averaged in μmol ascorbic acid equivalent (AAE)/g dry extract.

Analyse statistique

All tests and graphs were performed using Microsoft Excel version 2013 and GraphPad Prism 8.0.2. Results are exhibited in means $\pm$ standard deviation (SD) forms and analyzed by one-way ANOVA following Tukey's multiple comparison test and Student's t-test. Means are considered statistically significant at the $p \leq 0.05$ level.

Plant citation frequency (CF) was determined by the following formula:

$$FC = \frac{\text{Number of citations for the plant in question}}{N} \times 100$$

The family importance value was calculated according to the formula used by Kam *et al.* (2020).

$$FIV = \frac{\text{Family}}{N} \times 100 \quad \text{or } N \text{ indicates the total number of families.}$$

RESULT AT

Socio-cultural characteristics of the herbalists surveyed

In the course of this study, 50 traditional practitioners were enrolled. Women accounted for 76% of the total, compared with 24% for men. The average age of those surveyed was 46.31, with a minimum of 24 and a maximum of 75. In addition, the age brackets [20; 40[and [40; 60[were the most represented (figure 2). On the other hand, the study showed that people aged [60 80[did not engage in this activity to any great extent. The study revealed that 68% of tradipraticians are illiterate, compared with 24% with primary education, 6% with secondary education and 2% with university education (figure 3). These respondents claim to have

inherited their profession from their parents. As for traditional practitioners' level of knowledge of IR, 75 % of them said that these diseases are more prevalent during the dry season than the harmattan period, compared with 25% of those who said that they can occur at any time of the year.

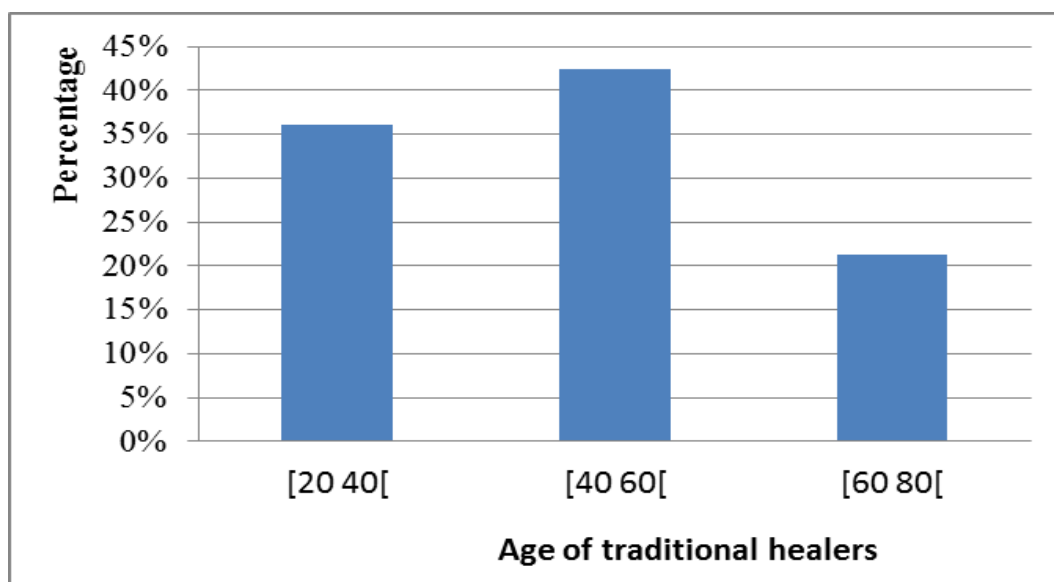


Figure 2: Distribution of respondents by age group.

