

Ethnopharmacological study of medicinal recipes sold in three communes of Abidjan (Ivory Coast)

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Abstract: In order to identify the phytomedicines sold in the form of drinks in three communes of Abidjan (Ivory Coast), an ethnopharmacological study was carried out. It was carried out through an ethnomedicinal survey followed by an inventory of the medicinal plants mentioned. The survey made it possible to inventory 67 medicinal plant recipes used in the treatment of numerous pathologies and symptoms in the 12 sampling points chosen in the three communes of the District of Abidjan. The products were listed according to their frequency of use and the number of diseases treated. Thus, Attoté, Anti malu, La joie, Cola bitters, Franko bitters, Waraba, Aloès substrat, Awurade kassa, Royal goji are often cited with frequencies ranging from 50 to 100%. Pathologies and symptoms were also grouped into categories. The category of gastroenterological ailments is the one for which the populations solicit phytomedicines a lot. It appears that the products identified are used in the treatment of several ailments. A total of 99 ailments are treated by the 67 products identified. Haemorrhoids are the most common condition treated by phytomedicines. The number of phytomedicines used against haemorrhoids is 32, and 27 against sexual dysfunctions, 20 against low back pain and malaria. Furthermore, these results can be considered as a source of information for scientific research in the field of phytochemistry and pharmacology.

Key words: phytomedicines, herbal medicine, ethnopharmacology

1.

INTRODUCTION

Herbal medicine is practised in all countries of the world as an alternative or complementary medicine. It has been used for centuries as the one and only form of medicine, it has become the main source of active principles used in allopathy (Eto 2013). Today, the effectiveness of herbal medicine is proven and its undeniable benefits for our health have allowed natural medicine to enter our daily habits. Even the most developed countries are not left behind (Bene et al., 2016) In Africa in general,

millions of people use primarily and sometimes exclusively traditional medicine for their primary health care, because it remains the most affordable and seems to be effective. Others, however, prefer Western medicine because they associate traditional medicine with superstition. (In Côte d'Ivoire, the last few decades have been marked by the publication of various works by several authors on ethnopharmacological knowledge. These include (Anon n. d.) (N'guessan et al., 2012). Despite all these publications, the inventory of medicinal recipes of plants

involved in the treatment of numerous pathologies has not yet been the subject of such a direct study in ethnopharmacological surveys. Thus, we focused our work on the ethnopharmacological study of medicinal recipes used in three cities (Côte d'Ivoire). The main objective of the study is to list and catalog the medicinal recipes used by the population of three towns in Abidjan.

1. MATERIAL AND METHODS

2.1 Study area

This study was conducted in three of the communes of the Autonomous District of Abidjan (Plateau, Abobo and Yopougon). The District of Abidjan is located in the southern forest region of the Lagoon (**Figure 1**). It covers an area of 2119 Km² and its geographic coordinates range from 5°20'27" North latitude to 4°01'41" West longitude. The population of the District is highly diverse, cosmopolitan and composed of several peoples and ethnic groups from various parts of the country but also from

neighboring countries **RGPH (2014)**. The Autonomous District of Abidjan has ten communes, among which Abobo, Yopougon, and Plateau were selected after a pre-survey to constitute the different sites of our study. Indeed, these communes occupy an important place in the socio-economic fabric of Abidjan and Côte d'Ivoire. The commune of Yopougon, with a population of 1,071,543 inhabitants, has several neighborhoods, some of which contain a middle-class population. Located in the northern sector of the District of Abidjan, Abobo is home to a cosmopolitan population, estimated at 1,030,658 inhabitants. This population is very active in commerce as well as in the informal sector (**INS, 2014**). These communes, due to their large population size and average standard of living were selected for this work. Plateau is the business district that houses the majority of the country's major institutions. It is one of the sites selected because of its role as a business district where all kinds of medical products can be found at various prices.

