International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Ethnobotanical Survey of Plants used by Traditional Healers for Treatment of Urinary Infections in Hauts-Bassins Areas of Burkina Faso

Sami Eric Kam[*,1,2], Roland Nâg-Tiero Meda[1], Zachari Kabre[1,3], Benjamin Kouliga Koama[1,3], Hermann Yempabou Ouoba[1], Victorien Yameogo[1], Drissa Madjo Zon[1], Eliasse Zongo[1] and Georges Anicet Ouedraogo[1]

[1]Laboratoire de Recherche et d'Enseignement en Santé et Biotechnologies Animales, Université Nazi BONI, 01 BP 1091 Bobo-Dioulasso 01, Burkina Faso

[2]Laboratoire de recherche en Bactériologie, INSP/ Centre MURAZ, 01 BP 390 Bobo-Dioulasso 01, Burkina Faso

[3]Laboratoire de médicine et pharmacopée traditionnelle, Institut de Recherche en Sciences de la Santé, Direction Régionale de l'Ouest, 01 BP 545 Bobo-Dioulasso 01, Burkina Faso
*(Corresponding author)

Abstract: ***This study aimed to collect ethnobotanical data from traditional healers about, medicinal plants used in Hauts-Bassins area from Burkina Faso to manage the urinary tract infections. An ethnobotanical survey was undertaken during April-September 2018; and using a semi-structured open questionnaire. The authentication of species was done using "Catalogue des plantes vasculaires du Burkina Faso". To determine well-known families and species, some indices such as family importance value (FIV) and relative frequency of citation (RFC) were calculated respectively. Forty-five (23 men and 22 women) traditional healers participated in this study. The majority of interviewees were aged between 41 to 60 years (48.9%) and have identified at least two of urinary infections symptoms (67%). Twenty-seven plant species belonging to 25 genera and 19 families were recorded to treat the urinary disorders. The most represented families were Fabaceae followed by Euphorbiaceae. The most used species were Euphorbia hirta L. and Terminalia avicennioides Guill. and Perr. The leaves (40%) and the roots (32%) were the most commonly used organs. The decoction (75%) was the main remedies preparation. These data might contribute to reinforce the Burkina Faso ethnopharmacological database through the traditional healer knowledges and practices of the urinary infections management in the Hauts-Bassins area.***

Keywords: Ethnobotanical, Traditional healers, Urinary infections, Hauts-Bassins, Burkina Faso

1. Introduction

Infectious diseases are a major public health problem linked to their frequency and incidence [1]. The urinary tract infections (UTI) are one of the most common bacterial infections after respiratory infections [2]. They are mainly caused by *Escherichia coli* (75 to 85%) followed by *Klebsiella* spp and *Proteus* spp (around 4%); and can be located in the lower urinary tract (cystitis, urethritis, prostatitis and epididymitis) or in the upper urinary tract (pyelonephritis or pyelitis) [3]. It is estimated that around 250 million people suffer from urinary tract infections annually [4]; with a prevalence of 50% in women (including 1/3 recurrence) and 20% in men [3]. UTI cause many complications during pregnancy [5].

Antibiotics such as pivmecillinam, trimethoprim /sulfamethoxazole, nitrofurantoin, fosfomycin trometamol, fluoroquinolones and ciprofloxacin are commonly prescribed for the management of UTI [6]. However, there are a resurgence of interest in plant medicines in recent years, due to emergence of bacterial resistances associated to higher toxicity and cost of antibiotics [7]. In Africa, up to 80% of people use traditional medicine to cure of their ailments [8]. Numerous of ethnobotanical surveys carried out world-wide have revealed that variety of medicinal plants were used frequently to treat UTI [9,10,11,12]. Those recurrent practices are linked to a number of reasons including socio-cultural factors; the accessibility, affordable costs and mostly the effectiveness of medicinal plants [13]. Several studies carried out world-wide, have demonstrated the efficacy of medicinal plants against strains responsible for urinary disorders. Methanol extracts of species from Saudi Arabia (*Acorus calamus* L., *Armoracia rusticana* Gaerth., *Capparis spinosa* L., and *Alpinia galanga* Wild.) have attenuated a maximum number of 11 UTI-causing bacteria with zones of inhibition of at least 22 mm [6]. The investigation of antibacterial activity of seventeen Indian folklore medicinal plants showed that ethanol extract of *Zingiber officinale*, *Punica granatum*, *Terminalia chebula*, *Ocimum sanctum Cinnamomum cassia*, *Azadirachta indica* and *Ocimum sanctum* exhibited strong antibacterial activity against multidrug resistant isolates of major urinary tract pathogens [14]. The screening of antibacterial activity of a Nigerian medicinal plant, *Parkia biglobosa* Jacq. against four strains associated with urinary tract infections showed the effectiveness of root bark aqueous extract [15]. Extracts of whole plants of *Euphorbia hirta* Linn. collected in Cascades region from Burkina Faso, showed antibacterial activity against some germs isolated from UTI [16].