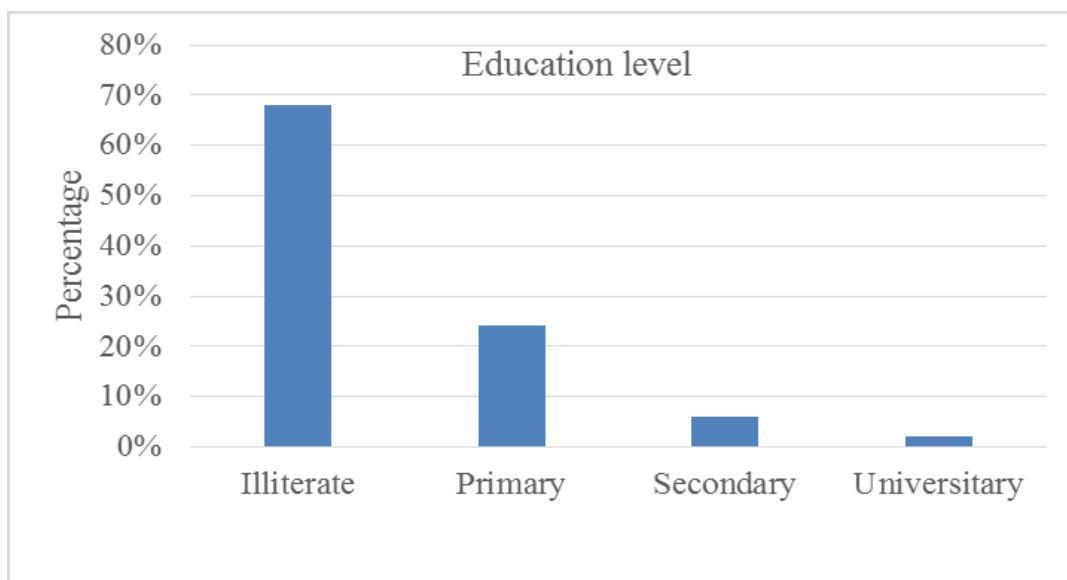


Figure 3: Education level of traditional practitioners.

Family importance value (FIV)

A total of 28 species in 17 families were recorded in this study (Figure 4). The Fabaceae family (52.94 %) is the most represented, followed by the Combretaceae (24.52 %) and

Sterculiaceae (11.76 %). Species such as *Sterculia setigera*, *Entada africana*, *Faidherbia albida* and *Annona senegalensis* were the most frequently cited, with frequencies of 18 %, 12 %, 8 % and 6 % respectively.

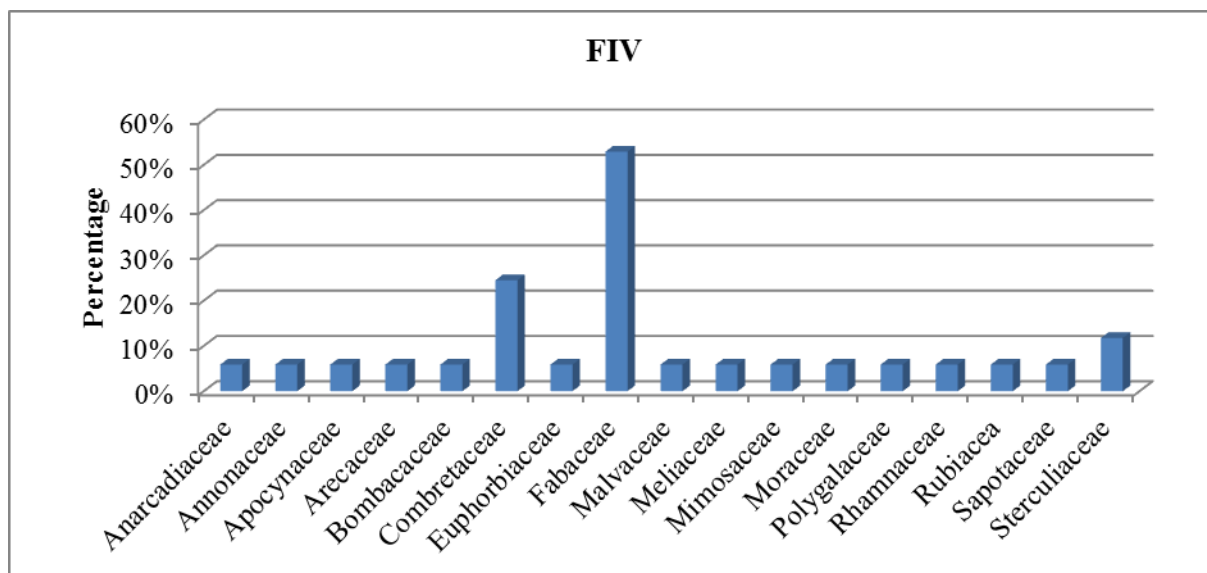


Figure 4: Proportion of plant families mentioned.