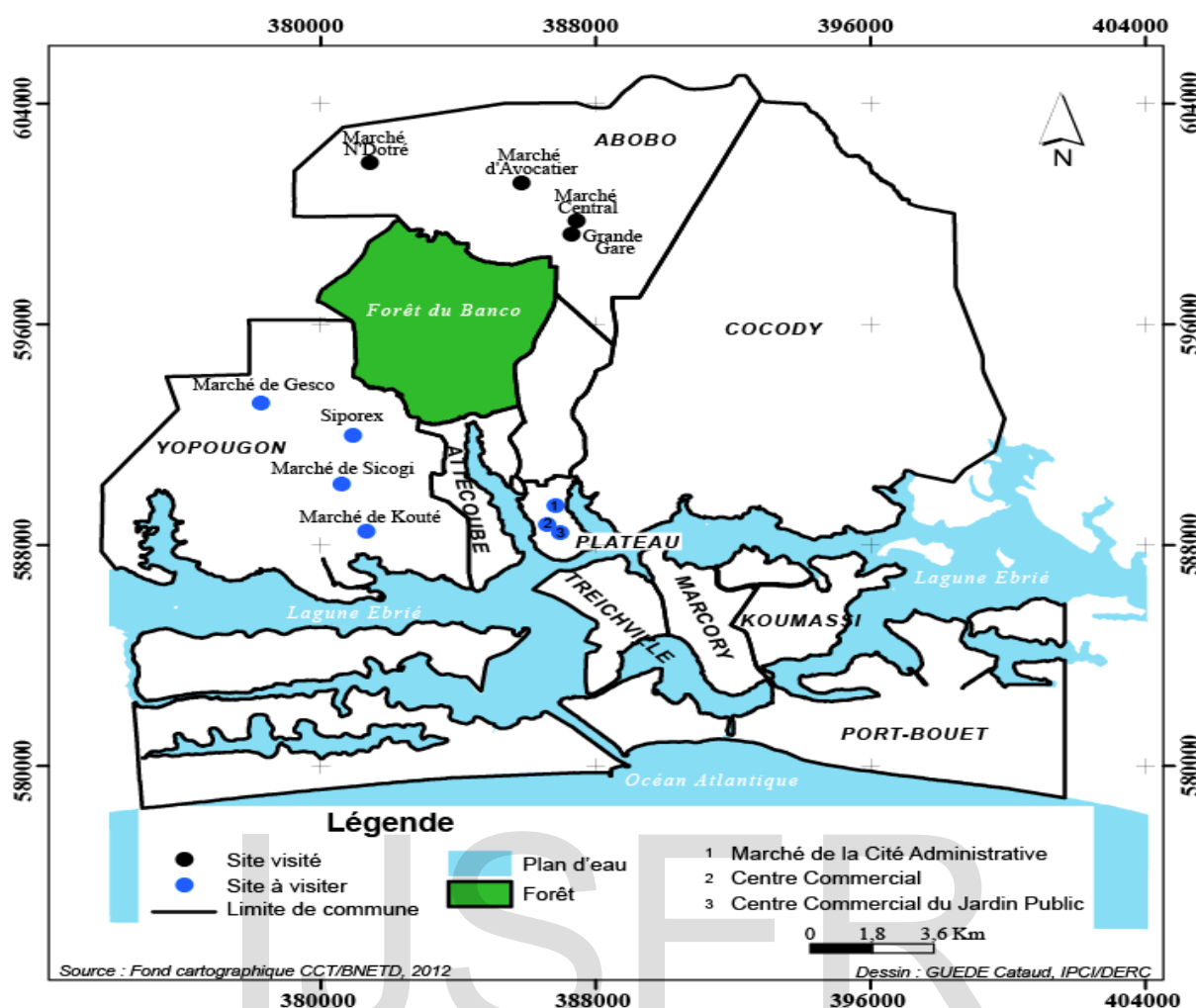


Figure 1: Map of the city of Abidjan showing the different sites visited during the ethnomedical surveys

2.2 Biological material

The biological material includes all the phytomedicines identified during the ethnomedical survey conducted in three communes of the Autonomous District of Abidjan (Yopougon, Abobo, Plateau). These medicines are essentially products sold in liquid form in warehouses and are used only orally.

