

*Full Length Research Paper*

# **Menopause disorders and their treatment in traditional medicine in Burkina Faso**

**Alphonsine Ramde-Tiendrebeogo<sup>1,5\*</sup>, Sabine Hien<sup>2</sup>, Hassanata Millogo-Kone<sup>1</sup>, Felix B. Kini<sup>1</sup>, Aristide Traore<sup>1</sup>, Joseph Issaka Boussim<sup>3</sup> and Innocent Pierre Guissou<sup>4</sup>**

<sup>1</sup>Department of Traditional Medicine and Pharmacopoeia-Pharmacy, Research Institute in Health Sciences (MEPHATRA-PH/IRSS), National Center for Scientific and Technological Research (CNRST), 03 BP 7034 Ouagadougou 03, Burkina Faso.

<sup>2</sup>Gaoua Medical Center S/C Ministry of Health, 03 BP 7009 Ouagadougou 03, Burkina Faso.

<sup>3</sup>Laboratory of Biology and Plant Ecology, Pr Joseph Ki-Zerbo University, 03 BP 7021 Ouagadougou 03, Burkina Faso.

<sup>4</sup>Faculty of Health Sciences (FSDS), St. Thomas d'Aquin University (USTA), 06 BP 10212 Ouagadougou 06, Burkina Faso.

<sup>5</sup>International Mixed Unit-Environment, Health, Societies (UMI 3189, ESS) CNRS / UCAD / UGB / USTTB / CNRST, Ouagadougou, Burkina Faso.

Received 16 September, 2019; Accepted 28 October, 2019

**A survey was conducted in the central region of Burkina Faso to find out about women's menopause-related disorders and their treatment in traditional medicine. Fifty-six (56) species have been identified to treat different symptoms such as hot flashes, insomnia, nausea, joint and muscle pain, itching, lower abdominal pain, edema, mood disorders, vertigo. Leaves and stem bark were the most recommended in the preparation of recipes, at 43 and 39% respectively. The majority of the species (60.72%) was local food plants with a high use value (UVs  $\geq 0.50$ ). Many chemical groups including alkaloids, polyphenols, flavonoids, saponins, tannins, sterols, triterpenes, anthraquinones, carotenoids, anthracenosides, phenolic acids, coumarins, capable of reducing or eliminating these different symptoms exist in these plants. Also, the presence of several mineral elements such as Calcium (Ca), Magnesium (Mg), Phosphorus (P), Sodium (Na), Aluminum (Al), Iron (Fe), Potassium (K), Iodine (I), Vitamins A, B, C, F, K, P, E, proteins, lipids, carbohydrates, fibers, resins and gum show the importance of these plants in human nutrition. These local plants are therefore potential sources for the development of new natural nutraceuticals in the management of menopausal period in women.**

**Key words:** Menopause, medicinal plants, nutrients, phytoestrogens.

## **INTRODUCTION**

Menopause or stopping menstruation, refers to the period that occurs when the ovaries stop producing reproductive

\*Corresponding author. E-mail: [mohtaram\\_a\\_m\\_e@yahoo.com](mailto:mohtaram_a_m_e@yahoo.com).

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

hormones. It is a natural phenomenon that usually starts around age of 50 in women (Lopes and Tremollières, 2004). It is preceded by a period of pre-menopause which causes disturbances related to imbalances in the reproduction of natural hormones. Indeed, at first, the woman's body faces a fall of progesterone and hyper impregnation in estrogen, which can create a kind of permanent premenstrual syndrome with water retention (edema), weight gain, tense breasts, headaches, and mood disorders (irritability, aggressiveness), then in a second time, a few months or a few years later, it is estrogen deficiency that prevails with hot flashes, tiredness, genitourinary disorders, joint pain, vaginal dryness before the definitive installation of menopause (Sidibe, 2005; Löwy and Gaudillière, 2006). Menopause affects an increasing number of women around the world and is a public health problem. A follow-up of woman is necessary during this period in order to avoid complications and the occurrence of other diseases such as cardiovascular diseases, diabetes, joint and metabolic diseases (Tillier, 2005). Modern medical care is based on hormonal menopause treatments (THM) that eliminate certain symptoms (Ribot and Tremollières, 2007). However, the use of these hormones to replace those naturally secreted by the ovaries often causes potentially serious side effects such as breast cancer, osteoporosis, heart disease including heart attacks and strokes, which are currently the leading cause of death in the world (Fournier et al., 2003; Azoulay, 2004). While the effects of menopause on women's bodies are well known in developed countries, the situation is opposite in Africa, especially in sub-Saharan Africa where management of the menopause period is almost non-existent (Cisse et al., 2008). Thus, very few African women can benefit from hormonal menopause treatments due to the unavailability and cost of these modern products. This would partly explain women's low attendance in health centers for menopause-related issues (Lombrail, 2000). Also, cultural attachment to the effectiveness of plant-based recipes means that at least 80% of rural populations living in developing countries depend on traditional medicine for their health care needs (OMS, 2013). Previous scientific works have shown that isoflavones present in some plants and recognized as phytoestrogens, are able to reduce the frequency of hot flashes and bone resorption (Lecerf, 2007). Also, some estrogens in plants are nervous sedatives against anxiety, insomnia and menopausal disorders (Nogaret, 2011). In addition, as a result of WHO's policy of promoting traditional medicine, plant medicines now occupy a considerable place in the international pharmaceutical trade (OMS, 2013). The current trend is thus converging towards health food. Indeed, many studies have proved the efficiency of nutraceuticals which are defined as foods whose specific properties go beyond the simple nutritive effect associated with the nutrients they contain (Bouyahya, 2016; Tchatchambe et al.,

2017). For example, studies have shown that women with traditional soy-based diet, suffer less from the effects of menopause (Vergne and Sauvant, 2006). There are several other medicinal and nutritional plants containing many active ingredients and which have complementary or synergistic therapeutic activities capable of relieving the menopausal disorders. However, this category of plants is very little known. It is therefore urgent to explore local plants in order to develop improved traditional medicines, nutraceuticals or isolate new bioactive molecules with fewer side effects for the management of menopausal period in women.

The objective of this study was to provide scientific documentation on the plants used by women in Burkina Faso to treat menopausal disorders.

## MATERIALS AND METHODS

### Data collection on the treatment of menopausal disorders in traditional medicine

The survey was conducted from February to March 2018 among women in households, at the level of their women's groups or associations in Ouagadougou, Pabre and surrounding villages as well as among some traditional healers identified through networks of traditional healers and on the basis of information provided by local population. Midwives working in maternal and child health centers were also interviewed. The interviews were based on a pre-tested questionnaire (Martin, 1995) which included specific questions about the informant, his age, his level of knowledge about menopause, the treatment of symptoms in modern and/or traditional medicine, the local name of the plant used, the parts used, the right period of collecting the used parts, the mode of use, the approximate duration of treatment before the treated symptom disappears. The interviews were recorded using a dictaphone. A total of 161 people including 54 traditional healers (9 men and 45 women) were interviewed. The age of women was between 41 and 65 years old. Investigators equipped with GPS (GPS map 62 Garmin) with an accuracy of less than 2 m visited and geo-referenced the practice sites of some traditional healers. Photos of plants of interest were taken in Pabre and surrounding villages. Samples of these plants were collected and identified by the Botany team of Ouaga 1 Professor Joseph Ki-Zerbo University. The APG III (2009) classification system was used (Group, 2009) and a herbarium has been made.

### Chemical composition of the listed plants

A bibliographic research made it possible to know chemical groups and phytonutrients present in the identified plants.

### Data analysis

The importance of each species was determined by calculation of its use value (*UVs*) according to the simplified formula of Cotton and Wilkie (1996).

$$UV_s = \frac{U}{N}$$

U indicate the number of uses where the plant is mentioned and N is the number of informants who mentioned the plant. Data were

treated and analyzed with SPSS software version 15. The average utilization values of the main parts of plant were compared using one-way analysis of variance (One Way ANOVA) and the differences are considered statistically significant for a value of "p less than 0.05".

## RESULTS

Fifty-six (56) local species used in the treatment of various menopausal symptoms have been identified. The information received concerns the local name of the plant, the disorders treated, the used parts in traditional recipes, the period of availability of the used parts, the method of preparation and the route of administration of recipes in traditional medicine, the edible parts and the mode of preparation of food parts. The mineral elements, vitamins and chemical groups found in each plant by literature are also shown in Table 1.

