fortune Journals

Research Article

JOURNAL OF FOOD SCIENCE AND NUTRITION RESEARCH

ISSN: 2642-1100

Assessment of the quality of plant-based food marketed in food-stores in Ouagadougou (Burkina Faso)

Cheick A Noukami Palm[2*], Aminata P Nacoulma[1], Naamwin-So-Bawfu R Meda[3], Sakinatou Wangrawa[1], Abdoul Karim Sakira[1], Touridomon Issa Some[1]

Abstract

Context: The purpose of human nutrition is to provide exogenous nutrients useful to the body to maintain good metabolism and prevent health disorders. However, some food products of plant origin can be toxic due to their intrinsic chemical composition, degradation during production and storage or adulteration. Therefore, it is essential to assess the quality and the safety of plant-based products marketed for safe nutrition.

Methods: Data on food product availability were collected using collection files. The phytochemical characteristics. were analysied by observation and application of colorimetric and thin layer chromatographic tests.

Results: About 1020 plant-based products were analysed, mainly as herbal tea for infusions (81.37%). Leaves were the most plant part frequently used (49.47%) compare to roots (6.32%). Based on botanical names, we found 55 species from 28 families. Among them 27.07% of plant-based products were from France. Only *Combretum micrantum*, *Hibiscus sabdarifa* and *Moringa oleifera* were found to be from Burkina Faso. Organoleptic analyses indicate that the raw material samples were similar for the same species. Phytochemical screening of plant-based products raw material indicated the presence of phenolic and terpenic compounds and absence of alkaloids. The HPTLC profiles of samples preparations showed qualitative and semi-quantitative similarities.

Conclusion: The plant-based products found in food from the market were mixted-type combining both food and medicinal purposes. Plant species found as raw materials did not exhibit any known toxicity; however, botanical and pharmacognosical characteristics of certain products indicate the presence of some degradations.

Keywords: Plant-based products; Food and medicinal plants; Pharmacognostic characteristics; Quality control; *Combretum micranthum; Hibiscus sabdarifa; Moringa oleifera*

Introduction

The main natural sources of human nutrition come from a great diversity of plant species able of providing water, proteins, lipids, carbohydrates, minerals, trace elements and vitamins. Consumed plants sometimes have therapeutic properties against pathologies including metabolic diseases such as *Allium sativum* (Liliaceae) [1], *Combretum micranthum* (Combretaceae) [2] and *Piper nigrum* (Piperaceae) [3]. However, other plant species such as *Panax ginseng* (Araliaceae) and *Pilocarpus microphyllus* (Rutaceae) can be toxic at some doses due to the presence of toxic chemical compounds [4-6].

Affiliation:

[1]Université Joseph KI-ZERBO, Unité de formation et de recherche en sciences de santé (UFR-SDS), Départment des sciences pharmaceutiques

[2]Agence nationale pour la sécurité sanitaire de l'environnement, de l'alimentation, du travail et des produits de santé (ANSSEAT)

[3]OYA – The Scientist

***Corresponding author:**
Cheick A Noukami Palm, Agence nationale pour la sécurité sanitaire de environnement, de l'alimentation, du travail et des produits de santé (ANSSEAT).

Citation: Cheick A. Noukami Palm, Aminata P. Nacoulma, Naamwin-So-Bawfu R. Meda, Sakinatou Wangrawa, Abdoul Karim Sakira, Touridomon Issa Some. Assessment of the quality of plant-based food marketed in food-stores in Ouagadougou (Burkina Faso). Journal of Food Science and Nutrition Research. 8 (2025): 56-64.

Received: February 16, 2025
Accepted: March 06, 2025
Published: July 02, 2025

Noukami Palm CA, et al., J Food Sci Nutr Res 2025
DOI:10.26502/jfsnr.2642-110000177

This toxicity can also be linked to the methods of preparation, preservation and storage conditions inducing degradation processes of chemical constituents [7,8]. Furthermore, several cases of intoxications associated to plant derived products have been reported and related to species confusion [9].

Herbal preparations show growing interest around the world. This is particularly true in France, where the market for supplement herbal food represents approximately 29% of sales, with an annual growth of 5 to 15% [10]. In Burkina Faso, more than one million tons of medicinal plants are sold each year and the same quantity is exported [11]. These sales generate a turnover of more than ten billion CFA francs [11]. In addition, the World Health Organization (WHO) recommends the integration of traditional medicine and associated plant-based recipes in primary health care in order to achieve universal health coverage [12,13]

Thus, to meet these needs, many herbal products are on sale in stores. These products are quite often found in grocery stores, food stores and herbal specialty stores. However, consuming plants and their derived products is not always without any risk for human health. These risks are related to poor quality, toxicity and possible interactions [9,10,14].