2.3 Technical equipment

2.4 Ethnomedical surveys

Ethnomedical surveys based on the uses of traditional medicines used in drink form were conducted in the communes of Yopougon, Abobo and Plateau in order to inventory the various phytomedicines marketed there. The sampling unit was the drug seller (wholesaler and retailer). The sampling unit is the drug seller (wholesaler

and retailer), which includes all persons who have a link in one way or another with the knowledge and use of traditional medicines in the form of drinks. Thus, the choice of respondents was made according to the markets in the various selected communes where traditional medicines in beverage form were sold in large quantities. In Yopougon, the markets

of Siporex, Sicogi, Gesco and Kouté were selected. In Abobo, the Avocatier market, the Central market and the Grand Gare were selected. In the Plateau commune, there is the Cité Administrative market, the Centre Commercial and the Centre Commercial du Jardin Publique (**Figure 1**). All vendors of medicines in beverage form in these different localities were interviewed. In

order to understand the purpose of this study, a questionnaire was designed to collect their opinions. The focus of this questionnaire was to inventory and list the different traditional medicines that are consumed in the form of beverages that people use for their health problems

(**Figure 2**).



Figure 2 : Kiosk of phytomedicines visited in Abobo Grande Gare

3. Data processing

The data collected during this ethnomedical survey were processed as follows: the tabulation of the survey forms followed by the statistical analysis of the results. Thus, the responses to the questionnaires were tabulated, coded, entered and processed using the EXCEL 2016 spreadsheet. These data were statistically processed using XIStat version 2014 software. Different parameters were determined. These are the number of citations (NC), the frequency of citation (FC), the number of disease treated (NDT) and the Informant Consensus Factor (ICF). The Informant Consensus Factor (ICF) was calculated according to the Heinrich et al. (1998) formula as follows:

$$CFI = \frac{nur - nt}{(nur - 1)}$$

Nur: the number of disease mentions in the category and nt the total number of phytomedicines used. This is an index that is often used for medicinal uses of plants.

The CFI is calculated using the Excel 2013 spreadsheet software. This factor indicates the homogeneity of the ethno-medicinal information. It makes it possible to assess the agreements between the respondents and the condition treated in the Abidjan district. The CFI varies between 0 and 1. A value close to zero indicates disagreement on the treatment of a particular condition. In this case, individuals do not agree with the treatment of that condition.

4. Statistical analyses

Two types of statistical analyses were performed in this study. These were the Correspondence Factorial Analysis (CFA) and the Hierarchical Ascending Classification (HAC). The CFA was carried out on the information concerning the different conditions for which the populations solicit phytomedicines. The results of the

AFC are essentially in the form of graphs where the modalities are projected in a plane (axis 1 and axis 2) (Michel, 1999). The Ascending Hierarchical Classification (ACH) was carried out to identify the different classes of phytomedicines linked to the frequency of their use using the XLSTAT 2014.5.03 software (XlStat, 2014). These analyzes were carried out using the XLSTAT 2014.5.03 software (XlStat, 2014).

5. RESULTATS

The ethnomedicinal surveys identified 67 products in the form of beverages at the 12 sampling points selected in the three communes of the District of Abidjan (Figure 2 and Figure 3). Table 1 presents the phytomedicines identified with their frequency of use and the number of diseases

treated. Some products such as Attoté, Anti malu, La joie, Cola bitters, Franko bitters, Waraba, Aloès substrat, Awurade kassa, Royal goji are highly cited with frequencies ranging from 50 to 100%. Most of the phytomedicines

identified treat several pathologies with the exception of Diabégène, Pile médecine and Farana attoté which treat only one pathology. At the end of the ethnomedicinal investigations, it appears that the products identified are used in the treatment of several diseases. The 67 products identified treat a total of 99 conditions. By considering the most common conditions treated by phytomedicines, table 2 has been drawn up. This table shows that hemorrhoids are the most commonly treated condition by phytomedicines. The number of phytomedicines used against hemorrhoids is 32 and 27 against sexual dysfunctions, 20 against lumbago and malaria.

