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Ethnopharmacological Survey on the Consumption of the Association of Medicinal Plants-koutoukou in the City of Abidjan (Ivory Coast)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The purpose of this study is to identify the medicinal plants used in the bistros and to determine the preference between the consumption of Koutoukou alone or the Koutoukou mixture associated with medicinal plants in the city of Abidjan.
Place and Duration: Pharmacodynamic Biochemical Laboratory, Faculty of Biosciences, University Félix Houphouët-Boigny, between December 2017 and June 2018.
Methodology: The investigation took place in the neighborhoods of Abobo, Cocody, Koumassi and Yopougon. This is an open-ended questionnaire intended for consumers of Koutoukou alone and association of medicinal Plants-Koutoukou. The identity, the region, the marital and professional status of the consumers on the one hand, the ethnobotany of the medicinal plants used and their associations with Koutoukou on the other hand were considered.

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Results: This study identified 12 species of medicinal plants commonly used in bistros. 70% of the surveyed population prefer and consume more cocktails at the expense of simple koutoukou. The Garcinia kola-Koutoukou combination is the most significantly consumed cocktail (Number of treated illnesses greater than 10).
Conclusion: This descriptive study resulted in the identification of 12 medicinal plants commonly used in the bistros of 4 Commune of the city of Abidjan and consumed in association with Koutoukou. The populations of these municipalities (70%) greatly appreciate. The Most consumed is the association of Garcinia kola-Koutoukou for his righ rate of healing.

Keywords: Abidjan; ethnopharmacology; bistros; koutoukou; medicinal plants.

1. INTRODUCTION

Medicinal plants are important source of drugs for health care around the world, and the global demand in this regard growing [1]. About 22,000 medicinal plants identified by World Health Organization (WHO) are used in traditional medicine [2]. These plants are the subject of research in several fields including pharmacology, pharmacognosy, phytochemistry, etc. [3] In most Third World countries such as Côte d'Ivoire, the practice of traditional medicine continues from generation to generation. According to the regions, it differs by adapting itself to the tradition by the association of certain substances whose homemade drinks such as Koutoukou.

Koutoukou is a drink from the distillation of sweetened juices, including fermented palm oil sap (Elaeis guineensis Jacq.).This drink appears to be more harmful than other so-called industrial alcoholic beverages because of its high concentration of butanol, methanol and even iron residues [4]. The work of some authors**,** has shown that regular and acute intake of this beverage could have very pronounced effects on alertness and epileptogenicity [5,6,7,8]. If Koutoukou taken alone has harmful effects on the health of populations, can the association medicinal plants-koutoukou have beneficial effects on the health of consumers?

The aim of this work is to realise an ethno-pharmacological survey on the consumption of the association of medicinal plants-koutoukou in four communes of the city of Abidjan (abobo, cocody, koumassi and yopougon). Specifically, it will be necessary to draw up the list of the medicinal plants used in koutoukou sales places called bistros, to define the preference between the cocktail and simple koutoukou, and to determine the most popular cocktail depending on the number of diseases treated.

2. MATERIALS AND METHODS

2.1 Framework of Study

The ethno-pharmacological survey was conducted in the city of Abidjan. Abidjan, is a city of 422 km2 with a population of 3.9 million (20% of the population of Côte d'Ivoire which is 19.3 million inhabitants).

It is the 7th most populous city in Africa after Cairo, Lagos, Kinshasa, Khartoum, Lunda and Alexandria and the 2nd largest French-speaking city in the world after Kinshasa (9.4 million) and before Paris (2.2 million 'inhabitants). Indeed, Abidjan, has 10 municipalities including abobo, cocody, koumassi, yopougon and is considered as cultural cluster of West Africa.

2.2 Materials

The technical material consists essentially of a simple and precise questionnaire, a Computer and a software acquisition and data processing.

