



ISSN (E): 2320-3862
ISSN (P): 2394-0530
<https://www.plantsjournal.com>
JMPS 2023; 11(1): 113-125
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Received: 14-10-2022
Accepted: 20-12-2022

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Trade and consumption of bitters, alcoholic macerates, in the district of Abidjan (southern Côte d'Ivoire)

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Abstract

"Bitters", are drinks obtained by macerating plant organs in alcohol, sold and consumed in Abidjan for various reasons. This study aimed to have a better knowledge on the practice of this activity in the said city. An ethnobotanical survey was carried out in 100 bistros in four popular municipalities of the city of Abidjan, through semi-structured interviews and focus groups. The sale of macerated is widely practiced by women (79.5%), while its consumption is the prerogative of men (97.29%). Twenty-three types of "bitters" were inventoried, 16 of which were found in the four communes. The evaluation of the level of knowledge, showed that the most important and most popular macerated were the "red-bitter" (Sa = 0.65), "yellow-bitter" (0.62) and "4 a.m." (0.58). Fifty-four species of plants were used in the composition of these beverages, distributed in 48 genera belonging to 30 families, of which the most popular were Apocynaceae, Annonaceae and Meliaceae. These results revealed that "bitters" were widely sold and consumed in Abidjan. Knowledge about these macerated drinks could be used to propose solutions for a better formalization of the sale of these drinks in Côte d'Ivoire.

Keywords: Abidjan, Alcoholic macerates, "bitters", "koutoukou", Côte d'Ivoire

1. Introduction

Alcoholic beverages have been a defining feature of many cultures [1]. These drinks are attached to traditions of hospitality and conviviality. During colonial times, their use was essential as a seal, for example, to the conclusion of alliances or territorial agreements with customary chiefs [2]. Alcohol is part of the *savoir-vivre* of most families and is used to seal relationships between individuals and even families [3]. Beside industrially produced alcohol, traditionally distilled alcohol remains in almost all countries and regions of the world [4]. In Sub-Saharan and Central Africa, a traditional beverage is obtained by distilling palm wine or sugarcane juice [5, 6]. This drink is known by different names depending on the country where it is produced: *Sodabi*, in Togo and Benin [7], *ondotol* or *hâ* in Cameroon [8], *Akpeteshie* in Ghana [9], *ogorogo* in Nigeria [10]. In Côte d'Ivoire, it is widely known as *koutoukou* [11]. Its use has been perpetuated through various cultural ceremonies (traditional religious rites, funerals, weddings), but also through the making of traditional therapeutic beverages [12]. This alcohol is often used in the maceration of various organs (fresh or dried) of medicinal plants [7] or animals [13]. These beverages were used in several indications namely aperitifs, digestives or aphrodisiacs [14]. This practice is widespread in West Africa, and is called *atikédy* in Togo [15] or "bitters" in Ghana [16]. In Côte d'Ivoire, it is known as "pitess", derived from the Ghanaian name "bitters" [17]. This practice seemed localized, some time ago, in the southeastern and eastern regions of Côte d'Ivoire. These regions have a cultural, geographical and historical proximity to Ghana where "bitters" have reached the stage of widely traded industrial products [17].

Today, the sphere of production and consumption of this drink spills over the original cultural, ethnic, a geographic framework. Bistros (or "*koutoukoudromes*" as known in Abidjan), abound in the neighborhoods of many cities in Côte d'Ivoire, and particularly in Abidjan. In this city, the *koutoukou* is highly prized by the population due to its low cost (100 CFA or 0.2 US Dollar /glass) and easy accessibility [11, 18]. Several studies have been conducted on the sale and consumption of *koutoukou* in Abidjan, but without mentioning the practice of alcoholic maceration. Yet, according to [19], alcoholic macerations are more popular than simple

koutoukou in Abidjan because of their alleged therapeutic properties. In this city, the *koutoukou* trade appears to be a very flourishing activity, but remains informal, with potential risks of intoxication [20]. Little information exists on the organization of this trade, the motivations of consumers and the different products consumed. This study was initiated to provide a better understanding of the practice of this activity in a few popular communes in the city of Abidjan. Specifically, it aimed to (i) establish the profile of sellers and consumers of bitters, (ii) list the types of macerates sold or consumed, (iii) research the preference of consumers of these macerates and (iv) make an inventory of the plants involved.

2. Materials and Methods

2.1. Study area

The study was conducted in Abidjan, the Ivorian economic capital, located on the Atlantic coast between latitudes 4°10' and 5°30' N and longitudes 3°50' and 4°10' W. This city is

subject to a hot and humid equatorial climate with two rainy seasons and two dry seasons [21]. It had 6,321,017 inhabitants at the 2021 census (36% of the Ivorian urban population) and remains the most populous city in Francophone West Africa. This population is made up of large ethnic groups such as Akan, Kru, Mande, Gur, Voltaic and also communities from the African sub-region [22]. The main economic activities carried out are trade, industry (construction and public works, chemical, textile), fishing (traditional and modern), agriculture (oil palm, rubber, food and market garden products), tourism and crafts [22]. The District is composed of 13 communes, but this study took place in those of Abobo, Yopougon, Koumassi, and Port-Bouët (Figure 1), which are the main popular in Abidjan. The choice of these four communes was also guided by the high proportion of low-income inhabitants as well as the existence of many precarious neighborhoods [23].

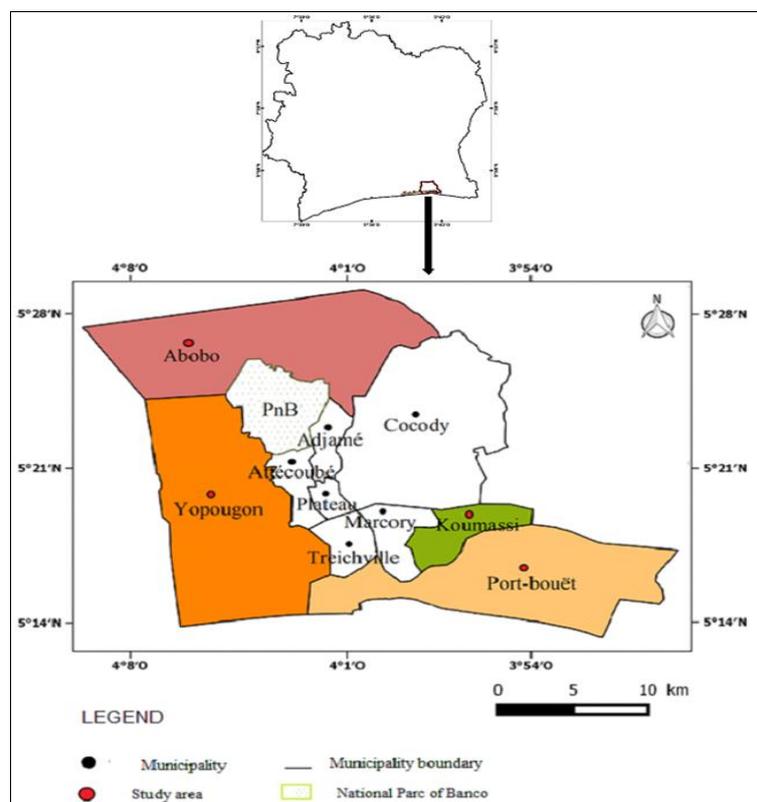


Fig 1: Localisation map of sampled communes in the city of Abidjan, [24] modified by Kouassi

2.2. Data collection

The selected communes were visited from October 2017 to April 2018. The survey was conducted following two stages. The first stage consisted in an individually free-list interview of men and women, met during a door-to-door approach, in bistros selected by a prior canvass. The questions asked were about the types of macerates sold or consumed, the preferred types, the number of glasses taken and the effect sought by the consumers. The second step consisted in obtaining samples of the plants mentioned by the sellers during the previous step, in the medicinal plant markets of the surveyed communes. These samples were confirmed, dried and then preserved for identification at the Laboratory Botany of the NANGUI ABROGOUA University. During, the survey, we followed the recommendations of the Code of Ethics [25].