Results showed that the most common symptoms experienced by women were hot flashes, insomnia, nausea, joint and muscle pain, irregular menstruation, itching, lower abdominal pain, edema, mood disorders, vertigo. Leaves and stem bark were the most commonly used in recipes preparation, at 43% and 39% respectively. Other parts such as roots, fruits, seeds and flowers were rarely used for care. Decoction as method of preparing recipes and oral route as mode of administration were the most recommended. Maceration was indicated when the stem bark is the used part. The majority of the plants (60.72%) used in the treatment of menopause disorders was also local food plants well known including *Acacia macrostachya*, *Adansonia digitata*, *Balanites aegyptiaca*, *Bombax costatum*, *Cassia tora*, *Cleome gynandra*, *Corchorus olitorius*, *Diospyros mespiliformis*, *Ficus sycomorus*, *Glycine max*, *Hibiscus sabdariffa*, *Mangifera indica*, *Moringa oleifera*, *Ocimum gratissimum*, *Parkia biglobosa*, *Petroselinum crispum*, *Psidium guajava*, *Sclerocarya birrea*, *Tamarindus indica*, *Vitellaria paradoxa*, *Zingiber officinale*, *Ziziphus mauritiana* (Table 1). They had a high use value (UVs  $\geq 0.50$ ). Fruits and leaves were the most consumed parts (41%) by populations. The leaves used in food are usually boiled and filtered and eaten or mixed with flour in the form of couscous. Certain leaves can be eaten as salad. For some recipes, they are dissolved in water and the filtrate is recovered as vinegar for the preparation of certain dishes. The fruits are consumed in their natural state for the most part but can be boiled at certain times. They can also be used as vinegar. The consumption of other parts such as calyx, seeds and rhizomes was specifically recommended for certain plants. Bibliographic data showed the presence of many chemical groups and phytonutrients in these plants including alkaloids, polyphenols, flavonoids, saponins, tannins, steroids, triterpenoids, anthraquinones, carotenoids, anthracenosides, phenolic acids, coumarins as well as numerous mineral elements such as calcium (Ca), magnesium (Mg), phosphorus (P), sodium (Na),

aluminum (Al), iron (Fe), potassium (K), vanadium (V), copper (Cu), lead (Pb), manganese (Mn), selenium (Se), chromium (Cr), iodine (I). Vitamins A, B1, B2, B3, C, F, K1, P, E and proteins, lipids, carbohydrates, gum, resin, fibers were also present in these plants.

Figure 1 (1a to 1e.) show some plants used to treat the most common menopausal symptoms encountered by women.

## DISCUSSION

Most of the population of Burkina Faso, a landlocked country in West Africa with an area of 274 000 km<sup>2</sup>, lives in rural communities and relies heavily on local plant products for their daily lives. Fifty-six (56) local plants were identified in the treatment of menopausal disorders with a predominance of woody species (84%) on herbaceous forms (16%). Previous work had also reported the therapeutic importance of woody plants over herbaceous forms (Betti, 2002; Zerbo et al., 2012). The results showed that leaves and stem bark were the most recommended parts at 43% and 39% respectively in traditional recipes to treat several symptoms. Using leaves is to be encouraged because it has a double advantage, firstly because being the site of synthesis of secondary metabolites, leaves contain many chemical groups, but also because the use of leaves prevents the destruction of the plant and preserves its durability (Lumbu et al., 2005; Bi et al., 2008). However, the leaves and fruits of some plants are only available during the rainy season, which explains why traditional healers dry them so they can be used all year long. The disadvantage of this method is that, exposure of leaves and fruits to sun or their decoction causes the loss of certain active ingredients they contain. It is therefore necessary to sensitize traditional healers as well as women to practice the right harvesting methods of drying and preserving some parts of plants or in cooking the traditional vegetables in order to preserve as many phytonutrients as possible.

Previous studies have shown that gynecological and obstetric disorders are among the first three health problems in Burkina Faso (Besancenot et al., 2004; Ramde-Tiendrebeogo et al., 2019). The plants in this study would contribute to the management of certain pathologies in women. Indeed, phytoestrogens and phytosterols present in some plants are recognized for their effectiveness in reducing the frequency of hot flashes which are the most common symptom encountered in women (Vergne and Sauvart, 2006). Plants such as *A. macrostachya*, *A. digitata*, *Azzeria Africana*, *Annona senegalensis*, *B. aegyptiaca*, *Boswellia papyrifera*, *C. gynandra*, *Combretum glutinosum*, *F. sycomorus*, *Gueira senegalensis*, *M. oleifera*, *O. gratissimum*, *P. crispum* indicated in the treatment of hot flashes (Table 1) constitute a source for new phytoestrogens research. Previous studies have shown

**Table 1.** Plants used in the treatment of menopausal disorders.

Species and family	Local names	Disorders treated	Used parts in medicinal practice	Edible parts in human nutrition	Average of Use value (UVs)	Bibliographic data	
						Chemical groups phytonutrients and other elements found in the plant	Reference
<i>Acacia macrostachya</i> Rchb. ex DC. Fabaceae-Mimosoideae	Zamanega	Lower abdominal pain, hot flashes, too much sweat	Leaf, Stem bark	Fruit, Leaf	0.65	Catechins, Saponins, Tannins, Alkaloids, Fe, Mg, V, Na, Ca, Vita P	Hilou et al. (2014) and Msika et al. (2014)
<i>Acacia nilotica</i> L. (Wild) ex Del. Fabaceae-Mimosoideae	Peguen-daaga	Edema, general tiredness	Leaf, Stem bark, Seed	Seed	0.55	Tannins, Flavonoids, Phenolic compounds, Mg, Fe, Na, Ca	Okuda et al. (1991) and Nagumanthri et al. (2012)
<i>Acacia gourmaensis</i> A. Rich. Fabaceae-Mimosoideae	Gonsabelga	Articular and muscular pain, palpitations, itching	Leaf, root	-	0.55	Alkaloids, Flavonoids, Tannins	Guinko (1997) and Pawinde et al. (2008)
<i>Acacia Senegal</i> (L.) Willd Fabaceae-Mimosoideae	Gonpeelega	Vaginal infection, stomach aches	Leaf, Stem bark	-	0.65	Tannins, Alkaloids, Flavonoids, Saponins, Phenolic compounds	Sereme et al. (2011) and Pal et al. (2012)
<i>Acacia seyal</i> Delile Fabaceae-Mimosoideae	Gon-ponsego	Lower abdominal pain, edema	Leaf, Stem bark	-	0.65	Tannins, Alkaloids, Flavonoids, Saponins, Phenolic compounds	Seigler (2003) and Sereme et al. (2011)
<i>Acacia tortilis</i> (Forssk.) Hayne subsp. raddiana (Savi) Fabaceae-Mimosoideae		Headaches, edema	Leaf, Stem bark	-	0.60	Tannins, Alkaloids, Flavonoids, Saponins, Phenolic compounds	Seigler (2003) and Jaouadi et al. (2015)
<i>Adansonia digitata</i> L. Malvaceae	Tohega	Lower abdominal pain, itching, hot flashes	Fruit	Leaf, Fruit	0.65	Pectins, Coumarins, Catechins, Tannins, Ca, Fe, P, Na, Vita A, Vita B1, Vita B2, Vita B3, Vita C, Vita P, Lipids, Proteins, Carbohydrates, Citric acid, Malic acid, Oxalic acid, Mucilage	Osman (2004) and Makalao et al. (2015)
<i>Azizelia africana</i> Smith Fabaceae Caesalpinioideae	Kankalga	Vomiting, general tiredness, hot flashes	Stem bark	Fruit, Leaf	0.55	Mucilage, Tannins, Coumarins, Vita P, Flavonoids	Akinpelu et al. (2008) and Ejikeme et al. (2010)
<i>Annona senegalensis</i> Pers. Annonaceae	Barkudga	Hot flashes, too much sweat, inflammation	Leaf	Fruit	0.55	Coumarins, Tannins, Vita C, Vita P, Mucilage, Pectins	Kini et al. (2008) and Potchoo et al. (2008)
<i>Anogeisus leocarpus</i> (DC) Guill and Perr (Stem) Combretaceae	Siiga	Lower abdominal pain	Stem bark, Leaf	-	0.50	Glycosides, Phenols, Tannins, Saponins, Alkaloids, Steroids, Ellagic acids, Anthraquinones	Mann et al. (2008) and Shuaibu et al. (2008)
<i>Antada africana</i> Guill.&Perr Fabaceae-Mimosoideae	Sinnogo	Lower abdominal pain, too much sweat	Root, leaf	-	0.55	Coumarins, Flavonoids, Gallic tannins, Anthocyanidins, Sterols, Triterpenes, Carotenoids, Saponosides, Rotenone, Paucine	Diallo et al. (2001) and Cioffi et al. (2006)
<i>Azadirachta indica</i> (A. Juss.) Meliaceae	Neem	Knee pain, general tiredness	Leaf, Stem bark	-	0.65	Azadirachtins, Nimocinol, Isomeldenin, Azadirachtol, Isoazadiranol	Sultana et al. (2007) and Atawodi and Atawodi (2009)

Table 1. Contd.

