#### CF ANOMAL ANOMAL SCRINCES

# Ethnomedicinal study of *Adansonia digitata L.* in the commune of Cotonou

Akochayé Martin Otchoumarée<sup>1</sup>, Armelle Sabine Yélignan Hounkpatin<sup>1</sup>, <sup>2\*</sup>Zinsou Franck Mignanwandé<sup>1</sup>, Wilfrid Hinnoutondji Kpètèhoto<sup>1</sup>, Hervé Bokossa<sup>1</sup>, Géraldo Houndeton<sup>1</sup>, Reine Kouaro<sup>1</sup>, Roch Christian Johnson<sup>1</sup>

<sup>1</sup> Université d'Abomey-Calavi, Centre Interfacultaire de Formation et de Recherche en Environnement pour le Développement Durable (CIFRED), Laboratoire d'Hygiène, d'Assainissement, de Toxicologie et de Santé Environnementale (HECOTES), 01 BP 1463, Cotonou, Bénin

<sup>2</sup> Université Nationale des Sciences, des Technologies, de l'Ingénierie et des Mathématiques (UNSTIM), Laboratoire de Recherches Pluridisciplinaires de l'Enseignement Technique (LARPET), BP 133 Lokossa, Bénin

\*Corresponding author. E-mail: <u>harmelle2011@gmail.com</u>; Tel: 00 (229) 97 66 28 55 Keys words: Ethnomedicinal, Adansonia digitata, Medicinal properties.

Submitted 16/12/2023, Published online on 29/02/2024 in the *Journal of Animal and Plant Sciences* (J. Anim. Plant Sci.) ISSN 2071 – 7024

#### 1 ABSTRACT

Adansonia digitata L. is well-known to Beninese population for its therapeutic and nutritional virtues. This research emphasizes the need for using of Adansonia in the cure of diseases. We asked around herbalist and phytoterapists about the etchnomedicinal in Cotonou. In many areas of Cotonou, some people frequently use the plant to treat or to cure some illnesses or diseases. Herbalists' and phytotherapists' knowledge of medicinal plants was assessed. Means of obtaining medicinal plants include purchasing, harvesting, ordering and cultivation. The main sources of supply are markets, fields, gardens, homes, forests and streets. Common medicinal plants include Adansonia digitata, Carica papaya, and Crateva adansonii. Herbalist and phytotherapist respondents share a high level of empirical knowledge, underlining the importance of these plants in local phytotherapy. Herbalist and phytotherapist respondents attributed a variety of uses to Adansonia digitata, grouped into categories such as biological, therapeutic, food, medicinal and ornamental. The therapeutic level is particularly emphasized, with A. digitata considered to be very important and used in some twenty medicinal uses to prevent or cure various common illnesses. The plant has some twenty known medicinal properties, used in medicinal preparations involving all its plant organs. Routes of administration and methods of use vary, illustrating the diversity of approaches to using this plant in local phytotherapy.

#### 2 INTRODUCTION

Throughout human history, plants have traditionally been considered as remedies for preventing or curing various diseases (Ramdane, 2018). Indeed, they contain thousands of molecules with considerable therapeutic potential (Danton, 2017). According to the literature, 80% of the world's population, including 70% of Benin's predominantly illiterate population, turns to Traditional Medicine to meet their health needs (WHO/MS-Benin, 2013). In Africa, 75% of the population rely on the plants that surround them for their health, and have no access to modern medicines. As a result, many plants are used that are just as effective as drugs imported from the West, and very often unknown to most of the population

(Dresse *et al.*, 2013). Leaves, barks, fruits and roots are successively the most commonly used organs. Some ethnopharmacological studies in Benin in recent years have reported the use of several woody plants in the treatment of malaria, haemorrhage, Buruli ulcer, oral hygiene, gynaecological diseases, human infections in general and animal infections (WAHO, 2013). The baobab is a species well known to rural African populations, who use it for therapeutic, dietary, economic and socio-cultural purposes. In rural Africa, farmers have a fairly sophisticated knowledge of the plant and use

#### 3 MATERIALS AND METHODS

3.1 Study framework: The scope of this study focuses on the commune of Cotonou, the only communal entity in the Littoral department of Benin, which extends 10 km to the west, bordered by the commune of Abomey-Calavi, and 6 km to the east, adjoining the commune of Sèmè-Podji. Bordered by the Atlantic Ocean to the south and Lake Nokoué to the north, it lies at the intersection of the 6°20 parallel north and the 2°20 meridian east. With geographic coordinates of 6.3625° latitude and 2.4255° longitude, it covers an area of 79 km<sup>2</sup>, is home to some 678,874 inhabitants and has a population density of 8,593 inhabitants per km<sup>2</sup>. Its sub-equatorial climate is characterized by two rainy and two dry seasons, with annual rainfall between 900 and 1,200 mm and average annual temperatures between 26°C and 28°C, various criteria to characterize its species (Gueye, 2012). Benineses use plants in order to heal some diseases when they are sick or ill. The leaves are used as antiasthmatics, diuretics, diaphoretics, tonics, against fever, diarrhoea and dysentery, lumbago and ophthalmia. The fibres in decoction are used against amenorrhea (Assogbadjo, 2014). Owing to the diversity of uses of *Adansonia digitata* L., this study was undertaken with the aim of contributing to the safe use of this plant and thus promoting the optimal health of the population.