2.3. Data analysis

To obtain the level of knowledge of the sellers or consumers,

the frequency of occurrence [26] and the Smith index [27] were calculated. This frequency varies from 0% (bitter not sold) to 100% (bitter sold in all bistros). The Smith's index, is a cognitive index based on the frequency of quotation (Fq), the average rank (Ar) of items [28] and the length of the free-lists obtained. This index, normed to vary between 1 (maximum importance) and 0. In this index, the average rank was used to establish the preference of each consumer as proposed by [29]. The saturation curve (point in the data collection where no new information was added), responder proficiency (responder-by-responder proximity matrix) and Smith index were also determined with FLAME 1.1 [30].

A comparative analysis was performed using the Venn diagram (*VennDiagram* package from [31]), regarding the types of macerates sold in the surveyed communes. Finally, a factorial correspondence analysis (FCA) was performed to determine the levels of correlation between some consumer's ages and the preferred types of macerates. All statistical

analyses were performed with R software (version 4.0.3).

3. Results

3.1. Profile of sellers and consumers

The trade of bitters in the city of Abidjan is almost exclusively carried out by women (79.5%) (318 female vendors out of a total of 400), compared to 20.5% of men. The majority of sales outlets (47.25%) were run by people between 30 and 40 year-old. In addition, this activity was mainly carried out by Ivorians (91.25%). However, a few Ghanaian (3.25%), Beninese, Burkinabe and Togolese (5.5%) sellers were observed. With regard to ethnicity, 67.75% of the Ivorian sellers belong to the Akan ethnic group, which

includes Baoule (31.25%), Anyi (20%) and Akyé (8.5%).

These different sellers surveyed engage in a variety of occupations, the most important of which were those involved in trade (74%) (Table 1). In the taverns, the vast majority of consumers were men (97.29%), with a small female presence (2.7%). Regarding age, most of the buyers (69.02%) were between 35 and 50 years old. In terms of nationalities, Ivorians represented 92.22% of the consumers surveyed, compared to 5.34% of West African nationals (Ghanaians, Beninese, Togolese and Burkinabe). Regarding ethnic groups, 60.41% of buyers were from the Akan ethnic group, notably the Baoule (30.12%), the Anyi (16.79%) and the Abbey (5.94%) (Table 2).

Table 1: Socio-demographic characteristics of sellers of bitters in Abidjan

		Municipality of proportion (%)				
		Abobo	Koumassi	Port-Bouët	Yopougon	Global (%)
Gender	Women	82	87	75	74	79.5
	Men	18	13	25	26	20.5
Age group	[20;35 years]	28	17	28	21	23.5
	[35;50 years]	42	49	58	40	47.25
	[50 years; more]	30	34	14	39	29.5
Nationality	Ivorian	97	88	81	99	91.25
	Ghanaian	-	4	8	1	3.25
	Beninese	-	1	5	-	1.5
	Burkinabe	1	-	2	-	0.75
	Togolese	2	7	4	-	3.25
Ethnic group	Akan	84	48	58	81	67.75
	Gur	5	16	-	4	6.25
	Kru	5	21	28	7	15.25
	Mandé	2	-	1	7	2.5
Ethnic	Abbey	7	3	4	2	4
	Abidji	2	-	-	-	0.25
	Abure	-	-	3	-	0.75
	Abron	4	3	4	3	3.5
	Anyi	27	22	15	16	20
	Alladjan	-	-	2	-	0.25
	Appolo	-	3	2	-	1.25
	Akyé	15	3	8	8	8.5
	Baoule	32	43	21	29	31.25
	Bété	3	-	9	4	4
	Dida	-	-	2	-	0.25
	Guro	-	3	2	7	3
	Wè	1	2	3	18	6
	Gwa	-	-	-	1	0.25
	Koulango	3	3	3	2	2.75
	Kroumen	1	-	-	-	0.25
	Lobi	-	-	-	1	0.25
	Niamboua	-	-	1	-	0.25
	Tagbana	-	-	-	1	0.25
	Wobê	-	-	1	-	0.25
Dan	2	-	1	7	2.5	
Occupation	shopkeeper	70	75	72	79	74
	Worker	6	8	10	7	7.75
	Official	2	-	3	1	1.25
	Learner	10	9	07	2	7
	Others	10	8	8	11	9.25

Note: other: Unemployed, carpenter, retired; seamstress; -: information not obtained in the municipality

Table 2: Socio-demographic characteristics of "bitters" consumers in Abidjan

		Municipality of proportion (%)				Global (%)
		Abobo	Koumassi	Port-Bouët	Yopougon	Global (%)
Gender	Women	95.28	99.44	99.72	94.72	97.29
	Men	4.72	0.56	0.28	5.28	2.71
Age group	[20;35 years [	23.33	26.67	35	34.72	21.73
	[36;55 years [	62.22	63.05	64	58.39	69.02
	[56 years, more [	14.44	10.27	19	8.88	9.23

Nationality	Ivorian	95.83	98.05	68.61	85	92.22
	Ghanaian	0.83	0.83	13.89	5.83	5.34
	Togolese	0.27	0.56	6.94	3.05	2.70
	Beninese	-	0.56	9.44	3.05	3.40
	Guinean	-	-	-	0.83	0.20
	Nigerian	1.67	-	-	-	0.41
	Burkinabe	0.83	-	1.11	2.22	1.04
Ethnic group	Akan	73.61	54.16	59.44	48.61	60.41
	Gur	3.89	5.83	1.38	1.11	2.98
	Kru	8.61	20.83	2.78	26.38	18.61
	Mandé	9.72	17.22	5	8.89	10.21
	Foreigners	4.17	1.96	31.38	15	7.77
Ethnic	Abbey	9.44	3.89	12.55	-	5.94
	Abron	3.89	0.27	-	3	1.35
	Adjoukrou	-	1.94	-	2.94	1.2
	Anyi	21.39	13.89	23.07	12.74	16.79
	Allandjan	-	-	-	6.86	1.58
	Appolo	-	-	8.5	0.98	1.80
	Akyé	11.38	0.27	6.47	5.23	5.57
	Avikam	-	-	-	0.98	0.22
	Baoulé	27.22	31.94	36.03	32.02	30.12
	Beté	4.44	6.94	2.43	9.83	5.79
	Dida	0.83	1.67	-	3.92	1.58
	Ebrié	0.27	0.27	-	1.30	0.45
	Godié	-	0.83	-	-	0.22
	Guro	1.94	8.05	-	3.59	3.53
	Wè	2.22	10.56	1.62	8.49	5.72
	Gwa	-	1.67	-	-	0.45
	Koulango	1.11	-	-	-	0.30
	Kroumen	0.27	0.27	-	-	0.15
	Lobi	-	5.83	0.40	0.98	1.88
	Malinké	5.83	1.67	1.62	0.98	2.56
	Niamboua	-	-	-	0.98	0.22
	Senoufo	2.78	-	1.62	-	1.05
	Tura	-	-	4.04	2.94	1.43
	Wobé	0.83	0.56	-	1.30	0.67
	Dan	1.94	7.5	1.62	2.94	3.53