Table1: List of phytomedicines in beverage form inventoried different

N°	Nom local	NC	FC	NDT
1	Attoté	12	100,00	15
2	Anti palu	11	91,67	21
3	La joie	10	83,33	13
4	Waraba	10	83,33	5
5	Franko bitters	7	58,33	11
6	Cola bitters	7	58,33	5
7	Aloès substrat	6	50,00	6
8	Awurade kassa	6	50,00	10
9	Royal goji	6	50,00	11
10	Anti ulcère 48	5	41,67	2
11	Diabégène	5	41,67	1
12	Diwafort	5	41,67	6
13	Djue djue	5	41,67	14
14	Petit cola	5	41,67	8
15	Sandipka	5	41,67	4
16	Ulceros plus top minceur	5	41,67	8
17	Aseda herbal	4	33,33	14
18	Farana attote	4	33,33	1
19	Gnamien SA Sirop	4	33,33	10
20	Harmonie	4	33,33	9
21	Top sexuel éjaculation précoce	4	33,33	9
22	Kpandjipklèpkè	3	25,00	10

23	Le colatier	3	25,00	5
24	Monsieur	3	25,00	5
25	N'zrama	3	25,00	5
26	Palu + typhoïde	3	25,00	5
27	Prostagène forte	3	25,00	6
28	Prostagengo	3	25,00	3
29	Rhumatisme	3	25,00	10
30	Sahara	3	25,00	9
31	Sirop dietosane	3	25,00	12
32	Spécial femme	3	25,00	6
33	Super anémie	3	25,00	11
34	Super sang	3	25,00	4
35	Tiza	3	25,00	7
36	Top ulcère	3	25,00	3
37	Typo palu	3	25,00	2
38	Ulcère	3	25,00	2
39	You	3	25,00	8
40	Agengo grâce mixture	2	16,67	11
41	Akangoua koko	2	16,67	9
42	Anémie	2	16,67	3
43	Anti- rhumatisme	2	16,67	5
44	Au village	2	16,67	8
45	King	2	16,67	4
46	La paix	2	16,67	6
47	Neutra solution soignante	2	16,67	10
48	Secret de femme	2	16,67	12
49	Sirop amaigrissement	2	16,67	7
50	Sirop rhumatisme	2	16,67	7
51	Arthro forte	1	8,33	4
52	Coco laban	1	8,33	8
53	Cure dent gouro	1	8,33	5
54	Dépuratif sanguin	1	8,33	6
55	Extra sirop	1	8,33	10
56	Gnamien nayé	1	8,33	6
57	Koko	1	8,33	4
58	Koko tara	1	8,33	5
59	La joie	1	8,33	8
60	Osoro kooko	1	8,33	5
61	Pile médecine	1	8,33	1
62	Sirop	1	8,33	6
63	Sirop	1	8,33	7
64	Sirop aloès	1	8,33	2
65	Sirop dégraissant	1	8,33	11
66	Sirop des lianes	1	8,33	2
67	Ulcère plus	1	8,33	6

NC: Number of citation; FC: Frequency of citation; NDT: Number of Diseases treated

Table 2 : Types of ailments most frequently mentioned on the leaflets of the phytomedicines in beverage form surveyed

Pathologies traitées	Nombre
Hémorroïdes	32
Dysfonctions sexuelles	27

Lombalgie	20
Paludisme	20
Asthénie physique	18
Diabète	16
Fièvre typhoïde	16
Hypertension artérielle	15
Constipation	14
Impuissance sexuelle	13
Ulcère gastrique	12
Fibromes	11
Kystes ovariens	10
Ulcère	10
Anorexie	10

The classification takes into account the absence or presence of a given phytomedicine on any site visited. It is also based on the opinions of the actors surveyed. These data and observations made it possible to divide the products into five (05) groups (Figure 3 and 4). These include products that are used too much (Group 4), used a lot (Group 3), used quite

a bit (Group 1), used little (Group 5) and rarely used (Group 2).

The diseases recorded in the surveys were also grouped into 14 categories. The categories of diseases most treated by the drugs are Gastroenterological, Other diseases, Urogenital and Metabolic syndrome (Table 4).