accompanied by relative humidity of over 60%. Ethnomedicinal data on Adansonia digitata were collected in thirty-four markets and thirteen arrondissements in the littoral department (Cotonou commune), namely rehabilitated markets (Wologuèdè, Saint Michel, Vêdoko, Gbégamey, Aïdjèdo), non-rehabilitated markets with some identified areas (Cadjèhoun, St Louis, Adjaha, Midombo, Fifadji, Dandji, Zogbo, Sainte Rita, Gbogbanou) and markets without specific and economical activities (Tokplégbé, Haie-vive, Fifatin, Gbèdjromèdé, Vodjè-rail, Kouhounou, Kindonou, Parc triangulaire). The figure below shows the positioning of the ethnomedicinal data collection sites (markets; arrondissements) listed in this study area on the 1/1000 scale map of Cotonou<sup>ième</sup>.



**Figure 1**: Map showing the geographical location of Cotonou Commune and positioning of the markets and arrondissements where ethnomedicinal information is collected.

3.2 collection Hardware: The data equipment consists of: electronic tablet devices for administering questionnaires in the field; questionnaire supports and observation forms digitized in Google forms software specific to each target group for field data collection; digital cameras for taking field images; recording devices for recording and storing interviews. The data processing and analysis equipment consists of the following elements: Computer package for centralizing, analysing and processing ethnomedicinal data; Google forms software for collecting the ethnomedicinal data researched; Word and Excel software for processing centralized data; Epi info and SPSS software for analysing centralized and processed data.

#### 3.3 Study method

**3.3.1 Type of study**: Here, it is a descriptive and analytical study. It was carried out by means of a CAP (Knowledge; Attitudes; Practices) survey supplemented by documentary research. The semi-direct or non-standardized interview technique based on a pre-tested questionnaire was used (N'guessan *et al.*, 2009; Zerbo *et al.*, 2011; Bourobou-Bourobou, 2013). For reasons of ease and convenience, these individual

surveys were doubled with a few focus groups (Fah et al., 2013, Bla et al., 2015).

**3.3.2 Sampling technique**: The study targets two main groups: herbalists and phytotherapists within selected Cotonou markets. Sampling focuses on these specific groups within the respondent population, distinguishing between samples of markets and respondents from each target group. Thirty-four markets were selected based on the presence of herbalists or phytotherapists, regardless of category or numerical importance. The aim of this approach was to ensure broad representativeness and reliability of results.

**3.3.3** Samples: Assessment of the number of herbalists and phytotherapists during the presurvey led to a sample size of eight (08) for each secondary market, divided into six (06) herbalists and two (02) phytotherapists, respectively 75% and 25%. These proportions were maintained for the 33 secondary markets targeted out of the 39 in the Littoral department, for a total of 264 respondents. In the Dantokpa international market, the sampling coefficient was multiplied by five (05) due to its size and international character, resulting in thirty (30) herbalists and ten (10) phytotherapists. As far as respondent selection is concerned, the first herbalist or phytotherapist at the main entrance is chosen, provided they meet the age criterion (> 18 years) and are available to answer the questionnaire. If not, the process is repeated with jumps of one, two, three or four, depending on the number of targeted players in the market. This approach is designed to ensure extensive market coverage, thus preventing any contagion effect through communication between respondents. The total number of herbalist and phytotherapist respondents in the markets was 304.

**3.4 Statistical analysis of data:** The raw data from the ethnomedical surveys were processed using certain software programs that generate univariate results. The univariate

#### 4 **RESULTS**

## 4.1 Univariate analyses of herbalists and phytotherapists

**4.1.1 Empirical knowledge of medicinal plants:** This part of the work takes into account the assessment of the level of empirical knowledge of medicinal plants, the means of obtaining them and sources of supply, and the main medicinal plants commonly prescribed, especially those with antibiotic properties.

analyses were then completed by bivariate tests. The software used was:

• Word and Excel: These two programs were used to compile, process and elaborate the raw data base. The raw database was then digitized.

• Epi info 3.5.3 and IBM SPSS Statistics 19: These two statistical software packages were used to carry out univariate analyses of each variable and bivariate analyses by crossing variables within each target group. This enabled the raw results to be translated into statistical form, and any significant relationships between variables to be identified and interpreted using the "Chi 2" test. According statistical significance, it was set at p < 0.05.