Organs used

Various organs are taken as samples for IR treatment. Those used by traditional practitioners are illustrated in figure 5. Trunk bark (43 %) was the most preferred organ.

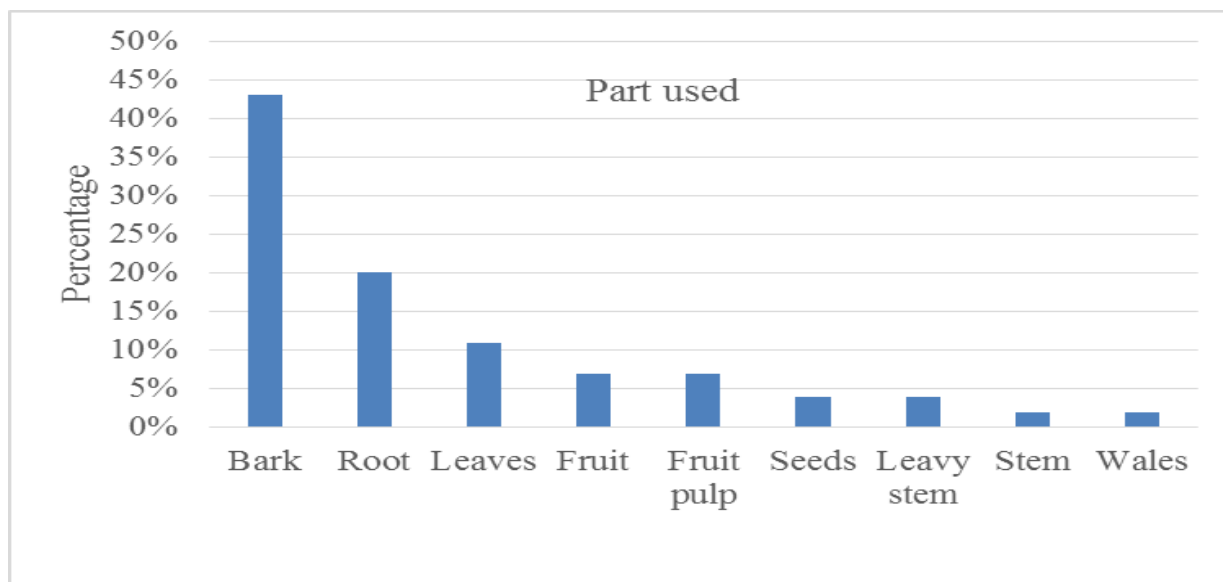


Figure 5: Frequency of organs used.

Method of obtaining and administering the drug

Figure 6 illustrates the frequency of methods of obtaining the drug used by traditional practitioners. The study shows that decoction (67%), the use of powder and maceration are those used by the respondents.

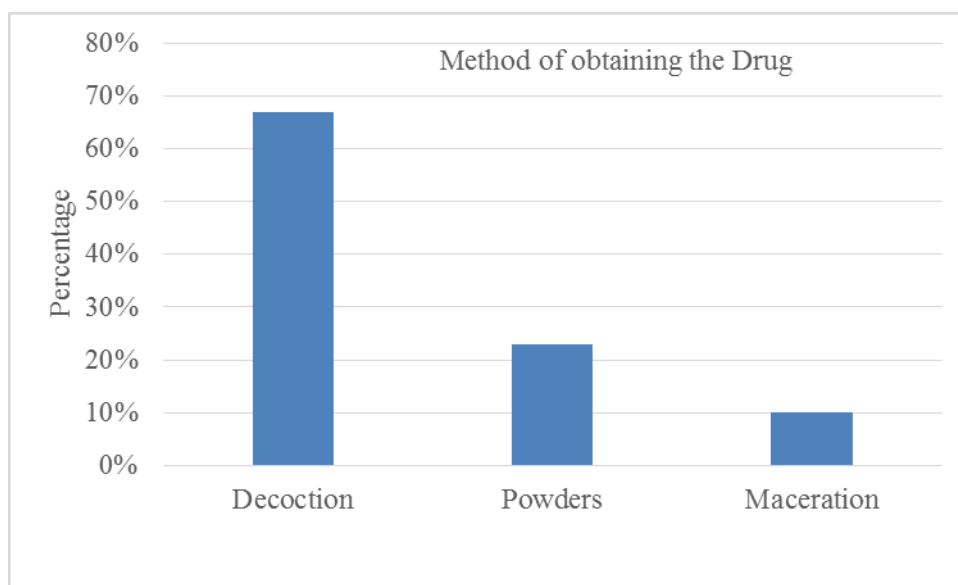


Figure 6: Frequency of plant drug production methods.