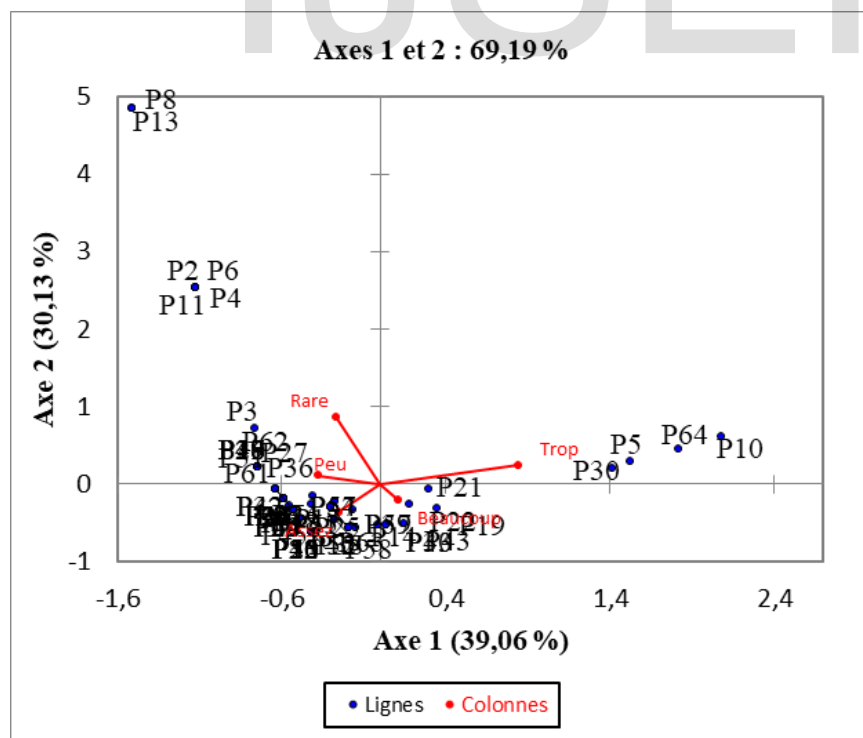


Figure 2 : Projection of products in beverage form according to frequency of use on the first two axes (1 and 2)

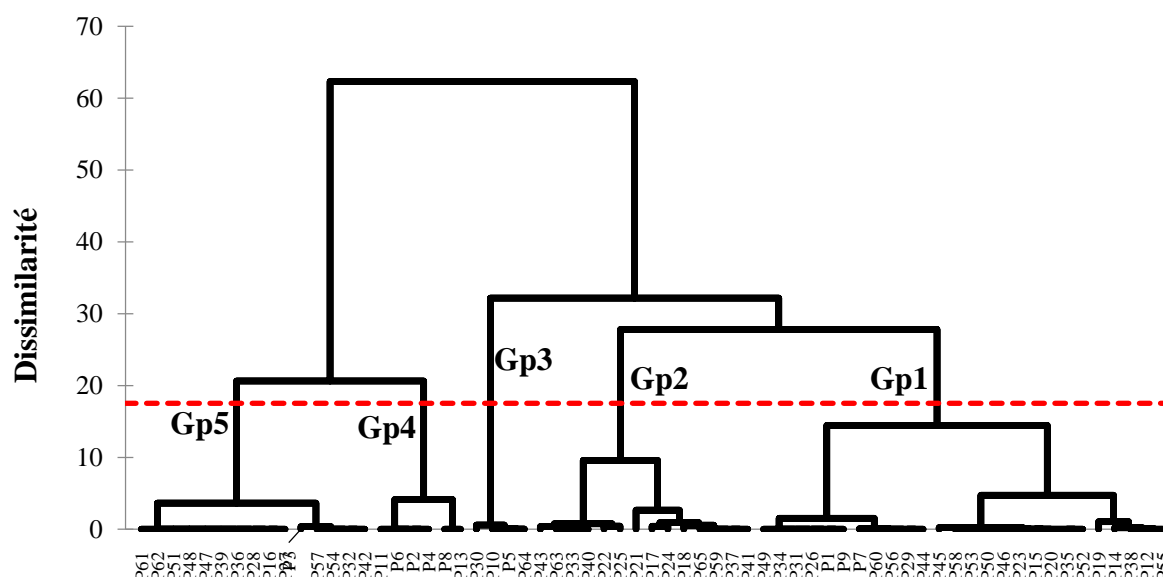


Figure 4 : Dendrogram of the different groups of phyto-medicines inventoried

Groupe 1	
Agengo grace mixture	P1
Anti ulcère 48	P7
Aseda herbal	P9
Awurade kassa	P12
cola bitters	P14
Cure dent gouro	P15
Djue djue	P19
Extra sirop	P20
Gnamien nayé	P23
King	P26
Kpandjipklèpkè	P29
La paix	P31
Neutra solution soignante	P34
N'zrama	P35
Petit cola	P38
Sahara	P44
Sandipka	P45
Secret de femme	P46
Sirop amaigrissement	P49
Sirop dégraissant	P50
Sirop dietosane	P52
Sirop rhumatisme	P53
super anémie	P55
Super sang	P56
Top sexuel éjaculation précoce	P58
Typo palu	P60