**4.1.2 Empirical medicinal knowledge of** *Adansonia digitata digitate:* This section focuses on the various uses, assessment of the level of therapeutic importance and medicinal uses of *Adansonia digitata*, known pathologies indicated and medicinal properties of *Adansonia digitata*, principles of use, drug forms, routes of administration and directions for use of *Adansonia digitata*.

Variables	Terms and conditions	Numbers ( $n = 304$ )	Frequency (%)	95% CI
Assessment of the	Quite good	10	3,29	[1,80 - 5,95]
level of empirical	Fine	118	38.8 1	[33,51 - 44,40]
knowledge of PM	Low	1	0,33	[0,06 - 1,84]
	Very good	175	57,57	[51,95 - 62,99]
Total		304	100,00	

**Table 1**: Assessment of the level of empirical knowledge of medicinal plants

Variables	Terms and conditions	Eff (n = 304)	Freq (%)	95% CI
M	Purchase / Payment, Harvest, Order	291	95,72	[92,82 - 97,48]
g D g	Purchase / Payment, Harvest, Order, Cultivation /			
ans	Production	6	1,97	[0,91 - 4,24]
Me	Harvesting, Ordering, Cultivation / Production	3	0,99	[0,34 - 2,86]
qo	Purchase / Payment, Harvest	4	1,32	[0,51 - 3,33]
	Total	304	100,00	
ly hts	Markets, Fields, Gardens / Farms, Homes / Houses,			
ppl blar	Forests	197	64,80	[59,28 - 69,96]
alf	Markets, Fields, Gardens / Farms, Homes / Houses,			
cin	Forests, Streetsides	68	22,37	[18,05 - 27,38]
ces	Markets, Fields, Gardens / Farms, Forests	9	2,96	[1,57 - 5,53]
JI U L	Markets, Fields, Homes / Houses, Forests	13	4,28	[2,52 - 7,18]
for	Markets, Fields, Gardens / Farms, Homes / Houses	17	5,59	[3,52 - 8,77]
	Total	304	100,00	

Table 2: Means of production and sources of supply for medicinal plants

#### Table 3: Most commonly prescribed medicinal plants

Variables	Terms and conditions	Eff $(n = 304)$	Freq (%)	95% CI
r known	Adansonia digitata , Momordica charantia, Crateva adansonii, Ocimum gratissimum, Annona muricata, Annona senegalensis, Phyllantus amarus, Khaya senegalensis, Cassia occidentalis, Manguifera indica	60	19,74	[15,65 - 24,58]
bed oi	Carica papaya, Crateva adansonii, Ocimum gratissimum, Momordica charantia, Manguifera indica, Phyllantus amarus, Jatropha gossypiifolia	50	16,45	[12,70 - 21,03]
ts prescri	Crateva adansonii, Adansonia digitata , Momordica charantia, Ocimum gratissimum, Annona muricata, Annona senegalensis, Phyllantus amarus, Khaya senegalensis, Cassia occidentalis, Manguifera indica	54	17,76	[13,88 - 22,45]
l plant	Jatropha gossypiifolia, Adansonia digitata , Crateva adansonii, Ocimum gratissimum, Momordica charantia, Phyllantus amarus, Khaya senegalensis, Cassia occidentalis	47	15,46	[11,83 - 19,95]
medicina	Momordica charantia, Adansonia digitata , Crateva adansonii, Sarcocephalus latifolius, Ocimum gratissimum, Jatropha gossypiifolia, Phyllantus amarus, Khaya senegalensis, Cassia occidentalis, Manguifera indica	46	15,13	[11,54 - 19,59]
Main	Ocimum gratissimum, Adansonia digitata , Momordica charantia, Sarcocephalus latifolius, Annona muricata, Annona senegalensis, Moringa oléifera	47	15,46	[11,83 - 19,95]
	Total	304	100,00	

VARIABLES	TERMS AND CONDITIONS	EFF (N = $304$ )	FREQ (%)	95% CI
otic	A. digitata, Carica papaya, O. gratissimum, P. amarus, K. senegalensis	7	2,30	[1,12 - 4,68]
libid	A. digitata, C. adansonii, O. gratissimum, K. senegalensis, C. occidentalis	11	3,62	[2,03 - 6,36]
anı	A. digitata, C. adansonii, O. gratissimum, P. amarus, C. occidentalis	8	2,63	[1,34 - 5,11]
ith	A. digitata, C. adansonii, O. gratissimum, P. amarus, K. senegalensis	12	3,95	[2,27 - 6,77]
8	A. digitata, C. adansonii, O. gratissimum, P. amarus, M. indica	13	4,28	[2,52 - 7,18]
ants	A. digitata, M. charantia, C. adansonii, O. gratissimum, C. occidentalis	35	11,51	[8,40 - 15,59]
pl	A. digitata, M. charantia, C. adansonii, O. gratissimum, C. occidentalis, M. indica	15	4,93	[3,01 - 7,98]
(05)	A. digitata, M. charantia, C. adansonii, O. gratissimum, K. senegalensis	9	2,96	[1,57 - 5,53]
e (	A. digitata, M. charantia, C. adansonii, O. gratissimum, P. amarus	7	2,30	[1,12 - 4,68]
Lfr.	A. digitata, M. charantia, O. gratissimum, C. occidentalis, M. indica	15	4,93	[3,01 - 7,98]
of	A. digitata, M. charantia, O. gratissimum, K. senegalensis, C. occidentalis	9	2,96	[1,57 - 5,53]
ries	A. digitata, M. charantia, O. gratissimum, P. amarus, K. senegalensis	137	45,07	[39,6 - 50,69]
Ser	A. digitata, M. charantia, O. gratissimum, P. amarus, K. senegalensis, C. occidentalis	11	3,62	[2,03 - 6,36]
pert	A. digitata, O. gratissimum, P. amarus, K. senegalensis, C. occidentalis	8	2,63	[1,34 - 5,11]
proj	M. charantia, C. adansonii, O. gratissimum, K. senegalensis, C. occidentalis, M. indica	7	2,30	[1,12 - 4,68]
	Total	304	100	