<i>Balanites aegyptiaca</i> (L.) Delile Zygophyllaceae	Kyegelga	Headaches, hot flashes, Two much sweat, edema	Fruit, Stem bark	Fruit, Leaf	0.65	Anthocyanins, Sterols, Triterpenes, Tannins, Saponins, Vita B1, Vita B3, Vita C, Vita E	Kini et al. (2008) and Makalao et al. (2015)
<i>Bauhinia refuscens</i> Lam Cesalpiniaceae	Tipoega	Hot flashes, nausea	Root, leaf, fruit	-	0.55	Anthraquinones, Resins, Flavonoids, Tannins, Saponins, Cardenolides	Usman et al. (2009) and Garbi et al. (2015)
<i>Bombax costatum</i> Pellegr.& Vuillet Malvaceae	Voaka	Insomnia, lower abdominal pain, two much sweat	Flower	Calyx, Leaf	0.70	Para-coumaric acid, Anthocyanins, Vita P, Vita E, Mucilage	Guinko and Pasgo (1992) and Nenonene et al. (2009)
<i>Boswellia papyrifera</i> Hochst Bruseraceae	Kombre-yongo	Vaginal infection, hot flashes	Leaf, Stem bark	-	0.55	Phenolic compounds, Alkaloids, Saponins	Abdallah et al. (2009) and Paul et al. (2012)
<i>Cassia tora</i> Linn. Fabaceae-Caesalpinioideae	Sogoda	Itching, lower abdominal pain, two much sweat	Leaf	Leaf, Fruit	0.65	Xanthones, Flavonoids, Vita A, Vita B1, Vita B2, Vita B3, Vita C, Mucilage	Kim et al. (2004) and Phongpaichit et al. (2004)
<i>Capparis sepiaria</i> Linn. Capparidaceae	Kalyanga	Stomach aches, palpitations, insomnia, nausea	Stem bark	Fruit, Leaf	0.50	Flavonoids. Alkaloids. Steroids, Tannins, Anthraquinones, Resin, Carbohydrates, Gum, Ca, Mg, Vita C, Proteins	Mishra et al. (2007) and Rajesh et al. (2010)
<i>Cleome gynandra</i> Linn. Cleomaceae	Kiennebdo	Hot flashes, general tiredness, itching	Leaf	Leaf	0.65	Para-coumaric acid, Gallic acid, Vanillin, Caffeic acid, Fe, Vita F	Muchuweti et al. (2007) and Anbazhagi et al. (2009)
<i>Combretum micranthum</i> G.Dom. Combretaceae	Randga	Osteoarthritis, itching	Leaf	-	0.65	Saponins, Tannins, Glycosides flavonoids, Alkaloids, Glycosylflavones, Flavans, Resins	Chika and Bello (2010) and Udoh et al. (2012)
<i>Combretum glutinosum</i> Perr.Ex DC Combretaceae	Kouenga	Hot flashes, eczema	Leaf, Stem bark	-	0.55	Sterols, Triterpenes, Flavonoids, Taninns, Saponins, Coumarins	Harouna et al. (2012) and Yahaya et al. (2012)
<i>Corchorus olitorius</i> L. Malvaceae	Bulvaka	Stomach aches	Leaf	Leaf	0.65	Quercetin, Caffeoylquinic acid, Glycosids, Vita A, Vita B2, Vita B3, Vita C, Mucilage	Azuma et al. (1999) and Ndlovu and Afolayan (2008)
<i>Crataeva adansonii</i> DC. Capparidaceae	Kalguem- tohega	Vaginal infection, stomach aches, itching, vomiting	Leaf	Leaf	0.60	Tannins, Flavonoids, Triterpenoids, Vita A, Vita B2, Vita C	Ahama et al. (2010) and Agbodan et al. (2017)
<i>Daniella oliveri</i> (Rolfe) Fabaceae - Caesalpinioideae	Aoga	Two much sweat, insomnia	Leaf, stem bark	-	0.55	Alkaloids, Steroids, Phenol, Tannins, Phylate, Oxalate Saponins, Na, K, Ca Mg, Zn, Fe Pb	Onoja et al. (2015) and Temitope et al. (2016)
<i>Diospyros mespiliformis</i> Hochst. ex A.DC. Ebenaceae	Gaaka	Vomiting, stomach aches, headaches	Stem bark, Fruit	Fruit, Leaf	0.65	Pectins, Tannins, Lupeol, Lupenone, Betulin, Betulinic acid, Vita P	Kini et al. (2008) and Mohamed et al. (2009)
<i>Faidherbia albida</i> (Del) a. Chev Fabaceae-Mimosoidae	Zaanga	Arthrose, stomach aches	Leaf, Stem bark	-	0.60	Alkaloids, Saponins, Tannins	Tijani et al. (2008) and Salawu et al. (2010)
<i>Feretia apodanthera</i> Del. Rubiaceae	Kitinga	Infections, edema, insomnia	Root bark, Leaf	-	0.50	Iridoids. Tannins Saponins, Steroids Triterpenes	Taiwe et al. (2016) and Owolabi et al. (2018)

Table 1. Contd.

<i>Ficus thonningii</i> Blume Moraceae	Kuusga	Vomiting, general tiredness	Leaf, Stem bark	-	0.55	Antraquinones, Flavonoids, Alkaloids, Saponins, Tannins, Carbohydrates	Otimenyin et al. (2004) and Usman et al. (2009)
<i>Ficus sycomorus</i> L. (Moraceae)	Kankanga	Hot flashes, osteoarthritis, nausea	Leaf, Stem bark	Fruit	0.65	Alkaloids, Phenols, Carbohydrates, Flavonoids, Saponins, Steroids, Tannins, Triterpenoids, Anthracenosides, Anthocyanins, Coumarins, Acide 3-hydroxybenzoic, Acide 4-Hydroxybenzoic, Fe, Ca, Vita C, Vita A, Vita B <sub>1</sub> , Vita B <sub>2</sub> , Vita B <sub>3</sub> , Proteins, Fibers	Kerharo and J-G (1974), Nongonierna et al. (2005), Abdel-Hameed (2009) and Ramde-Tiendrebeogo et al. (2012)
<i>Gardenia erubescence</i> Stapf & Hutch. Rubiaceae	Subudga	Vaginal infection, nausea	Root	Fruit	0.45	Phenolic compounds, Tannins, Flavonoids, Ca, Mg, K, Na Mn, Fe, Zn, C	Bello et al. (2008), Lamien-Meda et al. (2008) and Ouédraogo et al. (2019)
<i>Gardenia soketensis</i> Hutch Rubiaceae	Tang-rakweenga	Headaches, nausea, itching	Roots, leaf		0.50	Alkaloids, Steroids, Glycosides, Saponins, Flavonoids, Tannins	Jansen et al. (2008) and Jodi et al. (2008)
<i>Glycine max</i> (L.) Merr. (soja) Fabaceae	Soja	Hot flashes, rheumatism	Leaf, Stem bark	Seed	0.70	Proteins, Flavonoids, Carotins, Anthocyanins, Isoflavones glycosides, Phytoestrogens (Genistein, Daidzein), Fe, Mg, Ca, K, Mn, Na, Cu, Zn Se, Vita A, Vita B <sub>1</sub> , Vita B <sub>2</sub> , Vita B <sub>6</sub> , Vita C, Vita D, Vita E	Kudou et al. (1991), Plaza et al. (2003), and Barhe and Tchouya (2016)
<i>Gueira senegalensis</i> J.F. Gmel Combretaceae	Wiliwinga	Hot flashes, vaginal infection	Stem bark	-	0.65	Phenolic compounds, Flavonoids, Tanins	Zhigila et al. (2015) and Sulaiman (2016)
<i>Hibiscus sabdariffa</i> L. Malvaceae	Biito, Wegdo	Weight gain, vertigo, nausea	Leaf	Calyx, Leaf	0.70	Malic acid, Oxalic acid, Mucilage, Ca, Fe, P, Vita B <sub>1</sub> , Vita B <sub>3</sub> , Vita P, Vita C, Citric acid, Pectins	Ali et al. (2005) and Cisse et al. (2009)
<i>Lannea acida</i> A. Rich Anacardiaceae	Sabtulga	Vaginal infection, edema	Stem bark	-	0.55	Phenolic compounds, 6,7-(2'',2''-dimethyl chromeno)-8-γ,γ-dimethyl allyl flavanone, 3',4'-dihydroxy-7,8 (2'',2''-dimethyl chromeno)-6-γ,γ - dimethyl allyl flavanol, 7-methylfectorigenin Irisolidone, Tannins	Ouattara et al. (2011) and Muhaisen (2013)
<i>Lannea microcarpa</i> Engl. et K. Krause Anacardiaceae	Sabga, Siibi	Stomach aches, menstrual irregularities, insomnia	Leaf, Stem bark	Fruit, Leaf	0.60	Xanthons, Tannins, Terpenoids. Steroids, Anthocyanins, Flavonoids, Vita C, Vita A	Kini et al. (2008) and Ajiboye et al. (2013)
<i>Leptadenia hastata</i> (Pers.) Decne. Asclepiadaceae	Lelongo	Articular and muscular pain	Leaf	Leaf	0.65	Tannins. Favonoids. Proanthocyanidins, Saponins, Alkaloids, Al, Ca, Fe, V, Vita A, Vita C	Freiberger et al. (1998) and Bello et al. (2011)
<i>Maerua angolensis</i> DC (Forsk) Capparidaceae	Zlgo	Stomach aches	Stem bark	Leaf	0.45	Tannins, Steroids, Cardiac glycosides, Flavonoids, Terpenoids, Ca, Vita C	Ondiek et al. (2010) and Ayo et al. (2013)

Table 1. Contd.