2.3 Methods

The prospective study consisted of conducting an ethno-pharmacological survey in four (4) communes of the city of Abidjan namely: Abobo, Cocody, Koumassi, and Yopougon. These communes were chosen on the basis of their accessibility, the large number of bistros and the high rate of low-income people residing there. The survey was conducted using open-ended questionnaires for consumers of this artisanal brandy. The study is characterized by the socio demography of the consumers (Identity, region, marital situation, professional situation), the ethnobotany of the plants and their associations.
NB: Koutoukou, derived from the palm oil sap (Elaeis guineensis) or sugar cane juice or yeast-sugar-water mixture, is a high-titre brandy [9].

Bistros: *Place where Koutoukou is mainly sold*.

2.4 Statistical Analysis

The data collected during this survey were processed using EXCELL and R software, which allowed us to determine the preference between Koutoukou supplemented with plants (cocktails) or Koutoukou alone, to list the plants widely utilized in the association of koutoukou-medicinal plants and finally to determine the most popular cocktail.

3. RESULTS AND DISCUSSION

3.1 Plants Identified

The plants identified during the ethno-pharmacological survey in the bistrots are generally prepared in the form of maceration with Koutoukou and then administered orally. Table 1 presents the results of the census of plants used in macerations with koutoukou in the four communes of Abidjan. A total of twelve (12) plants were recorded in the four (04) communes of Abidjan. In the commune of Abobo, all twelve plants are used, while seven (07) of these plants (Garcinia Kola, Enantia polycarpa, Xylopia ethiopica, Zingiber officinale, Bitter Red (Unknown), Moringa olifeira and 4H (Unknown) are used in only three communes (Cocody, Koumassi and Yopougon) in addition to the municipality of Abobo. Five (05) of these plants (Siaguéhi (Unknown), Cocos nucifera, Tectona grandis, Citrus limon and Elymus repens) are only used in the commune of Abobo.

3.2 Preference between the Consumption of Cocktail (Medicinal Plants-Koutoukou) and Koutoukou Alone

The results of Fig. 2 show the preference in consumption between Cocktail (medicinal plant mixture -Koutoukou) and Koutoukou alone.

3.3 Discussion

In Côte d'Ivoire, like everywhere else in Africa, the use of medicinal plants is attracting ever-increasing interest due to three main reason such as the richness of our medicinal plant flora. In this context, we carried out an ethnopharmacological survey in the bistros to identify the medicinal plants that are consumed there and to define the pathologies that they were likely to treat.

A total of twelve (12) species of medicinal plants from eight families (Guttiffereae, Annonaceae, Verbenaceae, Rutaceae, Moringaceae, Arecaceae, Poaceae and Zingiberaceae) have been recorded (Table 1). These different species of plants are mostly prepared by maceration with koutoukou for 24 hours and then consumed orally. 3 plants including *Garcinia kola* (Guttiffereae), *Enantia polycarpa* (Annonaceae), *Zingiber officinale* (Zingiberaceae) were the most used. Our results corroborate those of Hong-xi and Song (2001); Tita, et al. (2001) [10,11]. According to these authors, these plant families are increasingly used in traditional African medicine. This craze for these 3 plants during this study , could be explained mainly by their compositions in certain chemical elements of medical or event nutritional interest. Thus, Mazi, et al. (2001); Shirin et al. (2010); Ajali, (2000), respectively in the work on *G. kola , Z. officinale* and *E. polycarpa*, have demonstrated the presence of tannin , phytic acid, phenol, Trypsin inhibitor, sterol, flavonoid , Alkaloid, oxalate and lot of Vitamins (A, C, E, B1, B2, B3) [12,13,14]. Indeed, these compounds help to cure many diseases like Flavonoids are potent water-soluble super antioxidants and free radical scavengers which prevent oxidative cell damage, have strong anti-cancer activity and protects against all stages of carcinogenesis [15].

However, the low use of other families (Verbenaceae, Rutaceae, Moringaceae, Arecaceae, Poaceae) of plants is explained by a lack of knowledge of their properties in the area surveyed. An ethnobotanical survey conducted by Ladoh-Yemeda, et al. 2016 [16], revealed in Cameroon a low frequency of citation of some families whose verbanaceae ranged between 0.04 and 0.19% at the expense of the frequency of citation of the announced family which was 0.70%.