JOLMINAL OF ANIMAL BLANT SCENCES

Table 4: Commonly prescribed medicinal plants with antibiotic properties

#### Table 5: Various known uses of Adansonia digitata

Variables	Terms and conditions	Eff	Freq	95% CI
		(n = 303)	(%)	
	Therapeutics	2	0,66	[0,18 - 2,37]
of	Therapeutic, Food	3	0,99	[0,34 - 2,87]
es	Therapeutic, Food, Organic	21	6,93	[4,58 - 10,36]
ta	Therapeutic, Food, Biological, Medicinal-magical	167	55,12	[49,49 - 60,62]
wn gita	Therapeutic, Food, Biological, Medicinal,	87	28,71	[23,91 - 34,05]
tno t di	Ornamental			
l st onic	Therapeutic, Food, Organic, Ornamental	3	0,99	[0,34 - 2,87]
iou	Therapeutic, Food, Medicinal-magical	14	4,62	[2,77 - 7,61]
Var Ad	Therapeutic, Food, Medicinal, Ornamental	6	1,98	[0,91 - 4,25]
	Total	303	100,00	

Variables	Terms and conditions	Eff	Freq (%)	95% CI
		(n = 304)		
Therapeutic	Very important	280	92,11	[88,52 - 94,64]
importance	Important	24	7,89	[5,36 - 11,48]
	Total	304	100	
igitata	Blood, blood-forming organs / Circulatory system / Respiratory system / Digestive system / Genitourinary organs / Skin, subcutaneous cellular tissue / Osteoarticular system, muscles, connective tissue / Traumatic injuries, poisoning	60	19,74	[15,65 - 24,58]
Medicinal uses of <i>Adansomia d</i>	Endocrine, nutritional, metabolic, immune / Blood, blood-forming organs / Mental disorders / Nervous system, sense organs / Circulatory system / Respiratory system / Digestive system / Genito-urinary organs	65	21,38	[17,14 - 26,33]
	Psychic disorders / Nervous system, sense organs / Endocrine, nutritional, metabolic, immune / Circulatory system / Respiratory system / Digestive system / Skin, subcutaneous cellular tissue / Osteoarticular system, muscles, connective tissue	48	15,79	[12,12 - 20,31]
	Traumatic injuries, poisoning / Pregnancy, childbirth / Skin, subcutaneous cellular tissue / Osteoarticular system, muscles, connective tissue / Congenital anomalies / Perinatal / Ill-defined symptoms, signs and disease states	31	10,20	[7,28 - 14,11]
	Extended list of medicinal uses	100	32,89	[27,86 - 38,36]
	Total	304	100	

Table 6: Assessment of the ther	apeutic importance	and various medicinal	uses of Adansonia digitata
---------------------------------	--------------------	-----------------------	----------------------------

Table 7: Common diseases or conditions indicated for use of Adansonia digitata

Variables	Terms and conditions	Eff	Freq	95% CI
		(n = 304)	(%)	
h	Asthma / Cough, Dysentery, Diuretic, Diaphoretic, Tonic / Fortifier, Fever / Febrifuge,	23	7,57	[5,09 - 11,10]
or wit a	Diarrhoea			
es ed <i>itat</i>	Diarrhoea, Lumbago / Lumbago, Ophthalmia, Tooth decay, Anorexia, Rickettsiosis, Antidote	24	7,89	[5,36 - 11,48]
eas eat dig	/ Counter poison, Wounds / Ulcers			
dis s tr <i>nia</i>	Hypertension, Malaria, Hemorrhoids, Typhoid fever, Diabetes, Asthma / Cough, Dysentery,	92	30,26	[25,37 - 35,65]
vn gie 1150	Tooth decay, Measles, Gingivitis, Dermatoses, Hepatitis			
nov olo 4 <i>da</i>	Hypertension, Malaria, Hemorrhoids, Typhoid fever, Diabetes, Cancer, u.B.	10	3,29	[1,80 - 5,95]
∠ ath K	Insomnia, Digestive disorders, Rheumatoid arthritis / Osteoarthritis / Fibromyalgia, Sexual			
b	weakness / Impotence / Erectile dysfunction	39	12,83	[9,53 - 17,06]