The resulting drug is administered to the patient by several routes, as shown in figure 7. The oral route via drinking (67 %) was the main mode of drug administration. Chewing, enema, scarification and purging together accounted for 33 % of routes of administration.

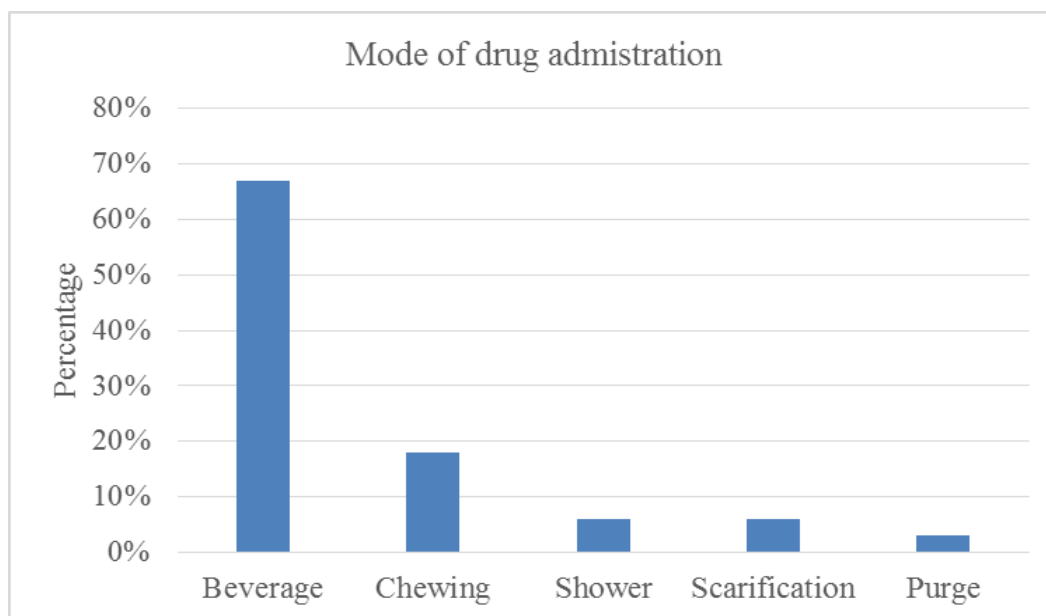


Figure 7: Drug administration routes.

Phenolic compound content

With the exception of *E. africana* and *S. setigera* extracts, methanolic extracts showed a higher total polyphenol content (Figure 8) than aqueous extracts. The highest polyphenol content was obtained with the aqueous extract of *E. africana* (55.413 ± 0.952 mg QE/100 mg dry extract).

The aqueous extract of *F. albida* had the highest total flavonoid content at 1.509 mg QE/100 mg extract. At the concentration used, flavonoids could not be detected in the *S. setigera* extracts and the aqueous and methanolic extracts for *A. senegalensis* and *F. albida* respectively.