In Burkina Faso genitourinary disorders are part of health problems most commonly addressed with medicinal plants [17]. It is well known that the enthusiasm of the populations for plants could threat the survival of species. Ethnobotanical survey is therefore necessary in order to know and enhance the medicinal plants used. A number of ethnobotanical studies have been carried out in various areas of Burkina Faso to evaluate local use-preferences; but very little or no information was listed about, medicinal plants used in Hauts-Bassins area from Burkina Faso to manage UTI [18,19,20,21].

This study aimed to collect ethnobotanical data from traditional healers about, medicinal plants used in Hauts-Bassins area from Burkina Faso to manage the urinary tract infections.

2. Materials and Methods

2.1 Study area

Hauts-Bassins regions (Bobo-Dioulasso) is located in western of Burkina Faso (Figure 1), between 11027'N latitudes and 4021'W longitudes. It is subdivided in 3 provinces (Houet, Tuy and Kénédougou) and covers an area of 25 479 km2 (about 9.4% of the country's) with a population around 1 469 604 people [22].

It is bounded on the north by Boucle du Mouhoun region (Dédougou), on the south by the Cascades (Banfora), on the east by Southwest region (Gaoua) and on the west by the Republic of Mali. The climate is tropical and it is marked by 2 main seasons: a wet season which lasts 6 to 7 months (May to October / November) and a dry season which lasts for 5 to 6 months (November / December to April). The rainfall is between 800 and 1200 mm. Average temperatures oscillate between 24°C and 30°C. Hauts-Bassins region is characterized by the density of its natural vegetation composed essentially of savannah, with all subtypes from wooded savannah to grassy savannah. It has 16 forests classified with a rich biodiversity compared to the rest of the country.

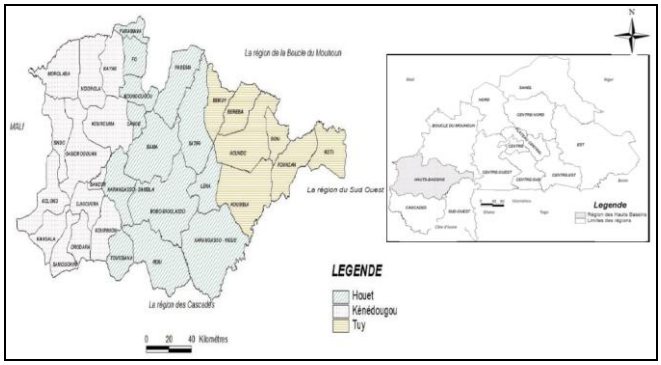

Figure 1: location of the study area (INSD 2009)

2.2 Data collection

To gather the information on the medicinal plants used in the UTI treatment by the traditional healers of Hauts-Bassins Areas, from Burkina Faso, the data were collected during April-September 2018. Forty-five traditional healers were interviewed in Bambara language using a semi-structured and open questioning questionnaire. The interview focused on the following main points:

- Knowledge of urinary tract infections symptoms by traditional healers;
- Local names of species used and utilized parts;
- Methods of preparation;
- Routes of administration;
- Accessibility of species in the studied region.