Otchoum	arée <i>et</i>	al., 2024
---------	----------------	-----------



Table 8: Known properties of Adansonia digitata

Variables	Terms and conditions	Eff(n = 304)	Freq (%)	95% CI
	Analgesic, Antibacterial / Antimicrobial / Antifungal, Antioxidant, Antiinfectious,	38	12,50	[9,24 - 16,69]
nia	Antianemic, Antihypertensive			
osun	Antibacterial / Antimicrobial / Antifungal, Anti-inflammatory, Antioxidant, Vitamin,	45	14,80	[11,25 - 19,23]
4dc	Astringent / Antiseptic / Wound healing			
of	Antibacterial / Antimicrobial / Antifungal, Antiviral / Mucolytic, Anti-inflammatory,	68	22,37	[18,05 - 27,38]
ies	Antioxidant			
erti.	Anti-inflammatory, Antibacterial / Antimicrobial / Antifungal, Antiviral / Mucolytic, Anti-	34	11,18	[8,11 - 15,22]
tate	hypertensive, Anti-carcinogenic			
l pı diği	Antioxidant, Anti-inflammatory, Vitamin, Immunostimulant, Anti-infectious, Analgesic,	39	12,83	[9,53 - 17,06]
ina	Antianemic, Antihypertensive			
dic	Antiviral / Mucolytic, Anti-inflammatory, Antioxidant, Anti-infectious, Analgesic,	30	9,87	[7,00 - 13,74]
ue M	Antianemic, Purgative / Organ protector			
u n	Purgative / Organ protector, Antibacterial / Antimicrobial / Antifungal, Antioxidant, Anti-	24	7,89	[5,36 - 11,48]
NOT	infective, Galactogenic / Galactogogue			
Ϋ́	Vitamin, Anti-inflammatory, Antioxidant, Astringent / Antiseptic / Healing, Anti-	26	8,55	[5,90 - 12,24]
	infectious, Galactogenic / Galactogogue			
	Total	304	100,00	

#### Otchoumarée et al., 2024

Variables	Terms and conditions	Eff	Freq (%)	95% CI
		(n = 304)	1 \ /	
ans	Trunk bark, Root bark, Stem, Leaves, Roots, Fruit shells	57	18,75	[14,76 - 23,52]
Jrga	Red fibre, Fruit pulp, Stem, Leaves, Roots, Trunk bark, Root			
U	bark	51	16,78	[13,00 - 21,39]
g pt	Stem, Leaves, Fruits, Roots, Trunk bark	119	39,14	[33,83 - 44,73]
Pla use	All plant organs	77	25,33	[20,77 - 30,50]
	Total	304	100	
	Decoction, Infusion, Maceration, Extraction, Trituration /			
	Kneading / Kneading / Softening	106	34,87	[29,73 - 40,38]
spc	Powder, Decoction, Infusion, Maceration, Trituration /			
the	Kneading / Kneading / Softening, Compress / Cataplasm	40	13,16	[9,81 - 17,42]
inte	Mother tinctures, Lotion, Powder, Infusion, Decoction,			
Diff on	Maceration, Trituration / Kneading / Kneading / Softening,	45	14,80	[11,25 - 19,23]
rati.	Medicinal wines			
pat	Medicinal wines, Sauce, Decoction, Infusion, Maceration,			
pre	Trituration / Kneading / Kneading / Softening	60	19,74	[15,65 - 24,58]
	All preparation methods	53	17,43	[13,58 22,10]
Total		304	100	

Table 9:	Principles	of use	of Adanso	nia	digitata
----------	------------	--------	-----------	-----	----------

#### Table 10: Different drug forms, routes of administration

Variables	Terms and conditions	Eff	Freq (%)	95% CI
		(n = 304)		
lin	Essential oil, Macerated, Decocted, Capsules / Lozenges	9	2,96	[1,57 - 5,53]
itec	Ointment, Essential oil, Decoctate, Macerated,	10	3,29	[1,80 - 5,95]
lica	Decoctate, Essential oil, Powder, Macerated,	22	7,24	[4,83 - 10,7]
IDC.	Essential oil, Powder, Macerated, Decocted, Capsules /	8	2,63	[1,34 - 5,11]
ms	Lozenges			
for es	Essential oil, Powder, Macerate, Decoctate, Ointment	77	25,33	[20,8 - 30,5]
ug	Decoctate, Ointment, Capsule / Lozenge, Essential oil,	33	10,86	[7,8 - 14,85]
$D_{r}$	Powder, Macerated			_