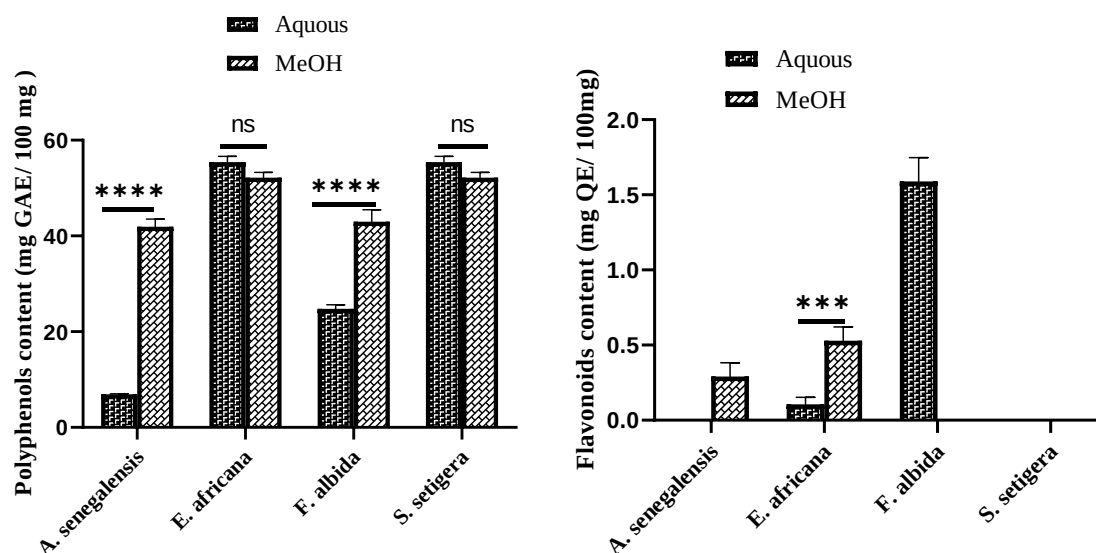


Figure 8: Phenolic compounds content in extracts.

GAE: Gallic Acid Equivalent; QE: Quercetin Equivalent; MeOH: Methanol extract. Different symbols ^{ns}P>0.05 *P<0.05, **P<0.01, ***P<0.001, ****P<0.0001 indicate significant differences in the extracts.

With regard to antioxidant activity (figure 9), the DPPH test showed that all extracts (methanolic and aqueous) exhibited good radical scavenging capacity. *Sterculia setigera* aqueous extract ($767, 688 \pm 5.901$ μ mol AAE/g dry extract) showed the highest activity. This activity was greater than that obtained with Trolox ($p<0.05$). Also, with the exception of *Annona senegalensis* extracts ($p<0.0001$), There was no significant difference between the activity of the two types of extract ($p>0.05$).

In terms of ABTS^{•+} radical inhibition, *Faidherbia albida* methanolic extract (8125, 3075 ± 208.187 µmol AAE/g dry extract) showed the highest activity. This activity was significantly no different from that of trolox ($p > 0.05$), but low compared with that of quercetin ($p < 0.05$). With the exception of *E. africana* extracts, methanolic extracts of the plants in the study showed higher ABTS^{•+} radical inhibition activity compared with aqueous extracts ($p < 0.05$). With regard to Fe³⁺ reduction, the study also shows good Fe³⁺ chelation activity of these plant extracts. At the concentration used, the aqueous extract of *Annona senegalensis* showed no activity. The aqueous extract of *E. africana* (4245.966 ± 52.1010 µmol AAE/g extract) showed the highest chelation activity. The impact of solvent on activity is species-dependent.