Note: Foreigners: Beninese, Burkinabe, Ghanaian, Guinean, Nigerian. Togolese; -: information not obtained in the municipality

3.2. Diversity and distribution of bitters sold in the surveyed municipality

Twenty-three types of "pitess" were listed under different names (Table 3). Most of these names (literally translated) were evocative of the desired effects. For example, "4 a.m." is evocative of the nocturnal erection occurring naturally around 4 a.m. following consumers. Other names such as "tear underpants" and "bandero" (evoking a strong erection), also indicate an aphrodisiac effect. Of the 23 types sold, the most commonly encountered "pitess", in general (Figure 2), were "red-bitter" (Frequency of occurrence, Focc = 90.75%), "yellow-bitter" (88%), "4 a.m." (82%) and "bitter kola" (61.75%). However, the order of importance and the frequencies of occurrence vary from one municipality to another. Thus, in Abobo, the most common macerates sold in taverns were 4 a.m. (93%), "red-bitter" (91%), "yellow-bitter"

(88%) and "bitter kola" (82%). In the communes of Koumassi and Port-Bouët, the most cited were "red-bitter" (98%; 86%), "yellow-bitter", (98%; 82%), "4 a.m." (72%; 75%) and "bitter kola" (70%; 35%). In Yopougon, "4 a.m." (91%), "yellow-bitter" (90%), "red-bitter" (88%) and "bitter kola" (60%) were the most frequent.

Of these 23 types, 16 (69.56%) were observed in all the four communes studied (Figure 3), including "red-bitter", "yellow-bitter", "4 a.m.", "bitter kola", "pepper", "ginger", "kplele", "koko", "siaguehi", "greenery", "moringa", "Blé Goudé", "poto-poto", "tear underpants", "bloody red" and "lemon". However, some particularities were found in some municipalities. For example, the macerated "lemongrass" was only observed in the commune of Abobo, when, "the sauce", "bandero" and "curcuma" were only found in taverns of Yopougon.

Table 3: Occurrence of "bitters" sold in Abidjan

Types of "bitters"	Municipality				
	Abobo Focc (%)	Koumassi Focc (%)	Port-bouët Focc (%)	Yopougon Focc (%)	Global Focc (%)
<i>Red-bitter</i>	91	98	86	88	90.75
<i>Yellow-bitter</i>	88	98	82	90	88.75
<i>4 a.m.</i>	93	72	75	91	82.75
<i>Bitter kola</i>	82	70	35	60	61.75
<i>Pepper</i>	81	41	38	78	58.75
<i>Ginger</i>	61	66	33	62	55
<i>Kplele</i>	45	41	7	50	37
<i>Siaguehi</i>	18	25	29	77	31

<i>Koko</i>	38	18	31	23	31
<i>Lemon</i>	32	19	17	23	25
<i>Moringa</i>	10	25	8	6	12
<i>Bloody red</i>	7	9	13	14	10.25
<i>Blé goudé</i>	3	9	2	10	5.25
<i>Greenery</i>	1	9	7	8	5.25
<i>Poto-poto</i>	4	9	2	7	5.25
<i>Tear underpants</i>	4	2	5	5	4
<i>Djeka</i>	3	-	3	-	1.5
<i>The sauce</i>	-	-	1	3	1.25
<i>African Baileys</i>	2	1	-	-	3
<i>African Pastis</i>	-	-	-	1	0.5
<i>Bandero</i>	-	-	-	1	0.25
<i>Lemongrass</i>	1	-	-	-	0.25
<i>Curcuma</i>	-	-	-	1	0.25

Note: Focc: Frequency of occurrence; type of bitters not mentioned



Fig 2: Four types of bitters most commonly found in the bistros of Abidjan. a) red-bitter, b) yellow-bitter, c) 4 a.m. and d) bitter kola

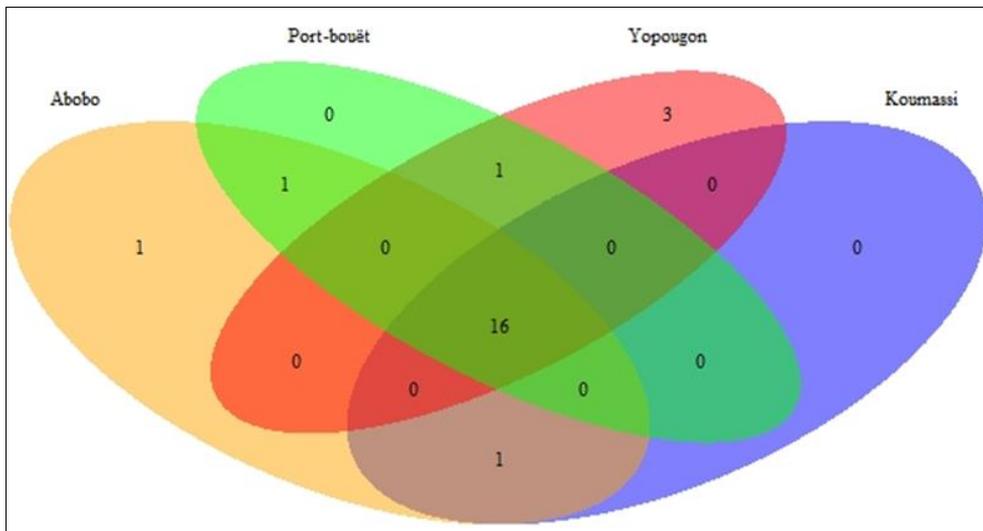


Fig 3: Venn diagram showing the distribution of the number of “pitess” types sold per surveyed commune

3.3. Knowledge and preference of “bitters” by consumers
 A total of 1440 free lists of “bitters” known and drunk by consumers were obtained with a data saturation level from the 9th respondent onwards (Figure 4). The length of free lists ranged from one to nine with an average of 2.3 bitters per list.

These values indicated that “bitters” were well known by consumers, which was confirmed by the high proximity of items cited given by the Respondent Competence Graph (Figure 5).