Groupe 2	
Akangoua koko	P2
Anémie	P4
Anti- rhumatisme	P6
Arthro forte	P8
Au village	P11
Coco laban	P13

Groupe 3	
Aloes substrat	P3
Depuratif sanguin	P16
Koko	P27
Koko tara	P28
Le colatier	P32
Osoro kooko	P36
Pile médecine	P39
Rhumatisme	P42
Sirop	P47
Sirop aloès	P48
Sirop des lianes	P51
Spécial femme	P54
Tiza	P57
Ulcère	P61
Ulcère plus	P62

Groupe 4	
Anti palu	P5
Attote	P10
La joie	P30
Waraba	P64

Groupe 5	
Diabégène	P17
Diwafort	P18
Farana attote	P21
Franko bitters	P22
Gnamien SA Sirop	P24
Harmonie	P25
Monsieur	P33
Palu + typhoïde	P37
Prostagène forte	P40
Prostagène	P41
Royal goji	P43
Top ulcère	P59
Ulcero plus top minceur	P63
You	P65

Table 4: Categories of ailments treated by the traditional medicines surveyed

Catégories	Diseases	Pourcentage	ICF
Osteo-articular and muscular	Lumbago, Rheumatism, Arthralgia, Muscle cramps, Back pain	5,01	0,20
Metabolic syndrome	Diabetes, High blood pressure	8,53	0,53

Respiratory	Asthma, Cough, Tuberculosis Lung cancer Respiratory disorders Lung diseases Choking	6,14	0,35
Uro-génital	Sexual dysfunctions, Sexual impotence, Prostate Hernia, Loss of white blood cells, Urinary tract infections, Vaginal infections, Urine retention	11,16	0,64
Hematological	Anemia, Blood depurative, Leukorrhea	4,29	0,07
Pediatric	Avitaminosis Malnutrition	0,35	0,00
Gastro-enterological	Hemorrhoids Gastric ulcer, Constipation Ulcer Colopathy, Belly bloating Nausea, Laxative Buzzing, Belly wound, Intestinal worms, Diarrhea Vomiting, Intestinal infections, Duodenal ulcer, Anorexia	22,44	0,82
Gyneco-obstetrics	Painful periods Early menopause Myomas Fibroids Ovarian cysts Dysmenorrhea Infertility, Male infertility	12,00	0,67
Nervous disorders	Neurological disorders, Nerve pain	0,40	0,00
Other Diseases	Flat stomach, Shrink sex, Enlarge penis, Intellectual asthenia Physical asthenia, Insomnia Hypercholesterolemia, Relieves anxiety fever, Aphrodisiac Obesity, Physical performance, Renal failure stress, Liver Cirrhosis Cancer, Liver Infection Tingling, Rejuvenating Vertigo Parasitic Infection Weight Loss, Vaginal Odor Reduces Excess Fat Antibiotic, Shrink Sex Enlarge Penis	13,43	0,70
Headache	Migraine Sinusitis, Headache	3,70	0,00
Ophthalmic	Eye pain Cataract, Itchy eyes, Blurred vision	3,58	0,00
Infectious and inflammatory	Typhoid fever Malaria, Influenza	7,58	0,40
Heart disease	Palpitation Heart infections, Heartache Chest pain Palpitation Infections cardiaques	1,07	0,00