<i>Mangifera indica</i> L. Anacardiaceae	Manguier	Weight gain	Stem bark, Leaf	Fruit	0.70	Flavonoids, Kinic acid Triterpenoids, Mangiferin, Xanthones, Isomangiferin, Tannins, Protocatechic acid, Catechin, Shikimic acid, Triterpenoids, Gallic acid, $\beta$ -carotene, Vita C, Dehydroascorbic acid, Alanine, Glycine, $\gamma$ -Aminobutyric acid	Anila and Vijayalakshmi (2002), Ribeiro et al. (2007) and Shah et al. (2010)
<i>Moringa oleifera</i> L. Moringaceae	Arzan-tiiga	Hot flashes, vertigo, insomnia	Leaf, Fruit, Stem bark	Leaf	0.65	Para-coumaric acid, Zeatin, Quercetin, $\beta$ -sitosterol, Tannins, Caffeoylquinic acid, Kaempferol, Ca, Cr, Fe, P, V, Vita A, Vita B1, Vita B2, Vita B3, Vita C	Movo et al. (2011) and Rani and Arumugam (2017)
<i>Ocimum gratissimum</i> L. Lamiaceae	Basilic	Hot flashes, Itching, vertigo	Leaf	Leaf	0.60	Thymol, Tert-Butanol, O-cymene, Flavonoids, Carbohydrates, Tannins, Ca, P, Na, K, Fe, Vita A, Vita B, Vita C, Vita K	Peter (2004) and Green et al. (2012)
<i>Parkia biglobosa</i> (Jacq.) R. Br. ex G. Don Fabaceae-Mimosoideae	Roaaga	Stomach aches, vertigo, allergy	Leaf, Stem bark	Fruit	0.65	Cardiac dlvcosids, Tannins, Alkaloids, Saponins, Steroids, Ca, Fe, Vita A, Vita B1, Vita B2, Vita C	Ajaiyeoba (2002) and Makalao et al. (2015)
<i>Petroselinum crispum</i> (Mill.) Fuss Apiaceae	Persil	Articular and muscular pain, rheumatism, hot flashes	Leaf	Leaf	0.65	Flavonoids, Tannins, Carbohydrates, Steroids, Saponins, Terpenoids, Ca, P, Na, K, Fe, I, Mn, Vita A, Vita B, Vita C	Green et al. (2012) and Wuyts (2012)
<i>Piliostigma reticulatum</i> (DC.) Hochst. Fabaceae-Caesalpinioideae	Baguende	Stomach aches, insomnia	Leaf, Stem bark	Leaf	0.65	Saponins, Tannins, Phlobatinins, Glycosids, K, Vita C, Vita P	Awe and Omojasola (2009) and N'Guessan et al. (2015)
<i>Psidium guajava</i> L. Myrtaceae	Goyaka	Edema, menstrual irregularities, lower abdominal pain	Leaf, fruit	Fruit	0.65	Glutamic acid, Asparagine, Malonic acid, Trans-aconitic acid, Cis-aconitic acid, Gallic acid, Tannins, Catechin, Xanthine, Quercetin, Lectins, Epicatechin, Uvaol, Carotenoids, Saponins, Triterpenes, Flavonoids, Ellagic acid, Guaianoic acid, Leucocyanidin, Amritoside, $\beta$ -sitosterol, Vita A, Vita C, Citric acid, Acetic acid	Wu et al. (2009) and Barbalho et al. (2012)
<i>Saba senegalensis</i> (A. DC) Pichon Apocynaceae	Weeda	Itching, lower abdominal pain, weight gain	Leaf	Fruit	0.65	Citric acid, Steroids, Malic acid, Terpenoids, Carotenoids, Ca, Vita A, Vita C	Kini et al. (2008) Boamponsem et al. (2013)
<i>Sarcocephalus latifolius</i> (Sm.) E.A. Bruce Rubiaceae	Guinga	Anxiety disorders	Leaf, root	-	0.55	Alkaloids, Tannins, 21-O methyl-strictosamide aglycone, 21-O-ethylstrictosamide aglycone, Carbohydrates, Cardiac glycosides, Anthraquinones, Steroids, Saponins, Flavonoids	Abreu and Pereira (2001) and Arome et al. (2014)

Table 1. Contd.

<i>Securidaca longepedunculata</i> (Fresen.) Polygalaceae	Pelga	Edema, insomnia	Stem bark	-	0.45	Methyl 2-hydroxybenzoate (methyl salicylate), Methyl 4-hydroxybenzoate, Methyl 2-hydroxy-6-methoxybenzoate Xanthone	Jayasekara et al. (2002) and Dibwe et al. (2012)
<i>Sclerocarya birrea</i> (A.Rich.) Hochst Anacardiaceae	Noabga	Stomach aches, mood disorders	Leaf, Stem bark	Fruit	0.65	Citric acid, Malic acid, Catechins, Tannins, Ca, Mg, K, P Vita C	Glew et al. (2004) and Mariod and Abdelwahab (2012)
<i>Tamarindus indica</i> L. Fabaceae-Caesalpinoideae	Pusga	Stomach aches, vaginal infection, nausea	Stem bark	Fruit, Leaf	0.65	Pectins, Tannins, Triterpenes, Flavonoids, Anthocyanins, K, Vita C, Vita K3, Vita P, Citric acid, Malic acid	Kuru (2014) and Makalao et al. (2015)
<i>Vernonia amygdalina</i> Delile Asteraceae	Koa safani	Weight gain	Stem bark, Leaf	-	0.60	Sesquiterpene lactone. Flavonoids, Terpenoids. Saponins, Tannins, Flavonoids, Reducing sugar	Akinpelu (1999) and Ayoola et al. (2008)
<i>Vitellaria paradoxa</i> C.F.Gaertn. Sapotaceae	Taanga	Stomach aches, weight gain	Stem bark	Fruit	0.65	Para-coumaric acid, Gallic acid, Catechins, Epigallocatechins, Cinnamic acid, Vita E, Vita F	(Maranz et al., 2003; Makalao et al., 2015)
<i>Vitex doniana</i> L. Lamiaceae	Aadega	Insomnia, mood disorders	Stem bark	Leaf, Fruit	0.55	Saponins, Tannins, Anthraquinones, Flavonoids, Terpenoids, Alkaloids, K, Na, Ca, Fe P, Mg, Cu, Vita A, Vita B1, Vita B2, Vita B6, Vita C	Agbafor and Nwachukwu (2011) and Vunchi et al. (2011)
<i>Ximenia americana</i> L. Olocaceae	Leenga	Amenorrhea, mood disorder	Stem bark, Leaf	Fruit	0.55	Cyanogen, Gallic acid, Sambunigrine, $\beta$ -glucogalline, Quercetin and derivatives, Na, K, Mg Ca, Fe, P, K, Cu, Mn, Vita C, Lipids, Proteins, Sugars	Le et al. (2012), Sarmiento et al. (2015) and Almeida et al. (2016)
<i>Zingiber officinale</i> Roscoe Zingiberaceae	Gnamaku	Rheumatism, stomach aches, mood disorder	Rhizomes	Rhizomes	0.60	Polyphenols, Tannins, Flavonoids, Proteins, Mn, Fe, Ca, P, Cu	Ali et al. (2008) and Prakash (2010)
<i>Ziziphus mauritiana</i> Lam. Rhamnaceae	Mugunuga	Stomach aches, weight gain	Root, Stem bark	Fruit	0.60	Mucilage Pectins Catechins, Flavonoids, Vita A, Vita B3, Vita C, Vita K1, Vita E	Kini et al. (2008) and Makalao et al. (2015)