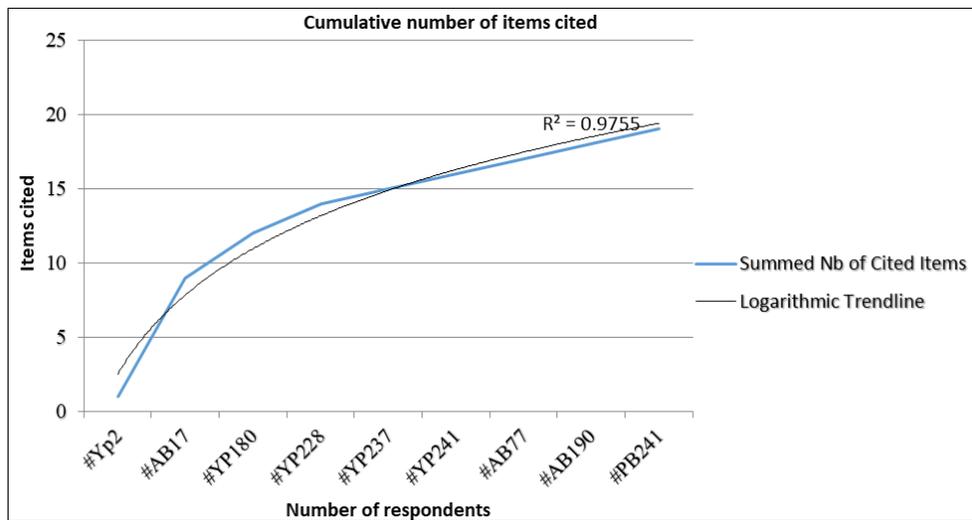


Fig 4: Level of data saturation on consumption of bitters by respondents in Abidjan

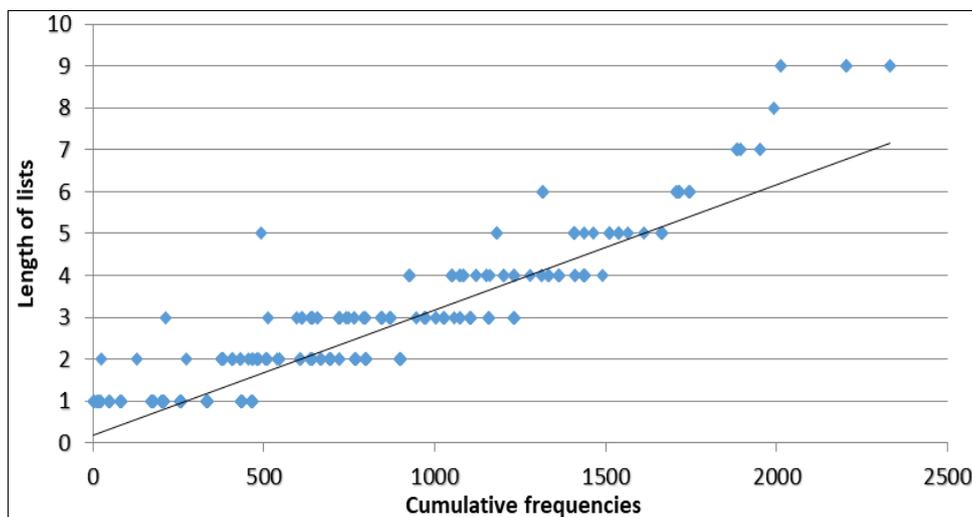


Fig 5: Informant competence about "bitters" in Abidjan

Following the consumers, the most known macerates were, in descending order "red-bitter » (Sa= 0.65; Fq= 91.75%), "yellow-bitter" (Sa= 0.62; Fq= 89.25%) and "4 a.m." (Sa = 0.58; Fq= 81.25%) (Figure 6). These types were also the most cited in each municipality, but in a different order. In the commune of Abobo for example the "red-bitter" (Sa = 0.45; Ar= 1.47), "4 a.m." (Sa = 0.41; Ar= 1.35) and "yellow-bitter" (Sa = 0.2; Ar = 2.48) were cited in decreasing order of importance. In the commune of Yopougon, the "yellow-

bitter" with (Sa= 0.41; Ar = 1.35), "Siaguehi" (Sa= 0.27; Ar = 1.12) and "pepper" (Sa= 0.13; Ar = 1.78) were the most important. In the commune of Koumassi, the most consumed were "red-bitter" (Sa = 0.36; Ar = 1.18), "4 a.m." (Sa = 0.27; Ar = 1.83) and "ginger" (Sa = 0.14; Ar= 1.44). Finally in Port-Bouët, the preferred types are "red-bitter" (Sa = 0.26; Ar= 1.19), "4 a.m." (Sa = 0.25; Ar = 1.11) and "yellow-bitter" (Sa= 0.14; Ar = 1.36) (Table 4).

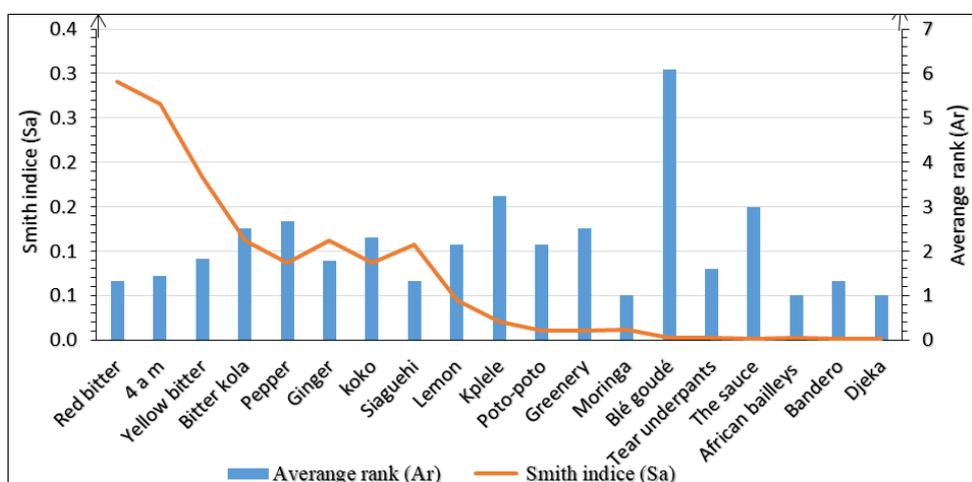


Fig 6: Importance and preference of "bitters" consumed in Abidjan

3.4. Correlation of “bitters” consumption with some consumers sociodemographic parameters

We tried to establish using AFC, correlations between the consumption preferences of bitters with social parameters of consumers such as age category, ethnic group and occupation. Regarding the correlation between age of consumers and type of preferred “bitters” three groups were distinguished (Figure

7). The first one (G1) included macerates preferred by young people (aged between 20 to 35) such as “bloody red” and “poto-poto”. The second group (G2) comprised macerates consumed by adults (aged between 36 to 55) including “4 a.m.”, “siaguehi” and “red-bitter”. The last group included macerates drunk by people over 56 years old, such as “bandero”, “koko” and “Kplele”.