However, in Burkina Faso in particular, data on the plants used, food distribution channels, quality of raw materials, safety and traceability of marketed herbal preparations are not available. The main objective of this study is therefore to contribute to providing factual information on herbal products consumed by populations of the city of Ouagadougou. More specifically, it involves assessing the supply of herbal products in food stores in the city of Ouagadougou and studying pharmacognostics characteristics of raw materials used to manufacture targeted products.

Materials and Methods

Plant-based products offer

Data on the plant-based products offer in food stores were collected from 30 stores in all the 12 districts of the city of Ouagadougou. These data were collected using a detailed informative form. All plant-based products found in visited structures were taken into account. Data was analysed using a descriptive statistical approach. Frequencies were calculated and acceptability threshold was set to more than 5%.

Pharmacognosic characteristics study raw materials

Products sampling and preparation for assays: *Combretum micranthum*, *Moringa oleifera* and *Hibiscus sabdarifa* were selected for more pharmacognosic investigations based on the frequency of use as raw materials and their disponibility in Burkina Faso. Then, four food-products containing *Combretum micranthum*, four others with *Moringa oleifera*, and three with *Hibiscus sabdarifa* were sampled for testing. All selected products raw materials were submitted to macroscopic observation. Then hot water extraction (HWE) based on the manufacturer's preparation instructions, were performed before phytochemical screening. When products were packaged in a tea bag form, raw material were directly collected and used for HWE. In other cases, HWE was performed after grounding.

Macroscopic and organoleptic observations: Selected product specimens were submitted to macroscopic observation for fungal contamination, presence of impurities or non-plant particles, and organoleptic characteristics as colour, odor and texture.

Phytochemical screening: Phytochemical screening was carried out on HWE from selected samples for terpenoids, phenolic compounds and alkaloids. Analyses were carried out respectively using the Salkowski test (chloroform-sulphuric acid) for terpenoids [15,16], ferric chloride (10% $FeCl_3$ solution) for phenolics [17,18] and the Dragendorff test (bismuth sub-nitrate, potassium iodide in concentrated hydrochloric acid) for alkaloids [15,19].

Thin layer chromatography analysis coupled to densitometric analysis: Ten (10) µL of HWE from samples were applied onto a TLC silica (Silica gel 60 F254, Merck®) glass plate (20 × 10 cm, Merck) previously dried in an oven at 110 °C, as 8 mm bands from 10 mm from the lower edge and 10 mm between them, by using an automatic CAMAG®-TLC auto-sampler. Then, plates were developed in a saturated Twin-Trough chamber with three different mobile phase systems (Table 1) to 10 mm from the top of plates. Developed TLC plates were then air dried and images were captured under white light, UV at 254 and 366 nm. Derivatization were performed by spraying with sulfuric vanillin reagent (for terpenoids) or Neu reagent (for flavonoids and phenolic acids).

To perform densitometric data collection, CAMAG Thin Layer Chromatography scanner IV with reflectance absorbance mode and Win CATS software and tungstun lamp was used after derivatization to obtain chromatograms [20,21].

Table 1 : TLC mobile phase according to phytochemical groups.

Phytochecmical groups	Mobile phase
Terpenoids	- dichloromethane : 5 mL
	- methanol : 5 mL
Phenolics	- ethyl acetate : 10 mL
	- formic acid : 1 mL
	- distilled water : 2 mL
Alkaloids	- ethyl acetate 17 mL
	- methanol 2 mL
	- ammonia 1 mL

Citation: Cheick A. Noukami Palm, Aminata P. Nacoulma, Naamwin-So-Bawfu R. Meda, Sakinatou Wangrawa, Abdoul Karim Sakira, Touridomon Issa Some. Assessment of the quality of plant-based food marketed in food-stores in Ouagadougou (Burkina Faso). Journal of Food Science and Nutrition Research. 8 (2025): 56-64..

Noukami Palm CA, et al., J Food Sci Nutr Res 2025
DOI:10.26502/jfsnr.2642-110000177

Results and Discussion

The supply of plant-based products

Samples were collected from 30 food stores in Ouagadougou. A total of 1020 plant-based products were identified. These products were mainly presented in manufactured form (81.37%) and were available at least in two stores (31.30%)

Plant parts in tea-bag for infusion represented (49.76%) of plant-based food products. Leaves were most plant part frequently found (49.47%) compare to roots (6.32%). This could be explained by their easy access and preparation [11]

Used plant identity was available for 842 (82.55%) products and allowed to identify fifty-five plant species belonging to twenty-eight plant families. Lamiaceae, Asteraceae and Rosaceae were the most represented (Table 2).