No known use, Ca: Calcium, Mg: Magnesium, P: Phosphorus, Na: Sodium, Al: Aluminum, Fe: Iron, K: Potassium, V: Vanadium, Pb: Lead Vita: Vitamin, Se: Selenium, I: Iodine, Mn: Manganese, Cu: Copper, Cr: Chromium.

that tannins, flavonoids and flavonols are able to inhibit lipoxigenase L-1 and cyclooxygenase-1, two enzymes involved in the production of inflammation mediators (Allcarz and Jimenez, 1988; Ayo et al., 2013). This could justify the use of certain plants listed which contain them in the treatment of edema, fever or pelvic pain. Also, the astringent and healing properties of tannins

(Derbré and Lamassiaude-Peyramaure, 2010) would justify the use of some plants that contain them in the treatment of many skin diseases during menopause. Alkaloids are compounds known for their action on the central nervous system and their calming effect. This could justify the use of certain plants that contain them such as *Daniella olivieri*, *Feretia apodanthera*, *Leptadenia*

*hastata*, *P. biglobosa*, *Sarcocephalus latifolius*, *Vitex doniana* in the treatment of sleep disorders and anxiety during the menopause period (Table 1). Many species listed (60.72%) were food plants well known by population with high use values (UVs  $\geq$  0.50). Indeed, various mineral elements, vitamins, proteins, lipids, carbohydrates, gum, resin, fibers are present in these plants as showed





*Ficus sycomorus* L.



*Combretum glutinosum* Perr.Ex DC

(a)



*Gardenia soketensis* Hutch



*Acacia gourmaensis* A. Rich.

(b)



*Antada africana* Guill.&Perr



*Psidium guajava* L.

(c)



*Vitex doniana* L.



*Sarcocephalus latifolius* (Sm.) E.A.Bruce

(d)



*Securidaca longepedunculata* Fresen.



*Feretia apodanthera* Del.

(e)

**Figure 1.** Plants used in the treatment of the most common menopausal symptoms - a) hot flashes b) itching c) lower abdominal pain d) insomnia and anxiety and e) Edema.

Source: (Photos) Ramde-Tiendrebeogo Alphonsine and Hien Sabine, 2018

by previous work (Table 1). Women must therefore be made aware of the menopause period in order to encourage them to choose foods – health whose effectiveness has been proven by previous studies. It is also urgent to develop and increase the range of natural nutraceuticals from the local plants of this study for the management of menopausal symptoms in women

### Conclusion

The objective of this study was to make known the plants used in the treatment of the different symptoms of menopause by women in Burkina Faso. Results showed that local food plants are the most used. This constitutes a scientific database that could help women better manage the menopause period through a healthy and varied diet. These results also constitute a scientific support for the development of new natural nutraceuticals or improved traditional medicines for the treatment of menopausal disorders in women.

### CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

### ACKNOWLEDGMENTS

The Ministry of Health is highly appreciated for supporting the project.

### REFERENCES

- Abdallah EM, Khalid AS, Ibrahim N (2009). Antibacterial activity of oleo-gum resins of Commiphora molmol and Boswellia papyrifera against methicillin resistant Staphylococcus aureus (MRSA). Scientific Research and Essays 4:351-356.
- Abdel-Hameed ES (2009). Total phenolic contents and free radical scavenging activity of certain Egyptian Ficus species leaf samples. Food Chemistry 114:1271-1277.
- Abreu P, Pereira A (2001). New indole alkaloids from Sarcocephalus latifolius. Natural Product Letters 15:43-48.
- Agbafor K, Nwachukwu N (2011). Phytochemical analysis and antioxidant property of leaf extracts of Vitex doniana and Mucuna

- pruriens. *Biochemistry Research International* Volume 2011, Article ID 459839, pp. 1-4. <https://www.hindawi.com/journals/bri/2011/459839/abs/>
- Agbodan KA, Simalou O, Boyode P, Adanlemegbe M, Agbodan MKL (2017). Conditions de synergie d'action des extraits anti-radicalaires de *Flueggea virosa* (Roxb. Ex Wild.) Royle et de *Crataeva adansonii* Forst. f. avec inductions acido-basiques extérieures. *International Journal of Biological and Chemical Sciences* 11:1124-1134.
- Ahama KY, Quashie M-LA, Agbonon I, Koumaglo K (2010). Activités antioxydantes in vitro des feuilles de *Crataeva adansonii*. *Revue Ivoirienne des Sciences et Technologie* 16:153-164.
- Ajaiyeoba EO (2002). Phytochemical and antibacterial properties of *Parkia biglobosa* and *Parkia bicolor* leaf extracts. *African Journal of Biomedical Research* 5:125-129.
- Ajiboye T, Raji H, Muritala H, Ojewuyi O, Yakubu M (2013). Anthocyanin extract of *Lannea microcarpa* fruits stall oxidative rout associated with aflatoxin B1 hepatocarcinogenesis. *Food Bioscience* 4:58-67.
- Akinpelu D, Aiyegoro O, Okoh A (2008). In vitro antimicrobial and phytochemical properties of crude extract of stem bark of *Azella africana* (Smith). *African Journal of Biotechnology* 20:3665-3670.
- Akinpelu DA (1999). Antimicrobial activity of *Vernonia amygdalina* leaves. *Fitoterapia* 70:432-434.
- Ali BH, Blunden G, Tanira MO, Nemmar A (2008). Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): a review of recent research. *Food and chemical Toxicology* 46:409-420.
- Ali BH, Wabel NA, Blunden G (2005). Phytochemical, pharmacological and toxicological aspects of *Hibiscus sabdariffa* L.: A review. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives* 19:369-375.
- Allcarz M, Jimenez M (1988). Flavonoids as anti-inflammatory agents. *Fitoterapia* 59:25-38.
- Almeida MLB, de Souza Freitas WE, de Morais PLD, Sarmento JDA, Alves RE (2016). Bioactive compounds and antioxidant potential fruit of *Ximenia americana* L. *Food Chemistry* 192:1078-1082.
- Anbzhagi T, Kadavul K, Suguna G, Petrus A (2009). Studies on the pharmacognostical and in vitro antioxidant potential of *Cleome gynandra* Linn. leaves. *Niscair Online Periodicals Repository* 2:151-157.
- Anila L, Vijayalakshmi N (2002). Flavonoids from *Embllica officinalis* and *Mangifera indica* effectiveness for dyslipidemia. *Journal of Ethnopharmacology* 79:81-87.
- Arome D, Enegeide C, Ameh SF, Agbafor A, Mbonne ER, Monica I (2014). Absence of anxiolytic activity of *Sarcocephalus latifolius* fruit extract. *Journal of Pharmaceutical Negative Results* 5:4.
- Atawodi SE, Atawodi JC (2009). *Azadirachta indica* (neem): a plant of multiple biological and pharmacological activities. *Phytochemistry Review s* 8:601-620.
- Awe S, Omojolasola P (2009). A comparative study of the antibacterial activity of *Pliostigma reticulatum* bark extract with some antibiotics. *Ethnobotanical Leaflets* 2009:11.
- Ayo R, Audu O, Amupitan J, Uwaiya E (2013). Phytochemical screening and antimicrobial activity of three plants used in traditional medicine in Northern Nigeria. *Journal of Medicinal Plants Research* 7:191-197.
- Ayoola G, Coker H, Adesegun S, Adepoju-Bello A, Obaweya K, Ezennia E, Atangbayila T (2008). Phytochemical screening and antioxidant activities of some selected medicinal plants used for malaria therapy in Southwestern Nigeria. *Tropical Journal of Pharmaceutical Research* 7:1019-1024.
- Azulay C (2004). Ménopause en 2004: le «traitement hormonal substitutif» n'est plus ce qu'il était. *La revue de médecine interne* 25:806-815.
- Azuma K, Nakayama M, Koshioka M, Ippoushi K, Yamaguchi Y, Kohata K, Yamauchi Y, Ito H, Higashio H (1999). Phenolic antioxidants from the leaves of *Corchorus ditorius* L. *Journal of Agricultural and Food Chemistry* 47:3963-3966.
- Barbalho SM, Farinazzi-Machado F, de Alvares Goulart R, Brunnati AS, Otoboni A, Otoboni B (2012). *Psidium guajava* (Guava): A plant of multipurpose medicinal applications. *Medicinal and Aromatic Plants* 1(4):1000104.
- Barhe TA, Tchouya GF (2016). Comparative study of the anti-oxidant activity of the total polyphenols extracted from *Hibiscus Sabdariffa* L., *Glycine max* L. Merr., yellow tea and red wine through reaction with DPPH free radicals. *Arabian Journal of Chemistry* 9:1-8.
- Bello A, Aliero A, Saidu Y, Muhammad S (2011). Phytochemical screening, polyphenolic content and alpha-glucosidase inhibitory potential of *Leptadenia hastata* (Pers.) Decne. *Nigerian Journal of Basic and Applied Sciences* 19 (2):181-186.
- Bello M, Falade O, Adewusi S, Olawore N (2008). Studies on the chemical compositions and anti nutrients of some lesser known Nigeria fruits. *African Journal of Biotechnology* 7(21):3972-3979.
- Besanenot JP, Handschumacher P, Ndione JA, Mbaye I, Laaidi K (2004). Climat, eau et santé au Sahel ouest-africain. *Science et changements planétaires/Sécheresse* 15:233-241.
- Betti JL (2002). Medicinal plants sold in Yaoundé markets, Cameroon. *African Study Monographs* 23(2):47-64.
- Bi FT, Irie GM, N'Gaman K, Mahou C (2008). Études de quelques plantes thérapeutiques utilisées dans le traitement de l'hypertension artérielle et du diabète: deux maladies émergentes en Côte d'Ivoire. *Sciences and Nature* 5:39-48.
- Boamponsem GA, Johnson FS, Mahunu GK, Awiniwoya SF (2013). Determination of biochemical composition of *Saba senegalensis* (Saba fruit). *Pelagia Research Library* 3(1).
- Bouyahya A (2016). Alicaments: des aliments aux médicaments, quel apport pour la santé? *Annales des sciences de la santé* 1:1-3.
- Chika A, Bello SO (2010). Antihyperglycaemic activity of aqueous leaf extract of *Combretum micranthum* (Combretaceae) in normal and alloxan-induced diabetic rats. *Journal of Ethnopharmacology* 129:34-37.
- Cioffi G, Dal Piaz F, De Caprariis P, Sanogo R, Marzocco S, Autore G, De Tommasi N (2006). Antiproliferative triterpene saponins from *Entada africana*. *Journal of Natural Products* 69:1323-1329.
- Cisse A, Diouf A, Dieng T, Gueye Dieye A, Moreau J (2008). Ménopause en milieu africain: épidémiologie, vécu et prise en charge à Dakar. *La lettre du gynécologue* 335:6-10.
- Cisse M, Dornier M, Sakho M, Ndiaye A, Reynes M, Sock O (2009). Le bissap (*Hibiscus sabdariffa* L.): composition et principales utilisations. *Fruits* 64:179-193.
- Cotton CM, Wilkie P (1996). *Ethnobotany: principles and applications*: John Wiley and Sons Chichester. <https://pubs.acs.org/doi/abs/10.1021/jm9701841>
- Derbré S, Lamassiaude-Peyramaure S (2010). Comment venir à bout des mycoses. *Actualités pharmaceutiques*, 49(495):44-46.
- Diallo D, Paulsen BS, Liljebäck TH, Michaelsen TE (2001). Polysaccharides from the roots of *Entada africana* Guill. et Perr., Mimosaceae, with complement fixing activity. *Journal of Ethnopharmacology* 74:159-171.
- Dibwe DF, Awale S, Kadota S, Tezuka Y (2012). Muchimangins A–D: novel diphenylmethyl-substituted xanthenes from *Securidaca longepedunculata*. *Tetrahedron Letters* 53:6186-6190.
- Ejikeme P, Obasi L, Egbuonu C (2010). Physico-chemical and toxicological studies on *Azella africana* seed and oil. *African Journal of Biotechnology* 9:1959-1963.
- Fournier A, Hill C, Clavel-Chapelon F (2003). Traitement hormonal substitutif de la ménopause et risque de cancer du sein. *Bulletin du Cancer* 90:821-831.
- Freiberger C, Vanderjagt D, Pastuszyn A, Glew R, Mounkaila G, Millson M, Glew R (1998). Nutrient content of the edible leaves of seven wild plants from Niger. *Plant foods for Human nutrition* 53:57-69.
- Garbi MI, Osman EE, Kabbashi AS (2015). Anticancer activity of *Bauhinia rufescens* (Lam.) leaf extracts on MCF-7 Human Breast Cancer Cells. *Journal of Medicinal Plants Studies* 3:103-106.
- Glew R, Vanderjagt D, Huang Y-S, Chuang L-T, Bosse R, Glew R (2004). Nutritional analysis of the edible pit of *Sclerocarya birrea* in the Republic of Niger (daniya, Hausa). *Journal of Food Composition and Analysis* 17:99-111.
- Green B, Nwargu F, Obazee M (2012). Spices and food condiments in Niger-Delta region of Nigeria. *African Journal of Biotechnology* 11:14468-14473.
- Group AP (2009). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Botanical Journal of the Linnean Society* 161(2):105-121.