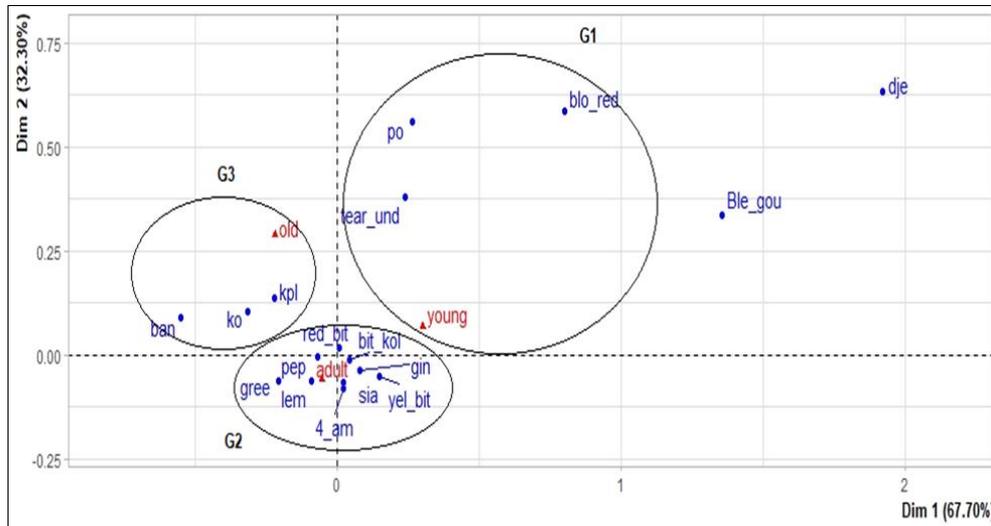


Fig 7: Distribution of bitters consumed according to age group in Abidjan

Dje: djeka, Ble_gou: Blé Goudé, blo_red: blood red, po: poto-poto, tear_und: Tear underpants, gin: ginger, bit_kol: bitter kola, red_bit: red-bitter, sia: siaguehi, lem: lemon, gree: greenery, pep: pepper, yel_bit: yellow-bitter, ko: koko, ban: bandero, kpl: kplele, Afr_bai: African baileys, the_sau: the sauce

With regard to ethnicity, the CFA does not make it possible to distinguish a clear correlation, which suggests that the choice of bitters follows a logic of individual preference. However,

regarding occupations, the CFA designed three groups of correlations. The first group (G1) indicated “bitters” preferred by civil servants, students and merchants. These “bitters” included “kplele”, “red bitter”, “yellow bitter”. The second group (G2), was made of “bitters” such as “moringa”, “tear underpants”, “siaguehi”, “koko” and “bloody red” preferred by the unemployed. The last group (G3) included macerates such as “4 a.m.”, “pepper”, “lemon”, “bandero”, “djeka” and “African pastis” requested by the workers (Figure 8).

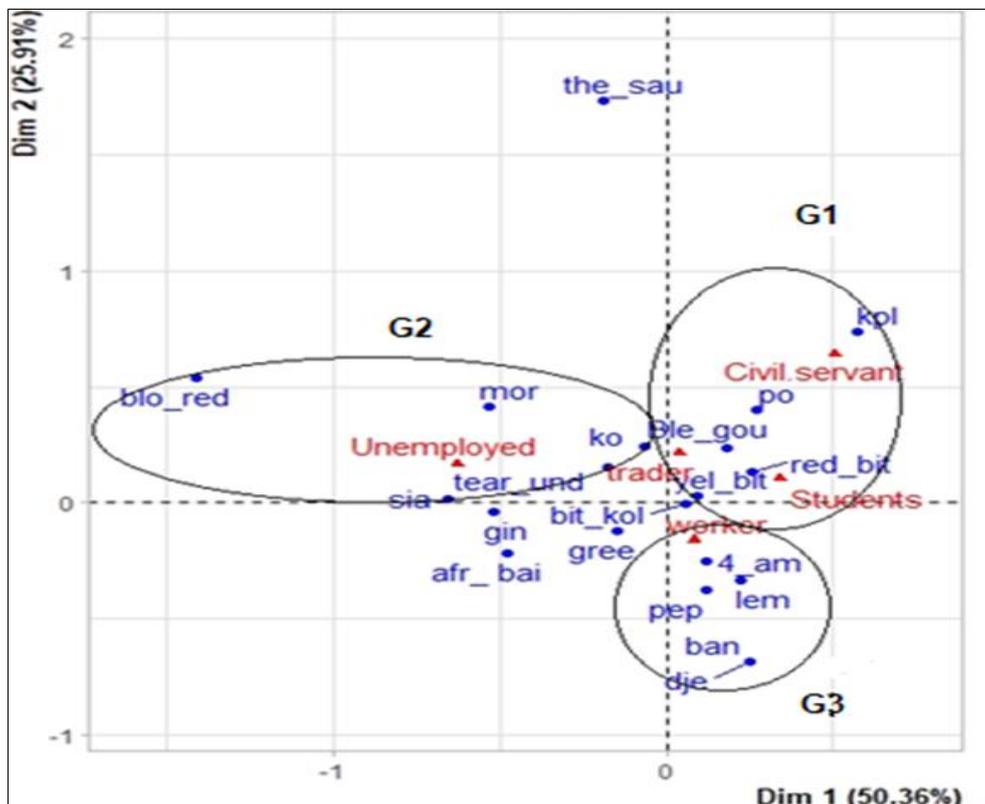


Fig 8: Correlation between of bitters consumed and occupation of respondents in Abidjan

Dje: djeka, ble_gou: blé goudé, blo_red: blood red, po: pô-tô-pô-tô, tear_und: Tear underwear, gin: ginger, bit_kol: bitter kola, red_bit: red bitter, sia: siaguehi, lem: lemon, gree: greenery, pep: pepper, yel_bit: yellow bitter, ko: koko, ban: bandero, kpl: kplele, Afr_bai: African baileys, the_sau: the sauce.

3.5 Desired effects, time and frequency of consumption

According to respondents, bitters were consumed for two reasons. However, 75.43% of the respondents drank them for

their therapeutic effects while 24.57% of them considered “bitters” as “simple drinks to pass the time” (Figure 9). Concerning the period of consumption “pitess” were preferably drunk before a meal (37.2% of respondents) or before and after a meal (35.6%). One group of respondents (27.2%) did not have a specific time to drink. As for the quantity consumed, it varies from one to more than 10 tea glasses per day from 70 ml to more than 700 ml/day approximately (Figure 10). In all bistros, the price of a glass of “bitters” is 100 XOF or around 0.15 US Dollars (15 cents).