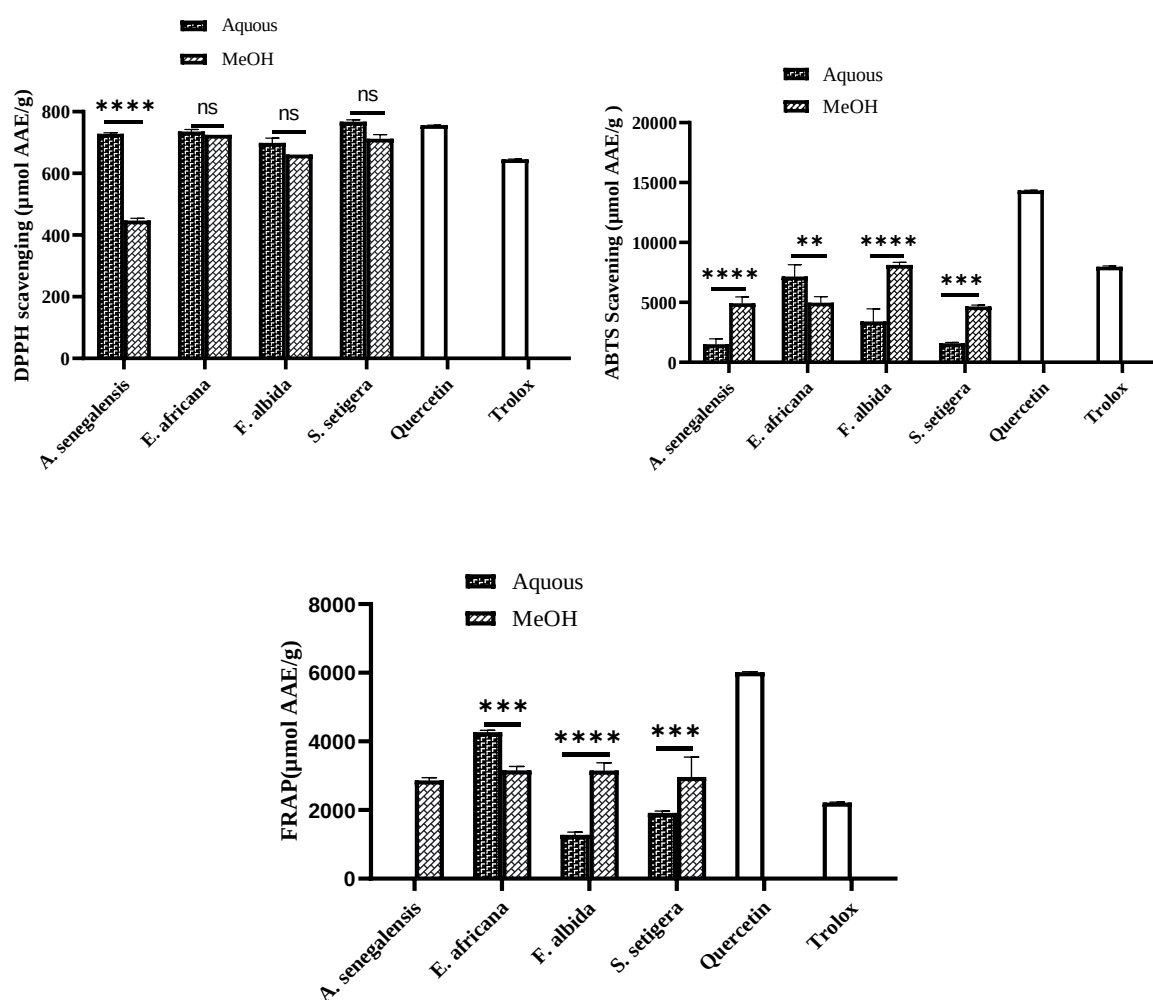


Figure 9: Antioxidant activity of extracts.

AAE: Ascorbic Acid Equivalent. Different symbols ^{ns} $P > 0.05$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, **** $P < 0.0001$ indicate significant differences in the extracts.

DISCUSSION

The study, which aimed to inventory the plants traditionally used by the populations of Bobo-Dioulasso against respiratory infections, showed a dominance of women in the herbalist profession. This could be explained by their high representation in the city's total population in 2019, which was around 51.7 % (INSD, 2019). Indeed, herbalists were more located in the [40 60] age bracket. This age range could be justified by the fact that, in Africa, it is people of a certain age who hold traditional knowledge of disease treatment (Dougnon *et al.*, 2018). On the other hand, the low representation of people of the last generation could be due to the fact that the age pyramid of the city's population has a tapered top (INSD, 2019), explaining that there are fewer old men and women. The high illiteracy rate obtained in this study would be explained by the fact that the people best suited for selling medicinal items are initiated from an early age by parents and generally do not receive a school education (Koudokpon *et al.*, 2015). Indeed, this is an activity whose knowledge is passed down from generation to generation (Kpodji *et al.*, 2019). Furthermore, Agboke *et al.* (2015) and Kpodji *et al.* (2019) had reported that traditional ethnomedicine is a societal science and its content remains a family heritage.

Of all the species families used, the Fabaceae are the most sampled. This high rate of Fabaceae use could be due to the fact that they belong to one of the most represented families in the flora of Burkina Faso (Kam *et al.*, 2020). According to Zizka *et al.* (2015), of the 744 species used in traditional medicine in Burkina Faso, Fabaceae account for 18 %.

Species such as *Sterculia setigera*, *Entada africana*, *Faidherbia albida* and *Annona senegalensis*, which were the most cited, have also been illustrated in other studies. Indeed, Mann *et al.* (2007) and Zerbo *et al.* (2011) had also mentioned these plants as part of the treatment of IR. They have also been the subject of several studies demonstrating their antibacterial properties. For example, authors have reported that *Annona senegalensis*, *Entada africana*, *Faidherbia albida* and *Sterculia setigera* have antibacterial activity (Traore *et al.*, 2012; Ballo, 2013; Aliyu *et al.*, 2008; Tor-Anyiin *et al.*, 2011).