Otchoumarée <i>et</i>	al., 2024 Journal of Animal & Plant Sciences (J.Anim.Plant Sci. Vol.59(2) : 10873 -10886 <u>https://doi.org/10.35759</u> ,	ISSN 2 /JAnmF	2071-7024) PISci.v59-2.3	A CONTRACTOR	
	Essential oil, Powder, Macerated, Ointment	19		6,25	[4,04 - 9,55]
	Powder, Macerated, Decocted	28		9,21	[6,5 - 12,99]
	Powder, Macerated, Decocted, Ointment	76		25,00	[20,5 -30,2]
	Powder, Macerated, Decocted, Ointment, Capsules / Lozenges	22		7,24	[4,8 - 10,71]
Total	0	304		100	
of	Buccal, Cutaneous, Respiratory / Nasal, Rectal, Anal	150		49,34	[43,8 - 54,9]
es	Buccal, Respiratory / Nasal, Rectal, Anal	22		7,24	[4,8 - 10,71]
out	Buccal, Cutaneous, Respiratory/Nasal	18		5,92	[3,78 - 9,16]
atic	Buccal, Cutaneous, Rectal, Anal	32		10,53	[7,6 - 14,48]
ent istr	Buccal, Cutaneous, Respiratory/Nasal, Rectal	15		4,93	[3,01 - 7,98]
ffer nin	Buccal, Cutaneous, Respiratory/Nasal, Rectal	57		18,75	[14,8 - 23,5]
Dif	Buccal, Cutaneous, Rectal	10		3,29	[1,8 - 5,95]
Total		304		100	
Table 11: Type	es of use				
Variables	Terms and conditions		Eff (n = 304)	Freq (%)	95% CI
ferent f use	Oral, Body bath		208	68,42	[62,99 - 73,39]
	Massage, Mouthwash, Oral Gargle, Body Bath		46	15,13	[11,54 - 19,59]
	Body bath, Oral, Instillation, Inhalation, Massage, Mouth	wash,	-		
Did s o	Gargle		30	9,87	[7,00 - 13,74]
qe	Oral, Body bath, Instillation, Compress / poultice, Fumig	ation			
mc	/ inhalation, Massage, Mouthwash, Gargle		20	6,58	[4,30 - 9,94]
Total			304	100	

**4.1.3** Prescription and evaluation of dosing principles and *Adansonia digitata:* This section considers the definition of dosage and posology, the definition of means of measuring

raw materials and preparations, and the undesirable effects resulting from the use of *Adansonia digitata*.

Variables	Terms and conditions	Eff	Frea	95% CI
v arrables	Terms and conditions	(n = 304)	(%)	<i>70</i> /0 OI
Indication / definition	Defines	298	98,03	[95,76 - 99,09]
dosage	Not defined	6	1,97	[0,91 - 4,24]
	Total	304	100	
Number of doses per	One (01)	7	2,30	[1,12 - 4,68]
day indicated in the	e Two (02)	90	29,61	[24,75 - 34,97]
dosages	Three (03)	203	66,78	[61,30 - 71,83]
	Not defined	4	1,32	[0,51 - 3,33]
Total		304	100	
Periods of intake M	lorning	1	0,33	[0,06 - 1,84]
indicated in dosages M	Iorning, Mid-day	3	0,99	[0,34 - 2,86]
Ν	Iorning, Mid-day, Evening	206	67,76	[62,32 - 72,77]
А	ll day long	2	0,66	[0,18 - 2,37]
N	Iorning, Evening	92	30,26	[25,37 - 35,65]
Total		304	100,00	
Definition D	Defines	293	96,38	[93,64 - 97,97]
treatment duration U	Intil satisfied	10	3,29	[1,80 - 5,95]
in dosages N	lot defined	1	0,33	[0,06 - 1,84]
Total		304	100,00	

|--|

**Table 13**: Definition of measurement methods for raw materials and preparations

Variables	Terms and conditions	Eff	Freq	95% CI
		(n = 304)	$(^{0}/_{0})$	
rial uts	Weight measurement, Leaf counting,	100	32,89	[27,86 - 38,36]
ur	Handshake, Containers			
jt B	Weight measurement, Leaf counting,	95	31,25	[26,30 - 36,67]
ner	Handshake			
n)	Weight measurement, Handshake,	106	34,87	[29,73 - 40,38]
w asu rga:	Containers			
Rav Me: (O1	Weight measurement, Handshake	3	0,99	[0,34 - 2,86]
	Total	304	100	
reparation asurement ts	Drinking bowls, Large glasses (Bamboo),	63	20,72	[16,55 - 25,63]
	Small glasses, Spoons			
	Spoons, Small glasses, Large glasses	60	19,74	[15,65 - 24,58]
	(Bamboo), Drinking bowls, Jars (liter),			
Ime	Containers			