Table 2 : Plants recorded by families and species.

Families	Number of species by family	Species	Common Names
Apiaceae	03	Pimpinella anisum	Anis vert
		Foeniculum vulgare	Fenouil
		Coriandrum sativum	Coriandre
Araliaceae	01	Panax ginseng	Panax
Asteraceae	05	Arctium lappa	Bardane
		Chamaemelum nobile	Camomille
		Carthamus tinctorius	Carthame
		Chrysanthellum indicum	Chrysanthellum
		Cichorium intybus	Chicorée
Bombacaceae	01	Adansonia digitata	Baobab
Cochlospermaceae	01	Cochlospermum planchonii	Cochlospermum
Combretaceae	01	Combretum micranthum	Combretum
Ericaceae	01	Vaccinium myrtillus	Myrtille
Fabaceae	02	Glycyrrhiza glabra	Réglisse
		Tamarindus indica	Tamarindus
Grossulariaceae	01	Ribes nigrum	Cassis
Lamiaceae	11	Ocimum basilicum	Basilic
		Lavandula angustifolia	Lavande
		Melissa officinalis	Mélisse
		Mentha spicata	Menthe
		Lamium album	Ortie
		Salvia officinalis	Sauge
		Rosmarinus officinalis	Romarin
		Origanum vulgare	Origan
		Origanum majorana	Marjolaine
		Thymus vulgaris	Thym
		Vitex doniana	Vitex
Lauraceae	02	Cinnamomum camphora	Camphre
		Cinnamomum verum	Cannelle
Liliaceae	01	Alium sativum	Sativum
Lythraceae	01	Punica granatum	Grenadine
Malvaceae	02	Hibiscus sabdariffa	Bissap
		Malva sylvestris	Mauve
Moraceae	01	Morus alba	Murier
Moringaceae	01	Moringa oleifera	Moringa
Myrtaceae	01	Syzygium aromaticum	Clou de girofle
Pedaliaceae	01	Sesamum indicum	Sesame
Poaceae	01	Cymbopogon citratus	Citronnelle
Rosaceae	04	Prunus cerasus	Cerise
		Fragaria ananassa	Fraise
		Rubus idaeus	Framboise
		Prunus persica	Pêche
Rutaceae	02	Citrus aurantifolia	Citron
		Citrus sinensis	Oranger
Sapindaceae	01	Paullinia cupana	Guarana
Sterculiaceae	02	Cola nitida	Cola
		Theobroma cacao	Cacao
Theaceae	02	Camellia sinensis	Thé noir
		Théa sinensis	Thé vert
Tiliaceae	01	Tilia europaea	Tilleul
Verbenaceae	01	Verbena officinalis	Verveine
Zingiberaceae		Elettaria cardamomum	Cardamone
	03	Curcuma longa	Curcuma
		Zingiber officinale	Gingembre
Zygophyllaceae	01	Balanites aegyptiaca	Balanites

These plants were used both for food and therapeutic purposes. Five plants are common to 85,98% of the 842 products (Table 3). Three of them (*Combretum micranthum*, *Hibiscus sabdarifa* and *Moringa oleifera*) are produced locally.

Table 3 : Main plants found in collected products.

Scientific name	Effective	Fréquence (%)
Moringa oleifera Lam., Moringaceae	189	29,45
Thea sinensis L., Theaceae	269	31,95
Hibiscus sabdarifa L., Malvaceae	93	11,04
Combretum micranthum G. Don., Combretaceae	93	11,04
Chicorium intybus L., Asteraceae	80	9,50
Total	**724/842**	**85,98**

Noukami Palm CA, et al., J Food Sci Nutr Res 2025
DOI:10.26502/jfsnr.2642-110000177

Collected product labellings did not include plant scientific names for 69.10% of cases and none indications were mentioned in 78.83% of products. When some information was mentioned it concern care benefit for digestive disorders, high blood pressure and the purgative effect. Preparation instructions and precautions were found only for 12.72% of the products. Labels also show that the products come mainly from France for 27.07% of products, Burkina Faso for 12.78% and China for 10.53%.

Furthermore, the labeling of surveyed products must be improved to meet regulatory requirements in Burkina Faso for prepackaged foodstuffs [22,23]. These include country of origin, indications, conditions of use and precautions for use. The absence of theses items for some products can lead to misuse, sometimes with negative consequences on consumer's health. The lack of information on the country of origin does not allow good traceability of product for risk management.

In order to improve the safety of use of prepackaged food products, rules have been edicted by the Codex Alimentarius, and have been integrated as Burkina Faso national standard NBF01-117:2009. The objective of these rules is to facilitate quality control and to ensure traceability to better inform consumers [22,23]. For herbal products, it is important to have an effective risk management policy because some plants can cause various allergic reactions and/or interact with other substances or medications when taken concomitantly.