- Guinko S (1997). Rôle des Acacias dans le développement rural au Burkina Faso et au Niger, Afrique de l'Ouest. L'Homme et Le Milieu Végétal Dans Le Bassin Du Lac Tchad. ORSTOM Paris: 35-51. <http://www.documentation.ird.fr/hor/fdi:010012402>
- Guinko S, Pasgo LJ (1992). Harvesting and marketing of edible products from local woody species in Zitenga, Burkina Faso. *UnasyIva* 43:16-19.
- Sore H, Hilou A, Sombie PAED, Compaore M, Meda R, Millogo J, Nacoulma OG (2012). Phytochemistry and Biological Activities of Extracts from Two Combretaceae Found in Burkina Faso: *Anogeissus Leiocarpus* (DC) Guill. and Perr. And *Combretum Glutinosum* Perr. Ex DC. *Universal Journal of Environmental Research and Technology* 2(5).
- Hilou A, Florence R, Pierre D (2014). Identification and quantification of phenolic compounds and flavonoids in anthelmintic ethnoveterinary plants used among Fulani and Mosse, central Burkina Faso. *International Journal of Phytomedicine* 6:87.
- Jansen O, Angenot L, Tits M, Nicolas J-P, De Mol P, Sacré P-Y, Jonville M, Frederich M (2008). In vitro antiplasmodial activity of ethnobotanically selected plants from Burkina Faso. *Planta medica* 74:PF14.
- Jaouadi W, Mechergui K, Ammari Y, Hamrouni L, Hanana M, Khouja M (2015). Ethnobotanical and ethnopharmacological study of *Acacia tortilis* (Forssk) Hayne subsp. *raddiana* (Savi) in a North African pseudo-Savanna. *Phytothérapie* 14(5):285-292.
- Jayasekara T, Stevenson P, Belmain S, Farman D, Hall D (2002). Identification of methyl salicylate as the principal volatile component in the methanol extract of root bark of *Securidaca longepedunculata* Fers. *Journal of Mass Spectrometry* 37:577-580.
- Jodi S, Adamu T, Abubakar U, Abubakar M, Adamu S, Ukato V (2008). Phytochemical and acute toxicity studies on the ethanol roots extract of *Gardenia sokotensis*. *Sokoto Journal of Veterinary Sciences* 7(2):68-70.
- Kerharo J, Adam J-G (1974). La pharmacopée sénégalaise traditionnelle: plantes médicinales et toxiques. Paris (France) Vigot. In AGRIS since 2015. 805-869. <http://agris.fao.org/agris-search/search.do?recordID=XF2015040378>
- Kim Y-M, Lee C-H, Kim H-G, Lee H-S (2004). Anthraquinones isolated from *Cassia tora* (Leguminosae) seed show an antifungal property against phytopathogenic fungi. *Journal of Agricultural and Food Chemistry* 52:6096-6100.
- Kini F, Saba A, Ouedraogo S, Tinguéri B, Sanou G, Guissou I (2008). Potentiel nutritionnel et thérapeutique de quelques espèces fruitières «sauvages» du Burkina Faso. *Pharmacopée et médecine traditionnelle africaine* 15. <http://publication.lecames.org/index.php/pharm/article/view/10/9>
- Kudou S, Fleury Y, Welti D, Magnolato D, Uchida T, Kitamura K, Okubo K (1991). Malonyl isoflavone glycosides in soybean seeds (*Glycine max* Merrill). *Agricultural and Biological Chemistry* 55:2227-2233.
- Kuru P (2014). *Tamarindus indica* and its health related effects. *Asian Pacific Journal of Tropical Biomedicine* 4:676-681.
- Lamien-Meda A, Lamien C, Compaoré M, Meda R, Kiendrebeogo M, Zeba B, Millogo J, Nacoulma O (2008). Polyphenol content and antioxidant activity of fourteen wild edible fruits from Burkina Faso. *Molecules* 13:581-594.
- Le NHT, Malterud KE, Diallo D, Paulsen BS, Nergård CS, Wangenstein H (2012). Bioactive polyphenols in *Ximenia americana* and the traditional use among Malian healers. *Journal of Ethnopharmacology* 139:858-862.
- Lecerf J-M (2007). Phytoestrogènes et os: de nouvelles données. *Cahiers de nutrition et de diététique* 42:207-217.
- Lombrail P (2000). 26. Accès aux soins. In: Les inégalités sociales de santé: La Découverte 2000:403-418.
- Lopes P, Tremollières F (2004). Guide pratique de la ménopause: Elsevier Masson. <https://livre.fnac.com/a1593724/Patrice-Lopes-Guide-pratique-de-la-menopause>
- Löwy I, Gaudillière J-P (2006). Médicalisation de la ménopause, mouvements pour la santé des femmes et controverses sur les thérapies hormonales. *Nouvelles questions féministes* 25:48-65.
- Lumbu S, Kahumba B, Kahambwe T, Mbayo T, Kalonda M, Mvamba M, Penge O (2005). Contribution à l'étude de quelques plantes médicinales anti diarrhéiques en usage dans la ville de Lubumbashi et ses environs. *Annales de Pharmacie* 3:75-86.
- Makalao MM, Savadogo A, Zongo C, Traore AS (2015). Composition nutritionnelle de 10 fruits sauvages consommés dans trois départements du Tchad. *International Journal of Biological and Chemical Sciences* 9:2385-2400.
- Mann A, Yahaya Y, Bansa A, Ajayi G (2008). Phytochemical and antibacterial screening of *Anogeissus leiocarpus* against some microorganisms associated with infectious wounds. *African Journal of Microbiology Research* 2:60-62.
- Maranz S, Wiesman Z, Garti N (2003). Phenolic constituents of shea (*Vitellaria paradoxa*) kernels. *Journal of Agricultural and Food Chemistry* 51:6268-6273.
- Mariod AA, Abdelwahab SI (2012). *Sclerocarya birrea* (Marula), an African tree of nutritional and medicinal uses: a review. *Food Reviews International* 28:375-388.
- Martin G (1995). *Ethnobotany. A methods manual*. Kew, Royaume-Uni, Royal Botanic Gardens. In: Londres, Chapman and Hall. <https://fr.scribd.com/document/311438001/Martin-1995-Ethnobotany-A-Methods-Manual-pdf>
- Mishra S, Tomar P, Lakra N (2007). Medicinal and food value of *Capparis*—a harsh terrain plant. *Indian Journal of Traditional Knowledge* 6(1):230-238.
- Mohamed IE, El Nur E, Choudhary MI, Khan SN (2009). Bioactive natural products from two Sudanese medicinal plants *Diospyros mespiliformis* and *Croton zambesicus*. *Record of Natural Products* 3:198-
- Moyo B, Masika PJ, Hugo A, Muchenje V (2011). Nutritional characterization of *Moringa (Moringa oleifera)* Lam.) leaves. *African Journal of Biotechnology* 10:12925-12933.
- Msika P, Saunois A, Leclere-Bierfait S, Baudoin C (2014). *Acacia macrostachya* seed extract and compositions containing same. US Patent. In: Google Patents. <https://patents.google.com/patent/US8642553B2/en>
- Muchuweti M, Mupure C, Ndhala A, Murenje T, Benhura M (2007). Screening of antioxidant and radical scavenging activity of *Vigna unguiculata*, *Bidens pilosa* and *Cleome gynandra*. *American Journal of Food Technology* 2:161-168.
- Muhaisen HM (2013). Chemical constituents from the bark of *Lanea acida* rich (anacardiaceae). *Scholars Research Library* 5:88-96.
- N'Guessan BB, Dosso K, Ngangoran BN, Amoateng P, Asiedu-Gyekye U, Yapo AP (2015). Antibacterial and antispasmodic activities of a dichloromethane fraction of an ethanol extract of stem bark of *Pliostigma reticulatum*. *Journal of Pharmacy and Bioallied Sciences* 7:128.
- Nagumanthri V, Rahiman S, Ahmad Tantry B, Nissankararao P (2012). In vitro antimicrobial activity of *Acacia nilotica*, *Ziziphus mauritiana*, *Bauhinia variegata* and *Lantana camara* against some clinical isolated strains. *Iranian Journal of Science and Technology (Sciences)* 36:213-217.
- Ndlovu J, Afolayan A (2008). Nutritional analysis of the South African wild vegetable *Corchorus olitorius* L. *Asian Journal of Plants Sciences* 7:615-618.
- Nenonene AY, Koba K, Sanda K, Rigal L (2009). Composition and binding properties of mucilages from stem bark of *Grewia venusta* and calyx of *Bombax costatum*, two tropical plants growing wild in Togo. *Bangladesh Journal of Scientific and Industrial Research* 44:247-253.
- Nogaret A-S (2011). *La phytothérapie: se soigner par les plantes: Editions Eyrolles*. 192 p. <https://izibook.eyrolles.com/produit/1082/9782212231854/La%20phytotherapie>
- Nongonierma RB, Sy GY, Ndiaye L, Thiam D, Samb I, Samb A (2005). Activité antidépanocytaire de la fraction F3 de l'extrait acétonique des écorces de tiges de *Ficus gnaphalocarpa*. *Le Pharmacien d'Afrique* 187:3-6.
- Okuda T, Yoshida T, Hatano T (1991). Chemistry and biological activity of tannins in medicinal plants. H, Wagner, N, R, Farnsworth ed (s) *Economic and Medicinal Plant Research* 5:130-165.
- Organisation mondiale de la Santé (OMS) (2013). *Stratégie de l'OMS pour la médecine traditionnelle 2014–2023*. Genève. [https://www.who.int/publications/list/traditional\\_medicine\\_strategy/fr/](https://www.who.int/publications/list/traditional_medicine_strategy/fr/)
- Ondiek J, Abdulrazak S, Njoka E (2010). Chemical and mineral