2.3 Plants identification

Traditional healers were asked to bring with them the plant specimens used. These specimens were botanically identified and authenticated by Mr. Hermann Yempabou OUOBA, botanist of Nazi BONI University**.**

2.4 Data analysis

IBM SPSS Statistics 20 was used to analyze the survey data. Socio-demographic profile of traditional healers, ethnobotanical and pharmacological characteristics of medicinal plants used were determined. To assess medicinal use of plants, the following ethnobotanical Indices were calculated:

- **Relative Frequency of Citation (RFC)**

RFC values determines the well-known and most used species. It was calculated according to the following equation [23]:

$$RFC = \frac{FC}{N} X\ 100$$

Where FC indicates the number of traditional healers who use a specie in the treatment of UTI and N is the total number of interviewees.

- **Family importance value (FIV)**

This index gives the local importance of the families of species. It was calculated by the following formula [24]:

$$FIV = \frac{FC\ (family)}{N} X\ 100$$

Where FC is the number of informants which cited a family and N is the total number of informants.

Microsoft Excel 2013 was used to realize the graphics.

3. Results and Discussion

3.1 Socio-demographic profile of Interviewees

Forty-five (23 men and 22 women) traditional healers of Hauts-Bassins areas from Burkina Faso participated in this study. Figure 2 displays the sociodemographic data of the interviewed informants. The age of interviewees was varied between 20 and 80 years (Figure 2 a). They had from 1 to 62 years of traditional medical practice (Figure 2 b). The majority of informants were illiterate (62.2%) and their age was ranged from 41 to 60 years (Figure 2 c). This

dominance could be explained by the literacy rate (41.22%) in Burkina Faso [25]; and the fact that according to several African cultures, herbal medical knowledge are acquired by experiences lived as users of medicinal plants or by learning from other people's experiences [26].

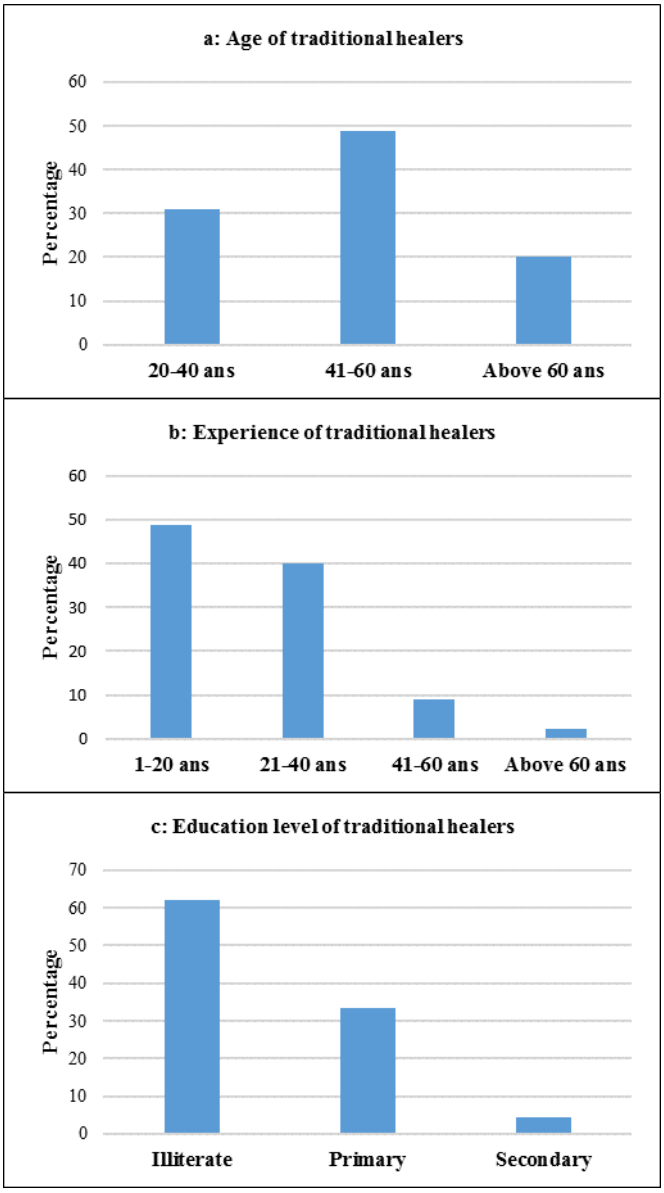

Figure 2: Socio-demographic profile of traditional healers

3.2 Level of knowledge of urinary tract infections symptoms by traditional healers

The symptoms of UTI cited by traditional healers are recorded in the Figure 3. The major symptoms indicated were suprapubic pain and dysuria, followed by hematuria. The pollakiuria was less identified. These results showed that the traditional healers (men and women) know the urinary tract infections symptoms at the same level outside the hematuria that the men better know. The interviewees had a good knowledge of UTI, because 67% of them have identified at least two of main symptoms listed by François and *al*. [3].