For example, excessive or chronic use of *Panax gingseng* can cause various disorders, including neurological, cardiovascular, haematological and/or skin rashes. Described interactions associated with *Panax gingseng* use, include alcohol, warfarin, and phenelzine [6,24]. *Allium sativum*, exhibit enzyme-inducing properties that influence some drug bioavailability eg. antiretrovirals (ARVs) [25,26].

Study of raw materials characteristics

Plant based products containing *Combretum micranthum*, *Hibiscus sabdarifa* and *Moringa oleifera* were selected for their frequency of use and the presence of their raw materials in Burkina Faso.

Macroscopic observation: In plant-based products containing *Moringa oleifera*, that had been coarsely ground, leaves were light green or green-brown. Samples contained petioles in similar size and colour (Figure 1A,1B).

Observed browning leaves may be relie to manufacturing process and/or storage conditions, such as high exposure to sunlight during drying or bad storage conditions.For the fourth sample in tea bags, plant parts were finely ground and contained woody elements (Figure 1C).

A: Finely and coarsely ground samples containing *Combretum micranthum*

B: Coarsely ground samples containing *Moringa oleifera*

C: Finely ground samples containing *Moringa oleifera*.

Figure 1: Macroscopic aspects of plant-based products raw material.

A: Finely and coarsely ground samples containing *Combretum micranthum*

B: Coarsely ground samples containing *Moringa oleifera*

C: Finely ground samples containing *Moringa oleifera*.

It is therefore difficult to conclude that this fourth sample contains Moringa on based on raw materials appearance. Then, macroscopic analysis revealed shortcomings related to quality and manufacturing process, such as browning and presence of wood in leaf samples. In addition, macroscopic observation is not effective to identify and/or to characterize plant powders.

Products containing raw *Combretum micranthum*, that had been coarsely ground, leaves were green and petioles brown (Figure 1A). Observed samples present a strong similarity when compared. This may suggest some similar storage conditions. In the tea bags specimens, leaves were finely ground with similar colour to each other. No foreign particles were detected on macroscopic observation.

Products containing raw *Hibiscus sabdarifa*, plant

Citation: Cheick A. Noukami Palm, Aminata P. Nacoulma, Naamwin-So-Bawfu R. Meda, Sakinatou Wangrawa, Abdoul Karim Sakira, Touridomon Issa Some. Assessment of the quality of plant-based food marketed in food-stores in Ouagadougou (Burkina Faso). Journal of Food Science and Nutrition Research. 8 (2025): 56-64..

Noukami Palm CA, et al., J Food Sci Nutr Res 2025
DOI:10.26502/jfsnr.2642-110000177

material had bright red and came from flowers calyxes. Tea bags specimens contain coarsely ground calyxes. All selected products present similar acidic smell.

Characterization and identification of plant powders require to combinate other analytical assays. To this end, various usefull analytical techniques that are simple, effective and economical, such as microscopy and infrared spectrometry, are insufficiently exploited [27,28]. This highlights the need of development and strengthenning analytical methods to standardize and authenticate raw materials for safe use in medicines and foods [29,28]. Analytical techniques applied by microscopy give excellent results that could be validated with multicentric samples. Also, infrared spectrometry applied in metabolomics approach on plant powders enabled good characterization and optimal discrimination of samples based on their spectral profile [30,31].

Phytochemical screening: All samples are positive to ferric chloride and Salkowski test, indicates the presence of phenolics and terpenoids compounds respectively. Draggendorf test was negative and indicates absence of alkaloids. Alkaloids are sources of plant actives substances responsible for most plant associated toxicity [4]. However, Bassene et al. and Mogue Ingrid et al. had reported presence of some nitrogenous compounds in *Combretum micranthum* [9,14]. Further investigations are need to precise types of nitrogenous compounds present in *Combretum micranthum*.

TLC analysis: **Visual observations:** TLC allow chemical profile comparison of hot water extract (HWE) obtained from selected products. Derivatization with vanillin sulfuric showed low intensities of spots for terpenoids detection This means low concentration of terpenic compounds in these extracts. In contrast, screening for phenolics using Neu's reagent reveal the presence of significant concentration (Figure 2) of phenolic compounds.

The extraction method could explain the concentration of different compounds. Indeed, with hot water infusion most terpenoids are weakly extract except oxygenated polar triterpenes and triterpenoids compared to organic solvent as acetone and ethanol coupled with hexane or ethyl acetate [32,33]. In contrast, phenolics compounds are best extracted in polar solvents such as water, notably with increased temperature. Extraction yields are improved when polar solvents such as acetone-water or ethanol-water are combined [34,35].