The study also noted that samples of these plants were largely taken from their trunk bark. This result is in line with those of other authors who had also mentioned in their studies that stem barks were the parts most used in the treatment of IR (Igoli *et al.*, 2005; Belem *et al.*, 2007; Lawal *et al.*, 2010). Thus, this part of the plant could contain the substances needed to combat IR compared with other organs. What's more, according to Zerbo *et al.* (2007), the

perennial nature of woody plants means that they have at least one organ in each season. As bark is one of the organs to be present on the tree, this could also justify its heavy use.

Most of these trunk barks are decocted being administered to the patient. This could be explained by the fact that this method of obtaining the drug attenuates or cancels out the toxicity of certain recipes (Briguiche and Zidane, 2019). In addition, the high use of decoction by traditional practitioners could be due to its ability to extract the most active compounds (Nadembega *et al.*, 2011; Traoré *et al.*, 2018).

The oral route via the drink was the one most recommended by traditional practitioners. Administration via the drink may be explained by the fact that this route allows better absorption of the active ingredients than other routes.

Determination of total polyphenols in the extracts showed that the aqueous extract of *E. africana* had the highest content. This may be explained by the fact water is more suitable for extracting phenolic compounds.

The low total flavonoid content observed in our extracts may be explained by the fact that the study used trunk bark. Indeed, flavonoids are abundant in leaf cuticle and epidermal cells and are likely to protect tissues against the harmful effects of UV radiation (Salem, 2009). Leaves, as the organs most exposed to this stress, could therefore be supplied with flavonoids to the detriment of other organs such as trunk bark.

In terms of free radical scavenging capacity, using the DPPH and ABTS tests, results showed that the extracts had a good capacity to scavenge these radicals. This could be explained by the high phenolic compound content in extracts. Indeed, there is a correlation between these compounds and the antiradical activity of DPPH (Trabelki *et al.*, 2010). In addition to phenolic compounds, other molecules could be involved in this activity. In this regard, study noted that the anti-free radical activity of an extract depends not only on its phenolic compound content, but also on the interaction between the various compounds making up the extract (Djeridane *et al.*, 2006). In addition, Sombie *et al.* (2018) has shown that compounds such as triperpenes and sterols exhibit antioxidant activity towards the ABTS^{•+} radical.

The extract showed a good capacity to reduce Fe^{3+} to Fe^{2+} . This reduction could be explained by their phenolic compound content. To this end, Bangou *et al.* (2012) showed that the Fe^{3+} reducing power of extracts was conditioned by their polyphenol content.

CONCLUSION

This ethnobotanical study shows that Bobo-Dioulasso has wide range of interesting medicinal plants for the treatment of respiratory illnesses. Of the 17 families inventoried, the Fabaceae are the most widely used. The results obtained show that trunk bark is the most widely used part of the plant, and that the method of preparation differs according to the plants, but decoction remains the most widespread method. In addition, the four most widely used plants showed high levels of total polyphenols with antioxidant activity.

Tableau II: Plants used for respiratory infections treatment.