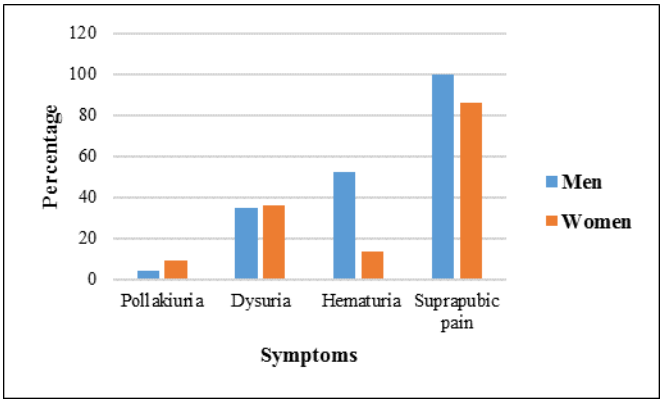

Figure 3: Knowledge of urinary tract infections symptoms

3.3 Family importance value (FIV)

The family importance value (FIV) of medicinal plants used for treatment of urinary infections is presented in the Figure 4. The highest FIV were Fabaceae (15.60) followed by Euphorbiaceae (13.30); Apocynaceae and Combretaceae (8.90 for both); Rutaceae (6.70); Asteraceae, Bixaceae, Lamiaceae, Phyllanthaceae, Verbenaceae, Ximeniaceae and Zygophyllaceae (4.40 for each). The other families had lower FVI index (2.20). It was reported elsewhere that the families such as Euphorbiaceae, Fabaceae, Lamiaceae Apocynaceae and Asteraceae are part of twelve most common plant families in Burkina Faso [17].

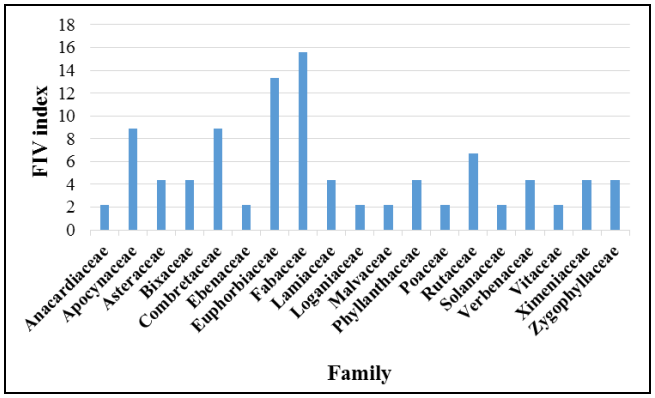

Figure 4: Family importance value (FIV) of medicinal plants used for treatment of urinary infections

3.4 Plant parts used

The leaves and the roots were the major plant parts used with a percentage of 40% and 32%, respectively (Figure 5). The flowers and the root barks were less used (4% for both). The frequency of use of the leaves and roots is in consent with a recent national-scale analysis of the traditional medicine [17]. The use of leaves could be linked to the fact that the leaves are the seat of photosynthesis and preferential sites of accumulation of active substances [27]. Leaf exploitation is beneficial for the plant survival [28]. However, harvesting root of plants is a threat to the species sustainability [29].

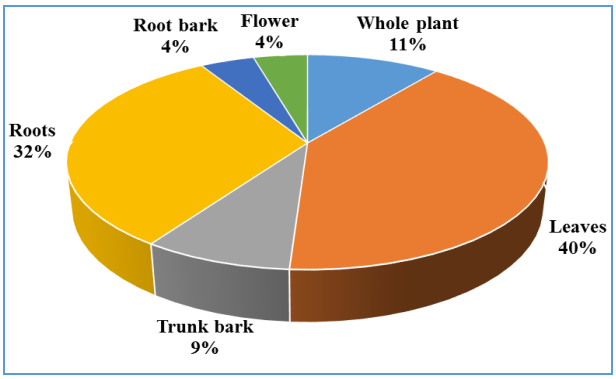

Figure 5: Plant parts used

3.5 Preparation and administration methods

The decoction was the preferable preparation methods (75%) followed by infusion and powder (8.3% for each); maceration (6.3%) and ash (2.1%) (Figure 6).