Chromatographic profile: TLC profile describe on literature data and using derivatization with Neu's reagent, products containing *Moringa oleifera* organs showed intense yellow-orange spots (Rf: 0.21 and 0.48) for flavonols [15], greenish yellow (Rf: 0.58) for flavones [16] and light blue (Rf: 0.44) for phenolics acids [16]. Several molecules belonging to these three families have already been characterized in *Moringa oleifera* leaves including quercetin, rutin and

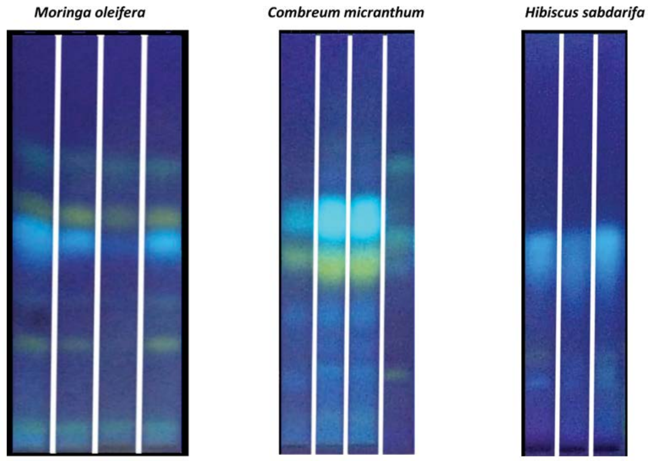

Figure 2: TLC profile of aqueous infusions from plant-based products.

kaempferol as flavonols, chlorogenic acid as phenolic acids and isorhamnetin as flavones. These compounds possess biological and physiological properties that have been extensively evaluated [36-38].

Products containing *Combretum micrantum*, showed two (02) dominant spots coloured in light blue (Rf of 0.48) and greenish yellow (Rf of 0.38), with however lower intensities for one of the products. These spots are characteristic of the presence of phenolics acids [16], and flavone type flavonoids respectively [16]. However, spots in the fourth sample differed completely from the others. Presence of phenolic acids and flavones such as gallic acid, hydroxybenzoic acid, chlorogenic acid, syringic acid and various flavones including vitexin, isovitexin, orientin and homoorientin in *Combretum micrantum* have been documented by several authors [39-41].

All products containing *Hibiscus sabdarifa* calyx, showed intense blue light colour (Rf: 0.44) characteristic of phenolics acids [17]. The purplish tendency in visible is characteristic of anthocyanins [18]. Among phenolic acids present in the calyxes several authors have already found chlorogenic acid, caffeic acid and protocatechuic acid [42,1].

Densitometric profile: Densitometric analysis was carried out under visible light after vaporisation with Neu's reagent. Spots from *Moringa oleifera* based products showed qualitative identical profiles for three while the fourth profile shows an additional peak, probably due to degradation product. Also, a density difference existed between similar profiles. This may be consistent to degradation state detected with macroscopic observations (Figure 3)

For plant foods containing *Combretum micranthum*, only samples with identical spots under UV light at 366 nm were processed by densitometry. Images showed qualitative similarities between three samples and suggest that these products come from the same species. However, contents

Noukami Palm CA, et al., J Food Sci Nutr Res 2025
DOI:10.26502/jfsnr.2642-110000177