The ethnopharmacological survey carried out in the 4 communes (Abobo, Cocody, Koumassi, Yopougon) of the city of Abidjan made it possible to highlight a preference of the population in the consumption of simple koutoukou and the association medicinal plants - Koutoukou (Cocktail) (Fig.1). In the commune of Abobo, 60 to 70% of the people surveyed prefer the cocktail at the expense of simple koutoukou. In the other communes of Cocody, Koumassi and Yopougon, respectively 50 to 60%, 55 to 65% and 60 to 64% of the surveyed population prefer the cocktail to the detriment of simple koutoukou. In total, the association medicinal plants - koutoukou is the most consumed because about 70% of the surveyed population prefer it to simple Koutoukou. This fad would be explained by

socio-cultural habits and or a low income of the population a presumption of healing that gives the population to these different cocktails.

Indeed, according to Hamon, et al. [17] the use of artisanal beverages obtained from palm wine, sugar cane juice and sugar water with yeast has since become permanent on the occasion of ancestor worship ceremonies, funerals and weddings. Hamon and Camara [9], also indicated that because of their low cost of production and sale, traditional alcoholic beverages (dolo, palm wine and Koutoukou) are increasingly consumed but they would not replace manufactured and / or imported beverages. In the encyclopedia of medicinal plants [18], decoction, infusion and maceration constitute the essential preparation and use recommended in traditional therapies. In addition, the recipes combined can contain biological supplements, of vegetable nature (dates, drinks, ...), animal (milk, honey) or even mineral (rock salt), intended to reduce the irritating nature or annihilate the toxic effect of a component or on the contrary enhance its activity either to enhance the curative effects of the various constituents in order to achieve a therapeutic synergy [19].

Our consumer survey of koutoukou associated with medicinal plants in bistros, revealed that these cocktails would cure some diseases such as malaria, sexual weakness, sore throat, hemorrhoids, sexual stimulant, cough, fever typhoid, diarrhea, belly sores. The preference of these cocktails was related to the number of illnesses that these would cure (Table 2). the association *Garcinia kola* - koutoukou was designated as the most preferred cocktail taking into account the number of cured diseases.The most common selection criterion was the repetition of vernacular use and its invariance in as wide a geographical area as possible [20]. This preference is significantly high.