#### Otchoumarée et al., 2024 Journal of Animal & Plant Sciences (J.Anim.Plant Sci. ISSN 2071-7024) Vol.59(2) : 10873 -10886 <u>https://doi.org/10.35759/JAnmPlSci.v59-2.3</u>

Dropper, Caps / Stoppers, Spoons, Small glasses, Large glasses (Bamboo), Drinking	112	36,84	[31,62 - 42,40]
bowls, Jars (liter), Containers Large glasses (Bamboo), Small glasses, Spoons, Caps / Stoppers, Bottle to Bottle	69	<b>22,</b> 70	[18,35 - 27,73]
Total	304	100	

**Table 14:** Adverse reactions associated with the use of Adansonia digitata

Variables	Terms and conditions	Eff(n = 304)	Freq (%)	95% CI
Undesirable	Yes	302	99,34	[97,63 - 99,82]
effects	No	2	0,66	[0,18 - 2,37]
Total		304	100	
SUC	Gastric reflux, Nausea, Hypnotic /	188	61,84	[56,27 - 67,
d ctic	Sleep aid	_		
Adverse read	Nausea, Heartburn, Hypnotic /	31	10,20	[7,28 - 14,11]
	Sleep aid	_		
	Heartburn, Dyspepsia, Hypnotic /	30	9,87	[7,00 - 13,74]
	Sleep aid			
	Itching, Nausea, Dyspepsia	28	9,21	[6,45 - 12,99]
	Stomach upset, Dyspepsia, Nausea	25	8,22	[5,63 - 11,86]
	No effect	2	0,66	[0,18 - 2,37]
Total		304	100	

### 5 DISCUSSION

Adansonia digitata herbalists and phytotherapists demonstrate high empirical knowledge, with a cumulative score of 99.68%. Means of obtaining medicinal plants include buying, harvesting, ordering and growing, with a dominant modal series of "buy or pay; harvest; order". Sources of supply include markets, fields, gardens/farms, homes/houses, forests and streetsides, with a modal combination of "Markets, Fields, Gardens/Farms, Homes/Houses, and Forests". Top medicinal plants include Adansonia digitata, Carica papaya, Cassia occidentalis, and others, with statistical percentages ranging from 15.13% to 35.82%. The top five medicinal plants with proven antibiotic properties are "Adansonia digitata, Momordica charantia, Ocimum gratissimum, Phyllantus amarus, Khaya senegalensis", with percentages ranging from 2.30% to 50.75%. Respondents mentioned various uses of Adansonia classified different digitata, in categories (Organic, Therapeutic, Food, Medicinal, Ornamental), with frequencies

ranging from 0.66% to 55.12% among herbalists and phytotherapists. The modal class includes the Therapeutic, Alimentary, Biological, Medico-Magical categories for both groups. Therapeutically, A. digitata is considered "very important" and "important", used in some twenty medicinal uses with frequencies ranging from 10.20% to 32.89%. It is used to prevent or cure dozens of common illnesses, with frequency ranges from 3.29% to 30.26%. According to herbalists and phytotherapists, Adansonia digitata has some twenty known medicinal properties, divided into frequency series ranging from 7.89% to 22.37%. Medicinal preparations use all A. digitata plant organs, with frequencies ranging from 16.78% to 39.14%. This translates into a diversity of preparation methods and dosage forms, with frequency combinations ranging from 2.63% to 52.24%. Routes of administration (Buccal, Cutaneous, Respiratory/Nasal, Rectal, and Anal) are mentioned with frequencies ranging from 3.29%

to 49.34% by herbalists and phytotherapists. Various methods of use are mentioned, with frequencies ranging from 6.58% to 68.42% by these two target groups. Some ethnopharmacological studies in Benin in recent years have reported the use of several woody plants in the treatment of malaria, haemorrhage, Buruli ulcer, oral hygiene, gynaecological diseases, human infections in general and animal infections (WAHO, 2013). The baobab is a species well known to rural African populations, who use it for therapeutic, dietary, economic and socio-cultural purposes. In rural Africa, farmers

#### 6 CONCLUSION

Benin's flora boasts a wealth of medicinal plants used by the local population for the prevention and treatment of various pathologies. The results of this ethnomedicinal study revealed that *Adansonia digitata is* a well-known and widelyused plant. Although knowledge of its use exists in many regions, the variations observed in its use by different communities are not significantly divergent. On the whole the results show that the female respondents are majority. Practitioners show an appreciable mastery of non-conventional medicines, in particular in-