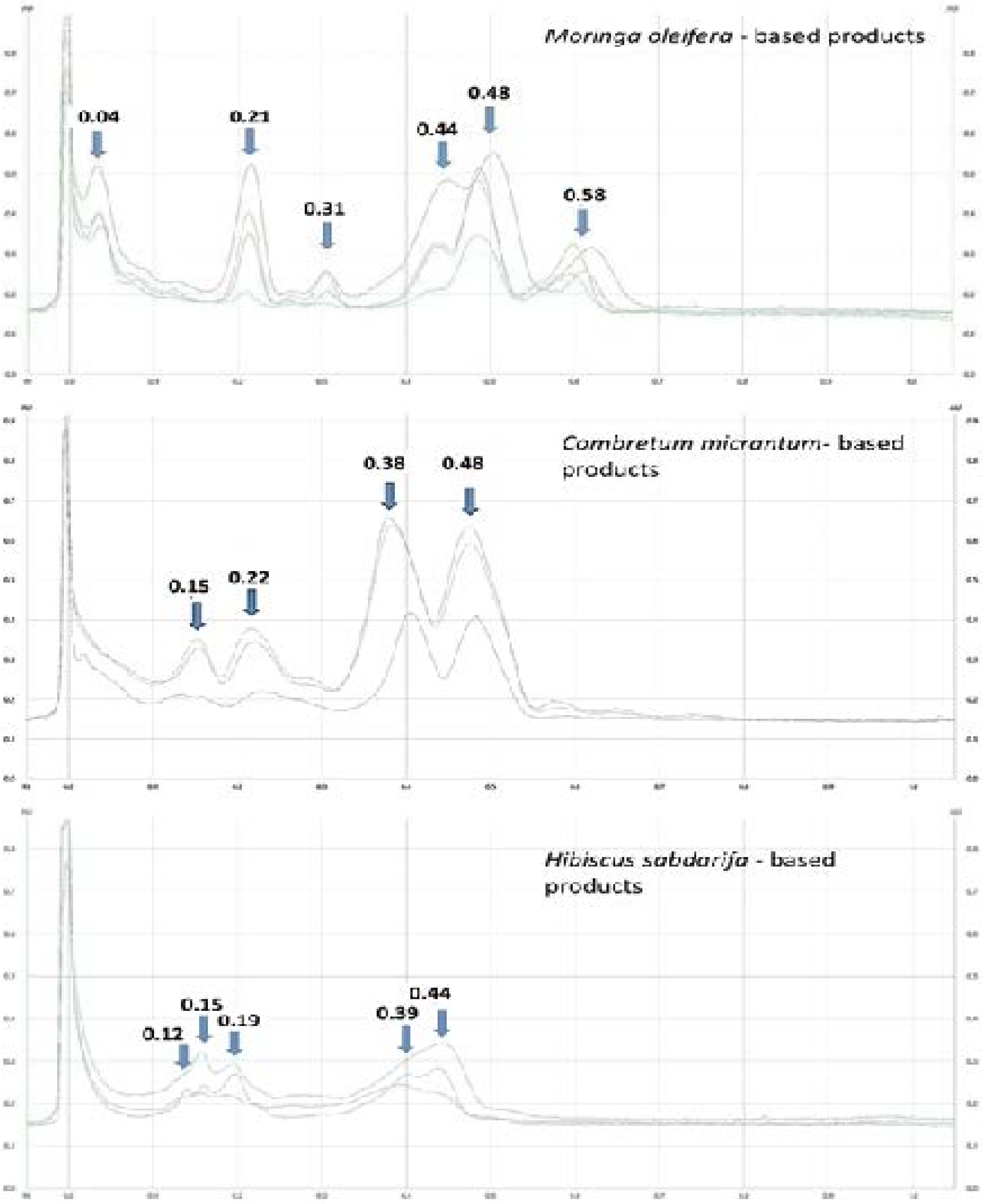

Figure 3: Densitometry densitometric profiles of aqueous infusions of plant-based products after TLC.

Citation: Cheick A. Noukami Palm, Aminata P. Nacoulma, Naamwin-So-Bawfu R. Meda, Sakinatou Wangrawa, Abdoul Karim Sakira, Touridomon Issa Some. Assessment of the quality of plant-based food marketed in food-stores in Ouagadougou (Burkina Faso). Journal of Food Science and Nutrition Research. 8 (2025): 56-64..

Noukami Palm CA, et al., J Food Sci Nutr Res 2025
DOI:10.26502/jfsnr.2642-110000177

were relatively low in infused samples (Figure 3) which could be explained by the extraction method from raw leaves. For *Hibiscus sabdarifa* containing products, TLC profiles were qualitatively similar which differences in semi-quantitative profile (Figure 3). The variations in chromatographic and densitometric profiles can be explained by the degradation of compounds or possible adulteration by mixing with other plants or non-plant materials [10,43].

These potential risks of adulteration require the development of quality control methods for natural plant-based products. These methods integrate multidisciplinary approaches to detect and characterize chemical markers of plant species. In the case of this study, for a given species, the TLC profiles of each sample show the presence of similar spots that could constitute chemical markers for species identification. Characterization of these substances could be a first step towards the identification of potential chemical tracers for *Combretum micranthum*, *Hibiscus sabdarifa* and *Moringa oleifera*.

Conclusions

The objective of this work was to document the availability of food and / or medicinal plant-based products found in supermarkets in the city of Ouagadougou, and to assess their pharmacognosic quality.

A total of 1020 products containing around 55 plant species from 28 families were identified. Five plant species were frequently used, include three from Burkina Faso's flora. Among these products, those containing *Moringa oleifera Lam*., *Combretum micranthum G. Don*., And *Hibiscus sabdarifa L*. were selected for pharmacognostics analysis.

Effective characterisation of plant speciy specific coumpounds could improve the quality control and traceability of food products containing these plants. This research should be pursued using multidisciplinary analytical methods coupled with high-throughput multivariate data analysis like chemometric tools.