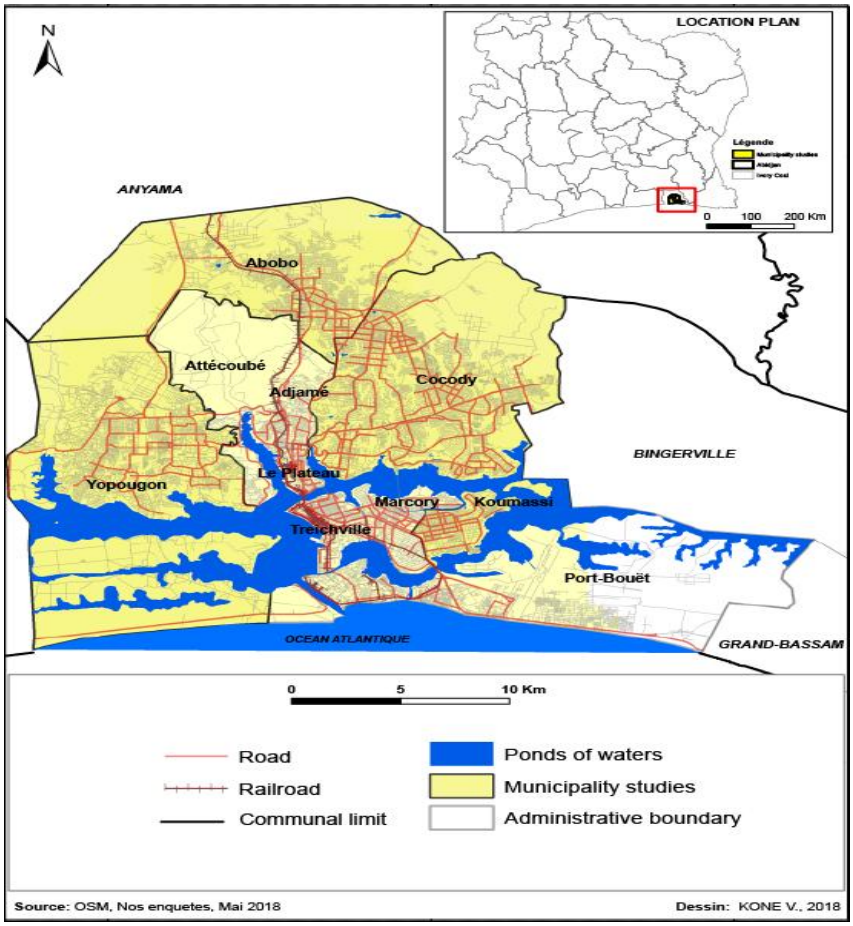

Fig. 1. Map of the city of Abidjan

Table 1. List of plants identified and used in the cocktail by communes

Plants		Communes				
Vernacular names	**Scientific names**	**Abobo**	**Cocody**	**Koumassi**	**Yopougon**	**total**
Petit kola	*Garcinia Kola*	x	x	x	x	4
Jaune amer	*Enantia polycarpa*	x	x	x	x	4
Poivre africain	*Xylopia aethiopica*	x	x	x	x	4
Gnamakou	*Zingiber officinale*	x	x	x	x	4
Rouge Amer	Unknown	x	x	x	4	4
Moringa	*Moringa olifeira*	x	x	x	x	4
4H	Unknown	x	x	x	x	4
Siaguéhi	Unknown	x	0	0	0	1
Coco	*Cocos nucifera*	x	0	0	0	1
Tek	*Tectona grandis*	x	0	0	0	1
Citron	*Citrus limon*	x	0	0	0	1
Chient dent	*Elymus repens*	*x*	0	0	0	0
Total	**12**	**12**	**12**	**7**	**7**	**-**