#### 7 **REFERENCES**

- Akpo L.-É. & Grouzis M., 2004. Interactions arbre/herbe en bioclimat semi-aride : influence de la pâture. Sécheresse, 15(3), 253-261.
- Assogbadjo A.E. et al, 2006. Connaissances autochtones des populations rurales et importance du baobab (*Adansonia digitata* L.) au Bénin. In : Proceedings of the 4th International Congress of Ethnobotany (ICEB 2005), Ethnobotany : at the junction of the continents and the disciplines, 21-26 August 2005, Istanbul, Turkey, 39-47.
- Assogbadjo A.E. et al. 2011. Ethnic differences in use value and use patterns of the threatened multipurpose scrambling shrub (Caesalpinia bonduc L.) in Benin (Différences ethniques dans la valeur d'usage et les modes d'utilisation de

have a fairly sophisticated knowledge of the plant and use various criteria to characterize its species (Gueye, 2012). In Benin, the plant is commonly used to treat a wide range of illnesses. The leaves are used as antiasthmatics, diuretics, diaphoretics, tonics, against fever, diarrhoea and dysentery, lumbago and ophthalmia. The fibres in decoction are used against amenorrhea (Assogbadjo, 2014). Because of the variety of uses of *Adansonia digitata* L., this study was undertaken with the aim of contributing to the safe use of this plant and thus promoting the optimal health of the population.

depth knowledge of medicinal plants with antibiotic properties, with *A. digitata* in particular. Herbalists show significant convergence in their pharmacological use of *A. digitata*, particularly in prescribing prophylactic measures and defining dosage. The lack of correlation between certain variables suggests the absence of significant links, while providing plausible and exploitable results. These results constitute a valuable ethnomedicinal repertoire for *A. digitata*.

> l'arbuste brouilleur à usages multiples menacé) au Bénin. J. Med. Plants Res., 5(9), 1549-1557.

- Assogbadjo AE. (2014) Stratégie Nationale et plan d'actions de valorisation des Produits Forestiers Non Ligneux (PFNL) prioritaires du Bénin : cas des fruitiers sauvages. 24-35 p.
- Boudjouref M. Etude de l'activité antioxydante et antimicrobienne d'extraits d'Artemisia campestris L. 2018
- Danton O. (2017). Extraction of natural analgesic substances from plants used in traditional pharmacopoeia in Mali. Doctoral thesis, specialty Organic Chemistry. University Clermont Auvergne. 255 pp.
- De Albuquerque U.P., Andrade L.H.C. & de Silva A.C.O., 2005. Use of plant

resources in a seasonal dry forest (Northeastern Brazil). Acta Bot. Brasilica, 19(1), 27-38.

- De Caluwé E. *et al.*, 2009. Ethnic differences in use value and use patterns of baobab (*Adansonia digitata* L.) in northern Benin. Afr. J. Ecol. 47(3), 433-440.
- Diarrassouba D., Aka S., Ouattara K., Bagré I., Zinzindorf N., Die K. (2020).Evaluation of the phytochemical composition and antimicrobial properties of two aromatic plants used in the production of sweet must and tchapalo, two artisanal beverages from Côte d'Ivoire. Int J Biol Chem Sci 2020 ;14:3215-30.
- Djelloul R, Mokrani K, Hacini N. Study of the antibacterial activity of the extract from the essential oil of Eucalyptus globulus and Rosmarinus officinalis on three bacterial strains. Int J Appl Env Sci 2017 ; 12 :47-56.
- Djeussi DE, Sandjo LP, Noumedem JAK, Omosa LK, T. Ngadjui B, Kuete V. Antibacterial activities of the methanol extracts and compounds from Erythrina sigmoidea against Gram-negative multidrug resistant phenotypes. BMC Complement Altern Med 2015 ;15 :453. <u>https://doi.org/10.1186/s12906-015-0978-8</u>.
- Dresse A., De Baeremaeker D. (2013). Amawato the health market in voodoo land. CTB, Brussels, 2013.
- Gueye M. (2012). Contribution à l'étude ethnobotanique chez les Malinké de la communauté rurale de Tomboronkoto (région de Kédougou) et valorisation des collections historiques de l'Herbier de l'Institut fondamental d'Afrique noire Cheikh Anta Diop (IFAN Ch. A. Diop) / UCAD. [Dakar Senegal]: UCAD; 2012.
- Krishnappa K., Elumalai K., Dhanasekaran S. & Gokulakrishnan J., 2012. Larvicidal and repellent properties of *Adansonia digitata* against medically important human malarial vector mosquito Anopheles

stephensi (Diptera: Culicidae). J. Vector Borne Dis. 49, 86-90.

- WAHO (2013). The pharmacopoeia of West African medicinal plants. 2013.
- Rabi'u T. & Rabi'u M., 2013. An assessment of multi-purpose use of *Adansonia digitata* (baobab tree) for sustainable development in the semi urban fringes of Dutsinma Katsina State Nigeria. Acad. Res. Int. 4(1), 486-494.
- Ramdane F. (2018). Contribution to the study of the biological activities of some medicinal plants from the Algerian Sahara: Nauplius graveolens, Ziziphus lotus and Capparis spinosa. Doctoral thesis in biology. Université Kasdi Merbah-Ouargla. 162 pages.
- WHO/MS-Bénin (2013). Strengthening the role of traditional medicine in the health system in Benin. 47 pages.