Conflicts of interests

No conflicts of interest have been registered on this work to the best of our knowledge.

References

1. Organisation Ouest Africaine de la Santé. The pharmacopoeia of medicinal plants of West Africa (2013).
2. Hama O, Kamou H, Abdou MMA, et al. Ethnobotanical knowledge and uses of Combretum micranthum in traditional pharmacopoeia in the Southwest of Tahoua (Niger, West Africa) Int J Bio Chem Sci 4 (2019) : 2173.
3. Sharif MK, Ejaz R, Pasha I. Nutritional and Therapeutic Potential of Spices. In: Therapeutic, Probiotic, and Unconventional Foods Elsevier (1st edtn), (2018): 181-199.
4. Cheze M, Gaillard Y, Pépin G. Analytical responses to poisoning by plant substances. Ann Toxicol Anal 4 (2000): 307-314.
5. Oulmaati A, Hmami F, Achour S, et al. Severe poisoning by traditional medication in newborns. Archives of Pediatrics 9 (2017): 833-836.
6. Chan PC, Fu PP. Toxicity of Panax genseng - An herbal medicine and dietary supplement. Journal of Food and Drug Analysis 4 (2020).
7. Schmidt M, Ouédraogo A, Dressler S, et al. Senckenberg biodiversity and climate research centre (bik-f), data and modelling centre, senckenberganlage 25, 60325 frankfurt am main, Germany 9 (2016).
8. Ouedraogo S, Yoda J, Traore TK, et al. Production of raw materials and manufacture of herbal medicines Int J Bio Chem Sci 2 (2021): 750-772.
9. Bensakhria A. Poisonous plants. General toxicology (2018): 129-136.
10. Pentel J, Vanrullen I, Berta JL. Herbal food supplements: a necessary safety requirement. Nutrition and Dietetics Notebooks 1 (2005): 23-29.
11. Zerbo P, Millogo Rasolodimby J, Nacoulma Ouedraogo O, et al. Medicinal plants and medical practices in Burkina Faso: the case of the Sanan. Bois for trop 307 (2011): 41.
12. World Health Organization. WHO Strategy for Traditional Medicine 2014–2023. World Health Organization, Geneva (2013).
13. World Health Organization. WHO Strategy for Traditional Medicine 2002-2005 (2002).
14. Schmidt M, Ouédraogo A, Dressler S, et al. Méthodes de collection d'herbiers. Annales des Sciences Agronomiques (2016).
15. Sharma V, Agarwal A, Chaudhary U, et al. Phytochemical investigation of various extracts of leaves and stems of Achyranthes aspera linn. International Journal of Pharmacy and Pharmaceutical Sciences 5 (2013).
16. Najoan GC, Prasetyaningsih A, Prakasita VC, et al. Anti-inflammatory Activity Test of Astaxanthin Extract from Litopenaeus vannamei Shrimp Waste Against the Number of Neutrophils and Lymphocytes in White Rats (Rattus norvegicus) Injected with Carrageenin. Scholars Academic Journal of Biosciences 7 (2021).
17. Brice BJ, Benson BB, Fernique KK, et al. Phytochemical and antibacterial investigations of medicinal plants used in the traditional treatment of urinary tract infections in

Noukami Palm CA, et al., J Food Sci Nutr Res 2025
DOI:10.26502/jfsnr.2642-110000177

Ivory Coast: case of Lannea barteri Engl. (Anarcadiaceae). Journal of the West African Chemical Society 9 (2019).