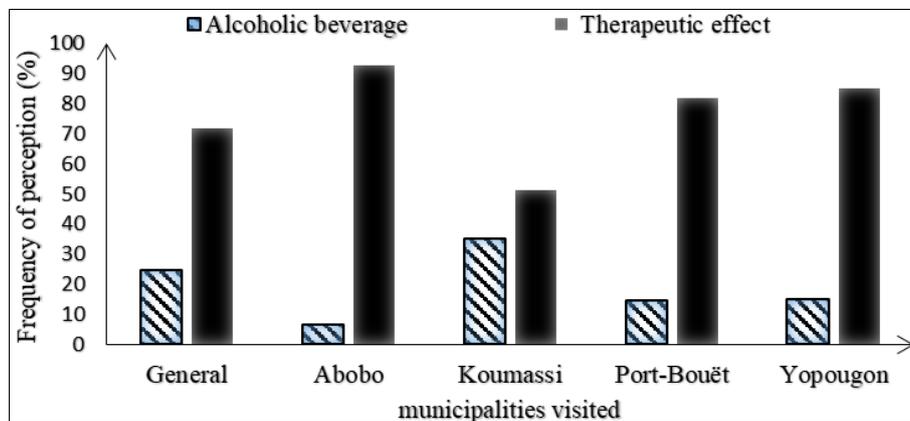


Fig 9: Perception of consumers of “bitters” in Abidjan

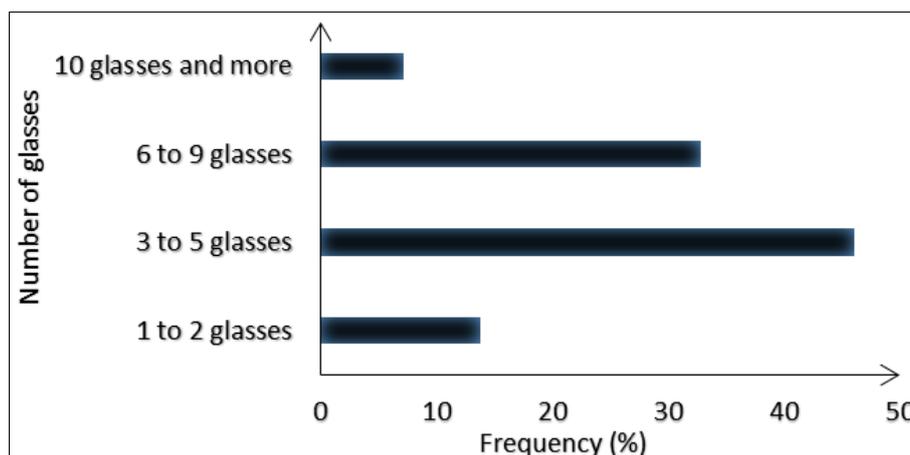


Fig 10: Frequency of consumption of “bitters” in bistros of Abidjan

3.6. Plants used for maceration

For the preparation of macerated, 54 ethnospecies were used corresponding to 57 plant species (Table 5). Indeed, *Anthocleista* (*A. djalonensis* A. Chev. and *A. nobilis* G. Don) are considered by local herbalists as a single taxon and are used thus without distinction. The same is true for the two species of *Zanthoxylum* (*Z. gillettii* (De Wild.) P.G. Waterman and *Z. zanthoxyloides* (Lam.) Zepern. & Timler) as well as

those of the *Khaya* (*K. ivorensis* A.Chev. and *K. senegalensis* (Desv.) A.Juss.) with the species *Entandrophragma angolense* (Welw.) C.DC. The 57 species (41 native and 16 exotic) were distributed into 48 genera belonging to 30 families. The most represented families were Apocynaceae (six species), Annonaceae, Meliaceae and Zingiberaceae (four species each). Of these species, 21 (38.89%) were used in all the four municipalities (Table 5).

Table 4: Importance and preference of alcoholic macerates consumed in Abidjan

Type of “bitters”	Municipality														
	Abobo			Yopougon			Koumassi			Port-Bouët			Global		
	Fq (%)	Ar	Sa	Fq (%)	Ar	Sa	Fq (%)	Ar	Sa	Fq (%)	Ar	Sa	Fq (%)	Ar	Sa
Red-bitter	50.83	1.47	0.45	12.22	1.5	0.10	38.06	1.18	0.36	27.78	1.19	0.26	32.22	1.33	0.29
4 a.m.	45	1.35	0.41	14.72	1.32	0.13	35.00	1.83	0.27	26.11	1.11	0.25	30.21	1.43	0.27
Yellow-bitter	31.94	2.47	0.20	34.44	1.09	0.33	10.83	2.92	0.06	15.56	1.36	0.14	23.19	1.83	0.18
Bitter kola	30.56	3.42	0.15	15.28	1.84	0.09	12.78	2.74	0.07	13.06	1	0.13	17.92	2.52	0.11
Pepper	20.56	3.53	0.11	17.78	1.67	0.13	13.89	3.24	0.06	4.72	1	0.05	14.24	2.67	0.09
Ginger	10.56	2.74	0.07	4.17	2.06	0.03	27.78	1.44	0.23	14.17	1.63	0.11	14.17	1.78	0.11
koko	19.17	2.97	0.11	0.28	4	0.00	20	1.92	0.17	9.44	1.74	0.07	12.22	2.31	0.09
Siaguehi	5	1.83	0.04	28.89	1.12	0.27	9.44	1.88	0.07	4.72	1	0.05	12.01	1.33	0.11
Lemon	7.22	3.69	0.04	0.28	2	0.00	15	1.38	0.14	-	-	-	5.63	2.14	0.05

<i>Kplélé</i>	7.50	3	0.05	2.22	1.37	0.02	3.33	5	0.01	-	-	-	3.26	3.23	0.02
<i>Poto-poto</i>	4.72	2.12	0.04	1.11	2.25	0.01	-	-	-	-	-	-	1.46	2.14	0.01
<i>Greenery</i>	-	-	-	0.00	-	-	1.67	6	0.00	1.67	1	0.02	1.39	2.5	0.01
<i>Moringa</i>	-	-	-	2.22	1	0.02	-	-	-	2.22	1	0.02	1.11	1	0.01
<i>Blé Goudé</i>	1.39	5	0.01	0.00	0	0	1.67	7	0.00	-	-	-	0.76	6.09	0.00
<i>Tear underpants</i>	-	-	-	1.39	1.6	0.01	-	-	-	-	-	-	0.35	1.6	0.00
<i>The sauce</i>	-	-	-	1.39	3	0.007	-	-	-	-	-	-	0.35	3	0.00
<i>African Bailleurs</i>	1.11	1	0.01	-	-	-	-	-	-	-	-	-	0.28	1	0.00
<i>Bandero</i>	-	-	-	0.83	1.33	0.01	-	-	-	-	-	-	0.21	1.33	0.00
<i>Djeka</i>	-	-	-	-	-	-	-	-	-	0.56	1	0.01	0.14	1	0.00
<i>Bloody red</i>	2.11	1.47	0.02	1.11	1	0.01	1.5	2.5	0.03	0.66	1	0.02	0.38	1.7	0.00