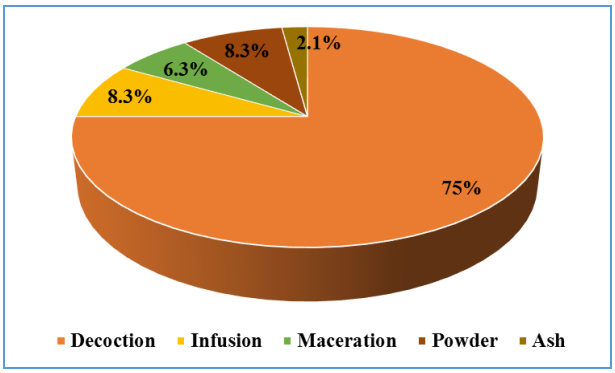

Figure 6: Drug preparation methods

Drugs was mostly taken orally (85%) followed by purge and bath (5.6% for each); application and chewing (1.9% for both) (Figure 7).

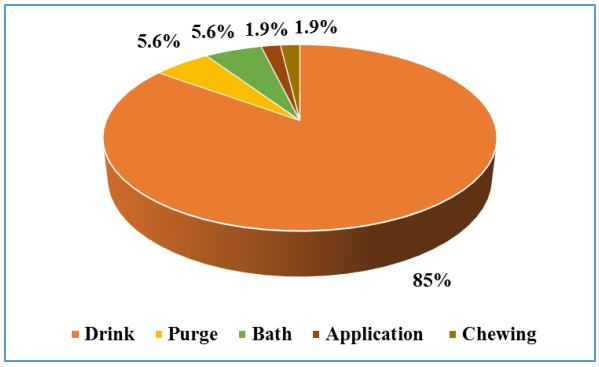

Figure 7: Drugs administration methods

Data collected through ethnobotanical survey included plant species with their local name, growth form, availability, parts used, mode of preparation and mode of administration are summarized in Table 1. Twenty-seven plant species recorded in this study belong to 25 genera and 19 families. Out of the 27 plant species, 12 shrubs, 7 herbs, 5 trees and 3 lianas were enumerated. The most represented growth forms were the ligneous. This frequency is in agreement with other studies conducted in other areas from Burkina Faso [19,20,21]; and could justify the availability of many plants (22 species) in the present study. The most used species, based on the relative frequency of citation (RFC) were *Euphorbia hirta* L. (13.33%), *Terminalia avicennioides* Guill. and Perr. (8.89%); *Tacazzea apiculata* Oliv. and *Zanthoxylum zanthoxyloides* (Lam.) Zepern. and Timler. (6.67% for both). They were followed by *Chrysanthellum americanum* (L.) Vatke., *Cochlospermum planchonii* Hook.f., *Flueggea virosa* (Roxb. ex Willd.) Voigt., *Stachytarpheta indica* (L.) Vahl., *Ximenia americana* L. and *Balanites aegyptiaca* (L.) Delile. (4.45% for each); and the rest of plants at 2.22%. Some of these plants were cited also by other authors as plants used to manage the genitourinary disorders [19,20,18,12,30]. It was reported that many of plants recorded are rich sources of secondary metabolites; and have shown many pharmacological properties [9]. That could explain the traditional use of these plants. Concerning the perception of twenty-seven medicinal plants availability, about 18% of plant species (*Sclerocarya birrea*, *Tacazzea apiculata*, *Senna alata*, *Caesalpinia pulcherrima* and *Stachytarpheta indica*) have been cited to be rare in the Hauts-Bassins areas according to informants. Anthropogenic factors, fire management, deforestation and poor protection of forests could certainly be the main causes of this rarity. The traditional healers should be sensitizing for the good practices of the medicinal plants collect.