18. Blaise KK, Affouet KM, Raphael OK, et al. Phytochemical screening, determination of total polyphenols and flavonoids, and evaluation of the antibacterial activity of leaves of Turraea heterophylla Smith (Meliaceae). J Pharmacogn Phytochem 5 (2021): 16-21.
19. John KK, Shcherazade O-SF, Georges A, et al. Anti-inflammatory activity and phytochemical studies of the aqueous extract of the bark of Distemonanthus benthamianus baill. (Caesalpiniaceae: leguminosae - caesalpinioideae) ESJ 7 (2021).
20. Cañigueral S, Frommenwiler DA, Reich E, et al.High performance thin-layer chromatography (HPTLC) in the quality control of herbal products. Pharmaceutical Sciences 18 (2018).
21. Mulaudzi N, Anokwuru CP, Tankeu SY, et al. Phytochemical Profiling and Quality Control of Terminalia sericea Burch. ex DC. Using HPTLC Metabolomics. Molecules 2 (2021): 432.
22. ABNORM. NBF 01–117 : 2009 Labeling of prepackaged foodstuffs (2009).
23. Codex Alimentarius General Standard for the Labelling of Prepackaged Foods CXS 1-1985 (2018).
24. Paik DJ, Lee CH. Review of cases of patient risk associated with ginseng abuse and misuse. Journal of Ginseng Research 2 (2015): 89-93.
25. Fasinu P, Gurley B, Walker L. Clinically Relevant Pharmacokinetic Herb-drug Interactions in Antiretroviral Therapy. Current drug metabolism (2015).
26. Madrigal Redondo GL, Loría Gutiérrez A, Blanco Barrantes J, et al. General aspects of Allium sativum - a review. Ars Pharm 4 (2021): 471-481
27. Ouedraogo S, Traore S, Sombie BC, et al. Quality control and compressibility study of Moringa oleifera powders and Adansonia digitata fruit pulp. Health Sciences 2 (2018).
28. Poornima Shukla. Pharmacognostical Evaluation and Antimicrobial activity of Moringa oleifera Lamk. Leaf. Int J Pure App Biosci (2015): 95-100.
29. Singh M, Singh S, Verma D. Morphological and Pharmacognostical Evaluation of Moringa oleifera Lam. (Moringaceae): A Plant with High Medicinal Value in Tropical and Subtropical Parts of the World. PHREV 28 (2020): 138-145.
30. Yehe MD. Physicochemical study of a natural coagulant: moringa oleifera seed powder. Rev Ivoir Sci Technol (2019): 287-299.
31. Kinda PT, Nacoulma AP, Guenné S, et al. The Metabolomic study of Calotropis procera Ait. from Burkina Faso, based on chemical functional groups profiling using FTIR. Journal of Complementary and Integrative Medicine 3 (2020): 2019-0134.
32. Jiang Z, Kempinski C, Chappell J. Extraction and Analysis of Terpenes/Terpenoids. Curr Protoc Plant Biol (2016): 345-358.
33. Masyita A, Mustika Sari R, Dwi Astuti A, et al. Terpenes and terpenoids as main bioactive compounds of essential oils, their roles in human health and potential application as natural food preservatives. Food Chemistry (2022): 100217.
34. Bourgou S, Beji RS, Medini F, et al. Effect of solvent and extraction method on phenolic compound content and antioxidant potential of Euphorbia helioscopia. Journal of New Sciences (2016).
35. Rebey IB, Sriti J, Besbess B, et al. Effect of provenance and extraction solvent on the phenolic compound content and antioxidant potential of fennel seeds (Foeniculum vulgarae Mill). Journal of New Science (2016): 1478-1487.
36. Muhammad HI, Asmawi MZ, Khan NAK. A review on promising phytochemical, nutritional and glycemic control studies on Moringa oleifera Lam. in tropical and sub-tropical regions. Asian Pacific Journal of Tropical Biomedicine 10 (2016): 896-902.
37. Amaglo NK, Bennett RN, Lo Curto RB, et al. Profiling selected phytochemicals and nutrients in different tissues of the multipurpose tree Moringa oleifera L., grown in Ghana. Food Chemistry 4 (2010): 1047-1054.
38. Mokgehle TM, Ndou D, Madala NE, et al. A Comprehensive and Comparative Metabolomic Study of Two Nutraceutical-Containing Plants; Moringa oleifera and Solanum lycopersicum: A Review. Nutraceuticals 3 (2022): 234-245.
39. Welch CR. Chemistry and pharmacology of kinkéliba (Combretum micranthum), a west African medicinal plant. Single thesis (2010): 283.
40. Zannou O, Pashazadeh H, Ibrahim SA, et al. Green and highly extraction of phenolic compounds and antioxidant capacity from kinkeliba (Combretum micranthum G. Don) by natural deep eutectic solvents (NADESs) using maceration, ultrasound-assisted extraction and homogenate-assisted extraction. Arabian Journal of Chemistry 5 (2022): 103752.
41. Dawe A. Phytochemical Constituents of Combretum Loefl. (Combretaceae). TOPHARMCJ 1 (2013): 38-59.

42. Mohd Ali SA, Che Mohd CR, Latip J. Comparison of Phenolic Constituent in Hibiscus sabdariffa cv. UKMR-2 Calyx at Different Harvesting Times. JSM 7 (2019): 1417-1424.

43. Chabrier JY. Plantes médicinales et formes d'utilisation en phytothérapie. Sciences pharmaceutiques (2010): 77.

Citation: Cheick A. Noukami Palm, Aminata P. Nacoulma, Naamwin-So-Bawfu R. Meda, Sakinatou Wangrawa, Abdoul Karim Sakira, Touridomon Issa Some. Assessment of the quality of plant-based food marketed in food-stores in Ouagadougou (Burkina Faso). Journal of Food Science and Nutrition Research. 8 (2025): 56-64..