Note: Fq: Frequency of quotation. Ar: Average rank. Sa: Saliency

Table 5: Lists of plants listed in the bitters sold by surveyed municipality

Species	Family	Origine	Municipality			
			Abobo	Yopougon	Koumassi	Port-Bouët
<i>Aframomum exscapum</i> (Sims) Hepper	Zingiberaceae	native	1	-	-	-
<i>Aframomum melegueta</i> (Roscoe) K. Schum	Zingiberaceae	native	1	1	1	1
<i>Alchornea cordifolia</i> (Schumacher & Thonn.) Müll. Arg	Euphorbiaceae	native	1	1	-	1
<i>Allium sativum</i> L.	Alliaceae	exotic	1	1	1	1
<i>Alstonia boonei</i> De Wild	Apocynaceae	native	1	1	-	-
<i>Ananas comosus</i> (L.) Merr	Bromeliaceae	exotic	-	-	1	1
<i>Annickia polycarpa</i> (DC.) Setten & Maas ex I.M. Turner	Annonaceae	native	1	-	-	-
<i>Anthocleista</i> spp. (<i>A. djalonensis</i> , <i>A. nobilis</i>)	Gentianaceae	native	1	-	-	-
<i>Capsicum annum</i> L.	Solanaceae	exotic	1	1	-	1
<i>Carapa procera</i> DC.	Meliaceae	native	1	-	-	-
<i>Carica papaya</i> L.	Caricaceae	exotic	-	-	-	1
<i>Cassia sieberiana</i> DC.	Fabaceae	native	-	1	-	-
<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	native	1	1	1	1
<i>Citrus × aurantiifolia</i> (Christm.) Swingle	Rutaceae	exotic	1	1	1	1
<i>Citrus × sinensis</i> (L.) Osbeck	Rutaceae	exotic	1	1	1	1
<i>Cocos nucifera</i> L.	Arecaceae	exotic	1	-	-	-
<i>Cola nitida</i> (Vent.) Schott & Endl.	Malvaceae	native	1	-	-	-
<i>Combretum paniculatum</i> Vent.	Combretaceae	native	1	-	-	-
<i>Curcuma longa</i> L.	Zingiberaceae	exotic	-	1	-	-
<i>Cymbopogon citratus</i> (DC.) Stapf	Poaceae	native	1	-	-	-
<i>Cyperus esculentus</i> L.	Cyperaceae	native	1	1	1	1
<i>Entandrophragma angolense</i>	Meliaceae	native	1	1	1	1
<i>Garcinia kola</i> Heckel	Clusiaceae	native	1	1	1	1
<i>Caesalpinia bonduc</i> (L.) Roxb.	Fabaceae	native	-	-	-	1
<i>Khaya</i> spp. (<i>K. ivorensis</i> , <i>K. senegalensis</i>)	Meliaceae	native	1	1	1	1
<i>Landolphia hirsuta</i> (Hua) Pichon	Apocynaceae	native	1	-	-	-
<i>Landolphia owariensis</i> P. Beauv.	Apocynaceae	native	1	1	1	1
<i>Mangifera indica</i> L.	Anacardiaceae	exotic	-	1	-	-
<i>Mentha spicata</i> L.	Lamiaceae	exotic	-	-	-	1
<i>Mezoneuron benthamianum</i> Baill.	Fabiaceae	native	1	-	-	-
<i>Mondia whitei</i> (Hook. f.) Skeels	Apocynaceae	native	-	-	1	1
<i>Monodora myristica</i> (Gaertn.) Dunal	Annonaceae	native	1	1	1	1
<i>Morinda lucida</i> Benth.	Rubiaceae	native	1	1	-	-
<i>Moringa oleifera</i> Lam.	Moringaceae	exotic	1	1	1	1
<i>Naucllea latifolia</i> Sm.	Rubiaceae	native	1	1	1	1
<i>Olex subscorpioidea</i> Oliv.	Olacaceae	native	1	1	-	-
<i>Paullinia pinnata</i> L.	Sapindaceae	native	-	1	-	-
<i>Petroselinum crispum</i> (Mill.) Fuss.	Apiaceae	exotic	-	-	-	1
<i>Phoenix dactylifera</i> L.	Arecaceae	native	-	-	1	1
<i>Phyllanthus amarus</i> Schumacher & Thonn.	Phyllanthaceae	native	1	1	1	1
<i>Pimpinella anisum</i> L.	Apiaceae	exotic	-	1	1	-
<i>Piper guineense</i> Schumacher & Thonn.	Piperaceae	native	1	1	1	1
<i>Rauvolfia vomitoria</i> Afzel.	Apocynaceae	native	-	-	1	-
<i>Ricinodendron heudelotii</i> (Baill.) Heckel	Euphorbiaceae	native	-	1	-	-
<i>Salacia nitida</i> (Benth.) N.E.Br.	Salaciaceae	native	-	1	-	1
<i>Solanum anguivi</i> Lam.	Solanaceae	native	-	1	-	-
<i>Sorghum bicolor</i> (L.) Moench	Poaceae	native	1	1	1	1
<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry	Myrtaceae	exotic	-	-	-	1
<i>Turraea heterophylla</i> Sm.	Meliaceae	native	1	1	1	1
<i>Uvaria afzelii</i> G.F. Scott-Elliot	Annonaceae	native	1	1	1	1
<i>Xylopia aethiopica</i> (Dunal) A.Rich	Annonaceae	native	1	1	1	1
<i>Zanthoxylum</i> spp. (<i>Z. gillettii</i> , <i>Z. zanthoxyloides</i>)	Rutaceae	native	1	1	1	1
<i>Zingiber officinale</i> Roscoe	Zingiberaceae	exotic	1	1	1	1

Note: 1: plants mentioned by sellers in the municipality; -: plants not mentioned by sellers in the municipality

4. Discussion

This study was carried out in order to have a better knowledge of the sale and consumption of bitters in the city of Abidjan. These macerations were very well known in traditional medicine circles^[17]. In the Dominican Republic, for example, "mamajuana", a highly prized alcoholic macerated to treat several illnesses, is widely used^[13]. The same is true for "atikedy" in Togo^[15] and "bitters" in Ghana and Nigeria, widely sold and consumed in taverns for their therapeutic effect^[13, 32]. As also noted by^[20] it is rather the plant-alcohol combination, a therapeutic factor that attracts customers to Abidjan's taverns.

In these bistros, the trade of alcoholic macerated was largely exercised by women, which is not an isolated case.^[15] showed in Togo that the production and sale of "atikedi" were mainly practiced by women. *Tchaplo*, a beer traditionally brewed in West Africa, is almost exclusively sold by women^[33]. It is a very informal sector which nevertheless allows actors to support to their minimum needs as also noted by^[15] in Togo. Notable fact, as is often the case in the sale of traditional drinks, "bitters" are marketed in Abidjan mainly by the Baoule (31.25%) and the Anyi (20%), two linguistically very close ethnic groups belonging to the Akan group. This indeed shows that the production and marketing of certain drinks reflect the cultural identity of certain peoples, as noted by^[33]. The high proportion of Akan in the sale of "bitters" is linked to their historical origin, as we know that the still was introduced in Côte d'Ivoire from Ghana^[34]. This preponderance of Baoule and Anyi in the sale of traditional liquor, beyond the historical explanation, is above all, linked to the fact that these two ethnic groups make up nearly half (46.91%) of consumers, thus creating "family taverns" where conviviality predominates.^[35] and^[36], already mentioned that the Ghanaian Akan were heavy consumers of alcoholic beverages. Indeed, according to these authors, this ethnic group has an ancient tradition in the production and consumption of alcoholic beverages.

Contrary to the sale, the consumption of macerated is largely dominated by men. This, too, is not an isolated observation, since other authors have noted it. Examples include^[37] in Côte d'Ivoire and^[38] in Ethiopia. As noted by several other authors^[39; 40; 41] in traditional societies, women are generally excluded from the consumption of alcohol, and especially drunkenness. Moreover, the proportion of women who habitually drink alcohol is lower than that of men due to their greater susceptibility to the harmful effects of alcohol^[20].