Table 1: Medicinal plants used for urinary infections treatment

Local name	*Scientific name*	*Growth forms*	*Families*	*RFC (%)*	*Parts*	*Mode of preparation*	*Mode of administration*	*Availability*
Demissin dôrô	*Sclerocarya birrea* (A.Rich.) Hochst.	Tree	Anacardiaceae	2.22	Leaves	Decoction	Drink; Bath	Rare
Zamba yiri	*Saba senegalensis* (A.DC.) Pichon.	Liana	Apocynaceae	2.22	Roots	Decoction	Drink	Abundant
Sabtivilga	*Tacazzea apiculata* Oliv.	Liana	Apocynaceae	6.67	Leaves	Decoction	Drink; Bath; Purge	Rare
Crisantelium	*Chrysanthellum americanum* (L.) Vatke.	Herbs	Asteraceae	4.45	Whole plant	Infusion	Drink	Abundant

N'dribala	*Cochlospermum planchonii* Hook.f.	Shrub	Bixaceae	4.45	Roots	Decoction Powder	Drink	Abundant
Wôlon	*Terminalia avicennioides* Guill. et Perr.	Shrub	Combretaceae	8.89	Leaves Roots	Decoction Infusion	Drink	Abundant
Sounsoun fing	*Diospyros mespiliformis* Hochst. Ex A. DC.	Tree	Ebenaceae	2.22	Leaves	Decoction	Drink	Abundant
Tougani sindji	*Euphorbia hirta* L.	Herbs	Euphorbiaceae	13.33	Whole plant; Leaves; Roots	Decoction	Drink	Abundant
Touabou sindjan	*Acacia nilotica* (L.) Willd. ex Delile.	Tree	Fabaceae	2.22	Flowers	Decoction	Drink	Abundant
Djoutougou	*Acacia seyal* Delile.	Shrub	Fabaceae	2.22	Leaves	Decoction	Drink	Abundant
Fadoualé	*Erythrina senegalensis* A.DC.	Shrub	Fabaceae	2.22	Leaves	Decoction	Drink	Abundant
Kôtaba	*Senna alata* (L.) Roxb.	Shrub	Fabaceae	2.22	Flowers	Decoction	Drink	Rare
Orgueil de chine	*Caesalpinia pulcherrima* (L.) Sw.	Shrub	Fabaceae	2.22	Leaves	Decoction	Drink; Bath, Chewing	Rare
Sindjan	*Cassia sieberiana* DC.	Shrub	Fabaceae	2.22	Roots	Powder	Drink	Abundant
Wani gouè	*Acacia senegal* (L.) Willd.	Tree	Fabaceae	2.22	Stem barks	Maceration	Drink	Abundant
Basilic	*Ocimum americanum* L.	Herbs	Lamiaceae	2.22	Leaves	Decoction	Drink	Abundant
Sana yiri	*Vitex doniana* Sweet.	Tree	Lamiaceae	2.22	Roots	Decoction	Drink	Abundant
Kongo barani	*Strychnos spinosa* Lam.	Shrub	Loganiaceae	2.22	Leaves; Stem	Decoction	Drink	Abundant
Daba da	*Waltheria indica* L.	Herbs	Malvaceae	2.22	Roots	Decoction	Drink	Abundant
Balanbalan	*Flueggea virosa* (Roxb. ex Willd.) Voigt.	Shrub	Phyllanthaceae	4.45	Roots	Decoction	Drink	Abundant
Karassa karassa	*Andropogon gayanus* Kunth.	Herbs	Poaceae	2.22	Whole plant; Leaves	Powder Decoction	Drink; Application	Abundant
Wô	*Zanthoxylum zanthoxyloides* (Lam.) Zepern. & Timler.	Shrub	Rutaceae	6.67	Stem barks; Roots	Maceration; Infusion; Powder	Drink	Abundant
Taba	*Nicotiana tabacum* L. [cult.]	Herbs	Solanaceae	2.22	Leaves	Decoction	Drink	Abundant
Bassa kou	*Stachytarpheta indica* (L.) Vahl.	Herbs	Verbenaceae	4.45	Leaves; Whole plant	Decoction	Drink; Purge	Rare
Garo	Cissus populnea Guill. & Perr.	Liana	Vitaceae	2.22	Leaves	Ash	Drink	Abundant
N'donguè	*Ximenia americana* L.	Shrub	Ximeniaceae	4.45	Roots	Maceration Poudre	Drink	Abundant
Zèguènè	*Balanites aegyptiaca* (L.) Delile.	Shrub	Zygophyllaceae	4.45	Roots	Decoction	Drink	Abundant