- composition, in-vitro gas production, in-sacco degradation of selected indigenous Kenyan browses. *Livestock Research for Rural Development* 22:2010.
- Onoja SO, Madubuike GK, Ezeja MI (2015). Hepatoprotective and antioxidant activity of hydromethanolic extract of *Daniella oliveri* leaves in carbon tetrachloride-induced hepatotoxicity in rats. *Journal of Basic and Clinical Physiology and Pharmacology* 26:465-470.
- Osman MA (2004). Chemical and nutrient analysis of baobab (*Adansonia digitata*) fruit and seed protein solubility. *Plant Foods for Human Nutrition* 59:29-33.
- Otimenyin S, Uguru M, Atang B (2004). Antiinflammatory and analgesic activities of *Ficus thonningii* and *Pseudocedrela kotschy* extracts. *Nigerian Journal of Pharmaceutical Research* 3:82-85.
- Quattara L, Koudou J, Zongo C, Barro N, Savadogo A, Bassole I, Ouattara A, Traore AS (2011). Antioxidant and antibacterial activities of three species of *Lannea* from Burkina Faso. *Journal of Applied Sciences* 11:157-162.
- Ouédraogo K, Dimobe K, Zerbo I, Etongo D, Zare A, Thiombiano A (2019). Traditional knowledge and cultural importance of *Gardenia erubescens* Stapf & Hutch. in Sudanian savanna of Burkina Faso. *Journal of Ethnobiology and Ethnomedicine* 15:28.
- Owolabi OO, James DB, Sani I, Andongma BT, Fasanya OO, Kure B (2018). Phytochemical analysis, antioxidant and anti-inflammatory potential of *Feretia Apodanthera* root bark extracts. *BMC complementary and alternative medicine* 18:12.
- Pal R, Hooda M, Bhandari A, Singh J (2012). Antioxidant potential and free radicals scavenging activity by pod extracts of acacia senegal wild. *International Journal of Pharmaceutical, Chemical and Biological Sciences* 2:500-506.
- Paul M, Brüning G, Bergmann J, Jauch J (2012). A Thin-layer Chromatography Method for the Identification of Three Different *Olibanum* Resins (*Boswellia serrata*, *Boswellia papyrifera* and *Boswellia carterii*, respectively, *Boswellia sacra*). *Phytochemical Analysis* 23:184-189.
- Pawinde E, Sereme P, Leth V, Sankara P (2008). Effect of aqueous extract of *Acacia gourmaensis* A. Chev and *Eclipta alba* (L.) Hassk. on seed length, seedling vigour and grain yield of Sorghum and Pearl Millet. *Asian Journal of Plant Pathology* 2:40-47.
- Peter V (2004). Introduction. *Handbook of herbs and spices Vol. 2*. In: Wood head publishing Ltd Cambridge. [https://www.academia.edu/18671222/Handbook\\_of\\_Herbs\\_and\\_Spices\\_Vol\\_2](https://www.academia.edu/18671222/Handbook_of_Herbs_and_Spices_Vol_2)
- Phongpaichit S, Pujenjob N, Rukachaisirikul V, Ongsakul M (2004). Antifungal activity from leaf extracts of *Cassia alata* L., *Cassia fistula* L. and *Cassia tora* L. *Songklanakarin Journal of Science and Technology* 26:741-748.
- Plaza L, de Ancos B, Cano PM (2003). Nutritional and health-related compounds in sprouts and seeds of soybean (*Glycine max*), wheat (*Triticum aestivum*. L) and alfalfa (*Medicago sativa*) treated by a new drying method. *European Food Research and Technology* 216:138-144.
- Potchoo Y, Richard D, Sakie E, Guissou I, Kini F, Yaro B (2008). Comparative phytochemical content of leaves extracts of two *Annona senegalensis* Pers: The one from Togo and the other originates from Burkina Faso. *Journal of Biological Sciences* 8:577-583.
- Prakash J (2010). Chemical composition and antioxidant properties of ginger root (*Zingiber officinale*). *Journal of Medicinal Plants Research* 4:2674-2679.
- Rajesh P, Latha S, Selvamani P, Kannan VR (2010). Capparis sepiaria Linn-Pharmacognostical standardization and toxicity profile with chemical compounds identification (GC-MS). *International Journal of Phytomedicine* 2(1).
- Ramde-Tiendrebeogo A, Tibiri A, Hilou A, Lompo M, Millogo-Kone H, Nacoulma O, Guissou I (2012). Antioxidative and antibacterial activities of phenolic compounds from *Ficus sur* Forssk. and *Ficus sycamor* L.(Moraceae): potential for sickle cell disease treatment in Burkina Faso. *International Journal of Biological and Chemical Sciences* 6:328-336.
- Ramde-Tiendrebeogo A, Zerbo R, Ouattara B, Doulikom A, Guissou IP (2019). Plantes sahéliennes adaptées dans la récupération des terres dégradées et leurs usages pour la santé: cas de la province du Soum au Nord du Burkina Faso. *Journal of Animal and Plant Sciences* 41:6767-6783.
- Rani EA, Arumugam T (2017). *Moringa oleifera* (Lam)—A nutritional powerhouse. *Journal of Crop and Weed* 13:238-246.
- Ribeiro SMR, Queiroz JH, de Queiroz MELR, Campos FM, Sant'Ana HMP (2007). Antioxidant in mango (*Mangifera indica* L.) pulp. *Plant Foods for Human Nutrition* 62:13-17.
- Ribot C, Tremolieres F (2007). Traitement hormonal chez les femmes ménopausées: tous les traitements sont-ils équivalents? *Gynécologie obstétrique and fertilité* 35:388-397.
- Salawu OA, Tijani A, Babayi H, Nwæze A, Anagbogu R, Agbakwuru V (2010). Anti-malarial activity of ethanolic stem bark extract of *Faidherbia Albida* (Del) a. Chev (Mimosoidae) in mice. *Archives of Applied Science Research* 2(5):261-268.
- Sarmiento JDA, de Moraes PLD, de Souza FI, de Miranda MRA (2015). Physical-chemical characteristics and antioxidant potential of seed and pulp of *Ximenia americana* L. from the semiarid region of Brazil. *African Journal of Biotechnology* 14:1743-1752.
- Seigler DS (2003). Phytochemistry of *Acacia-sensu lato*. *Biochemical Systematics and Ecology* 31:845-873.
- Sereme A, Milogo-Rasolodimby J, Guinko S, Nacro M (2011). Propriétés thérapeutiques des plantes à tanins du Burkina Faso. *Pharmacopée et médecine traditionnelle africaine*, 15. <http://publication.lecames.org/index.php/pharm/article/download/8/7>
- Shah K, Patel M, Patel R, Parmar P (2010). *Mangifera indica* (mango). *Pharmacognosy Reviews* 4:42.
- Shuaibu MN, Wuyep PT, Yanagi T, Hirayama K, Ichinose A, Tanaka T, Kouno I (2008). Trypanocidal activity of extracts and compounds from the stem bark of *Anogeissus leiocarpus* and *Terminalia avicennoides*. *Parasitology Research* 102:697-703.
- Sidibe E (2005). La ménopause en Afrique. In: *Annales d'endocrinologie*: Elsevier. p 105-107. <https://www.sciencedirect.com/science/article/pii/S0003426605817068>
- Sulaiman S (2016). Phenolic content, flavonoid content and antioxidant activity of some medicinal plants used for traditional maternal healthcare in Katsina State, Nigeria. *ChemSearch Journal* 7:47-56.
- Sultana B, Anwar F, Przybylski R (2007). Antioxidant activity of phenolic components present in barks of *Azadirachta indica*, *Terminalia arjuna*, *Acacia nilotica*, and *Eugenia jambolana* Lam. trees. *Food Chemistry* 104:1106-1114.
- Taiwe GS, Dabole B, Tchoya TB, Menanga JR, Dzeufiet PDD, De Waard M (2016). Anticonvulsant effects of iridoid glycosides fraction purified from *Feretia apodanthera* Del.(Rubiaceae) in experimental mice models of generalized tonic-clonic seizures. *BMC Complementary and Alternative Medicine* 16:285.
- Tchatchambe W, Ngombe NK, Mpiana PT, Mbemba TF, Ngbolua K-t-N (2017). Analyses nutritionnelle et toxicologique de trois plantes alimentaires traditionnelles de la Tshopo en République Démocratique du Congo [Nutritional and toxicological analyses of three traditional edibles plant species of Tshopo in the Democratic Republic of the Congo]. *International Journal of Innovation and Applied Studies* 21(2):291-297.
- Temitope OO, Fasusi O, Ogunmodede A, Thonda A, Oladejo B, Yusuf-Babatunde A, Ige O (2016). Phytochemical Composition and Antimicrobial Activity of *Daniella oliveri* extracts on selected clinical microorganisms. *International Journal of Biochemistry Research and Review* 14(1):1-13.
- Tijani A, Uguru M, Salawu O (2008). Anti-pyretic, anti-inflammatory and anti-diarrhoeal properties of *Faidherbia albida* in rats. *African Journal of Biotechnology* 7(6):696-700.
- Tillier A (2005). Un âge critique. La ménopause sous le regard des médecins des XVIIIe et XIXe siècles. *Clio Femmes, Genre, Histoire* 21(2005):269-280.
- Udoh I, Nworu C, Eleazar C, Onyemelukwe F, Esimone C (2012). Antibacterial profile of extracts of *Combretum micranthum* G. Don against resistant and sensitive nosocomial isolates. *Journal of Applied Pharmaceutical Science* 2:142-146.
- Usman H, Abdulrahman FI, Kaita HA, Khan IZ (2009). Comparative phytochemical and antimicrobial evaluation of stem bark extracts of *Bauhinia rufescens* lam (Caesalpinioideae-Leguminosae) and *Sclerocarya birrea* (A. Rich.) Hochst (Anacardiaceae). *Medicinal and Aromatic Plant Science and Biotechnology* 3:110-116.