Unsurprisingly, the Akan (60.41%) constituted the largest part of the consumers of bitters in Abidjan. The *koutoukou*, as mentioned above, was imported from neighboring Ghana, stronghold of the Akan. However, at the ethnic level, we were surprised by the fact that 30.12% of consumers were Baoulé, far ahead of the Anyi (16.79%). However, in the collective imagination in Côte d'Ivoire, the Anyi were the biggest drinkers of *koutoukou*, which has not been demonstrated in this work.

The study identified 23 types of "bitters" in all the municipalities surveyed. It is a dynamic environment. In the opinion of sellers, a composition of "bitters", often born in a bistro and depending on its perception by buyers, its marketing gradually spreads to other municipalities. Thus, we can see that the best known macerated are among the oldest. These were sold in almost all taverns. This is the case, for example, of "red-bitter", "4 a.m." and "yellow-bitter" macerations, knowledge of which is widely shared^[19]. On the other hand, we assumed that certain macerations such as

"African pastis", "bandero", "lemongrass", "turmeric", "sauce" with a low frequency of occurrence and a low salience, were of recent appearance. These drinks should see, in the years to come, their sphere of consumption expand, as it is known that therapeutic knowledge is influenced by multiple circulations and interactions between cultural groups^[42; 43], provided that their effectiveness is recognized by consumers. Indeed, the prestige of a commercial product depends of course on the satisfaction provided to the customer. Thus, the high representativeness of "red-bitter" "4 a.m." and "yellow-bitter" testifies to the therapeutic effect that they could provide to consumers. These macerates were indicated for gastric disorders, general or sexual asthenia. These three indications were also found by^[17], as the most effects sought by the Sanwi and Ndenye, two Anyi sub-groups.

Beyond these well-known macerates, we established a few preference groups linked to age category and occupation. Thus, "Bandero", "koko" and "Kplele" macerated were preferably sought after by men over 50 years old. This age category is affected by problems related to sexual dysfunctions as it is known that the prevalence of erectile disorder increases with age^[44]. Most of the plants used in the preparation of these macerates have shown aphrodisiac effects. For example, the phytochemical screening carried out on the extract of *Turraea heterophylla* used to make "Kplele" bitters, revealed the presence of phytochemicals inducing vasorelaxation leading to better blood circulation, which is at the origin of erectile potential^[45].

However, there are also aphrodisiac plants in the macerates preferred by people between 30 and 40 years old, who are moreover the most likely to frequent bistros. This age group often represents in Africa, the largest part of the population. The propensity of young people to seek more and more aphrodisiac substances could suggest a rising prevalence of erectile dysfunction in young people, as observed by^[46], even if the causes of these dysfunctions are different^[47] from those of old people. Other studies have also made this observation^[38; 20]. Moreover, above all, the possibility of consuming alcoholic beverages is linked to the financial means of the respondents^[37].

Concerning the CFA carried out on the consumption of macerates by the different ethnic groups, there was no real preference. None of the macerated was really linked to a particular ethnic group. All the macerated products listed are consumed without preference overall by the ethnic groups encountered during the surveys. This suggests that the preference for bitter is a personal choice. In addition, these macerations are often an opportunity to maintain friendships, which beyond ethnic divisions, are woven in the networks of occupation. This would explain the preference of certain occupation categories for the same macerates. For example, civil servants, learners and merchants preferred macerated "kplele", "red bitter", "yellow bitter", "koko". These macerates were supposed to treat health problems related to walking or standing (fatigue, malaria, constipation, hemorrhoids).

For the preparation of these various macerated, 57 plants were used, close to the 61 recorded in Togo by^[15], but very far from the 12 plants identified by^[19], also in Abidjan, for the same purpose. These authors obviously worked on a very small sample. The plants were chosen for their supposed medicinal virtues. Some, in fact, have been widely studied and their therapeutic properties demonstrated. For example, *Alchornea cordifolia*, used for "djeka bitters" is used

extensively in traditional medicine for curing coughs, gonorrhoea, infertility, prostatitis, bacterial infections, diarrhoea, ulcers, pain, inflammation, fever and bronchial troubles^[48]. For some, on the other hand, the scientific bases of their fame are not so obvious as that. For example, the "4 a.m." drink is made mainly with the roots of *Uvaria afzelii*. The name "4.a.m" is of course related to nocturnal erections, which according to consumers, would be a sign of good sexual health for a man. Nocturnal erection is a normal physiological phenomenon that takes place in the phase of so-called "light" sleep. Obviously, the number and duration of nocturnal and morning erections are not necessarily an indicator of good or bad sexual health^[49]. On the other hand, as noted by^[50], the presence of nocturnal erection indicates that the neurovascular axis is functionally intact and that the cause of erection dysfunctions is most likely psychogenic. However, the aphrodisiac effects of this plant have not been the subject of any serious pharmacological study, to our knowledge, even if its hepatoprotective properties has been demonstrated^[51]. In any case, the plants used are well known in the tropical world in general and in particular in West Africa for their therapeutic uses, which could justify the success of bitters.

Several studies have shown the harmful effects of the consumption of *koutoukou* on human health. For example, samples analysed by^[52] revealed that the traditional *koutoukou* produced was very acidic, contained toxic elements including heavy metals (cadmium, lead, and copper), methanol and higher alcohols. This poor quality could lead to health problems or death of consumers as confirmed by^[18] and^[53]. Following^[18], the *koutoukou* of palm wine, handcrafted, would have a more prolonged effect over time, on the memory capacities of consumers. Moreover, regular consumption of *koutoukou* has an impact on liver function and on lipid metabolism^[53].

Consumers met in bistros were, for the most part, aware of the risks associated with alcohol consumption. Nevertheless, they argue that *koutoukou* mixed with medicinal plants is harmless and is, on the contrary, beneficial to health, which justified their preference for these mixtures, as^[19] also observed. However, recent studies have drawn attention to possible adverse effects of Bitters. For example,^[54] showed that chronic consumption of several industrial alcoholic bitters in Nigeria may induce haematotoxicity. In Côte d'Ivoire,^[55] found that the long-term and high-dose consumption of the 4 a.m. bitters poses a huge risk and harmful effect that could compromise the health of consumers. However, they agreed with^[53] that the simple *koutoukou* or Bitters, like any other alcoholic beverage, may be beneficial if consumed in moderation, no more than 125 ml per day. As reported in this study, and as also observed by^[20], this limit is only respected by less than 15 percent of consumers, which means that the other 85% are surely exposed to serious health risks.

5. Conclusion

This study aimed to bring a better knowledge on the different traditional alcoholic macerates sold in the city of Abidjan through an ethno botanical survey. It showed that the sale was ensured by women while the consumers were almost exclusively men, the vast majority of whom were over 35 years old. In the various bistros, 23 types of bitters were listed, some of which, such as Red Bitter, Yellow Bitter and 4 a.m. Bitter were widely known. Contrary to popular belief, prolonged consumption could cause serious health problems. So, the results of this study could be used for a better

sensitization on the harmful effects of alcohol by the public authorities and other organizations working in this field.

6. Acknowledgements

Local inhabitants of study areas were gratefully acknowledged for sharing valuable information. We declare no competing interests. This study does not receive any specific grant from funding agencies.

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