Species	Family	Local Name	Parts	Preparation	RFC	Administration	Availability
<i>Acacia seyal</i> DC.	<i>Fabaceae</i>	Gon migou (Mooré)	B	Decoction	2 %	Beverage	Abundant
<i>Acacia nilotica</i> (L) Willd. ex Del	<i>Fabaceae</i>	Bagaba yiri (Dioula)	FR	Powders	4 %	Chewing	Abundant
<i>Adansonia digitata</i> L.	<i>Bombacaceae</i>	Cira yiri (Dioula)	B	Decoction	2 %	Beverage	Rare
<i>Annona senegalensis</i> Pers.	<i>Annonaceae</i>	Mandesounsoun (Dioula)	L, R	Decoction	6 %	Beverage	Abundant
<i>Anogeissus leiocarpus</i> (DC) Guill & Perr	<i>Combretaceae</i>	Galama (Dioula)	B	Maceration	2 %	Beverage	Abundant
<i>Borassus aethiopum</i> Mart.	<i>Arecaceae</i>	Duladu (Dioula)	B	Decoction	2 %	Beverage	Abundant
<i>Calotropis procera</i> (Aiton) R. Br	<i>Apocynaceae</i>	Fogofoko (Dioula)	LS, L	Powders	2 %	Chewing	Abundant
<i>Combretum nigricans</i> Lepr. ex Guill. et Perr	<i>Combretaceae</i>	Gon migou (Mooré)	L	Decoction	2 %	Beverage	Abundant
<i>Daniellia oliveri</i> (Rolfe) Hutch & Dalz.	<i>Fabaceae</i>	Sanam-brou (Dioula)	B	Decoction	2 %	Beverage	Abundant
<i>Detarium microcarpum</i> Guill & Perr.	<i>Fabaceae</i>	Tambakoumba (Dioula)	FP	Powders	2 %	Chewing	Abundant
<i>Entada africana</i> Guill. & Perr	<i>Fabaceae</i>	Sama nèrè (Dioula)	B, R	Decoction	12 %	Beverage	Abundant
<i>Erythrina senegalensis</i> DC	<i>Fabaceae</i>	Digana yiri (Dioula)	B	Decoction	2 %	Beverage	Abundant
<i>Euphorbia hirta</i> L.	<i>Euphorbiaceae</i>	Tugani ba singi (Dioula)	LS	Powders	2 %	Beverage	Abundant
<i>Faidherbia albida</i> (Delile.) A. Chev	<i>Fabaceae</i>	Balansa (Dioula)	B, R	Decoction	8 %	Beverage, Shower	Rare
<i>Ficus sycomorus</i> L.	<i>Moraceae</i>	Ten toro (Dioula)	B	Decoction	2 %	Beverage	Abundant
<i>Gardenia erubescens</i> Stapf et Hutch.	<i>Rubiaceae</i>	Bouré (Dioula)	R	Decoction	2 %	Beverage	Abundant
<i>Guiera senegalensis</i> J.F.Gmel	<i>Combretaceae</i>	Counglê yiri (Dioula)	W	Powders	4 %	Chewing, Scarification	Abundant
<i>Khaya senegalensis</i> (Desr.) A.Juss	<i>Meliaceae</i>	Djala (Dioula)	B, FR	Decoction, Powders	4 %	Beverage	Rare
<i>Piliostigma reticulatum</i> (DC.) Hochst	<i>Fabaceae</i>	Niamairi (Dioula)	L	Decoction	2 %	Beverage	Abundant
<i>Prosopis africana</i> (Guill. & Perr.) Taub	<i>Mimosaceae</i>	Woulélou (Bobo Madarin)	R, B	Decoction	2 %	Beverage	Abundant
<i>Sclerocarya birrea</i> (A. Rich.) Hochst.	<i>Anacardiaceae</i>	Gouna (Dioula)	R, B	Decoction, Maceration	2 %	Beverage	Rare
<i>Securidaca longepedunculata</i> FRESEN	<i>Polygalaceae</i>	Djoro (Dioula)	R	Decoction	2 %	Beverage	Rare
<i>Sterculia setigera</i> Delile	<i>Sterculiaceae</i>	Koungosira (Dioula)	B, R, S	Decoction, Powders	18 %	Beverage, Shower, purge, Scarification	rare

<i>Tamarindus indica</i> L.	<i>Fabaceae</i>	Tomi yiri(Dioula)	FP	Maceration	4 %	Beverage	Rare
<i>Terminalia avicenioides</i> Guill. et Perr.	<i>Combretaceae</i>	Waa iri (Dioula)	L, R	Decoction, Maceration	2 %	Beverage	Abundant
<i>Vitellaria paradoxa</i> Gaertn.f	<i>Sapotaceae</i>	Siyiri (Dioula)	B	Decoction	2 %	Beverage	Abundant
<i>Waltheria indica</i> L.	<i>Sterculiaceae</i>	Yaar yaamdé (Mooré)	LS	Powders	2 %	Chewing	Abundant
<i>Zizyphus mauritiana</i> Lam	<i>Rhamnaceae</i>	Tomono (Dioula)	FP	Powders	2 %	Chewing	Abundant

RFC : Frequency of citation ; L : Leaves ; B : Bark ; R : Root ; FR : Fruit ; LS : Leafy stem ; FP : Fruit pulp ; W : wals ; S : Seeds.

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