4. Conclusion

This study is the first one done in Hauts-Bassins area of Burkina Faso to identify the plants used against urinary infections. The results showed that traditional healers used 27 plant species to manage urinary tract infections. *E. hirta* and *T. avicennioides* were the most used plant species. The leaves and the roots were the plant parts frequently used for remedies preparation. It was reported that some of cited plants were listed by other authors as plants used to treat genitourinary disorders. These data might contribute to reinforce the Burkina Faso ethnopharmacological database through the traditional healer knowledges and practices of the urinary tract infections management in the Hauts-Bassins area. In addition, these results provide a base for future pharmacological and ethnomedical investigations to treat urinary tract infections.

References

[1] WHO. (2006). Maladies infectieuses en Afrique. Situation et perspectives d'action. 7ème reunion du forum pour le parteriat avec l'Afrique. Mouscou, Russie 19p.

[2] Alan E. (2015). Les infections urinaires communautaires bactériennes: évaluation des connaissances de l'équipe officinale et des conseils apportés aux patients. Thèse de Doctorat en pharmacie, Université de Lorraine, p.7.

[3] François A, Brandstätter H, Bréchet A and Huttner A. 2013. Infections Urinaires. HUG – DMCPRU – Service de médecine de premier recours: Genève. 12p.

[4] Saderi H, Owlia P, Nadoushan MRJ, Zaeri F, Zandieh EA. (2006). 3-year study of demographic characteristics of patients with urinary tract infection, microbial etiology, and susceptibility of isolated bacteria to antibiotics in Shaheed Mostafa Khomeini Hospital. *Iran J Pathol*, 1(3): 99-104.

[5] Patterson TF and Andriole VT. (1997). Detection, significance, and therapy of bacteriuria in pregnancy. *Infectious disease clinics of North America*, 11:3.

[6] Mickymaray S and Al Aboody MS. (2019). In Vitro Antioxidant and Bactericidal Efficacy of 15 Common Spices: Novel Therapeutics for Urinary Tract Infections? *Medicina*, 55, 289.

[7] Kamsu-Foguema B and Foguem C. (2014). Adverse drug reactions in some African herbal medicine: literature review and stakeholders'interview. *Integr Med Res*.