6. Discussion

The ethnomedicinal surveys carried out among the populations of the communes of Abobo, Plateau and Yopougon made it possible to identify the various medicines sold in drink form on the markets of Abidjan. The sixty-seven (67) phytomedicines identified are generally used in the treatment and relief of numerous diseases and symptoms. The work of various authors (**Kipré et al., 2017 ; N'Guessan et al., 2009; Sylla et al., 2018**) have inventoried respectively 54, 57 and 57 species in the District of Abidjan and the Department of Agboville. We count 21, 15, 14, 5 pathologies treated respectively by Anti malu, Attoté, djue-djue, Cola bitters. This ability of a phytomedicine to treat

several diseases would be linked to the compounds present in the plants from which they were prepared. Indeed, several authors report the numerous therapeutic virtues that a plant can have thanks to the metabolites it contains (**Nga et al., 2016; Lopez et al., 2013; Kouhadé et al., 2016**)

The high frequency of use of some products such as Attoté (100%), La joie (83.33%), Anti malu (91.67%), Cola bitters (58.83%), could be explained by the fact that they are used by the populations for the treatment of some common ailments such as hemorrhoids, sexual dysfunction, malaria, physical asthenia, low back pain. Our results are in line with those of **N'guessan et al (2009) and Ouattara et al (2016)**. Indeed, these authors through their work on

medicinal plants have shown respectively that malaria and hemorrhoids are conditions that are frequently suffered by the populations.

Five groups were obtained following the classification of phytomedicines identified and sampled in the city of Abidjan. The first group is that of products used quite a lot, in which there are twenty-nine (29) products; the second group, the group of products rarely used, has six (06) products; the products used a lot, numbering fifteen (15), make up group 3; group 4 contains four (04) products used too much; and finally, group 5 contains thirteen (13) products used little. The importance of these products in this classification is based on their demand on the market by the population. Thus, groups 4, 3 and 1 are found in practically all twelve (12) sample points, showing the high demand for these products. The importance of the different products mentioned above is related to the fact that they treat several conditions. In addition, products that are rarely used were found in only a few sample points. These products are generally used in the management of certain diseases and are therefore specific to one or two diseases, which gives them the status of less used products.

In addition, the diseases were categorized according to the model used by **Amani et al. (2019)** and **Soumaïla et al. (2017)** to calculate their Degree of Consensus of Use (GCI). GSIs based on condition categories vary across categories. However, in some condition categories, the data obtained show that the populations in the study area use the same type of treatment. The condition category on which they agree the most is Gastroenterological conditions with a GSI equal to 0.82. This is followed by the "other conditions" category (0.7),

Gyneco-obstetrics (0.67), Uro-genital (0.64), Metabolic syndrome (0.53). For this study the categories for which the GSI is above average, would imply a good knowledge of phytomedicines, but also an exchange of information between users of phytomedicines. The categories of

conditions with zero GSI are: Cardiopathy, Ophthalmic, Nervous, Headache, Pediatrics would reflect a disagreement at the level of phytomedicines used in their management. For the other categories of ailments with an IFC below the average (0.5) the level of knowledge of phytomedicines would not be shared between users. Indeed, studies show that for conditions in the infectious and inflammatory categories, the products most used are analgesics and antipyretics such as paracetamol and chloroquine, which are commonly used for self-medication (**Ndol et al., 2013; Perret and Ngomo 1993**).

Conclusion

The objective of this research work was to establish a catalog of phytomedicines in the form of beverages used by the population of the city of Abidjan. Through ethnobotanical investigations, statistical analyses (CFA, CAH) and the calculation of the CFI, we were able to identify the phytomedicines sold in three communes (Plateau, Abobo, Yopougon) of the Abidjan district. In this study we counted sixty-seven (67) phytomedicines used in the treatment of numerous pathologies and symptoms. The products were divided into five (5) groups according to the frequency of their use. The most used products obtained in this work are Anti palu, Attoté, La joie and Waraba. The pathologies and symptoms were also grouped into categories. The category of Gastroenterological diseases is the one for which the populations solicit phytomedicines a lot.

The results of this work have allowed us to characterize the phytomedicines sold on certain markets in Abidjan. However, it would be important to conduct more in-depth studies in order

-to Complete ethno-medicinal investigations to obtain an exhaustive list of products sold on the Ivorian markets.

-To determine the exact chemical composition of the chemical molecules present in these traditional medicines.

-To know the effects of these products on vital organs such as the liver and kidneys.

-To associate traditional practitioners with scientific research for the promotion of traditional medicine in Côte d'Ivoire and to improve their living conditions.

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