- Vergne S, Sauvant P (2006). Les isoflavones de soja dans le traitement de la ménopause. *Phytothérapie* 4:172-180. <https://link.springer.com/article/10.1007/s10298-006-0178-2>
- Vunchi M, Umar A, King M, Liman A, Jeremiah G, Aigbe C (2011). Proximate, vitamins and mineral composition of *Vitex doniana* (black plum) fruit pulp. *Nigerian Journal of Basic and Applied Sciences* 19(1):97-101.
- Wu J-W, Hsieh C-L, Wang H-Y, Chen H-Y (2009). Inhibitory effects of guava (*Psidium guajava* L.) leaf extracts and its active compounds on the glycation process of protein. *Food Chemistry* 113:78-84.
- Wuyts D (2012). Persil, petroselinum. *Phytothérapie* 10:117-120.
- Yahaya O, Yabefa J, Usman B (2012). Phytochemical Screening and Antibacterial Activity of " *Combretum glutinosum*" Extract against Some Human Pathogens. *British Journal of Pharmacology and Toxicology* 3:233-236.
- Zerbo P, Millogo RJ, Nacoulma O, Van Damme P (2012). Plantes médicinales et pratiques médicales au Burkina Faso: cas des Sanan. *Pharmacopée et médecine traditionnelle africaine*, 16. <http://revues.cirad.fr/index.php/BFT/article/view/20481>
- Zhigila DA, Saw a FB, Abdul SD, Abba HM, Tela M (2015). Diversity and Phytogeographic Investigation into the Woody Plants of West Tangaza Forest Reserve, Sokoto State, Nigeria. *International Journal of Plants Research* 5:73-79.