[8] WHO. (2002). Traditional Medicines Strategy 2002-2005. WHO/EDM/TRM/2002.1: Geneva; Switzerland.
[9] Nacoulma OG. (1996). Medicinal plants and their traditional uses in Burkina Faso. Ph.D. thesis, University of Ouagadougou. 328p.
[10] Omwenga EO, Hensel A, A.Shitandi, Goycoolea FM. (2015). Ethnobotanical survey of traditionally used medicinal plants for infections of skin, gastro intestinal tract, urinary tract and the oral cavity in Borabusub-county, Nyamira county, Kenya. *Journal of Ethnopharmacology*, (176): 508–514.
[11] Mahalik G, Sahoo S and Satapathy KB. (2015). Ethnobotanical Survey of Plants used in Treatment of Urinary disorders in Dhenkanal district of Odisha, India. *IOSR-JESTFT*, 9(8): 58-63.
[12] Jaradat NA, Zaid AN, Al-Ramahi R, Alqub MA, Hussein F, Hamdan Z, Mustafa M, Qneibi M and Ali I. (2017). Ethnopharmacological survey of medicinal plants practiced by traditional healers and herbalists for treatment of some urological diseases in the West Bank/Palestine. *BMC Complementary and Alternative Medicine*, 17:255.
[13] Elisabeth B. (2008). Les changements climatiques: vulnérabilité, impacts et adaptation dans le monde de la médecine traditionnelle au Burkina Faso. *Vertigo*, 8(1).
[14] Sharma A, Chandraker S, Patel VK and Ramteke P. (2009). Antibacterial Activity of Medicinal Plants against Pathogens causing Complicated Urinary Tract Infections. *Indian Journal of Pharm Sci*, 71(2): 136-139.
[15] El-Mahmood AM and Ameh JM. (2007). In vitro antibacterial activity of Parkia biglobosa (Jacq.) root bark extract against some microorganisms associated with urinary tract infections. *African Journal of Biotechnology* 6 (11): 1272-1275.
[16] Soma, OB. (2002). Activité antibactérienne d' extraits d' *Euphorbia hirta* (Linn), une plante utilisée traditionnellement dans le traitement des infections urinaires. Thèse de Doctorat d'Etat en pharamacie, Universite de Ouagadougou.
[17] Zizka A, Thiombiano A, Dressler S, Nacoulma BMI, Ouédraogo A, Ouédraogo I, Ouédraogo O, Zizka G, Hahn K and Schmidt M. (2015). Traditional plant use in Burkina Faso (West Africa): a national-scale analysis with focus on traditional medicine. *Journal of Ethnobiology and Ethnomedicine*, 11:9.
[18] Nadembega P, Boussim JI, Nikiema JB, Poli F, Antognoni F. (2011). Medicinal plants in Baskoure, Kourittenga Province, Burkina Faso: An ethnobotanical study. *Journal of Ethnopharmacology*, 133: 378–395.
[19] Zerbo P, Millogo-Rasolodimby J, Nacoulma OG, Damme PV. (2011). Plantes médicinales et pratiques médicales au Burkina Faso: cas des Sanan. *Bois et forêts des tropiques*, 307 (1): 41-53.
[20] Zerbo P, Compaore M, Meda NTR, Lamien-Meda A, Kiendrebeogo M. (2013). Potential medicinal plants used by traditional healers in western areas of Burkina Faso. *World journal of pharmacy and pharmaceutical sciences*, 2 (6): 6706-6719.
[21] Tibiri A, Sawadogo WR, Dao A, Elkington BG, Ouedraogo N and Guissou IP. (2015). Indigenous Knowledge of Medicinal Plants among Dozo Hunters: An Ethnobotanical Survey in Niamberla Village, Burkina Faso. *The journal of alternative and complementary medicine*, 21 (5): 294–303
[22] INSD. (2007). La région des Hauts-Bassins en chiffres, www.insd.bf
[23] Tardio J and Pardo-de Santayana M. (2008). Cultural importance indices: a comparative analysis based on the useful wild plants of southern Cantabria (northern Spain). *J Eco Bot*, 62: 24-39.
[24] Vitalini S, Iriti M, Puricelli C, Ciuchi D, Segale A, Fico G. (2013). Traditional knowledge on medicinal and food plants used in Val San Giacomo (Sondrio, taly) an alpine ethnobotanical study. *J Ethnopharmacol*, 145: 517-529.
[25] UNESCO. (2020). Institut de statistique de l'UNESCO http://uis.unesco.org/fr/country/bf
[26] Skalli S, Hassikou R, Arahou M. (2019). An ethnobotanical survey of medicinal plants used for diabetes treatment in Rabat, Morocco. *Heliyon*, 5 e01421. doi: 10.1016/j.heliyon.2019.e01421
[27] Bigendako-polygenis MJ and Lejoly J. (1990). Pesticide et médicament en santé animale. In La pharmacopée traditionnelle au Burundi. Namur University Press, Bruxelles, Belgique, p. 425-442.
[28] Sadeghi Z, Kuhestani K, Abdollahi V, Mahmood A. (2014). Ethnopharmacological studies of indigenous medicinal plants of Saravan region, Baluchistan, Iran. *J Ethnopharmacol*, 153: 111-118.
[29] Ragunathan M and Abay SM. (2009). Ethnomedicinal survey of folk drugs used in Bahirdar Zuria District, Northwestern Ethiopia. *Indian J Traditional Knowledge*, 8(2):281– 284.
[30] Reimers EAL, Fernández EC, Reimers DJL, Chaloupkova P, Zepeda del Valle JM, Milella L and Russo D. (2019). An Ethnobotanical Survey of Medicinal Plants Used in Papantla, Veracruz, Mexico. *Plants*, 8, 246.

Author Profile

Sami Eric Kam received in 2019 a Master degree, in Applied Biological Sciences, Biochemistry Natural Substances option from University of Nazi Boni. He currently joined the Plants and Innovations research program of the National Institute of Public Health (INSP).