Absent: 0; Present: x

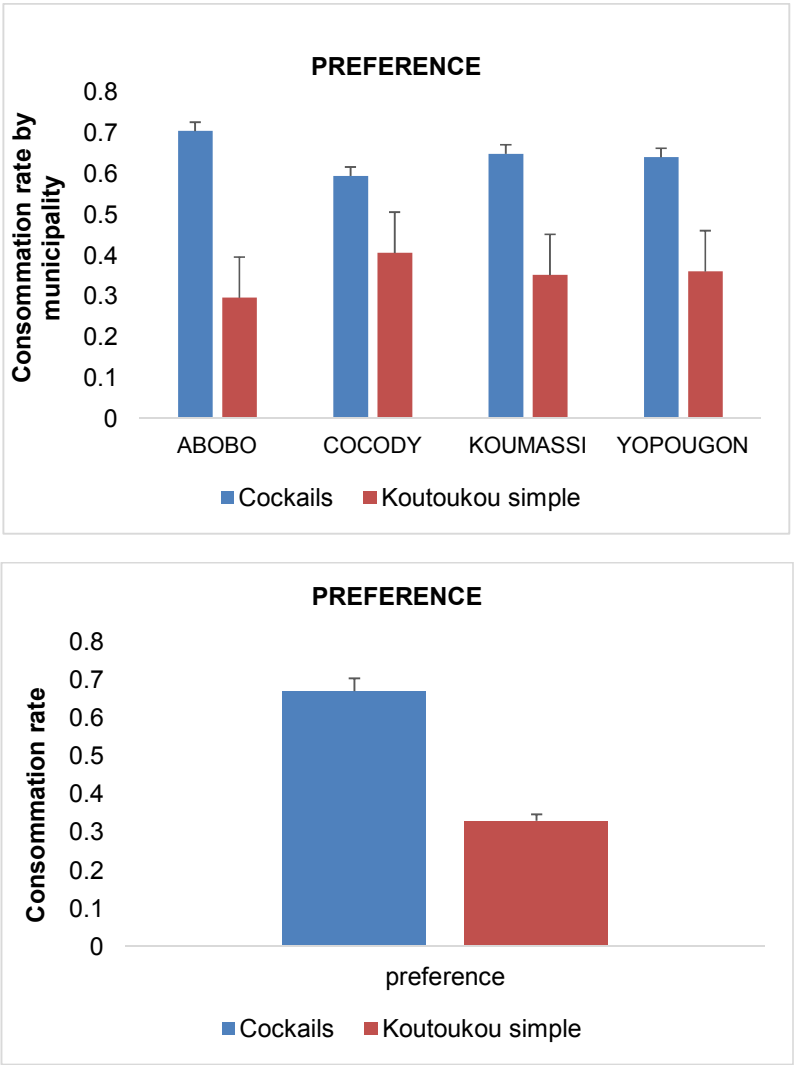

Fig. 2. Consumption rate per commune between the cocktail (Koutoukou-medicinal plant mixture) and koutoukou alone

Table 2. (A) List of medicinal plants used in the cocktail according to the treated disease

	Plants						Deseases						
Vernacular names	**Scientific names**	**Malaria**	**Sexual weakness**	**Sore throat**	**Hemorroid**	**Sexual stimulant**	**cough**	**Aperitif**	**Typhoid fever**	**Diarrhea**	**Belly wood**	**Tiredness**	**total**
Petit kola	*Garcinia Kola*	x	x	x	x	x	x	x	x	x	x	x	11 a
Jaune amer	*Enantia polycarpa*	x	0	0	0	0	0	x	0	0	x	0	3 b
Poivre africain	*Xylopia aethiopica*	0	0	x	0	0	0	x	0	0	0	x	3 b
Gnamakou	*Zingiber officinale*	0	x	x		0	x	x	0	0	0	0	4 b
Rouge Amer *Inconnu*		**0**	**x**	**0**	**0**	**0**	**0**	**x**	**0**	**x**	**x**	**0**	**3 b**
Moringa	*Moringa oliferea*	x	0	x	0	x	0	x	x	x	x	x	8 a
4H	inconnu	0	x	0	0	x	0	x	0	0	0	0	4 b
Siaguéhi	inconnu		x	0	0	x	0	x	0	0	0	0	3 b
Coco	*Cocos nucifera*	0	0	0	0	x	0	x	x	0	x	0	4 b
Tek	*Tectona grandis*	x	0	0	0	0	0	x	x	0	0	x	4 b
Citron	*Citrus limon*	x	0	0	0	0	0	x	x	0	0	x	4 b
Chient dent	*Elymus repens*	X	0	0	0	0	0	x	x	0	0	0	3 b

Binomial non-parametric test of samples in pairs ($p \leq 0.05$); NB: alphabetical letters (a different from b)

(B). Table summary of 2(A)

Plants	**Petit kola**	**Jaune amer**	**Poivre africain**	**Gnamakou**	**Rouge Amer**	**Moringa**	**4H**	**Siaguéhi**	**Tek**	**Citron**	**Chient dent**	**Coco**
Number of deseases traited	++++	+	+	++	+	+++	++	+	++	++	+	++

≤ 3 correspond to: +; 3 ≤ Number of diseases treated≤ 8 correspond to: ++; Number of diseases treated ≥ 8 correspond to: ++++

Thus according to the works of Farombi, et al. 2002 [21]; Garcinia kola has hypoglycemic, antioxidant, antibacterial, anti-hepatotoxic properties etc that would be the cause of its effects. These effects are known and sought after by consumers. However, the koutoukou added to plants decreases its healing effect because of its consequences on an organism as hepatoxicity [22].

4. CONCLUSION

This study identified twelve (12) medicinal plants from 8 families, used in the koutoukou sales places called bistros. The surveyed population prefers and consumes more the association koutoukou-medicinal plants to the detriment of simple koutoukou for several reasons including the presumption of cure. Thus, the cocktail koutoukou-Garcinia kola (Guttiffereae), is the most popular because of the multiplicity of diseases that it would cure. In short, high consumtpion can cause damage to vital organs.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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